Washington County, Pennsylvania

Request for Proposals
for
Project 25 Public Safety Radio System

CONTRACT # 062524-RADIO RFP

Issued: June 8th 2024

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1. PROJECT OVERVIEW

1.1. INTRODUCTION

Washington County, Pennsylvania, (County) invites proposals from qualified vendors for the provisioning of an Association of Public-Safety Communications Officials (APCO) International Project 25 (P25) radio communications system to support mission-critical public safety communications within the county. The proposed communications system shall provide enhanced, two-way land mobile radio (LMR) communications capabilities to all public safety users. In addition to the primary proposal for a County-owned 800 megahertz (MHz) P25 Phase 2 simulcast trunked system, the County will consider alternate proposals. All equipment and services that would be purchased by the County for the alternate system options shall follow the requirements and specifications outlined in this document as applicable. The County will consider proposals for the following three additional alternate system options:

- Joining the Inter-County Regional Radio System (ICORRS)
- Allegheny County–Washington County Trunked Radio System Partnership
- Joining the Pennsylvania Statewide Radio Network (PA-STARNet)

A. A new County-owned 8-channel P25 Phase 2 trunked simulcast system (backward compatible for Phase 1 operation) to replace the County's existing legacy radio system. The new system's design shall enhance the level of coverage/signal strength so that a portable radio will work reliably outdoors.

1. The number of channels specified above is for a single cell simulcast system. If the proposed design consists of more than one simulcast cell or additional sites, the number of channels will need to be determined by the Proposer and the methodology to arrive at the proposed number of channels fully described.
2. The County requires outdoor border-to-border coverage throughout the entire county. Radio configurations shall assume a portable radio carried on the user's belt, with a radio-mounted antenna and a wired speaker/microphone.
3. The County currently uses a mix of County, local municipality, and leased sites to provide radio communications to first responders. County equipment is analog. All operate on very high frequency (VHF). Each site consists of different repeater stations and an antenna system.

B. New VHF tone and voice paging systems.

1. A new Countywide VHF analog single channel simulcast paging system utilizing the P25 infrastructure. The new paging system shall be compatible with the existing VHF pagers. The Proposer shall indicate the coverage guarantee for the pager outdoors and inside 12

decibel (dB) buildings. Pager configurations shall assume a Minitor VI pager carried on the user's belt.

C. New multiprotocol label switching (MPLS) ring microwave network to provide backhaul for the new radio system repeater sites and both the primary and backup 911 dispatch centers. The new MPLS ring microwave network may need to be installed earlier and may require T1 backhaul, depending on the transition cutover plan for the 911 centers. The County's preference would be to implement a separate new system, leaving the existing system intact until after cutover.

1. The new microwave will need to support the transport of the new VHF paging system.

D. The County maintains 15 radio dispatch consoles at the County's 911 center and eight radio dispatch positions at the backup center. The system is licensed for 30 total positions. The County prefers to maintain this system and fully integrate it into the new radio system.

1. The County is a voting member of Region 13, which oversees its Emergency Services Internet Protocol (IP) network (ESInet). There is an existing ESInet fiber connection between the two public safety answering points (PSAPs) that is available for the new P25 system interconnection. The connections would also be available to other regional PSAPs.
2. The existing consoles support up to 40 four-wire voice channels.
3. The current consoles and control stations are recorded by Eventide using Real-time Transport Protocol (RTP).

E. Mobile and portable subscriber radios for the county's first responders. The approximate number of radios expected on the system is 2,238 portables, mobiles, and control stations.

F. Frequency planning to include an analysis of current 800 MHz public safety frequency reuse and the selection and distribution of available frequencies. The plan shall be licensable and allow for antenna types that maximize system coverage performance and minimize the potential limitations of directional antennas unless directing coverage to remove gaps.

G. Frequency planning to include an analysis of current VHF frequencies suitable for a countywide paging channel. The plan shall be licensable and allow for antenna types that maximize system coverage performance and minimize the potential limitations of directional antennas unless directing coverage to remove gaps.

H. Civil work to support upgrades to new and existing radio sites and tower upgrades to support the communications subsystems.

1. The County anticipates the use of existing system sites and other existing towers that may provide free or minimum lease costs to the County. The use of greenfield sites should be a last resort.
2. Regarding additional or alternate tower sites proposed to meet a coverage guarantee, the Proposer's submittal must include letters of commitment from those site and tower owners indicating the availability of tower space to accommodate the proposed facilities and antennas. Such letters must indicate a commitment to enter negotiations with the County for tower space or construction on greenfield sites. Anticipated tower and antenna height requirements should be noted in the letters.
3. The County anticipates reuse of existing generators, transfer switches, and uninterruptible power supplies (UPSs) for all sites, provided the Proposer certifies their suitably for the new system.
4. Civil work to support new sites, not currently used by the County, shall be provided as a separate proposal. Depending on the site development work that is proposed, the County reserves the right to use existing County resources and contracts to accomplish some or all the associated tasks.
    a. The county has seven 220-foot towers on the ground ready for installation.

I. While the County anticipates receiving turnkey proposals from radio vendors, it also will accept separate proposals from other vendors for the subscriber equipment (Section 9).

    1. Additional direction and assumption details can be found in those sections to assist vendors that may wish to provide a limited proposal.

J. Proposed systems and subsystems shall include project management and engineering, hardware and software installation, software programming, software and hardware licenses, training, acceptance testing, coverage testing, cutover plan, decommissioning, and warranty and maintenance.

K. Proposed systems and subsystems shall be complete, highly redundant, and fully functional, with guaranteed coverage, capacity, and reliability.

L. All equipment shall be provided in new condition and be covered by a full factory and/or manufacturer's warranty of not less than one year beginning at the time of system acceptance.

In addition to the above, Proposers should address in their responses system installation and commissioning, and ongoing maintenance support to ensure a state-of-the-art system.

The proposed system will be owned by the County.

1.2. CURRENT SYSTEM OVERVIEW

1.2.1. Current Radio System

The County currently operates and maintains a 20-site VHF radio system serving law enforcement, fire, emergency medical services (EMS), and other public safety users throughout the county. Dispatch operations for the county are configured to support three primary geographical zones for law enforcement and three for fire communications.

A. EMS Channel

1. The EMS agencies in the county operate on a 12-site, manual transmitter steering, conventional analog VHF system. The system uses a single frequency as a simplex operation. The 12 sites used by the current system are as follows:

Scenery Hill	Claysville	McMurray	McDonald
Mount Wheeler	Smith Township	California	Mingo
Washington Park	North Strabane	Donora	Cross Creek

B. Fire Channel

1. The Fire channel uses an automatic transmitter steering repeater system with separate two-frequency analog VHF channels in each of the three fire zones. The 16 sites used by the current system are as follows:

Scenery Hill	Cross Creek	Donora	McDonald
Mount Wheeler	East Finley	Charleroi	West Finley
Washington Park	Smith Township	California	Allenport
Claysville	North Strabane	East Bethlehem	Mingo

C. Law Channel

1. The Law channel, like the Fire channel, uses an automatic transmitter steering repeater system with separate two-frequency analog VHF channels in each of the three law enforcement zones. The 16 sites used by the current system are as follows:

Scenery Hill	North Strabane	Donora	Charleroi
Mount Wheeler	Cross Creek	California	Allenport
Washington Park	West Finley	East Beth	East Finley
Claysville	Mount Pleasant	McDonald	Mingo

In Washington County, there are approximately 2,238 mobile and portable radios affiliated with the main dispatch channels; of this total, 617 are mobile radios, 1,481 are portable radios, and 140 are desksets or radio frequency (RF) control stations.

1.2.2. Current Sites

A system map showing the location of the current sites used by the existing systems is included at the end of Appendix A-1. Additional information regarding the sites can be found in Appendices A-1 and A-2.

1.2.3. Frequencies

The frequencies operated by and licensed to Washington County are shown below.

Table 1: Washington County Radio Dispatch System Frequencies

Channel Name	TX[1] MHz	RX[2] MHz	FCC[3] Call Signs
EMS	155.2950	155.2950	KNJN428
Fire Zone 1	151.4300	155.895	WPNP403
Fire Zone 2	151.0625	159.3825	KGF358
Fire Zone 3	151.3475	159.2025	KGF358
Law Zone 1	155.2500	158.7300	KGF398
Law Zone 2	159.1650	155.9700	WPKT967
Law Zone 3	155.6400	155.0700	WPAU478

[1] Transmit
[2] Receive
[3] Federal Communications Commission

1.2.4. PSAP and Dispatch Operations

The radio console equipment used by the 911 center is shown below.

Table 2: Radio Consoles

PSAP	Radio Console Positions	Radio Console Make
911 Center	15	Avtec
Backup Center	8	Avtec

1.2.5. Logging Recorders

A. The 911 center uses an Eventide recording system at the primary and backup centers.

1. The specifications for the logging recorder at the primary and backup centers are as follows:
   a. Primary site: 192 Voice over IP (VoIP) channels, 24 analog channels
   b. Backup site: 128 VoIP channels, 16 analog channels
2. Recording is accomplished through RTP transport directly to the consoles and control stations.
3. Each position is logged.
4. Each channel is logged.
5. Telephony logging.

1.2.6. Computer-aided Dispatch System

The 911 center uses a Hexagon I/CAD computer-aided dispatch (CAD) system.

1.2.7. Interconnection of Radio Sites and PSAPs

The radio sites and the 911 center interconnect via a combination of licensed, unlicensed, and 4.9/5.8 gigahertz (GHz) microwave. Appendix A-4 shows the current site interconnectivity.

1.2.8. Fire Paging

The dispatch consoles in the 911 center can transmit paging tones, primarily to activate volunteers of a call for service. Currently, the County paging system has three different zones with three different frequencies. The proposal for the new paging system would require (or prefer) a single countywide VHF channel.

1.2.9. Radio System Responsibility

Each entity is responsible for maintenance and operation of its radio system and equipment. The Washington County Department of Public Safety is responsible for maintaining its dispatch equipment and the dispatch radio channel infrastructure.

Municipalities are responsible for maintaining their equipment, including radio subscriber units.

1.2.10. Major Concerns and Challenges

Major issues identified with the existing system are as follows:

- Inadequate channel capacity and channel congestion during busy periods
- Inadequate radio coverage in various parts of the county
- Inadequate interoperability with other Region 13 and adjacent county agencies
- Fire operations channels that are not monitored
- Co-channel interference (Fire Zone 3, EMS Dispatch)
- Disparate control stations that fill in coverage

1.3. REQUEST FOR PROPOSAL OVERVIEW

A. This section provides a high-level overview of this RFP.

1. Section 1, Project Overview – Provides background information and a general overview of the requirements contained in this RFP.
1. Section 2, Instructions to Proposers – Provides instructions to Proposers, including, but not limited to: proposal due date, pre-proposal conference information, and evaluation criteria.
2. Section 3, Radio Communications System Requirements – Provides requirements for the desired communications system. The County requires procurement of a P25 radio system. It includes requirements for system configuration, site selection, RF coverage, and site equipment. Subsections address the need for reuse of the existing radio dispatch consoles, a new network management system (NMS), and provision of a new VHF tone-and-voice paging system.
3. Section 4, Backhaul Network – Provides requirements for digital microwave backhaul equipment.
4. Section 5, Site Development – Provides requirements for site development work, including site compound preparation, site grounding, tower deployment, shelter deployment, and electrical and generator systems.

5. Section 6, Dispatch Consoles – Provides requirements for reuse of the current dispatch consoles or the provision of a new dispatch console system and related equipment.
6. Section 7, Warranty, Maintenance, and Support – Provides requirements for the warranty, extended warranty, maintenance, and support of the proposed system and subsystems.
7. Section 8, System Implementation, Testing, and Acceptance – Provides requirements for system cutover, staging, installation, fleet mapping, coverage testing, and final acceptance.
8. Section 9, Subscriber Equipment – Provides requirements for subscriber equipment, including mobiles, portables, and control stations, as well as subscriber warranty and maintenance.
9. Glossary of Terms and Acronyms – Provides key acronyms and terms contained in this RFP.
10. Appendices
    - Appendix A: Tower Site Information (four appendices)
    - Appendix B: Compliance Matrix
    - Appendix C: Proposal Pricing Instructions
    - Appendix D: Available VHF Frequencies for the VHF Paging Proposal Consideration
    - Appendix E: Backup Control Stations at PSAPs
    - Appendix F: Subscriber Radios – Proposed P25 System
    - Appendix G: Washington County Terms and Conditions
    - Appendix H: Washington County Proposal Form

1.4. PROJECT SUMMARY

A. The Contractor shall provide the following project components:

1. Furnish and install system equipment and ancillary facilities
2. Engineering, system design, and FCC licensing preparation
3. Project management
4. Software installation and programming
5. Training
6. Acceptance testing, including coverage testing
7. Cutover plan and execution
8. Warranty and maintenance

B. The Contractor shall furnish the following complete, highly redundant, and/or fully functional systems and equipment:

1. 800 MHz P25 LMR communications system, including the guarantee of system coverage and reliability

2. Digital MPLS ring microwave network including the guarantee of system availability
3. Infrastructure facilities (e.g., towers, shelters, fencing, generators)
4. Network management system (NMS)
5. Subscriber mobile and portable radio equipment

C. All equipment shall be provided in new condition and be covered by a full factory and/or manufacturer's warranty of not less than one year beginning at the time of system acceptance.

D. The County prefers that existing radio tower sites be used in the new system design, if possible. The Proposer may use other towers or propose greenfield construction of new towers if doing so improves system coverage and helps realize the coverage goals. The cost-effectiveness of new greenfield towers versus adding other existing towers to the network will be an evaluation factor. Government, utility, or other sites with low to no lease are preferred. The use of County-owned property for new sites within the county is encouraged if viable. Consideration of sites outside of the county is allowable.

E. Existing towers may require structural modifications to support the proposed new system and transitional loading. Proposers should account for the time required to remediate these towers, including the time required for engineering, design, procurement, and implementation of any required modifications.

F. There are seven 220-foot towers unconstructed at the airport location ready for use.

G. In the event additional or alternate tower sites are proposed to meet a Proposer's coverage guarantee, the response must include letters of commitment from those site and tower owners indicating the availability of tower space to accommodate the proposed facilities and antennas. Such letters must indicate a commitment to enter negotiations with the County for tower space or construction on greenfield sites as well as an estimate of lifecycle lease costs.

H. Work shall be planned, coordinated, and conducted with minimal interruption of service to existing critical systems.

I. Proposals shall completely describe the equipment and methods that will be used to implement the system. The intent of this document is to allow vendors to propose the best equipment, technology, and methods available to provide state-of-the-art public safety communications systems of the highest quality and performance.

J. Proposals shall not be accepted that include systems or equipment within five years of the end of their respective lifecycles at the time of system acceptance.

K. Proposals shall not be accepted that include systems or equipment that will no longer be supported for software, spare parts, and repair by the Proposer or manufacturer within 15 years of system acceptance. Product roadmaps must be provided.

L. Recurring fees for hardware will not be accepted for the life of the project. The County will own the hardware.

M. The County requires the Proposer to provide a comprehensive system platform and subscriber roadmap (noting the timetable of initial release through end of Proposer supportability) for the proposed network, defining the product lifecycles of all fixed network equipment, major network elements, software operating systems, software applications, subscriber units, dispatch consoles, subsystems, and ancillary network components. The County further requires the Proposer to define the original equipment manufacturer's status of all fixed network equipment, major network elements, software operating systems, software applications, subscriber terminals, dispatch consoles, subsystems, and ancillary network components. Throughout the manufacturer support period, the County shall be entitled to receive, at no charge, the appropriate quantities of any software/hardware upgrade kit(s) that address an identified product defect or bug fix.

N. If a product or feature included in a Proposer's response is no longer offered, supported, or being sold at the time of system acceptance, the Contractor shall offer the equivalent product or service at no additional upfront or recurring cost.

O. If requirements are stated in more than one section and appear to conflict, the more stringent requirement shall apply.

1.5. PROPOSALS DESIRED

A. The County desires a complete turnkey solution addressing all project systems, subsystems, and components.

B. Any requirements placed on the County throughout the project must be specifically identified in the Proposer's response. Any requirements for project completion that have not been identified as a County responsibility will be the responsibility of the Contractor at no additional cost to the County.

1.5.1. Systems Technical Requirements

A. This RFP seeks proposals for the construction of a countywide radio system that will include:

1. A new 800 MHz P25 Phase 1 and 2 system that will support first responders within Washington County
2. A trunked simulcast system to meet the capacity and coverage requirements of the County
3. A new VHF tone and voice paging system
4. Reuse of existing dispatch consoles and logging recorder
5. A new MPLS ring microwave network suitable for the new P25 system and future growth
6. Purchase of P25 subscriber units (mobiles, portables, and control stations)
7. New generators, transfer switches, and UPSs for new sites
8. Site construction/improvements to include tower enhancements, new towers, and new shelters, where appropriate

1.5.2. Services

A. Design and engineer the P25 radio system to provide 95% portable coverage countywide outdoors with a portable carried on the hip with a wired speaker/microphone using a ½-wave dipole radio-mounted antenna. Please assume that hip level is at three feet.

B. Provide border-to-border countywide belt-level outdoor portable coverage for both the VHF paging system and the 800 MHz P25 radio system. In-building coverage is required for a Minitor VI pager carried on the user's belt. The requirement for the outdoor belt-level portable coverage is for a 95% service area reliability. The service area is defined as the Washington County boundary.

C. Design and engineer a microwave system or alternate connectivity to interconnect the LMR sites and the 911 centers.

D. Conduct a structural analysis of all towers proposed for use in the system, where the tower loading will be modified, to meet the current Telecommunications Industry Association (TIA) 222-H, *Structural Standard for Antenna Supporting Structures, Antennas and Small Wind Turbine Support Structures*, Class IV standard.

1.6. QUALITY ASSURANCE AND COORDINATION

1.6.1. Standards and Guidelines

A. Proposers shall comply with applicable standards, rules, regulations, and industry guidelines from the following:

1. Local municipality building codes and zoning regulations
2. International Building Code (IBC)

3. American National Standards Institute (ANSI)
4. National Electrical Manufacturers Association (NEMA)
5. Electronic Industries Alliance (EIA)
6. Telecommunications Industry Association (TIA)
7. Telecommunications Distribution Methods Manual (TDMM)
8. National Fire Protection Association (NFPA), particularly:
    a. NFPA 70, *National Electrical Code® (NEC®)*
    b. NFPA 72®, *National Fire Alarm and Signaling Code®*
    c. NFPA 1225, *Standard for Emergency Services Communications*
9. Institute of Electrical and Electronics Engineers (IEEE)
10. Federal Communications Commission (FCC)
11. UL, LLC
12. American Society of Testing Materials (ASTM)
13. Other contractor/industry standards
    a. Proposers shall provide information to the County for review and approval prior to contract award.

B. The Contractor shall comply with industry best practices for system installation, grounding, bonding, and transient voltage surge suppression (TVSS), as outlined in 5.1.D.

C. Governing codes and conflicts: If the requirements of this specifications document conflict with those of the governing codes and regulations, then the more stringent of the two shall apply.

D. If a Proposer cannot meet any of the standards or guidelines listed above, the Proposer shall list in its response all deviations for approval by the County.

E. The Contractor shall identify and coordinate all necessary codes, permitting, etc., including building permits. The Contractor shall notify the County of any issues.

F. The Contractor shall be responsible for performing a structural analysis for each tower where loading will be modified, and for advising the County where remediation will be required and the cost options for proposed modifications.

1.6.2. P25 Standard Compliance

A. The proposed trunked radio system shall comply with the latest applicable P25 suite of standards adopted as TIA and/or ANSI documents at the time of proposal submission.

B. The system shall be delivered in accordance with the P25 Phase 2 standards outlined in the RFP. If these standards change or are updated for final release, the Contractor shall implement the final standards at no additional charge to the County.

C. The proposed system shall not include proprietary features that prohibit or impede the use of P25-compliant subscriber equipment provided by any equipment vendor. Any proprietary features that would be available as an option should be clearly explained.

1.6.3. Frequency Coordination and Licensing

A. LMR Licenses: The Contractor shall be responsible for the research and preparation of all license acquisitions to support the new system. Following approval of the preliminary design phase, the Contractor shall provide all modifications and applicable forms to the County for review and approval. The Contractor shall be responsible for evaluating frequencies in the VHF band for the new paging system and the 800 MHz bands to determine the feasibility of licensing frequencies in these band for the new P25 radio system. Any proposed designs shall align with the associated restrictions of the frequency band proposed by the Proposer. For example, the use of 700 MHz or 800 MHz National Public Safety Planning Advisory Committee (NPSPAC) frequencies will need to comply with Region 36 requirements, including protection of Computer Assisted Pre-Coordination Resource & Database System (CAPRAD) allotments, responsible radiation, the Region 36 frequency plan, etc. The County shall be responsible for coordination and licensing fees, if any, and signatures, as applicable.

1. Appendix D contains a listing of VHF frequencies that are available for a new VHF paging system . As indicated, some channels are currently in use. Proposers shall describe their cutover plans when using those channels for the new system. Additionally, if the provided VHF frequencies are deemed unsuitable, the Proposer shall provide an explanation of the findings for each frequency.

B. Microwave Licenses: The Contractor shall be responsible for all microwave frequency research, prior coordination, and preparation of all associated FCC license applications and submittals on behalf of the County. The County shall be responsible for coordination and licensing fees, if any, and signatures, as applicable.

1.6.4. Federal Aviation Administration (if applicable)

A. The Contractor shall complete Federal Aviation Administration (FAA) forms as necessary. The Contractor also shall complete any associated FCC Antenna Structure Registration (ASR) submittals.

1.6.5. Local, State, and Federal Environmental and Historical Requirements

A. The Contractor shall be responsible for securing all approvals acquired for construction and installation activities. This shall include the preparation of all applications and exhibits in support of these approvals. The following exhibits provide examples of required approvals that will be the Contractor's responsibility.

1. FCC Tower Notification application
2. National Environmental Policy Act (NEPA) checklist and supporting documentation
3. State Historic Preservation Office (SHPO) requirements
4. Environmental Assessment compliant with FCC/federal requirements
5. Wetland mitigation including any required credits with the Army Corp of Engineers
6. Storm water mitigation plan
7. Native species assessment and mitigation
8. Tribal notification and mitigation, if impact identified
9. Endangered species assessment and mitigation
10. Floodplain assessment and mitigation
11. Local newspaper posting of tower notification

1.6.6. Permitting

A. The Contractor shall be responsible for all permitting activities required to complete site construction and system implementation, including building and electrical permits.

B. The Contractor is responsible for identifying the Authority Having Jurisdiction (AHJ) for each proposed location, existing and new.

C. The Contractor shall propose designs that fall within the zoning requirements of each AHJ. For example, if a new raw-land site is proposed, the site must comply with the AHJ's tower height and setback requirements.

D. The Contractor shall research all requisite exhibits required by each AHJ and be responsible for preparing those exhibits.

E. The Contractor shall track the progress of all permit applications and seek expedited processing when possible.

F. The Contractor shall respond to any comments received in response to comments from the AHJ within one week of receipt.

G. The Contractor is responsible for any required certifications of permitting submittals, including engineer-sealed drawings by a State of Pennsylvania registered Professional Engineer (PE).

H. The Contractor shall be available to represent the County at any meetings for site approval, including local government or public outreach meetings.

I. The Contractor shall be responsible for preparing any exhibits required in support of zoning variances.

1.6.7. Project Management

A. Proposers shall provide a project management plan (PMP) in their proposals that provides detail on the following: project scope, deliverables, schedule, quality assurance/quality control (QA/QC) processes, and risk management.

B. The PMP shall describe how the Contractor intends to monitor and control the installation and deployment of the proposed system and mitigate risks to ensure that the system meets the design specifications and is delivered on time.

C. Regularly scheduled status meetings shall be established between the County's project team and the Contractor. The Contractor shall provide a schedule for these meetings subject to the County's approval.

1.6.7.1. Scheduling

A. The Contractor shall develop and maintain a project schedule including tasks, milestones, start and end dates, task precursors, and task owners.

B. The schedule shall represent tasks associated with completing work and shall be updated with actual dates as tasks are completed.

C. The updated schedule shall be provided as an agenda item for all County/Contractor status meetings.

D. The schedule shall address the following at a minimum:

1. Site surveys
2. Detailed design review

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

1.6.7.2. Project Punch List

A. The Contractor shall establish and maintain a punch list, as mutually agreed to with the County, for site facilities, equipment, and acceptance tests.

B. The punch list shall be maintained in real time and published weekly. The punch list shall include the following at a minimum:

1. Sequential punch-list item numbers
2. Date identified
3. Item description
4. Party responsible for 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

C. The Contractor shall be responsible for reviewing each punch-list item and advising the County of any changes. The status of punch-list items shall be updated during each status meeting.

1.6.8. Project Meetings

A. A project kickoff meeting shall be scheduled prior to the beginning of the project.

B. Regular project status meetings shall be scheduled following contract award and the initial kickoff meeting.

C. The Contractor shall be responsible for scheduling the meetings, as well as preparing meeting agendas and minutes. In addition to those identified in Section 1.6.7.1, Scheduling, above, meeting agenda items shall include, at a minimum, the following items:

1. Schedule review
2. Status of deliverables
3. Risk items
4. Changes
5. Action-item assignments

1.6.9. Project Staffing

A. Project staffing shall be managed by the Contractor based on workload and the level of effort required throughout the implementation/installation process; however, the positions identified below shall be staffed throughout the duration of the project and shall not be changed without prior approval of the County.

B. Contractor's Project Manager

1. The Contractor's project manager shall be the primary point of contact between the County and the Contractor.

2. The Contractor's project manager shall bear full responsibility for supervising and coordinating the installation and deployment of the communications system; be responsible for development and acceptance of the PMP; manage the execution of the project against that plan; and oversee the day-to-day project activities, deliverables, and milestone completions.

3. The Contractor's project manager shall be responsible for coordination of the regular project status meetings.

C. Contractor's Project Engineer

1. The Contractor's project engineer shall have primary responsibility for managing the system design and ensuring that the system is installed in accordance with the approved system design. Any deviation from the system design shall be subject to project change control procedures and shall not be undertaken until approved by the County.

2. The Contractor's project engineer shall ensure the development of block diagrams, system-level diagrams, and rack diagrams to assist the installation team in completing the installations.

3. The Contractor's project engineer shall supervise the development and execution of the acceptance test plan (ATP) and coverage acceptance test plan (CATP), as well as guide the County's project team through the processes and procedures necessary to prove that the system performs as specified in the contract. No test plan shall be executed until approved by the County.

1.6.10. Quality Assurance/Quality Control Program

A. The Contractor shall submit a QA/QC plan for review during preliminary design as described in this section. The plan shall address all stages of the project, including at a minimum:

1. Procurement
2. System design
3. Installation
4. Implementation
5. Testing
6. Cutover

B. The QA/QC plan shall specifically describe the plans and procedures that ensure the proposed system is designed in accordance with the standards and requirements described in this RFP.

C. The QA/QC plan shall be included as part of the PMP developed by the project manager.

D. The QA/QC plan shall be an integral part of the project and include County personnel as part of the review-and-approval process for all deliverables and submittals.

E. The proposed QA/QC plan shall address the following project tasks at a minimum:

1. Design analysis and verification
2. RF coverage analysis and verification
3. Design changes and document control
4. Material shipping, receiving, and storage
5. Site preparation (if required)
6. Field installation and inspection
7. Equipment inventory and tracking

8. System testing and validation
9. Software regression testing
10. Deficiency reporting and correction
11. Implementation and cutover
12. Training and certification

1.7. DELIVERY, STORAGE AND HANDLING

A. The Contractor shall be responsible for the storage of equipment following shipment from staging. All costs associated with the storage shall be the responsibility of the Contractor. The County shall not be liable for equipment or material stored onsite prior to system acceptance.

1.8. PROJECT SUBMITTALS

A. Key project deliverables and submittals are outlined below and are described in further detail throughout this RFP.

B. All project submittals shall be subject to review and approval by the County and its engineer/consultant.

C. All submittals shall be provided in hard copy, properly bound, and in electronic format on a universal serial bus (USB) drive. The quantity of hard copies required shall vary for each type of submittal and shall be determined by the County prior to submission.

D. All submittals shall include a cover letter or letter of transmittal, signed, dated, and fully describing the contents of the submittal.

E. For the duration of the project, the Contractor shall provide a Web-based portal or File Transfer Protocol (FTP) site for sharing and exchanging project documents.

1.8.1. Preliminary Design (45 days after notice to proceed)

A. The Contractor shall submit the preliminary design package 45 days after receiving the notice to proceed. The preliminary design package shall include the following:

1. QA/QC plan
2. Detailed project schedule
3. System-level block diagrams
4. Patching schedules and termination details for all cabling necessary for a complete record of the installation

5. Radio and microwave channel plans
6. Microwave path engineering report(s)
7. Equipment room overview drawings
8. Equipment rack/cabinet elevation drawings
9. Tower profile drawings indicating antenna-mounting locations
10. Detailed lists of materials for each site
11. 30-day operational test plan
12. CATP

1.8.2. Final Design (90 days after notice to proceed)

A. The contract design review (CDR) shall occur no sooner than 90 days after the Contractor receives the notice to proceed, unless the County agrees to an earlier date, or before proposed site acquisition can be validated and the County provides confirmation.

B. The CDR shall be delayed until proposed sites in the Proposer's design can be validated, acquired, and finalized.

C. The Contractor shall submit the final design package no earlier than 90 days after receiving notice to proceed, which shall include the following:

1. Any updates to previously submitted design information
2. Cutover plan
3. System operation and maintenance manuals for all equipment
4. Factory test data
5. Site installation drawings
6. Structural analyses and results
7. A detailed preliminary staging acceptance test plan (SATP) outlining a comprehensive series of tests that will demonstrate proof of performance and readiness for shipment

D. The final SATP shall be submitted no later than 15 business days before the testing begins and shall be approved no later than five business days before the testing begins. Any system feature that was inadvertently omitted from the test plan also may be tested either at the factory and/or in the field.

1.8.3. System Staging, Delivery, and Installation

A. System staging shall not occur earlier than the final CDR approval or site validation and acquisition unless agreed to by the County.

B. System staging must be performed in the United States.

C. The Contractor shall submit a bill of materials/packing list with two copies for each equipment shipment. The packing list shall include the following information at a minimum for each component included in the packaging:

1. Manufacturer
2. Model
3. Serial number
4. Unique identification of the package containing the item

D. All items shipped by the Contractor or its suppliers will include the above information in a barcode format.

1.8.4. Final System Acceptance

A. The Contractor shall submit a detailed final acceptance test plan (FATP) that outlines a comprehensive series of tests that will demonstrate proof of performance and readiness for final acceptance by the County/Owner.

B. The final FATP shall be submitted no later than 15 business days before the testing begins and shall be approved by the County before it is considered finalized. A preliminary FATP shall be submitted with the Proposer's proposal. Any system feature that was inadvertently omitted from the test plan also may be tested in the field.

C. The Contractor shall submit three final and complete sets of as-built documentation, including the following:

1. Documentation index
2. Field test reports, with dates and actual readings
3. Coverage test reports
4. Warranty documentation
5. Detailed list of materials for each site
6. A copy of all red-line documents for each site prior to issuance of the as-built documentation
7. As-built system-level block diagrams
8. As-built site drawings, including all cabling and terminations
9. Site layout drawings, as appropriate
10. Tower drawings showing any new installations

2. INSTRUCTIONS TO PROPOSERS

2.1. SCHEDULE OF EVENTS

While the County is not obligated to comply with the following timeline, it intends to comply with the following schedule, which may be changed in the County's sole discretion.

Table 3: Schedule of Events

Event	Date and Time
Solicitation Issued	**Observer Reporter June 8th, 2024** and **June 15th 2024**
Written Questions Due	**June 14th, 2024, 2:00 p.m**.ET
Pre-Proposal Teleconference	**June 17th 2024 2:00p.m**. ET
Intent to Submit Deadline	**June 17th, 2024, at 12:00 noon** ET
Response/Addendum Issued	**June 18th 2024**
Proposal Due	**Tuesday, June 25th, 2024, at 11:00 a.m**. ET
Evaluation of Proposals	**June 25th, 2024 – July 9th 2024**
Oral Interviews and Negotiations	**July 9th – July 15th 2024**
Tentative Contract Award	**July 18th, 2024, 6:30p.m.** Board of Commissioners Meeting

2.2. PROPOSAL FORMAT

A. Proposers shall complete the compliance matrix provided in Appendix B. Failure to respond to any item in the compliance matrix may cause the proposal to be rejected.

A. Proposers shall adhere to the proposal format provided below, organized by section.

1. Proposal Authorization and Signature Page

   This page should act as the cover page of the proposal, followed by the sections below.

2. Section 1 – Cover Letter

3. Section 2 – Table of Contents

4. Section 3 – Executive Summary

5. Section 4 – Qualifications

   All Proposers shall provide in their proposals, and upon request by the County, information that describes their experience and qualifications concerning similar projects, including at a minimum:

   a. Descriptions of the Proposer's qualifications

   b. Resumes of key personnel and subcontractors

   c. Supplementary information

   d. A list of three systems/solutions of similar size and complexity, successfully completed by the Proposer, including:
      i. Name of the system/solution
      ii. Location
      iii. Contact person
      iv. Contact person email
      v. Contact telephone number

      Note: These references will be contacted. Failure of a reference to respond may count against a Proposer's final score. Proposers are urged to contact references and request their prompt response.

6. Section 5 – Description of the system/solution, including equipment, software, design, and services to be provided

   a. Radio communications systems, including RF coverage predictions

   b. Dispatch console

   c. Tower construction, including proposed plan for conducting structural analyses and remediation for existing towers where necessary

   d. Microwave backhaul connectivity

   e. System management systems

   f. System event-monitoring systems

g. Additional subsystems (if applicable)

h. Detailed equipment specification sheets for all proposed equipment

i. System design information, including a complete detailed description, block diagrams, equipment layouts, and equipment lists necessary to provide a complete and comprehensive description

7. Section 6 – Dispatch console system

8. Section 7 – Preliminary project schedule with detailed Gantt chart

9. Section 8 – Training programs and additional information not covered in other sections

10. Section 9 – Point-by-point compliance matrix

Proposers shall provide compliance statements in the spreadsheet found in Appendix B, Compliance Matrix, for each outline level of this RFP. Proposers shall provide a response to every section with which they do not comply. Compliance statements are limited to three choices:

a. COMPLY: The proposal meets or exceeds the specified requirement. When using this statement, a Proposer is confirming that it is providing the equipment and/or service associated with that paragraph.

b. COMPLY WITH CLARIFICATION: The proposal does not meet the exact stated requirement; however, it meets a substantial portion, or meets the intent, of the requirement. Proposers must provide a detailed explanation when using this statement.

c. EXCEPTION: The proposal does not meet the specified requirements. Proposers must provide a detailed explanation when using this statement.

Capable/Enabled versus Capable/Extra Cost: Any time a Proposer uses the word "capable," it must use one of the following to distinguish if the feature or function is "capable/enabled" (at no additional cost) or "capable/extra cost" (cost should be provided in the pricing workbook).

11. Section 10 – System and subsystem warranty information to include a list of maintenance plans and alternate tiers available, spare parts list, and 15-year cost-of-ownership information.

12. Section 11 – Total proposal cost and detailed pricing breakdown

    a. Proposers shall provide total proposal cost and itemized pricing for both equipment and services using the pricing workbook, which is a separate document; instructions are provided in Appendix C, Proposal Pricing Instructions. Each line item shall indicate the Proposer's list cost and discount offered. Costs for services must include the hourly rate and the total number of hours. Costs for optional items also shall be provided. Alternate proposals shall be provided with a separate set of proposal pricing forms.

    b. The costs shall include upfront capital costs and the 15-year cost-of-ownership, including maintenance costs, system update costs, and tower lease costs.

    c. Pricing shall be valid for a period of not less than 12 months from the date of submittal.

13. Section 12 – Documentation of financial responsibility and stability

14. Section 13 – Required attachments

2.3. EVALUATION

A. The County, along with an evaluation committee, shall evaluate proposals based on numerous criteria, including:

1. RFP compliance and willingness to accept the County's contract terms
2. Proposer experience and demonstrated ability to perform the services described
3. Cost of equipment and lifecycle costs
4. Capability, features, and functionality
5. System design
6. Warranty, maintenance, and support
7. Quality of work as verified by references
8. Demonstrated history of providing similar services to comparable entities
9. Any other factors the evaluation committee deems relevant

2.4. PROPOSAL OPTIONS

A. Requirements described as an "OPTION" or "OPTIONAL" refer to features or equipment that may or may not be purchased by the County, or items whose quantities are not determined yet. It is not the Proposer's option to respond to these requirements; therefore, a Proposer must respond to all optional requirements to the greatest extent possible.

2.5. ALTERNATE PROPOSALS

A. If a Proposer has a technological solution that does not meet the exact requirements in this RFP, the Proposer may offer more than one proposal, if each proposal fully addresses the intent of the requirements set forth in this document.

B. Alternate proposals shall be submitted separately under a different cover from the base proposal and be clearly marked "ALTERNATE PROPOSAL."

C. The Proposer shall comply with the same submittal instructions in Section 2.2, Proposal Format.

2.6. ADDENDA TO THE CONTRACT

A. During the proposal period, the County may issue written addenda to change or correct the specifications as issued. Such changes or corrections shall be included in the work and/or materials covered by the proposal, and such addenda shall become part of the specifications and contract. Any such addenda will be issued by June 18th 2024.

2.7. AWARD OF CONTRACT

The County intends to award a contract(s) that includes each identified system component. However, the County specifically reserves the rights below, consistent with procuring a system that best meets the needs of the County and system users:

A. The County reserves the right to accept or reject any proposal, or any portion thereof, to waive any informalities or irregularities, and to award this bid, in whole or in part, in the best interest of the County.

B. The County reserves the right to accept all or part of any proposal, depending solely upon the requirements and needs of the County.

C. The County reserves the right to seek clarifications regarding any proposal submitted, or specific aspects of any proposal, prior to contract award. After seeking such clarifications, the County will allow the Proposer an opportunity to provide the requested clarification.

D. The County reserves the right to adjust item quantities and/or reconfigure the communications system in the best interest of the County, subsequent to contract award.

E. The County may request an interview with and/or oral presentation from any firms that submit a proposal. These meetings provide an opportunity for the County to ask questions and for the Proposer to clarify its proposal or demonstrate its product/solution.

F. If multiple contracts are awarded, in lieu of a turnkey contract, the County may:

1. Negotiate additional scope of work to designate one of the Contractors as the project's prime contractor.

2. Or allow one of the Contractors to provide system integration or prime contractor services, provided that the Contractor has submitted a separate proposal for those services.

G. The County reserves the right to delay evaluation and award for up to 12 months following the receipt of proposals. All proposals must be valid for a period of not-less-than one year following submittal.

3. RADIO COMMUNICATIONS SYSTEM REQUIREMENTS

3.1. OVERVIEW

A. Proposers shall propose complete systems as described below. Requirements for each system are described herein and are delineated throughout this RFP according to trunked system requirements.

1. Primary Simulcast System – P25 – The digital simulcast system should consider the radio sites detailed in Appendix A, along with any other radio site locations identified by the Proposer, and integrate them into a standalone system with a controller owned and operated by the County. Multiple simulcast cells will be considered if there are licensable frequencies to meet the system loading requirements. The system must seamlessly integrate all sites such that end users can roam freely throughout the service area without interruption of service or the need to manually select sites. The system must use the latest

system platform at the time of system acceptance. The system must meet the coverage and capacity needs of the County. The system must be expandable to allow for additional capacity and features.

2. Tone-and-Voice Simulcast Paging – Included in the base offering, Proposers shall propose a VHF tone-and-voice analog paging solution using the P25 infrastructure compatible to the County's existing VHF pagers. For the VHF tone-and-voice paging option, Proposers shall base their proposals on a minimum of 1,108 pagers.

3. Tone-and-Voice Simulcast Paging – As an OPTION, Proposers may propose an 800 MHz integrated digital voice paging solution using the P25 infrastructure with compatible P25 Phase 2 pagers. For the integrated digital voice paging option, Proposers shall base their proposals on a minimum of 1,108 pagers. Proposers shall provide coverage maps for pagers inside 10 dB and 15 dB buildings.

B. These systems shall provide mobile, portable, and paging coverage throughout the county as described in Section 3.5, Coverage, below.

3.2. INTEROPERABILITY/P25 STATEMENT OF REQUIREMENTS

A. The proposed radio system shall comply with the latest applicable P25 suite of standards adopted as TIA, ANSI, and/or EIA documents at the time of proposal submission. These standards establish technical parameters that allow compatibility and interoperability of digital radio equipment from different manufacturers.

B. By stating compliance with a level-two heading in the Statement of Requirements (SoR), a Proposer claims compliance with all applicable level-three requirements in the SoR. If a Proposer is not compliant with a requirement, the Proposer shall identify the requirement by number and name and provide a detailed explanation of why the proposed system does not meet the requirement.

3.3. SYSTEM CONFIGURATION

3.3.1. Redundancy and Survivability

A. The proposed radio communications systems are intended to support mission-critical operations; therefore, a high degree of redundancy and survivability is required. A backhaul network topology utilizing fault tolerance shall be incorporated to the greatest extent possible through a distributed and/or redundant architecture.

B. Geographic redundancy is required for all system elements in which failure would result in a major failure of the system; single points of failure are not acceptable. Such elements include, but are not limited to, the following:

   1. System controllers and fixed site equipment
      a. System servers
      b. Simulcast controllers
      c. Network components, switches, and routers
   2. Simulcast controllers and voting equipment
   3. Backhaul network – Reversible ring, monitored hot standby (MHSB), or ad hoc routing
   4. Power systems
   5. Network management and fault reporting systems

C. The system shall include several modes of degraded operation, known as failure modes. The system shall maintain communications in the event of a system failure. Additionally, the system shall switch to a failure mode gracefully. Failure modes shall include the following scenarios, at a minimum:

   1. Loss of single site
   2. Loss of multiple sites
   3. Loss of two hops on the loop microwave
   4. Loss of system/console controller
   5. Loss of simulcast controller
   6. Loss of a frequency channel due to interference
   7. Loss of multiple channels due to wideband interference
   8. Loss of a repeater station due to an equipment failure

D. Proposers shall provide a description of each failure mode and describe how communications are affected by the failure.

E. Equipment shall be proposed with redundant direct current (DC) power supplies and network interfaces.

F. Network routers and switches shall have a sufficient number of spare ports to accommodate all equipment connected to a failed network router or switch.

3.3.2. Expansion

A. The systems shall be expandable by adding additional hardware and/or software to increase coverage, capacity, or features. Where possible, Proposers shall propose equipment such that

the system can be easily expanded by a minimum factor of 20%. For example, if a transmitter combiner requires five ports for the system design, a six-port combiner should be provided for ready expansion.

B. The system shall be expandable to meet the capacities listed below through the addition of hardware and/or software. Replacement of the system and site control equipment to meet this requirement shall not be acceptable.

1. Total frequency channels per simulcast cell – 12
2. Total sites – 30
3. Unit identifications (IDs) – 5,000
4. Affiliated users – 2,000
5. Talkgroups – 2,000
6. Dispatch positions – 30

C. The system shall include all required licenses to meet the capacities without any additional costs incurred.

1. Total frequency channels – Proposed total plus 20%
2. Total sites – Proposed total plus 20%
3. Unit IDs – 3,000
4. Affiliated users – Proposed total plus 50%
5. Talkgroups – 1,000
6. Dispatch positions – Proposed total plus 20%

D. Undisclosed Expansion Costs: Any one-time or ongoing system expansion costs that are not identified and priced in the proposal will become the responsibility of the Contractor to provide at no extra cost.

E. Proposers shall provide detailed information on the expansion and scalability capabilities of the proposed system and ancillary subsystems (i.e., fire station alerting [FSA] subsystem). These details shall include the following items that facilitate a total County understanding of the Proposer's offering as related to expansion capabilities.

1. Maximum number of sites/subsystems (multi-cast, simulcast, RF subsystems, etc.)
2. Maximum number of talkgroups
3. Maximum number of unit IDs
4. Maximum number of dispatch consoles
5. Maximum number of channels/talk-paths
6. Maximum number of NMS clients/concurrent applications

7. Maximum number of discrete alarm points per site
8. Maximum number of conventional mutual aid interfaces
9. Maximum number of console auxiliary inputs/outputs
10. Maximum number of logging recorder channel hours
11. Maximum number of encryption keys manageable by infrastructure
12. Expandability of microwave network
13. Upper and lower limits of the controllers and network elements inputs and outputs
14. Maximum number of control channels
15. Impact to the system architecture
16. Impact to system access
17. Impact to other support systems
18. Impact to shelters
19. Impact to towers
20. Impact on existing users
21. System expandability incremental costs

3.3.3. Grade of Service

A. The measure of traffic-loading capacity for any trunked system is defined by grade of service (GoS). GoS is used to measure the probability that a radio call will not gain immediate access to a radio channel, but rather be placed in a busy queue for later processing when a voice channel becomes available. For example, a GoS of 2% represents that 98% of the radio calls attempted on the system are processed immediately, and 2% are placed into the user queue.

B. The proposed system shall meet a GoS of 1% with a time in queue not to exceed one second.

C. If a Proposer's proposed system contains multiple subsystems or cells, an additional loading increase shall be included to account for calls that involve talkgroups on two or more cells. Proposers shall provide calculations and explain justifications.

D. Proposers shall submit traffic-engineering studies in their proposals describing how their proposed system designs meet this criterion. The traffic-engineering study shall describe the methodology used in developing the study, along with any assumptions.

3.4. SITE SELECTION

A. Proposers shall determine the number and location of sites needed to provide the required coverage. Proposers shall determine the radio sites that provide the best combination of coverage and value for the County. Proposers shall perform mandatory site visits prior to submitting their proposals to ensure a full understanding of each site's condition.

B. The number and location of sites within a Proposer's design are the Proposer's responsibility.

C. Government, utility, and/or commercial sites for lease may be proposed, as well as greenfield sites that would be owned by the County. However, it is the County's desire to consider the long-term cost/value factor when evaluating designs, and, as such, designs capable of using existing tower sites alone are preferred.

D. It will be the responsibility of a Proposer to ensure that the identified frequencies are licensable at the proposed locations. It also is a Proposer's responsibility to perform due diligence with the tower or landowner to determine availability of the site to accommodate the proposed antennas (lease) and/or tower and shelter (greenfield), as well as associated costs, zoning, and planning restrictions. Availability and associated costs related to these sites must be documented and included in the Proposer's proposal.

E. For any leased locations, Proposers shall include a cost of $3,000 per month over the expected 15-year lifecycle of the system, which equates to $540,000. The lease cost will be factored into the evaluation. A lower monthly payment will be considered if a Proposer can guarantee a lease cost less than $3,000 per month with written confirmation from the tower owner.

3.5. COVERAGE

A. The radio system shall be designed to provide highly reliable coverage within the geographical boundaries of Washington County while meeting licensing restrictions and requirements for the proposed system regarding out-of-county signal propagation.

B. Coverage design, implementation, and testing for the system shall adhere to the TIA Telecommunications Systems Bulletin (TSB)-88-D, *Wireless Communications Systems Performance in Noise-Limited Situations*, latest version. In the event of differing interpretations of these standards, the specific testing requirements and protocols, as outlined in this RFP, will be the controlling approach to testing.

C. Channel Performance Criteria (CPC)

1. RF coverage is defined as the digital bit error rate (BER) that provides an audio signal that delivers a minimum delivered audio quality (DAQ) score of 3.4 for both outbound (talk-out) and inbound (talk-in) communications.

2. TIA defines DAQ 3.4 as "speech understandable with repetition only rarely required," which is the minimum acceptable level for public safety communications. *In the coverage guarantee, there will be no retries.*

D. The radio system must provide coverage as described below. All coverage at the designated levels shall be provided at 95% within the boundary with 95% reliability.

1. County border-to-border mobile coverage.

2. County border-to-border portable outdoor coverage. The portable configuration is for the portable carried on the user's belt with a radio-mounted antenna and a wired speaker/microphone.

3. System coverage shall be at DAQ 3.4 or better, per TIA TSB-88-D definitions of DAQ. The County will not allow for grid retesting in the case of a single failed grid. Grid retesting (re-try) will only be allowed in the case of human error or test equipment failure.

E. The paging system must provide coverage as described below. All coverage at the designated levels shall be provided at 95% within the boundary with 95% reliability.

1. County border-to-border outdoor coverage.

2. A new Countywide VHF analog single channel simulcast paging system utilizing the P25 infrastructure. The new paging system shall be compatible with the existing VHF pagers. The proposer shall indicate the coverage guarantee for the pager outdoors and inside 12 dB buildings.

3. The configuration is for a Minitor VI or equivalent pager carried on the user's belt.

4. System paging coverage shall be at DAQ 3.0 or better, per TIA TSB-88-D definitions of DAQ. The County will not allow for grid retesting in the case of a single failed grid. Grid retesting (re-try) will only be allowed in the case of human error or test equipment failure.

3.5.1. Coverage Maps

A. Proposers shall include a detailed description of the propagation models used and the assumptions made in preparation of the maps. A brief description of the methodology the software used to calculate coverage also shall be included in the proposal narrative.

B. Coverage maps will be representative of the coverage guarantee. In the coverage guarantee, there will be no retries.

C. Proposers shall submit both talk-out and talk-in system composite coverage maps for all proposed design configurations. The maps shall be clearly labeled and shall show link budget calculations for each of the following:

   1. Mobile radios – Standard dash- or trunk-mount, with antenna mounted on the trunk
   2. Portable radios – Standard portable radio outdoors with ½ wavelength antenna:
      a. Talk-out to a portable radio on hip with a swivel belt clip
      b. Talk-in from a portable radio at hip level with a swivel belt clip

D. Coverage shall be depicted using a light transparent color or cross-hatching for those areas that meet or exceed the minimum coverage reliability threshold.

E. All maps must clearly delineate the difference between areas with coverage predicted to be equal to or greater than DAQ 3.4 and areas that do not meet this coverage requirement. Proposers shall include the effects of simulcast interference in all coverage maps.

F. Coverage maps must include sufficient detail to allow another party to duplicate the predicted coverage utilizing propagation software. This information must include a complete link budget calculating the minimum signal threshold (in decibel-milliwatt [dBm]) required to obtain the performance depicted.

G. At least one set of maps depicting mobile and portable radio coverage shall be provided showing coverage extending outside the service area, although the County acknowledges this is not guaranteed coverage. These maps will show the extent of interoperability coverage outside the service area.

H. Proposers shall provide required coverage maps and contours for FCC Region 36 (800 MHz frequency bands).

I. Coverage maps shall be provided in the proposal in three formats:

   1. 11-inch x 17-inch (minimum), full-color, hardcopy format
   2. In .pdf file format on USB flash drive
   3. In Google Earth .kmz format

3.5.2. Map Criteria

A. All maps shall include a background layer suitable for County reference (e.g., topographic map, roads, rivers). Link budgets shall be provided, clearly defining the following minimum information relating to each map and each site:

1. Base station/repeater RF power output
2. Antenna gain
3. Antenna model
4. Antenna mounting height and azimuth
5. Antenna down tilt (if applicable)
6. Transmit power and effective radiated power (ERP)
7. Receiver sensitivity
8. Transmit and receive antenna heights
9. Combiner/multicouplers/tower-top amplifier (TTA) gains/losses of each
10. Transmission line lengths and line loss
11. Mobile and portable antenna height for talk-out and talk-in
12. Mobile and portable RF output power
13. Configuration of field units (e.g., talk-out to portable on street)
14. Simulcast timing parameters (if applicable)
15. Signal strength thresholds (in dBm)

For the purposes of uniformity in making assumptions for the portable antenna attenuation when worn at hip level, Proposers shall design the system based on the TIA TSB-88.1-D recommendation for the "Swivel Case on hip" in Table D 5, which is 8.5 dB (for 800 MHz). Proposers shall use the appropriate attenuation indicated in the above TIA table for the other proposed frequency bands.

B. Thirty-meter U.S. Geological Survey (USGS), National American Datum (NAD)-83 terrain elevation data shall be used for coverage simulations. Alternatively, three arc-second data may be used where 30-meter data is not available.

3.5.3. Coverage Model

A. Proposers shall employ a suitable coverage prediction model using appropriate terrain and land-cover data for the county environment. (Reference TIA TSB-88, latest revision, for guidelines.)

3.5.4. TIA TSB-88 – User Choices

A. User Choices
   1. 800 MHz system
      a. Minimum of seven voice paths for Phase 1 trunking and 14 voice paths for Phase 2 trunking for a single simulcast cell
      b. One frequency channel for control in a trunking design

   2. P25 compliance

B. Service Area

   1. The service area is the defined geographical area of Washington County.

   2. The target device, usage, and location are:
      a. Mobile radios: Standard dash- or trunk-mount, with antenna mounted in the center of the trunk
      b. Portable radios: Standard portable radio on hip with swivel belt clip
         i. Outbound (talk-out) from the transmitter to a portable radio on hip
         ii. Inbound (talk-in) to the transmitter from a portable radio on hip
      c. Basic network coverage for mobile radios shall be designed to accommodate vehicles traveling at speeds up to 75 miles per hour.
         i. This criterion is to be applied to the coverage areas defined in this section (3.5, Coverage), and to the coverage maps as defined in Section 3.5.2, Map Criteria.

C. CPC: Minimum CPC – BER that provides a minimum DAQ 3.4

D. Reliability Design Target: The CPC reliability design target is a service area probability of 95%

E. Terrain Profile Extraction Method: map-to-grid method

F. Interference Calculation Method: Monte Carlo Simulation method

G. Metaphors to Describe the Plane of the Service Area: Tiled method

H. Required Service Area Reliability: 95%

I. Willingness to Accept a Lower Area Reliability to Obtain a Frequency: The County is not willing to accept lower area reliability to obtain a frequency.

J. Adjacent Channel Drift Confidence Factor: Confidence that combined drift due to desired and adjacent channel stations will not cause degradation: 95%

K. Conformance Test Confidence Level: 99%

L. Sampling Error Allowance
   1. True value error: ±1%
   2. Number of subsamples: 50

M. Pass/Fail Criterion: "Greater than" test

N. Treatment of Inaccessible Grids: All inaccessible grids will be eliminated from the calculation

3.6. SITE EQUIPMENT

3.6.1. Overview

A. All site equipment supplied shall be new, of high quality, designed to provide high reliability to support mission-critical communications, and in current production. The site equipment, or RF infrastructure, consists of the following components:

   1. System and site control equipment
   2. Simulcast equipment
   3. Receiver voting
   4. Transmitters
   5. Receivers
   6. Combiners/multicouplers
   7. Antenna systems

3.6.2. System and Site Control Equipment

A. The system and site control equipment shall be capable of controlling all voice and data channels in the proposed system. The control equipment may use a distributed or centralized architecture.

B. The control equipment shall fully support APCO P25 functional requirements, features, and performance objectives as outlined in Section 3.2, Interoperability/P25 Statement of Requirements, including the common air interface (CAI).

C. Proposers shall fully describe the manner in which the proposed system and site controllers function and operate (if used).

D. Because the system and site control equipment are critical to the network, placement of the equipment at a secure, highly stable location is of the utmost importance. Proposers shall carefully consider the location for this equipment.

E. Proposers shall define backhaul bandwidth requirements for each backhaul link within the network.

3.6.3. Simulcast Equipment

A. The Contractor shall provide all necessary simulcast components and signal-processing elements that are required to optimize voice quality in coverage overlap areas.

B. Non-captured overlap areas with delay spreads in excess of those required to meet the DAQ objective shall be minimized inside the service area.

C. Simulcast systems shall operate without the need for frequent manual optimization and system/subsystem alignment. All alignments and adjustments shall be automated where possible (e.g., signal-conditioning adjustments for channel banks, signal launch times at sites).

3.6.4. Base Station Equipment

A. General

1. Base station equipment shall be solid state in design and function with standard site conditions for temperature, altitude, and humidity.

2. Equipment shall have alarm contact interfaces to provide status to a separate alarm system.

3. The units shall be as compact as possible, with mounting configurations for standard relay racks or cabinets.

B. Prior to implementation, the Contractor shall perform the following studies at each site:

1. Intermodulation analysis – The Contractor shall consider equipment from all tenants located at the proposed site. The Contractor will be responsible for gathering the required information from the tower owner and/or any co-located tenants.

2. Maximum Permissible Exposure (MPE) study (per latest revision of Office of Engineering & Technology [OET] Bulletin 65) – The Contractor shall consider equipment from all tenants located at the proposed site, per FCC license information.

3. The Contractor shall gather the site data needed for these studies.

C. The Contractor shall resolve all issues predicted during the intermodulation analysis and MPE studies. If an intermodulation problem is identified following implementation and within 12 months after final acceptance, the Contractor shall resolve the issue without degrading system coverage or performance, at no cost to the County.

D. Proposers shall include detailed specification sheets for all proposed equipment in their proposals.

E. All base stations shall be installed with all available modes of operation and software options, including those modes of operation that are not otherwise required for system operation as designed. For example, base stations shall include the ability to dynamically operate in the frequency division multiple access (FDMA) or time division multiple access (TDMA) modes, and support frequency modulation (FM) operation.

F. Each base station transceiver site shall be equipped with an external wattmeter or directional coupler for each transmit combiner output port and receive antenna port that provides a reading of the forward and reflected power of each antenna. This power monitor shall be installed in series with the combiner transmit output and multicoupler input. The inclusion of the device shall allow monitoring of the antenna system including Polyphaser failures.

3.6.5. Antenna Systems

A. Proposers shall propose all antenna system equipment necessary for a complete design.

B. Antennas shall be appropriate to provide the required coverage and meet applicable FCC rules and regulations.

C. Transmission line type and length shall be constructed of copper and appropriate to provide the required coverage. Antenna line shall be of the type to withstand at least 20 years of prolonged exposure to the environment in Washington County without degradation.

D. Proposers shall fully describe the expansion capacity for combiner and multicoupler systems.

E. Proposers shall include detailed specification sheets for all proposed equipment, including, at a minimum: antennas, receiver multicouplers, transmitter combiners, and TTAs (if applicable) in their proposals.

F. If applicable, TTAs shall be accompanied by a test line for troubleshooting purposes.

G. Antenna systems shall be designed with sufficient redundancy so that a failure to any one component in the transmission system will not disable the entire site.

H. Both transmit and receive antennas shall be equipped with power monitors that automatically report antenna or line faults.

3.6.6. Antenna Installation

A. Antennas and cable shall be provided and installed by the Contractor. Antennas shall be fed with the coaxial cable specified below.

B. The Contractor shall supply, install, and make operational the antennas specified.

C. The Contractor shall install antennas at the appropriate height and direction specified by the County or its representative and the Contractor's engineer.

D. Vertical transmission lines shall be supported by an appropriate system designed to securely attach antenna transmission lines when installed on tower structures.

E. Antennas shall be installed in accordance with the manufacturer's requirements.

F. Tower lighting cables shall not be bundled along with transmission lines or other conductors anywhere within cable ladders or the building interior.

G. Each transmission line run shall have entry port boots (inside and/or outside), lightning protectors and associated mounting brackets, and any additional jumpers required by the site-specific RF configuration. Some manufacturers provide transmission line kits, which include the main line connectors, top and bottom jumpers, line grounding kits (typically three per line), hoist grips, and weatherproofing materials.

H. Transmission lines shall be anchored to the tower using hardware recommended by the transmission line manufacturer for that type of tower.

1. Spacing of anchoring hardware is determined by the line manufacturer and is dependent on the type and size of the line.

2. Hangers and/or angle adapters typically are provided for every three feet of line, including any ice bridge paths. No snap-on style hanger kits shall be used.

3. Clamps and hardware shall be corrosion resistant.

I. Cables shall be secured to the tower with the appropriate cable hangers and hardware. The Contractor shall not use tie wraps, wire wraps, pieces of wire, tape, or similar temporary material to secure cables on the tower.

J. Cables shall be secured to the tower using hanger kits supplied by the tower contractor. Such hangers shall be used in the quantity and attached in the manner specified in this document.

K. An ice bridge with a cable support system may be used at the communications shelter point of entry.

L. The transmission line support system shall run to the highest-mounted antenna and allow for two times the identified cable requirements in the contract drawings.

M. The Contractor shall install and run RF jumpers from the RF surge protectors to the radio equipment.

N. Transmission lines shall be identified in a permanent manner using metal tags (or equivalent method) located at the antenna, at the bottom of the tower, at the shelter cable entrance, and inside the shelter or building.

3.6.7. Removal of Existing Infrastructure and Equipment

A. The Contractor shall be responsible for the decommissioning, removal, and transport of legacy equipment from existing County sites. This shall occur no earlier than the completion of system cutover and acceptance of a fully operational system.

B. All removed or de-installed equipment shall be properly stored at a location provided by the County. The Contractor shall provide the County with a detailed inventory list of all equipment including model number, serial number, and location of removal. The County

encourages Proposers to offer a salvage credit in its proposal for the Proposer to take possession of any desired salvaged material.

C. The County also encourages Proposers to offer current market trade-in value for working radios, both handheld and mobile. The approximate numbers are reflected in the current inventory stated in the RFP.

D. The final salvage and trade in value will be negotiated with the Contractor based on market demand. The County reserves the right to dispose of any scrap-salvaged and saleable equipment using current policies and procedures if deemed in the best interest of the County.

E. If negotiated that the Contractor will process salvaged and/or trade-in equipment, it ensures that all surplus equipment meets all local, state, and federal guidelines for this type of electronic equipment. All and any refurbishing, processing, recycling, and disposal venues used by the Contractor for disposal and/or recycling of the equipment, lead-bearing or mercury-bearing component, and other residuals are to be ISO 14001-compliant or otherwise demonstrate a bona fide commitment to responsibly disposing of any hazardous material to the satisfaction of the County.

F. The County will require proof of required permits and environmental protection compliance records for the regulatory agency(ies) within the jurisdiction where the processing/recycling facility is located and/or based for approval by County officials.

G. Pricing for the removal of existing infrastructure and equipment shall be broken out separately with line-item pricing.

3.7. NETWORK MANAGEMENT SYSTEM

A. This section provides specifications and requirements for an integrated monitoring-and-control system for local and remote site facilities and equipment. The NMS is used to provide remote indication of status, alarms, and analog values, and to provide remote control relay operations. Some terminals may be required to manage or provision different subsystems in the network. Proposers shall describe their NMS, including capabilities and available options.

B. System Alarms: The NMS shall acquire, process, and display information in an integrated and uniform fashion for a variety of critical systems. Alarms on major components that allow for Simple Network Management Protocol (SNMP) will be displayed via the NMS. Devices that have an option for SNMP must be properly configured to allow for transport back to the NMS. The following devices should be monitored:

1. Radio infrastructure/fixed network equipment
2. Dispatch consoles and logging recorder
3. Legacy/Existing mutual aid radio
4. Tone-and-voice paging
5. Shelter systems (HVAC[4], fire suppression, TVSS, leak detection, and fuel)
6. Tower lights
7. Primary and backup power systems (generator, transfer switch, DC power plant)
8. Microwave, leased line, and data networks
9. In-building systems
10. FSA system

C. Site Alarms: Any change in the state of site equipment shall induce an alarmed state. Equipment and site environmental alarms monitored shall include, at a minimum:

1. Surge arrestors
2. Transfer switch (normal or bypass state)
3. Power fail
4. HVAC
5. Smoke detector
6. Intrusion detection
7. High temperature
8. Low temperature
9. High humidity
10. DC power fail
11. DC power state (normal or bypass)
12. Generator (including generator run, low fuel, high temperature, fail, etc.)
13. Generator not in automatic mode
14. Floor water/flood alarm

To reduce false alarms, all alarm contacts normally shall be closed when no alarm is present. Any device that can send alarms via IP methods should be provided instead of contact closures.

D. The system shall be capable of SNMP traps. The County reserves the right to have the microwave and other SNMP traps monitored by the network management terminal (NMT).

E. NMS components include NMTs and remote terminal units (RTUs).

[4] Heating, ventilation, and air conditioning

F. Historical Reports: Proposers shall describe the equipped capabilities the system will provide to generate customizable reports and graphical display for real-time and historical system utilization, fault management, alarm history, and dynamic radio command data, including the following search fields for user-specific date ranges:

1. System capacity/GoS
2. Number of busies
3. Number of affiliated users
4. Affiliated subscriber IDs
5. Affiliation history of individual subscriber IDs
6. Subscriber registrations/de-registrations
7. Denied registration attempts
8. Talkgroup activity
9. Talkgroup usage
10. Performance statistics on console activity by stored or ad hoc queries:
    a. Number of push-to-talks (PTTs) by position and by talkgroup/channel
    b. Total transmit time by position and by talkgroup/channel
    c. Total receive time by position and by talkgroup/channel
    d. Number of emergency alarms/calls by position and by talkgroup/channel
    e. Number of individual calls by position and by talkgroup/channel
    f. Number of telephone interconnect (as provided) calls by position and by talkgroup/channel
    g. Number of system busies by position and by talkgroup/channel
    h. An average of all the above
    i. List the above by hour of the day
    j. Number of fire/EMS pages by position

11. All reporting functions shall be easily exported into real-time, standardized, spreadsheet and word processing formats for easy retrieval and custom report formatting
    a. At a minimum, all retrievable system data shall be equipped to format data in *.csv (comma separated value) and/or tab-delimited format so that external applications can also manipulate the specific information independent of the NMS.

G. Historical Information Storage/Archive Capabilities

1. The NMS shall be equipped to provide a minimum of one year's worth of data for all call processing, fault management, and network utilization from any client workstation. All historical NMS data shall be written to fault-tolerant server disk drives and/or RAID-5 hard drive arrays (or superior level) so that a single failure does not cause the loss of any historical data. NMS data shall be written to these hard drives on a first-in-first-out (FIFO)

basis. For a minimum of the entire year, historical NMS data shall be retrievable from a client workstation with the same granularity/level of detail as data is presented to the NMS client workstations in real-time.

2. The NMS shall provide a mechanism to store/write the NMS data at any time to such storage media as CD-R/W, DVD-R/W, and DAT drives. Both automated and manual NMS data archive techniques shall be provided with the proposed NMS so that the archiving of NMS data can be handled routinely or as necessary. A visual warning or dialogue box shall be provided to the end user and network administrator if/when NMS data, which has not been externally archived, is subject to being permanently overwritten. NMS data shall be archived in a format that is recognizable and capable of being used in both the core applications NMS and off-the-shelf industry standard spreadsheet, database, and word processing applications.

3. Proposers shall define the historical NMS information and archive capabilities for the proposed NMS subsystem. Proposers shall define all databases that are capable of being archived and retrieved.

3.7.1. Network Management Terminal

A. The NMT shall provide primary processing, display, and control of information to and from a variety of RTU locations. System status and alarm conditions shall be displayed. The system shall provide the ability to remotely access the system to check the operational status of the system and to view alarms.

B. A minimum of four NMTs shall be installed at locations to be determined by the County.

C. The NMT shall meet the following general requirements:

1. There shall be four computer terminals with two each of licenses for concurrent use exclusively for County use. Motorola will provide any extra licenses it requires beyond the County's two exclusive-use licenses.

2. Expandable software and hardware architecture shall be easily updated by adding software modules and hardware boards.

3. Hardware and software platforms shall be personal computer (PC)-based using current versions of hardware and software.

4. Both graphic and tabular displays shall provide instantaneous and comprehensive network status information.

5. The NMT shall provide full archiving and control functions.

6. Multiple alarm protocols for higher-level NMSs shall be mediated by the NMT.

7. The NMT shall be designed to monitor a large cross section of equipment so that it can consolidate multiple alarm systems, rather than just poll alarms from RTU locations.

8. The NMT must perform full management functions with a local terminal; that is, each hardware terminal must have its own active license without having to share a specific number of system licenses for NMT use.

9. The NMT shall provide email notification of alarms.

10. The NMT shall provide alarm filtration and consolidation.

11. A Web browser interface shall be provided for common management functions. Functions that cannot be displayed for remote access shall be listed in the proposal response.

12. A secure Web browser interface shall be provided to monitor alarms and perform control and management functions via intranet or internet.

D. NMTs/RTUs Communications Protocol(s)

1. Proposers shall fully describe all protocols used or supported.

2. Proposers shall identify which of the following protocols are supported, either standard or as an option:
   a. American Standard Code for Information Interchange (ASCII)
   b. SNMP and version

3. Proprietary protocols may be acceptable, provided that all requirements are met.

E. Standard Features: Proposers' solutions shall include the features below.

1. Proposers shall provide programmable display screens including the following:
   a. System Summary: High-level screen summary window with links to other screens

   b. Change of State: Summary of points that have changed state from alarm to normal or normal to alarm
   c. Standing Alarms: Summary of all points in alarm condition
   d. Programmable Alarm Windows: Allows logical grouping of alarms, such as by type or site

2. Proposers shall provide for the graphic depiction of the network allowing annunciation and point selection via icons:
   a. Nested-tree depiction of the network with drill-down capability
   b. Capability to drive external display devices

3. Programmable console environment, including:
   a. Database definition
   b. Screen colors
   c. Alarm summary formats
   d. Blink attributes
   e. Pager alarm formats
   f. Audible alert formats

4. Status Points – The following status types shall be supported:
   a. Simple status: Contact open or closed
   b. Change detect: Simple status plus change detect since last scan

5. Control Points – The following relay control types shall be supported:
   a. Direct control
   b. Select before operate
   c. Batch: Control multiple relays with a single operation

6. Analog Points – Display the value of a monitored quantity such as temperature, fuel level, voltage standing wave ratio (VSWR), etc.

7. Time stamp indicating date and time of message within 0.5 seconds

8. Conditional assignable text messages (minimum 256 characters) for each point to be issued on a change of state or alarm

9. Alarm Qualification – On a point basis, programmable delay before alarm is issued

10. Alarm Deactivation – On a point basis, the ability for the operator to deactivate an alarm to inhibit additional annunciation

11. Alarm History
    a. Logging of all alarms to disk and printer (selectable)
    b. Minimum history log of 500,000 entries

12. Email Support – Text message of alarm sent to email lists

13. Ping Interrogator – To confirm that servers, routers, and IP-based equipment are physically present on the network

14. Editor – Providing point configuration utilities to create and edit point databases

15. Security – Multiple levels of username and password protection to all for flexible system management

16. Reports – Proposers shall define the reports that are available. Proposers shall describe how trend analysis is supported and how current system status is reported. The system shall be able to provide comprehensive planning and analysis and shall have a flexible user interface.

3.7.2. Remote Terminal Units

A. RTUs shall be provided in sufficient quantities to monitor the entire network, including:

1. Trunked and conventional radio network components
2. Site facilities including shelter, tower, lighting, power, and generator
3. Microwave radios, channel banks, etc.
4. Simulcast paging transmitters (if equipped)
5. Data network equipment, including routers, switches, etc.
6. Remote access to all data and provisioning aspects of the system
7. Other miscellaneous equipment

B. RTUs shall be fully compatible with NMTs supplied and provide complementary functionality wherever necessary to provide a complete working system.

C. RTUs shall support the following points:

1. Status/alarms – 48 minimum, expandable to 256
2. Control outputs – 8 minimum, expandable to 32
3. Analog inputs – 8 minimum, expandable to 16

D. RTUs shall support time stamp and system time synchronization.

E. Terminations for all points shall be provided on suitable terminal blocks providing ease of installation, testing, and maintenance.

F. Proposers shall submit as a part of the proposal a cloud diagram showing each NMS server and terminal in the system. This diagram will show how to remotely access each terminal for any NMS, including a proposed IP scheme.

3.8. BACKUP CONTROL STATIONS

A. Stand-by or backup radio control stations shall be incorporated into the design to ensure the ability to transmit and receive on all proposed public safety voice spectrum allocations and all trunked talkgroups and conventional resources in the event of a console subsystem failure.

B. The backup control stations shall be integrated with the dispatch console electronics and equipped with both headset and handset functionality for dispatch flexibility and shall provide either a digital or tone remote control interface. PTT unit ID and alias information shall be provided to the dispatcher in all modes while operating the backup control stations. Trunking signaling information and advanced functionality tones (e.g., emergency, unit paging, individual call, etc.) shall be provided to the dispatcher in all modes while operating the backup control stations.

C. If a talkgroup is encryption selectable, the dispatcher shall be equipped to access all clear and encrypted trunking and conventional resources in any mode while operating the backup control stations.

D. Backup control stations shall be able to be physically remoted from the dispatch console position while the handset and headset interfaces are available at the dispatch console position.

E. One backup control station and associated accessories/peripherals shall be provided for each dispatch console position.

F. Backup control stations shall be installed in a manner consistent with the installation of all other fixed network infrastructure (e.g., single point grounding, lightning/surge protection, plenum-rated cable as required, RF shielding, etc.) and the backup control stations shall have antennas mounted to reliably access the County network from multiple RF sites in any communications mode.

G. All backup control station audio shall be logged at the logging recorder for all positions.

H. Refer to Appendix E, Backup Control Stations at PSAPs, for the required number of backup control stations.

3.9. CALL SIGN (BASE STATION) IDENTIFIER

A. The proposed system shall be equipped to automatically generate and transmit all FCC assigned call signs in International Morse Code format, or other methods as permitted by FCC rules, every 30 minutes, at a minimum per FCC §90.425 guidelines. Every channel shall be capable of transmitting the appropriate call signs so that in the event of a specific channel failure the FCC call signs are assured to be transmitted without any manual intervention required.

B. The proposed system shall offer the ability to easily modify/change all FCC call signs through a craft interface without the need to generate new hard-coded PROMS or "codeplug." The proposed system also shall provide the ability to change the timing between automatic call sign identifiers from the NMS (e.g., set the timer to every 15 minutes). The call sign shall be properly synchronized and phased with other call sign transmissions between sites so as not to cause distortion or a heterodyne effect in any possible overlap coverage areas.

3.10. CONSOLE PRIORITY

A. The proposed system shall provide console priority functionality for all dispatch consoles. Console priority is defined as the ability for a dispatch console to assume control of a talkgroup call at any time. The audio generated at a dispatch console position shall always be broadcast to all members of the talkgroup even if a subscriber terminal is actively transmitting. If a dispatch console assumes control of an active talkgroup call and asserts console priority, the dispatch console should still hear the transmitting unit's inbound audio but the rest of the members of the talkgroup shall hear only the outbound dispatch console audio.

3.11. CHANNEL BEACON

A. The proposed system must have the ability to provide channel beacon functionality. Channel beacon is defined as the ability for a dispatch console to apply or generate a recurring, unique audible alert tone on a specific talkgroup and/or conventional resource to notify resource members of the need to refrain from using the channel or talkgroup (e.g., officer shot, stakeout in progress, working fire, etc.) while a serious event is being managed. Channel

beacon and the associated configuration control shall be explained in detail. All subscriber terminals and dispatch consoles shall provide the channel beacon functionality.

1. Proposers should explain if the existing Avtec consoles can support this feature when integrated into the proposed new P25 radio system.
2. All application programming interfaces (APIs) and integration services required to support this feature shall be included in the base proposal.

3.12. PRIORITY LEVEL ACCESS

A. In a busy talk-path condition, the system shall stack or queue call service requests from users on a FIFO basis. The system shall be capable of rearranging the queue based upon a relative priority level associated with a specific radio unit ID or talkgroup ID, allowing faster servicing of higher priority (i.e., public safety) calls. By system design default, emergency calls shall have the highest priority of any other call in the busy queue. Priority levels shall be configurable by individual ID and/or talkgroup ID.

B. The system must have a priority structure that is supported throughout the network. This must enable the following:

1. Network administrators must be able to dynamically assign different priority levels to various types of calls and radio users.

2. Emergency calls must have the highest priority and be capable of preempting lower priority calls if no channels are available.

3. Channels shall be assigned based on the highest priority among calls waiting.

4. At least ten priority levels should be supported.

5. Recent users shall be capable of giving an elevated priority to maintain continuity of conversation.

C. Proposers shall describe the proposed priority scheme in detail. All subscriber terminals and dispatch consoles shall be capable of participating in the proposed multiple priority access level scheme.

3.13. BUSY PROCESSING/QUEUING

A. If no talk-paths or voice channel resources are available, radios requesting channels for new conversations should be placed in a busy queue. Users of the same priority should move through the queue in a FIFO sequence; however, users of higher priority should be elevated ahead of lower priority users in the queue.

B. When a voice channel becomes available, the radio at the top of the busy queue shall receive a channel assignment and generate a callback tone to the user. This callback tone alerts the user that a channel assignment has been made and communication is now possible on the selected talkgroup. All subscriber terminals and dispatch consoles shall be capable of providing the busy queuing/callback functionality.

3.14. BROADCAST/ANNOUCEMENT TALKGROUP CALL

A. The proposed system shall provide broadcast/announcement talkgroup call functionality. Broadcast/Announcement talkgroup call functionality is defined as the ability for a properly configured dispatch console or subscriber terminal to transmit to multiple talkgroups simultaneously using a single talk-path for the duration of the call. A broadcast/announcement talkgroup call shall be configurable to either wait for all associated transmitting talkgroup members in active calls to de-key, or the proposed system shall be configurable to interrupt calls in progress when a broadcast/announcement talkgroup call is initiated. Talkgroup membership in a broadcast/announcement talkgroup call shall be configurable at the dispatch console or NMS workstation. The proposed system shall provide the capability to create multiple, different broadcast/announcement talkgroup call resources. All subscriber terminals and dispatch consoles shall be capable of generating and participating in a broadcast/announcement talkgroup call.

3.15. LATE ENTRY

A. The proposed system must provide late entry capabilities. Late entry is defined as the functionality whereby the proposed system can transmit late entry indications related to any active call, thus allowing latecomer users (e.g., previously turned off radio, radio out of range, etc.) to join an active talkgroup, broadcast/announcement group, or sub-network call. All subscriber terminals and dispatch consoles shall provide late entry functionality.

3.16. TRANSMISSION/MESSAGE TRUNKING

A. In all modes of trunking operation, the proposed network shall be capable of operating both in transmission trunking and message trunking modes of operation, configurable by talkgroup

resource. Transmission trunking refers to the ability to configure the system so that the network does not associate any hangtime with a talkgroup call so that channel resources are immediately available for reassignment following a subscriber radio or console de-key. Message trunking refers to the ability to configure the system such that the network associates a configurable length hangtime with a talkgroup call so that channel resources remain temporarily available following a subscriber radio or console de-key on a specific talkgroup to preserve continuity of conversation. All subscriber terminals and dispatch consoles shall be capable of working in either transmission trunking or message trunking modes.

3.17. PUSH-TO-TALK UNIT IDENTIFICATION/DISPLAY

A. In all modes of trunking operation, the proposed network and all subscriber radios shall be capable of operating in a PTT-ID mode of operation in which the programmable radio unit ID is transmitted to the network upon every radio PTT for call logging and radio user recognition at the NMS and dispatch workstations. All radio IDs shall be capable of being alphanumerically aliased at the NMS and dispatch workstations. PTT-ID signaling shall not delay or degrade the radio transmission in any manner. All display wireless dispatch, dispatch consoles, and subscriber field radio units must display the transmitting radio unit ID and display a user alias as well. Proposers shall describe, and include in their pricing, their method within the P25 system to push alias updates out to all subscribers over-the-air. Over-the-air functionality shall not interfere with voice communications or reduce the voice traffic capacity of the radio system.

3.18. SCAN/PRIORITY MONITORING

A. The proposed system shall be capable of being configured to provide talkgroup and conventional mode scan functionality. Scan is defined as the ability for a subscriber to monitor/temporarily join active talkgroup or conventional calls (other than the talkgroup or conventional mode currently selected/tuned on the subscriber radio) in progress based on a configurable subscriber radio scan list of talkgroup and/or conventional resources. Scan functionality shall be controlled either by a configurable subscriber radio switch/button/menu item or through radio programming using auto-scan functionality configured by talkgroup or conventional modes. Scan also shall be configurable to provide talkback scan functionality, meaning that a subscriber radio user could key up on an actively scanned mode if the subscriber radio PTT switch is activated. Scan and associated configuration control shall be explained in detail. All subscriber terminals shall provide multiple, user-configurable subscriber scan modes and lists. All subscriber terminals shall be capable of working in the various scan modes.

B. The proposed system also shall be capable of being configured to provide priority monitoring scan functionality. Priority monitoring scan is defined as the ability for a subscriber or a talkgroup member to scan to an active higher priority talkgroup while involved in an active, lower priority talkgroup call. Various levels of priority shall be configurable for a subscriber terminal. Priority monitoring scan and associated configuration control shall be explained in detail. All subscriber terminals shall be capable of working in a priority monitoring scan mode.

3.19. OUT-OF-RANGE INDICATIONS

A. The proposed system subscriber terminals shall provide audible and visual out-of-range indications upon entering a service or geographic area in which trunked system RF coverage levels have dropped below an acceptable and reliable usage threshold. All subscriber terminals shall be capable of providing audible and visual out-of-range indications.

3.20. ALERT TONES

A. The proposed system must have the ability to provide alert tones functionality. Alert tones functionality is defined as the ability for a dispatch console and/or properly equipped subscriber terminal to apply unique, audible alert tones on a specific talkgroup and/or conventional resource to notify resource members of a special situation or to preamble a special dispatcher broadcast. The system shall provide multiple (at least three) unique alert tones so that various routine situations and announcements can be associated with a specific alert tone for operational efficiency. Alert tones and the associated configuration control shall be explained in detail. All subscriber terminals and dispatch consoles shall provide alert tones functionality.

3.21. READY-TO-TALK TONE

A. The proposed system must have the ability to provide ready-to-talk tone functionality. Ready-to-talk tone functionality is defined as the ability to configure a subscriber terminal with a unique, audible tone that signifies to the radio user that a trunked talk-path or voice channel has been assigned and is ready for use. The intent of the ready-to-talk tone is so radio users do not begin speaking too quickly following the activation of the PTT switch, creating a condition in which audio may be truncated to some degree. The ready-to-talk tone shall be configurable for all subscriber terminals.

3.22. REPEAT DISABLE

A. This section is only applicable to conventional channels.

B. The proposed system must have the ability to provide repeat disable functionality. Repeat disable functionality is defined as the configurable system ability for a dispatch console and/or NMS terminal to disable the normal repeat mode functionality of the network infrastructure so that only dispatch console positions can monitor the talkgroup and multigroup audio generated by a subscriber terminal. Although the system should normally operate in a repeat mode configuration so that field users can hear each other, the system shall provide the configuration capability to engage a repeat disable mode by talkgroup and/or multigroup so that a dispatcher can restrict sensitive or strategic communications to only being heard by dispatch consoles. Repeat disable functionality and the associated configuration control shall be explained in detail. All subscriber terminals, dispatch consoles, and fixed network infrastructure shall be capable of participating in the repeat disable functionality.

3.23. MULTIPLE KEY ENCRYPTION (OPTIONAL)

A. The proposed system shall include, as an OPTION for selected subscriber units, multiple key hardware-based encryption utilizing the Advanced Encryption Standard (AES) algorithm. No single key encryption configurations shall be proposed with this system. Security and confidentiality of system operations are major and growing concerns for some of the public safety agencies. As a result, it is the County's objective to protect the system from eavesdropping, corruption, or compromise of information; denial of service; disruption; or any other type of event using scanners, hacking, electronic break-ins, use of unauthorized radios, stolen radios, etc.

B. Select subscriber terminals (portables, mobiles, control stations) and all dispatch consoles shall be capable of the encryption algorithm approach with the ability to store at least 16 different encryption keys per algorithm and per subscriber terminal. The network infrastructure shall be capable of processing any combination of at least 256 different encryption keys per algorithm. Dispatch consoles shall be able to decrypt any of the 256+ encryption keys per algorithm created in the system on an end-to-end basis. Over-the-air-rekeying (OTAR) from the NMS shall be available for key distribution to remote subscriber terminals within the coverage range of the trunked system. Manual encryption key distribution also shall be available using a handheld, battery-operated, password-protected key fill device. Consoles shall have the ability to be rekeyed via Ethernet.

C. Multiple key encryption and associated configuration control shall be explained in detail. Encryption functionality shall be available in both trunking and conventional modes on both a user selectable and hard-coded "mode-strapped" basis for select subscriber terminals and all dispatch consoles.

3.24. DYNAMIC REGROUPING

A. Proposers need to commit to provide this capability once approved and published as part of the TIA P25 standard. Dynamic regrouping is the ability of a radio system to create a new talkgroup(s) and automatically assign radios to that new talkgroup(s) without requiring the user to manually change the channel selector switch.

B. Dynamically regrouped radio units can either be forced to remain on the new talkgroup(s) (restricted mode) or be allowed to freely change talkgroups (selectable mode). Pre-defined "action plans" can be created and initiated to regroup an unlimited number of affiliated subscriber radios into a new talkgroup automatically with a minimum of keystrokes by the system manager or dispatcher.

C. The NMS shall be capable of issuing the dynamic regrouping command as an instantaneous data service not utilizing a talk-path or voice resource. Likewise, the NMS shall be capable of issuing a dynamic "unregroup" command as a data service not utilizing a talk-path to remove the target subscriber terminal from the regrouping scenario. Positive or negative acknowledgement shall be provided to the NMS console as to whether the target radios receive the dynamic regrouping and unregrouping commands. All subscriber terminals and NMS workstations shall be equipped with dynamic regrouping functionality. Proposers shall describe the proposed dynamic regrouping functionality in detail.

D. Proposers shall provide the itemized cost for this option as 1) the current feature and 2) when it conforms to the P25 standard.

3.25. DYNAMIC (TACTICAL) PRIORITY

A. Proposers need to commit to provide this capability once approved and published as part of the TIA P25 standard.

B. The proposed system must have the ability to provide dynamic (tactical) priority functionality. Dynamic (tactical) priority functionality is defined as the configurable system ability for a dispatch console and NMS terminal to dynamically elevate (above its normally configured priority level) the priority level of an active talkgroup or multigroup resource. The target elevated priority level shall be the priority level just below emergency priority status. Dynamic (tactical) priority functionality and the associated configuration control shall be explained in detail. All subscriber terminals, dispatch consoles, and fixed network infrastructure shall be capable of participating in dynamic (tactical) priority functionality.

3.26. SUBSCRIBER TRACKING/GPS LOCATION SERVICES

A. The proposed system shall have subscriber tracking/global positioning system (GPS) location services capabilities quoted as an option. Subscriber tracking/GPS location is defined as the service whereby a network control point or properly equipped dispatch console may monitor the real-time location of mobile or portable subscriber terminals (within coverage range of the proposed network) on a map display using the proposed network infrastructure. Automatic network polling and/or manual user polling functionality shall be offered to provide real-time location status, and the location information shall be displayed on a map that updates at specified time intervals.

B. Additional triggers for location updates shall include: (1) emergency alert/call activation, (2) user PTT channel request, (3) dispatcher/administrator query, and (4) power-up/affiliation. All subscriber location change data (latitude, longitude, time of date, subscriber ID, etc.) shall be capable of being archived to a *.csv file on a designated network control point client computer/server for a period of up to 30 days on a FIFO basis. Subscriber tracking/GPS location services functionality and the associated configuration control shall be explained in detail. Proposers shall further identify and price any available API that may exist in which subscriber GPS location services data may be exchanged with a third-party mapping system. The County currently uses Esri-based geographic information system (GIS) maps.

C. Proposers shall indicate the number of subscriber radios that their proposed system can support for the triggered scenarios described above. Proposers shall indicate any additional frequency resources that may be required. Proposers also shall indicate any additional requirements that their proposed system may have on the backhaul network bandwidth for the PSAPs.

D. Proposers shall describe the future expansion capability of the location services options and resources that would be required to accommodate additional County users or departments.

3.27. OVER-THE-AIR PROGRAMMING (OPTIONAL)

A. The system shall offer the ability to provide over-the-air subscriber provisioning to download complete subscriber radio personality configuration changes. All subscriber radios shall be capable of being uniquely addressed and receiving, in real-time, over-the-air subscriber provisioning data.

B. All data contained in the subscriber radio personality shall be reconfigurable in an over-the-air exchange, and the personality data shall be transmitted in a discreet, protected mode to stymie eavesdroppers.

C. Over-the-air programming (OTAP) may be performed on an individual subscriber-by-subscriber basis, or subscribers may be reprogrammed in batches.

D. OTAP shall not interfere with voice communications or reduce the voice traffic capacity of the radio system.

E. From a dedicated over-the-air subscriber provisioning workstation or NMT, a network administrator shall be able to download all or any subset of the radio personality data to one or multiple field subscriber radios that are actively affiliated with the trunked network.

F. Over-the-air subscriber provisioning tools shall provide the same user functionality, user feedback, dialogue messages, and historical programming data as a traditional hard-wired programming configuration (e.g., laptop with required radio programming software, interface cables, adapters, etc.).

G. Target radios shall provide positive or negative acknowledgment as to the success of the intended over-the-air provisioning transaction. An over-the-air subscriber provisioning transaction shall take place in real-time, and the transaction time shall be commensurate with the bit rates offered by the proposed network. Compression techniques are encouraged to reduce the necessary duration of an over-the-air subscriber provisioning transaction.

H. Proposers shall fully discuss the over-the-air subscriber provisioning capabilities, methodologies, and limitations in the proposal response, to include the required infrastructure for supporting this feature.

I. Proposers shall itemize the optional pricing for the OTAP feature.

J. Proposers shall list all media (e.g., Wi-Fi, long-term evolution [LTE], Bluetooth, other) available for OTAP functionality.

3.28. OVER-THE-AIR REKEYING (OPTIONAL)

A. OTAR from the NMS shall be available for key distribution to remote subscriber terminals within the coverage range of the trunked system.

B. Manual encryption key distribution also shall be available using a handheld, battery-operated, password-protected key fill device.

C. Multiple key encryption and associated configuration control shall be explained in detail.

D. Encryption functionality shall be available in both trunking and conventional mode.

3.29. STATUS AND MESSAGE (OPTIONAL)

A. The proposed system shall include, as a system option, status and message functionality. Status and message are the capabilities for a source radio unit to send pre-defined status indication updates and/or preprogrammed message definitions to a dispatch console and NMT. Radio users shall be capable of initiating status and message indications from a preprogrammed status and message list. A source radio shall be notified if a target does not receive the sent status message. The proposed system shall provide capability for the dispatch consoles to query the field terminals by sending preprogrammed or canned messages. The proposed network and subscriber terminals shall be capable of processing status and message data services without the use of a dedicated talk-path or voice channel resource. Status and message functionality should be quoted as a system OPTION for all subscriber terminals and dispatch consoles. Proposers shall describe the proposed option and cite examples of this option in use.

3.30. DISCREET TERMINAL MONITORING (OPTIONAL)

A. The proposed system shall have discreet terminal monitoring capabilities quoted as an option. Discreet terminal monitoring is defined as the service whereby a dispatch console/network control point may place a subscriber terminal into a special type of individual voice call mode whereby the target terminal begins transmitting without any action from, or indication to, the called user. The purpose of the discreet terminal monitoring functionality is for the dispatch console/network control point to discreetly listen to the activities of a field user that may be operating in a dangerous or volatile situation. Discreet terminal monitoring functionality should be quoted as a system OPTION for all subscriber terminals and dispatch consoles. Proposers shall describe archive capabilities for this option and its interface to the proposed NMS.

3.31. SHORT MESSAGE/ALPHANUMERIC TEXT SERVICE (OPTIONAL)

A. The proposed system shall have Short Message Service (SMS)/alphanumeric text service capabilities quoted as an option. SMS/alphanumeric text service is defined as the data service whereby any combination of subscriber terminals, dispatch consoles, and NMS workstations can exchange free text messages using alphanumeric characters. Alphanumeric message length shall be at least 150 characters. Users shall be capable of generating the free text messages from the subscriber terminal keypad and/or workstation keyboards.

B. Sent and received text messages shall be time- and date-stamped in the respective source and target radios/consoles/NMS workstations. The proposed subscriber terminals/dispatch consoles/NMS workstations shall provide address book functionality so that target recipients can easily be stored and retrieved. Receipt of a message shall provide visual and audible indication to the subscriber terminals/dispatch consoles/NMS workstations. At least five messages shall be archived in the subscriber terminals on a FIFO basis and a user shall have the capability to flag a message to be saved and not deleted. Messages received and generated at dispatch consoles and NMS workstations shall be capable of being archived and printed for historical record-keeping purposes. A source radio/dispatch console/NMS workstation shall be notified if a target does not receive the sent message.

C. The proposed network and subscriber terminals shall be capable of processing SMS/alphanumeric text services without the use of a dedicated talk-path or voice channel resource. SMS/alphanumeric text service functionality and the associated configuration control shall be explained in detail. SMS/alphanumeric text service functionality should be quoted as a system OPTION for all subscriber terminals, dispatch consoles, and NMS workstations.

3.32. OTHER DATA (OPTIONAL)

A. Proposers shall describe and optionally price the ability to utilize the P25 backbone to support third-party data applications and include examples of such capabilities.

4. BACKHAUL NETWORK

4.1. OVERVIEW

A. Proposers shall propose an IP-based microwave/fiber backhaul system that provides redundancy protection to all connected radio sites and the county PSAPs.

B. The County has an existing microwave network, which is available to support the new P25 system. Proposers must state their requirements for use of the existing backhaul network.

C. Proposers shall propose a detailed backhaul plan including a detailed network engineering plan to leverage the network. The plan shall include, at a minimum, path-loss calculations and annual availability for each new path, as well as an overall network topology.

D. Proposers shall state their backhaul interconnectivity requirements that may be utilized to specify future backhaul expansion or changes. The future backhaul expansion may include

microwave, fiber, or leased Ethernet. The performance requirements shall include, but not be limited to, bandwidth, latency, and jitter for each site, including RF and dispatch locations used in the Proposer's proposed system.

4.2. DIGITAL MICROWAVE NETWORK

A. The digital microwave network shall consist of the following components:

1. Point-to-point digital microwave radios
2. Microwave antennas
3. Antenna systems
4. Waveguide dehydrator and manifold system
5. Alarms
6. NMS
7. MPLS aggregation service routers
8. -48 volt DC (VDC) rectifier system
9. Batteries

4.2.1. Requirements

A. The digital microwave backhaul network shall consist of monitored ring-protected point-to-point licensed microwave hops. MHSB shall be permitted if paths are not available for ring-protection.

B. Microwave terminal equipment shall include transmitter, receiver, modem, power supply, automatic switching device, multiplexer, service channel(s), and all associated interconnections to provide a complete and functional system.

C. The radio shall deliver two-frequency, full-duplex operation. Space diversity configurations are acceptable, if necessary, to meet reliability requirements.

D. Where MPLS or an equivalent network technology is used, it shall provide automatic traffic rerouting around an equipment failure and/or unavailable path(s) and restore affected connections in 50 milliseconds (msec0 or less [fast reroute (FRR)] or MPLS local protection).

E. Capacity

1. Each hop shall be equipped for the proposed IP radio network requirements.

2. Each new hop shall deliver a minimum payload capacity of 155 megabits per second (Mbps) or more, as required to serve the proposed network.

F. Performance Objectives

1. The Contractor shall include a tree growth factor of 20 feet, to be added to measured tree heights at critical points along all microwave paths. Path profile data sheets included with the final path engineering documents shall clearly denote the tree growth factor used at each critical point.

2. All paths in the system, including rings and spurs, shall be designed for a minimum two-way path reliability of 99.999% per year using the Vigants model in TIA TSB-10-F. The 10E-6 BER receiver threshold specified for full modulation shall be used as the outage point calculation. Path reliability must be calculated with adaptive modulation and meet required reliability at the desired throughput.

3. All paths in the system, including spurs and rings, shall have a required long-term, unfaded residual BER (RBER) of 10-11.

4. All paths in the 11 GHz and 18 GHz bands, and any band where rain outage is a significant factor, shall be designed for a minimum rain availability of 99.999% per year, using Crane 2003 rain rates appropriate to the area. Proposers shall be responsible for the complete design of all microwave paths. If criteria other than those defined in this paragraph are proposed, Proposers shall provide in their proposal a discussion of all specific differences and why those are being suggested in place of those following. For calculating path clearances on non-diversity paths or top dishes on space diversity paths, the worst case of 0.3 F1 @ K=2/3rds and F1 @ K=4/3rds shall be used. For diversity paths (top to bottom dishes), clearance shall be as provided for in International Telecommunication Union (ITU)-R Rec. P.530-11, Propagation data and prediction methods required for the design of terrestrial line-of-sight systems.

5. The mean time between failures (MTBF) for the proposed MHSB transceiver equipment shall exceed 25 years.

6. Adaptive modulation shall be included but shall not negate the requirement to meet the required capacity at the defined performance objectives.

G. Frequency

1. The Contractor shall be responsible for all microwave frequency research, prior coordination, and preparation of all associated FCC license applications and submittals on behalf of the County.

2. The County shall be responsible for coordination fees and licensing fees, if any, and signatures, if applicable.

3. Proposers shall propose the most appropriate licensed frequency band for each hop based on the requirements and FCC Part 101 regulations.

4. If frequencies in the 6 GHz band are proposed, Proposers shall consider the potential impact of Wi-Fi 6e operation within the band and describe their approach for mitigating the impacts of interference.

H. Transmitter

1. Proposers shall provide transmit output power referenced to the antenna port.

2. Transmit output power shall be software adjustable.

3. Automatic transmit power control (ATPC) shall be available.

4. A switch from the main transmitter to the standby transmitter shall not result in a system outage. Proposers shall describe the expected switchover time.

5. Radios shall be equipped with redundant power amplifiers. Switching between power amplifiers shall not result in a system outage.

I. Receiver

1. Proposers shall provide a guaranteed receiver threshold.

2. Proposers shall provide performance criteria of the proposed radios for the following:
   a. Co-channel interference
   b. Adjacent-channel interference
   c. Dispersive fade margin

3. The receiver shall be designed to ensure that the receiver with the better performance is operational at any given moment. Proposers shall equip radios with a 10:1 split to prevent frequent switching.

4. Transferring to the backup receiver shall not result in a system outage.

J. Antenna System

1. Microwave antennas shall be compatible with the radio frequency bands and conform to applicable FCC requirements. Solid parabolic-type, Category A antennas shall be used in accordance with FCC Part 101.115.

2. All microwave antennas, regardless of size and frequency band, shall be provided with protective radomes, standard four-inch pipe mounts, dual side struts, and ice shields.

3. Antennas, side struts, ice shield mounts, transmission lines, and grounds shall be attached to the tower in accordance with the manufacturer's instructions and relevant EIA/TIA standards.

4. A pressurized elliptical waveguide shall be used. Connectors shall be standard, premium-type, and compatible with antenna and radio and in accordance with latest revision of the ANSI/TIA-222 interfaces. Tower-mounted outdoor units (ODUs) shall not be proposed.

5. All mounting brackets, connectors, and other hardware shall be supplied as necessary for a complete installation.

6. An automatic dehydrator/pressurization system shall be provided to maintain at least 5-pounds per square inch gauge (psig) positive pressure of conditioned air in the elliptical waveguide and antenna feed unit. Individual pressure gauges on a distribution manifold shall be provided for each line.

7. All installed antenna/transmission lines shall be purged, pressure tested, and tested for low VSWR using return loss measurements. The minimum acceptable return loss shall be a VSWR of 1.5:1 and return loss of 14 dB or greater.

8. All RF paths shall be tested to demonstrate proper antenna alignment by measuring the net path loss between sites, as measured at the equipment rack interface.

9. All antenna sweep testing results shall be documented and provided in the as-built documentation at each site.

K. Microwave NMS (MNMS)

1. Proposers shall fully describe alarm, monitor, and control capabilities of the microwave terminal equipment, including capacity for external alarms (e.g., door alarms, generator).

2. Proposers shall define each alarm to the MNMS, and define the alarm protocol (e.g., SNMP v.3 or dry contact closure).

3. The County prefers to have alarm and control capabilities for microwave equipment integrated into the NMS for the P25 trunked system; see Section 3.7, Network Management System. Proposers shall fully describe the nature of the interface between the systems and how to provision the microwave or the P25 interconnection paths.

L. DC Power

1. Redundant equipment shall have dual, independent power feeds from separate circuit breakers and power panels to ensure that no single point of failure will cause a disruption of service.

2. Proposers shall provide a -48 VDC power system to support all P25 equipment, microwave equipment, and ancillary site equipment at existing and proposed sites used in the proposed system design. The vendor providing site development shall provide the DC plant.

3. Proposers shall provide dedicated double-pole 220 volt alternating current (AC) (VAC)/30-ampere circuits for each pair of rectifiers on the DC plant and provide electrical connections and grounding to the DC plant.

4. The Contractor shall perform electrical-loading analysis for shelter equipment, radio system equipment, and microwave equipment, excluding HVAC subsystems, during preliminary design to verify the DC system size required. All assumptions regarding power consumption and duty factors shall be thoroughly explained in the analysis.

5. Proposers shall provision distribution breakers and circuits for DC power to each designated row of equipment racks and provide installation. Equipment installed within those racks shall be immediately accessible to the DC power source and connected.

M. Performance Requirements:

1. Input:
   a. Single-phase, three-wire
   b. Voltage: 120/240 V nominal
   c. Frequency: 50/60 hertz (Hz) +/- 3 Hz

2. Output:

   a. Capacity: Assumed at 1,000 amperes, to be finalized during the design phase
   b. Voltage: -24/-48 VDC, 12 VDC, and 120 VAC

3. Minimum duration of supply – If the DC power system is the sole backup energy source, the duration of the supply is eight hours. Proposers shall assume 50% average base station/repeater usage (transmit and receive) for eight-hour runtime calculations. Proposers shall ensure four hours of DC runtime under 100% load.

4. Electromagnetic interference (EMI) emissions – The Proposer's proposed system shall comply with FCC rules and regulations and with Title 47 of the Code of Federal Regulations (CFR), Part 15 for Class A equipment.

5. Electronics equipment – Proposers shall provision solid-state devices using hermetically sealed semiconductor elements. Devices include rectifier-charger, inverter, and system controls.

6. Surge suppression – Proposers shall protect internal DC components from surges that enter at each AC power input connection and protect controls and output components.

N. Tests and Inspections:

1. The Contractor shall comply with the manufacturer's written instructions.

2. The Contractor shall inspect interiors of enclosures, including the following:
   a. The integrity of mechanical and electrical connections
   b. Component type and labeling verification
   c. Ratings of installed components

3. The Contractor shall test manual and automatic operational features, as well as system protection and alarm functions.

4. The Contractor shall provide inspection reports.

O. Demonstration: The Contractor shall train County maintenance personnel to adjust, operate, and maintain the DC power system.

4.2.2. Microwave Engineering

A. The Contractor shall conduct physical path surveys following notice to proceed to assure that all proposed paths meet proper clearance criteria.

B. The Contractor also shall conduct mandatory visits to all sites and notify the County/Owner of any site modifications necessary for the microwave hop.

C. The Contractor shall provide antenna centerline mounting height recommendations, based upon the information gathered during the physical path surveys and site visits.

D. Proposers shall include fade margin calculations with their proposal, showing the preliminary antenna sizes, system gains, and system losses.

E. The equipment shall be type-accepted for licensing under Part 101 of the FCC Rules and Regulations.

5. SITE DEVELOPMENT

5.1. GENERAL

A. Proposers shall consider the reuse of existing County sites; sites from the candidate site list in Appendix A-3, Candidate Tower Sites for the Proposed P25 System; new leased sites; and new raw-land sites as they develop a design. Site selection that will support the required system performance while minimizing costs is desired. Proposals shall include items such as shelter, generator, and site development to support the radio site, as appropriate, to the sites being recommended.

B. Proposers shall perform due diligence in verifying all proposed site data for inclusion in the proposed radio system. Proposers are responsible for all work and costs associated with the locations proposed, except for tower modification costs.

C. Proposers shall be responsible for ensuring all radio sites are brought up to the latest revision of generally accepted standards as specified in 5.1., General, D. Proposers must identify any specific enhancements required to existing radio sites during the mandatory site visits. If

Proposers identify leased tower locations, any associated work required to upgrade those sites as specified in 5.1.D, must be included.

D. Proposers shall identify, propose, and perform any additional work necessary including, but not limited to, materials, design, labor, and construction procedures to enhance each radio site including towers, shelters, backup power, site preparation, and fencing. The enhancements shall be in accordance with the latest revision of the following codes and standards; the more stringent shall apply.

1. NFPA 70®, *National Electrical Code (NEC®)*
2. NFPA 780, *Standard for the Installation of Lightning Protection Systems*
3. ANSI/TIA-222-H, *Structural Standard for Antenna Supporting Structures, Antennas and Small Wind Turbine Support Structures*
4. ANSI/TIA-607, *Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises*
5. ANSI/NECA 1, *Standard for Good Workmanship in Electrical Construction*
6. OSHA
7. IBC
8. Federal, state, and local codes and regulations (e.g., NEPA, SHPO, THPO, MPE, etc.)

E. Any potential grounding deficiencies that were not identified but should have been identified through a reasonable level of due diligence by the Proposer will become the responsibility of the Proposer to correct at no additional cost.

F. For the 45-day design, the Contractor shall provide detailed drawings, including all structures and foundations, sealed by a PE registered in the State of Pennsylvania.

1. Detailed drawings containing dimensions shall be provided that show all system components and locations.

2. Drawings and/or specifications shall describe any auxiliary equipment.

3. Manufacturer slick sheets of all equipment used also shall be provided.

G. Code Compliance

1. Installation of all electrical equipment, power distribution, lighting assemblies, and associated wiring shall comply with the most recent edition of the NEC and OSHA regulations.

2. All electrical equipment shall be listed or approved by UL.

3. The Contractor, and any subcontractor employed by the Proposer, shall comply with all local codes and industry best practices and guidelines stipulated in Section 1.6.1, Standards and Guidelines.

H. The Contractor shall assume total responsibility for maintaining liability insurance covering the following items:

1. Project design
2. Implementation
3. Licenses
4. Shipping
5. Receiving
6. All required site work
7. Any items required for the Contractor or any required subcontractors

I. Prior to any excavations, the Contractor or its subcontractor(s) shall follow appropriate procedures outlined at the following website: www.call811.com.

J. The Contractor shall coordinate with utility companies for all utility-related items, such as electrical service hookups and disconnects.

K. Concrete

1. For all foundations and concrete work, the Contractor or its subcontractor(s) shall provide to the project engineer a test sample of each mix of concrete demonstrating that it has been tested for compliance with the foundation specifications set forth by the requisite site engineer. Written reports certifying the strength of the concrete shall accompany each test cylinder.

2. If any concrete used in the foundation does not meet specifications, the Contractor or its subcontractor(s) shall remove the foundation and pour a new foundation using compliant materials, at no expense to the County/Owner.

L. The Contractor shall ensure any proposed leased locations meet the following:

1. Tower, shelter, and generator rated for sustained and V_{ult} wind loading consistent with Pennsylvania Building Code requirements for a Risk Category IV structure, and ANSI/TIA-222-H for a Class IV tower.

2. New dedicated 12-foot by 20-foot equipment shelter compliant with Section 5.3, Shelters. Use of an existing shared shelter will be permitted if available and mutually agreeable to the County.

3. New, dedicated, propane generator of sufficient size to run the site and charge the batteries with 25% anticipated future growth with an associated automatic transfer switch (ATS) and tank appropriately sized for a minimum 72-hour runtime compliant with Section 5.4, Generator and Automatic Transfer Switch. The Contractor shall complete an assessment of generator capacity sufficiency for each site and recommend any enhancements required to meet the proposed system backup power requirements.

4. Upgrade of sites to meet the requirements as specified in 5.1, General, D, including the subterranean grounding system (if required).

5. Modifications to the compound to accommodate the shelter, generator, and fuel tank as described above.

6. Coordination of power delivery with a dedicated utility meter.

M. The Contractor is responsible for all regulatory approvals, permitting, and zoning requirements with the proposed locations, including preparation of all exhibits required to obtain such approvals consistent with Sections 1.6.5, Local, State, and Federal Environmental and Historical Requirements, and 1.6.6, Permitting.

5.2. TOWERS

A. General

1. If Proposers determine that additional towers are required, or existing towers must be replaced or modified, the Proposer shall propose required solutions.

2. Any tower manufacturer supplying a tower(s) for this system shall guarantee structural integrity of the tower for a period of not less than 20 years from the date of acceptance.

3. Proposers shall propose tower heights to achieve the required coverage levels and achieve microwave path requirements.

B. Tower Loading

1. The tower and foundation shall be designed for all proposed equipment, legacy equipment, appurtenances, ancillary equipment, and initial antenna loading, plus 50% future antenna system growth, without addition to or modification of the finished tower or foundation.

2. The proposed tower structure shall be designed and installed in accordance with ANSI/TIA-222-H standard for a Class IV structure.

3. The tower shall be rated for sustained and V_{ult} wind loading consistent with Pennsylvania Building Code requirements for a Risk Category IV structure.

C. Proposed towers shall include the following:

1. Ice Bridge – A 24-inch, open mesh-type, horizontal transmission-line ice bridge, extending from the tower cable ladder to the equipment building, including 24 four-inch-diameter line entry ports, shall be provided.

2. Transmission Line Support – A vertical transmission line support system shall be provided to securely attach the antenna transmission lines. Holes shall be provided in the tower support members, tower hanger adapter plates, or separate ladder structures to allow installation of cable hangers and bolt-in cable hangers at maximum three-foot intervals. The mounting holes shall be precision punched or drilled, and sufficiently separated to accommodate the snap-in or bolt-in hangers.

3. Climbing Access – A ladder, beginning at a point at least ten feet off the ground, shall be provided as an integral part of the tower to permit access by authorized personnel. The tower shall be equipped with an OSHA-approved anti-fall safety device in accordance with the latest revision of ANSI/TIA-222-H. This device must not interfere with the climber's ease of reach by hand or foot from one rung of the ladder to the next, either going up or coming down. Two safety climbing belts shall be supplied with each new tower.

4. Lighting (as applicable)

   a. Tower lighting shall be supplied, as required, by the applicable determination as issued by the FAA for this project and shall be fully compliant with FAA AC 70/7460-1K, latest revision.

b. The system control circuitry shall provide synchronization and intensity control of the obstruction lighting system and shall monitor the overall integrity of the lighting system for component failure or improper operation.

c. The Contractor or its subcontractor(s) shall wire all alarms to the provided Type 66 block located in the communications shelter or equipment room. All alarms shall be clearly labeled.

5. A lightning ground rod shall be installed at the very top of the tower to extend at least two feet above the top of the tower or lighting fixture.

6. Labeling shall be clearly provided near the base of all new towers for the following:
   a. Make
   b. Model
   c. Serial number
   d. Tower height
   e. Latitude and longitude
   f. FAA and FCC identification numbers (if applicable)

D. Construction

1. All welding must be done in the factory prior to the galvanizing process. Field welding is not acceptable.

2. The tower shall be constructed of high-strength steel. All components and hardware shall be hot-dip galvanized with a zinc coating after fabrication, in accordance with latest revision of the ANSI/TIA-222-H standards. A zinc coating shall be permanently fused to the steel, both inside and outside, so that all surfaces are protected, and no painting is required for rust protection.

3. Each tower leg shall have two tabs included for the attachment of grounding bonding jumpers leading to the tower ground ring (ground electrode system) The tabs shall be spaced approximately 120 degrees apart and be of sufficient size to allow for exothermic welding of a single 4/0 conductor to each tab.

4. Prior to galvanization, each piece of steel and every weld must be deburred and smooth-finished.

E. Final Testing and Acceptance – Upon completion of the work, documentation detailing final inspection and testing shall be submitted, documenting the following:

1. Steel structure
   a. Vertical alignment and plumbness
   b. All bolts tight and torqued to specification
   c. No damaged or missing structural members
   d. All surface scratches and damage to the galvanization repaired
   e. No signs of stress or vibration
   f. All climbing ladders and other devices installed correctly
   g. Labels and tags

2. Foundation
   a. Concrete finish shall exhibit no cracks or blemishes
   b. Grouting, if used, shall have drain holes if the tower uses hollow leg construction or monopole design
   c. Backfilling and grading shall be conducted

3. Grounding shall meet applicable standards as specified in 5.1., General, D; items include the following, at a minimum:
   a. Verify lugs and exothermic welds
   b. Test and record ground resistance
   c. Install lightning ground rod at top of tower

4. Ice Bridge – Install per tower manufacturer specifications

5. Lighting and controls
   a. Inspect conduit and wiring installation
   b. Verify proper lamp operation
   c. Verify alarm contact operation
   d. Verify labeling

6. Photographs
   a. Overall structure from north, east, south, and west
   b. Footers
   c. Grounding

5.3. SHELTERS

A. General

1. Proposers shall propose a new or used equipment shelter at new site locations and where existing shelters are deemed inadequate. If used shelters are proposed, the Proposer shall ensure that the used shelters meet the same specifications as a new shelter, as specified within this RFP.

2. The shelter can be a prefabricated, preassembled shelter, or, if not feasible, a shelter can be constructed on site. The shelter can be constructed from concrete and/or aggregate materials.

B. Size

1. Shelter dimensions shall be determined by the Contractor dependent upon final design. Legacy and proposed systems shall use up to 60% of the floor space, leaving a minimum of 40% for future expansion.

2. The minimum shelter size shall be 12-foot by 20-foot, with a minimum interior height of nine feet.

C. Foundation – The foundation for the shelter shall consist of concrete piers or a poured concrete slab constructed by the Contractor or subcontractor that will properly support and secure the shelter. Foundation drawings recommended by the shelter manufacturer shall be the criteria by which the foundation is constructed.

D. Flooring

1. Proposers shall propose a structure where the floor or solid foundation features a minimum uniform load rating of 300 pounds per square foot with no more than 3,000 pounds over any four-square-foot area, unless additional load rating is required for batteries. This rating shall be increased in sections as necessary to support heavyweight equipment. If the shelter is delivered with the floor already assembled, the floor shall exhibit a minimum 90 pounds per square foot uniform live load capacity while the building is being lifted.

2. Floors shall be insulated to a minimum R-11 rating. Insulation shall be secured in place to prevent shifting during construction and transportation.

3. Exterior covering of the floor shall be included to prevent rodent penetration.

4. The floor shall be covered by a high-quality, industrial/commercial-grade asphalt or vinyl tile. All edges shall be covered by wall molding. Sealed or painted concrete is acceptable.

E. Walls

1. The shelter shall be rated for sustained and V_{ult} wind loading consistent with Pennsylvania Building Code requirements for a Risk Category IV structure.

2. The outside walls shall be finished concrete or an aggregate composition.

3. A wall feed-through with 12 four-inch openings shall be provided on the tower side of the building to accommodate elliptical waveguide and coaxial transmission lines. The openings shall be properly booted to provide a good weather seal. The wall feed-through shall be bonded to the site ground system per guidelines specified in Section 1.6.1, Standards and Guidelines.

4. The inside walls shall be finished with a minimum of $^{5}/_{8}$-inch plywood (or equivalent) with fiberglass reinforced plastic (FRP) laminate and coordinated molding. The FRP shall have a Class A fire rating. Interior walls shall be designed to allow the mounting of electrical and electronic equipment using standard fasteners available from local hardware stores. This requirement does not apply to used shelters.

5. High-performance insulation shall provide a minimum insulation factor of R-11.

F. Roof

1. The building roof shall support a minimum of 150 pounds per square foot uniform live load.

2. The roof is to be pitched to facilitate water runoff.

3. The shelter roof shall withstand the impact of ice falling from the adjacent tower without suffering any damage or shall otherwise be protected from such damage. Proposers are to describe in their proposals how this requirement will be met.

4. High-performance insulation shall provide a minimum insulation factor of R-19.

G. Doors

1. Shelters shall have one 42-inch by 84-inch insulated door, with three stainless steel tamper-proof ball-bearing hinges, passage-style lever handle, deadbolt lockset, and fiberglass weather hood or awning. The door shall be equipped with a hydraulic door closer.

2. The exterior door shall be of aluminum or steel (stainless or galvanized) construction with a finish to match the building finish.

3. The door sill shall be of stepped construction to prevent rainwater from entering the shelter at the bottom of the door or from around the door frame. The door frame shall have a weather seal around the door to limit air and water intrusion.

4. Locks shall be constructed of non-corroding materials, and shelter locks shall be keyed alike for shelters. Four keys per shelter shall be provided to the County.

5. Doors shall also be equipped with an electric door strike and a single cylinder deadbolt lock. The lockset shall be protected on the exterior by an anti-prying plate.

H. Finishing

1. Proposers shall describe the interior and exterior finishes. Color and finishes shall be selected by the County from samples provided by the Contractor or its subcontractor.

2. All joints shall be sealed with a compressible, resilient sealant.

I. AC Power System

1. The Contractor shall deliver the building complete with a minimum 200-ampere-capacity, 240-volt, single-phase electrical panel box with a ground bar.

2. This panel shall be equipped with a minimum 200-ampere-capacity main circuit breaker used to supply power for all electrical functions related to the site.

3. Overall panel size shall be determined by the need to provide the number of individual breakers required, plus a reserve of at least six 240-volt slots.

4. Breakers for shelter air conditioning will be of the bolt-down, not snap-in, type.

5. Receptacles

    a. Each radio equipment unit (or rack) shall be supplied with two 30-ampere circuits, each terminated at a typical NEMA L15-30 receptacle. Receptacles and junction boxes shall not be supported by the cable tray. This a violation of NFPA 70, Article 392. They may be supported by the structure or cable tray support system in compliance with NFPA 70.

    b. Service receptacles shall be mounted on the walls at six-foot intervals or less.

    c. Four weatherproof ground fault interrupter (GFI) exterior power receptacles shall be provided with each shelter, one to be mounted near the center of each exterior wall.

    d. Each receptacle shall be fed from an individual breaker. The feeding breaker shall be identified at the receptacle and the receptacle shall be identified at the breaker. All breakers or circuits shall be rated at 20 amperes, unless otherwise noted.

J. Power Line Surge Suppression

1. Equipment shelters shall be equipped with permanently connected, hard-wired UL-listed Type 1 and Type 2 surge protection devices (SPDs) in accordance with the latest edition of ANSI/UL 1449.

2. Type 1 and Type 2 SPDs shall use silicon avalanche diodes (SADs) and metal oxide varistors (MOVs), be equipped with plug-in modules, and provide both local visual and remote status monitoring. An acceptable unit shall be an in-line type such as the AC Data Systems "integrated load center." An alternate unit must meet or exceed all capabilities of this model unit.

3. Minimum surge protector requirements:
    a. Built-in redundancy of dual stages per phase with filtering
    b. Surge energy shunted to ground, not to neutral
    c. Front panel indicator lamps
    d. Remote/local status contacts
    e. Fusible link protected so as not to interrupt power
    f. Field replacement protection blocks or fuses, if needed
    g. UL-listed components
    h. 45 kiloamperes (kA)-per-phase ANSI C62.1 8/20 waveform
    i. Electromagnetic interference/radio frequency interference (EMI/RFI) filtering per MIL-STD-220

j. Capable of handling the full 240-volt, 200-ampere capacity of the electrical system

K. Wiring Methods

1. All wiring noted on the site drawings or otherwise included by the Contractor shall be installed in conduit or ductwork. Where no protection method is specified, conduit shall be used.

2. All conduits and ducts shall be securely surface-mounted and supported by approved clamps, brackets, or straps as applicable, and held in place with properly selected screws. No wiring shall be embedded inside any walls, floor, or ceiling. Entrance power, outside light, air-conditioning outlet, and telecommunications are the only wiring that may penetrate shelter walls or floor.

3. All wire raceways, conduits, etc. are to be mechanically joined and secured. Compression fittings shall be used; set screw fittings are not permitted.

4. All wire raceways, conduits, etc. are to be cleaned and free of manufacturer's stickers and labels.

5. Flexible steel conduit or armored cable shall protect wiring connected to motors, fans, etc., and other short runs where rigid conduit is not practical.

6. Unless otherwise specified, all power wiring shall be a minimum #12 American wire gauge (AWG)-size solid copper conductors with insulation rated for 600 VAC.

L. Portable Generator Support

1. The shelter shall have an external generator power connector for portable generator support. The Contractor shall provide an Appleton connector, or equivalent, on the outside of the shelter on the short wall closest to the shelter door, or where possible.

2. The shelter shall have a UL-listed internal double-throw switch to allow switching between the Appleton power connector and power from the commercial utility provider. This will allow the shelter to operate from the mobile generator while the site generator is serviced in the event of an extended outage.

M. Light Fixtures

1. Ceiling-mounted, four-foot, light-emitting diode (LED) light fixtures (two bulbs per fixture) shall be supplied for the equipment shelters. Enough light fixtures shall be supplied to provide a uniform light level throughout the building of 150-foot candles at four feet above the floor.

2. Light fixtures shall be fed as a gang from a common breaker and controlled by an on/off switch near the door.

N. Outdoor Lighting

1. An exterior LED 100 watt (W) or equivalent wall-mounted, dusk-to-dawn or constantly on light shall be mounted on the front entrance of the shelter on the same side of the doors as the lock and handle.

2. The exterior lighting system shall be fed from a separate, appropriately rated breaker and light switch by the door.

O. HVAC

1. Proposers shall provide an HVAC system for each shelter proposed. Proposers shall propose dual air-conditioning units with lead lag controller. Each air-conditioning unit shall be sized for 100% of the building's required cooling capacity, as determined by British thermal unit (BTU) analysis. Residential-type, window or split unit, HVAC is acceptable provided it meets the capacity requirements.

2. The Contractor shall perform BTU analysis (heat-load calculations) for all shelter equipment during preliminary design to verify HVAC system size. All calculations shall include a 50% expansion factor, and all assumptions regarding power consumption, duty factor, and heat loading shall be thoroughly explained.

3. Each unit shall be capable of maintaining an inside ambient temperature range between 65 and 85 degrees (°) Fahrenheit (F). Each unit shall be sized to maintain temperatures inside the shelter at 70° F when exterior temperatures go as high as 100° F.

4. The HVAC system shall be controlled by a wall-mounted thermostat. The thermostat shall turn the heater on when the temperature inside the shelter drops to 65° F and off when it rises to 68° F. It shall turn on the air-conditioner when the interior temperature

reaches 78° F and off when the temperature drops below 75° F. Thermostat control shall be adjustable within the range of 45° to 85° F.

P. Antenna Cable Conduit Entry: A bulkhead panel shall be supplied to accommodate coaxial transmission lines between ½-inch and $1^5/_8$-inch diameter elliptical waveguides. A minimum of 12 transmission lines shall be accommodated with four-inch openings. The building manufacturer shall seal the cables with the appropriate entry port boot or cushion for the cables to assure that they are watertight. Glue, adhesive, caulk, foam, tape, and other methods of sealing the entry port are not acceptable.

Q. Cable Tray: All shelters shall be equipped with cable trays. The Contractor shall install a minimum 18-inch-wide cable-tray system above the equipment.

R. Shelters shall be supplied with at least one ten-pound, carbon-dioxide (CO_2) fire extinguisher, an approved eye-wash station, first-aid kit, and 13-gallon trash can.

5.4. GENERATOR AND AUTOMATIC TRANSFER SWITCH

This section provides specifications and requirements for standby power systems to supply electrical power if the normal supply fails. Standby power systems shall consist of a liquid-cooled engine, an AC alternator, and system controls with all necessary accessories for a complete operating system, including at a minimum the items as specified.

A. Proposers shall provide an emergency generator system at each new radio communications site for backup power, sized appropriately for the system with a minimum capacity to allow for running the site and charging fully discharged batteries. For existing sites where a generator may be reused, an assessment of sufficiency should be completed, and any recommended enhancements proposed.

B. Proposers shall perform electrical-loading analysis for shelter equipment, including HVAC subsystems, during preliminary design to verify generator size and fuel-tank capacity. All electrical-loading calculations shall include a 50% expansion factor, and all assumptions regarding power consumption and duty factor shall be thoroughly explained.

For the proposal, Proposers shall assume the following:

1. Single phase
2. 60 Hz operating frequency
3. 0.8 power factor
4. Propane fuel

5. Minimum 72-hour runtime

C. In the event of a commercial power outage, the emergency generator shall provide power to the entire shelter without a system outage.

D. Quality Assurance – The system shall be supplied by a manufacturer that has been regularly engaged in the production of engine-alternator sets, ATSs, and associated controls for a minimum of ten years, thereby identifying one source of supply and responsibility.

E. The generator system and all accessories and ancillary equipment shall comply with the following standards:

1. NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*
2. NFPA 55, *Compressed Gases and Cryogenic Fluids Code*
3. NFPA 70, *National Electrical Code (NEC)*, with particular attention to Article 700, "Emergency Systems"
4. NFPA 110, *Standard for Emergency and Standby Power Systems,* requirements for Level 1 Emergency Power Supply System
5. NFPA 101, *Life Safety Code®*
6. ANSI/NEMA MG 1, *Motors and Generators*
7. ANSI/NEMA 250-2018, *Enclosures for Electrical Equipment (1000 Volts Maximum)*

F. Labeling and Identification – All wiring harnesses and connectors shall be clearly identified by number and function according to the associated schematic diagrams and documentation provided by the Proposer.

G. Factory Testing

1. Before shipment of the equipment, the generator set shall be tested under rated load for performance and proper functioning of control and interfacing circuits. Tests shall include:
   a. Verification that all safety shutdowns are functioning properly
   b. Verification of full load operation at full nameplate rating, per NFPA 110-2016, 7.13.4.1.4 (1) through (12).
   c. Verification of transient and voltage-dip responses and steady-state voltage and speed (frequency) checks
   d. Full load test for a minimum of 1.5 hour

2. The Contractor shall provide complete report(s) of all testing performed.

3. A letter of compliance by the supplier as specified in 5.6.10.5 for compliance and performance with NFPA 110.

H. Startup and Checkout

1. The supplier of the electricity-generating plant and associated items covered herein shall provide factory-trained technicians to check the completed installation and to perform an initial startup inspection to include:
   a. Ensuring that the engine starts (both hot and cold) within the specified timeframe
   b. Verifying that engine parameters are within specification
   c. Verification of no-load frequency and voltage adjustment (if required)
   d. Testing of all generator automatic shutdowns
   e. Performing a simulation of power failure to test generator startup and the ability of the ATS to pick up building load correctly
   f. Returning to commercial power and testing the generator and ATS to demonstrate correct cycling to normal commercial power
   g. Performing a load test, for a minimum of one hour, of the generator, to ensure full-load frequency and voltage is within specification when using building load
   h. Testing and verifying all remote indicators and controls

2. The Contractor shall provide complete report(s) of all testing performed.

5.4.1. Propane Generator

A. The prime mover shall be a liquid propane gas (LPG) engine.

B. The engine shall have a sufficient horsepower rating to drive the generator to full output power without a gear box between the engine and generator.

C. The engine shall have a battery-charging DC alternator with a solid-state voltage regulator.

D. The generator shall meet temperature-rise standards for Class H insulation, operating within Class F standards for extended life.

E. The alternator shall have internal thermal-overload protection and an automatic-reset field circuit breaker.

F. One-step load acceptance shall be 100% of the generator set nameplate rating, and shall meet the requirements of NFPA 110, paragraph 5-13.2.6.

G. The electricity-generating plant shall be mounted with vibration isolators on a welded-steel base that shall permit suitable mounting to any level surface.

H. A main-line-output circuit breaker carrying the UL mark shall be factory installed.

1. Form C auxiliary contacts rated at 250 VAC/10 amperes shall be provided to allow remote sensing of the breaker status.

2. A system utilizing manual-reset field circuit breakers and current transformers is unacceptable.

I. An alternator strip heater shall be installed to prevent moisture condensation from forming on the alternator windings.

J. Controls

1. All engine alternator controls and instrumentation shall be designed, built, wired, tested, and shock-mounted in a NEMA 1 enclosure mounted to the generator set by the manufacturer. It shall contain panel lighting, a fused DC circuit to protect the controls and a +/- 5% voltage-adjusting control.

2. The generator set shall contain a complete two-wire automatic engine start-stop control that starts the engine on closing contacts and stops the engine on opening contacts.

3. A programmable cyclic cranking limiter shall be provided to open the starting circuit after four attempts if the engine has not started within that time. Engine control modules must be solid-state plug-in type for high reliability and easy service.

4. The panel shall include:
    a. Analog meters to monitor:
        i. AC voltage
        ii. AC current
        iii. AC frequency
    b. Phase selector switch
    c. Emergency stop switch
    d. Audible alarm
    e. Battery charger fuse
    f. Programmable engine control
    g. Monitoring module

5. The programmable module shall include:
   a. Manual on/off/auto switch
   b. Four LED status lights to indicate:
      i. Not in Automatic Mode
      ii. Alarm Active
      iii. Generator Running
      iv. Generator Ready

6. The module shall display all pertinent unit parameters including:
   a. Generator Status – On/Off/Auto
   b. Instrumentation – Real-time readouts of the following engine and alternator analog values:
      i. Oil pressure
      ii. Coolant temperature
      iii. Fuel level
      iv. DC battery voltage
      v. Run-time hours
   c. Alarm Status
      i. High or low AC voltage
      ii. High or low battery voltage
      iii. High or low frequency
      iv. High or low oil pressure
      v. Low water level
      vi. High or low water temperature
      vii. High and pre-high engine temperature
      viii. High, low, and critical-low fuel levels (where applicable)
      ix. Over crank
      x. Over speed
      xi. Unit not in automatic mode

K. Unit Accessories

1. Weather-protective enclosure

   a. The generator set shall be factory-enclosed in a heavy-gauge steel enclosure constructed with 12-gauge corner posts, uprights, and headers.

   b. The enclosure shall be coated with electrostatically applied powder paint, baked, and finished to manufacturer's specifications.

c. The enclosure shall have large, hinged doors to allow access to the engine, alternator, and control panel.

2. The exhaust silencer(s) shall be provided of the size recommended by the manufacturer and shall be of critical grade.

3. The generator set shall include an automatic dual-rate battery charger manufactured by the generator set supplier. The battery charger shall be factory installed on the generator set. Due to line-voltage-drop concerns, a battery charger mounted in the transfer switch is unacceptable.

4. A heavy-duty, lead-acid, 12-volt DC battery shall be provided by the generator set manufacturer. The generator set shall have a frame suitable for mounting the battery and shall include all connecting battery cables.

5.4.2. Automatic Transfer Switch

A. The ATS shall be compatible with the generator set to maintain system compatibility and local service responsibility for the complete emergency power system.

B. Representative production samples of the ATS supplied shall have demonstrated through tests the ability to withstand at least 10,000 mechanical operation cycles. One operation cycle is defined as the electrically operated transfer from normal to emergency and back to normal.

C. Wiring must comply with NEC Table 373-6(b). The manufacturer shall furnish schematic and wiring diagrams for the ATS proposed and a typical wiring diagram for the entire system.

D. Ratings and Performance

1. The ATS shall be housed in a corrosion-resistant NEMA 3 enclosure approved for indoor or outdoor installations.

2. The ATS shall be adequately sized to match the generator and shelter electrical systems.

3. The ATS shall be a two-pole design rated for 600-VAC, 200-amperes continuous operation in ambient temperatures of -20° F (-29° Celsius [C]) to +140° F (+60° C).

4. The operating mechanism shall be a single operating coil design, electrically operated, and mechanically held in position.

5. A provision shall be supplied to be able to manually operate the switch in the event of logic or electrical coil failure.

E. Controls

1. A solid-state under-voltage sensor shall monitor all phases of the normal source and provide adjustable ranges for field adjustments for specific application needs.

    a. Pick-up and drop-out settings shall be adjustable from a minimum of 70% to a maximum of 95% of nominal voltage.

    b. A utility-sensing interface shall be used, stepping down system voltage of 120/240 VAC single phase to 24 VAC, helping to protect the printed circuit board from voltage spikes and increasing personnel safety when troubleshooting.

2. Controls shall signal the generator set to start in the event of a power interruption.

    a. A solid-state time-delay start, adjustable from 0.1 to 10 seconds, shall delay this signal to avoid nuisance start-ups on momentary voltage dips or power outages.

3. Controls shall transfer the load to the generator set after it reaches proper voltage.

    a. Adjustable from 70%–90% of system voltage.

    b. Adjustable from 80%–90% of system frequency.

    c. A solid-state time delay, adjustable from 5 seconds to 3 minutes, shall delay this transfer to allow the generator to warm up before application of load.

    d. There shall be a switch to bypass this warm-up timer when immediate transfer is required.

4. Controls shall retransfer the load to the line after normal power restoration.

    a. A return-to-utility timer, adjustable from 1 to 30 minutes, shall delay this transfer to avoid short-term normal power restoration.

5. The operating power for transfer and retransfer shall be obtained from the source to which the load is being transferred.

6. Controls shall signal the generator to stop after the load retransfers to normal.

    a. A solid-state engine cool-down timer, adjustable from 1 to 30 minutes, shall permit the engine to run unloaded to cool down before shutdown.

    b. If the utility power fails during this time, the switch shall immediately transfer back to the generator.

7. The transfer switch shall have a time-delay-neutral feature to provide a time delay, adjustable from 0.1 to 10 seconds, during the transfer in either direction, during which time the load is isolated from both power sources. This allows residual voltage components of motors or other inductive loads (such as transformers) to decay before completing the switching cycle.

8. A switch shall be provided to bypass all transition features when an immediate transfer is required.

9. The transfer switch shall have an in-phase monitor, which allows the switch to transfer between live sources if its voltage waveforms become synchronous within 20 electrical degrees within 10 seconds of the transfer-initiation signal.
    a. If the in-phase monitor will not allow such a transfer, the control must default to time-delay-neutral operation.

10. Front-mounted controls shall include a selector switch to provide for a NORMAL TEST mode with full use of time delays; FAST TEST mode that bypasses all time delays to allow for testing the entire system in less than one minute; or AUTOMATIC mode to set the system for normal operation.

    a. The controls shall provide bright lamps to indicate the transfer switch position in either UTILITY (white) or EMERGENCY (red). A third lamp is needed to indicate STANDBY OPERATING (amber). These lights must be energized from the utility source or the generator set.

    b. The controls shall provide a manually operated handle to allow for manual transfer. This handle must be mounted inside the lockable enclosure and be accessible only to authorized personnel.

c. The controls shall provide a safety disconnect switch to prevent load transfer and automatic engine start while performing maintenance. This switch also shall be used for manual transfer switch operation.

d. The controls shall provide LED status lights to give a visual readout of the operating sequence including:
   i. Utility on
   ii. Engine warmup
   iii. Standby ready
   iv. Transfer to standby
   v. In-phase monitor
   vi. Time-delay neutral
   vii. Return to utility
   viii. Engine cool down
   ix. Engine minimum run

5.4.3. Propane Fuel System

A. Proposers shall provide a complete fuel system including tank(s), concrete pads, and all associated piping, valves, regulators, controls, etc.

B. Above-ground tanks shall be installed securely in a protected manner.

C. Tank and fuel system components shall be sized to provide a minimum of 72 hours of run time at full load.

D. The propane tank shall be located per site drawings or as determined onsite with the County/Owner and the utility.

E. Clear access shall be provided for refueling.

F. Controls and Monitoring Equipment

1. Fuel capacity gauge with low-fuel-level alarm contact closure

G. The Contractor shall install the fuel line between the fuel tank and generator.

1. The fuel line shall be buried per governing regulations and codes.
2. All necessary valves and reducing valves shall be furnished and installed.

3. The fuel line shall be grounded per generally accepted standards as specified in 5.1., General, D or within specifications of this document.

H. Quality Assurance:

1. Electrical components, devices, and accessories shall be listed and labeled, as defined in NFPA 70, by a qualified testing agency and marked for intended location and application.

2. UL compliance shall be listed and labeled under UL 1778 by a nationally recognized testing laboratory (NRTL).

3. NFPA compliance shall identify UPS (if provided) components as suitable for installation in computer rooms according to NFPA 75, *Standard for the Fire Protection of Information Technology Equipment*.

5.5. SITE PREPARATION

A. The Contractor shall perform all preparations for site improvements as necessary. Work includes the following at a minimum:

1. Protecting existing plants and grass to remain
2. Removing existing plants and grass as necessary
3. Clearing and grubbing
4. Stripping and stockpiling topsoil
5. Removing above- and below-grade site improvements
6. Disconnecting, capping or sealing, and removing site utilities
7. Temporary erosion and sedimentation control measures
8. Access road development

B. The following Construction Specifications Institute (CSI) standard sections are referenced, but are not included in this specifications document:

1. Division 1 Section, *Temporary Facilities and Controls* – for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and temporary erosion and sedimentation control procedures

2. Division 1 Section, *Execution Requirements* – for verifying utility locations and for recording field measurements

3. Division 1 Section, *Selective Demolition* – for partial demolition of buildings or structures undergoing alterations

4. Division 2 Section, *Building Demolition* – for demolition of buildings, structures, and site improvements

5. Division 2 Section, *Tree Protection and Trimming* – for protecting trees remaining onsite that are affected by site operations

6. Division 2 Section, *Earthwork* – for soil materials, excavating, backfilling, and site grading

7. Division 2 Section, *Lawns and Grasses* – for finish grading including preparing and placing planting soil mixes and testing of topsoil material

8. Division 2 Section, *Site Construction* – for construction of sites

C. The Contractor or its subcontractor(s) shall comply with local guidelines for erosion and sedimentation (E&S) control.

D. Proposers shall carefully examine and study existing conditions, difficulties, and utilities affecting execution of work. Later claims for additional compensation due to additional labor, equipment, or materials required due to difficulties encountered or underground water conditions will not be considered.

E. The Contractor shall verify the existing plant life to remain and that clearing limits are clearly tagged, identified, and marked in such a manner as to ensure the safety of said plant life throughout construction operations.

F. Protection

1. The Contractor shall protect and maintain benchmark, monument, property corner, and other reference points, reestablishing them by registered professional surveyor if disturbed or destroyed, at no cost to the County.

2. The Contractor shall locate and identify existing utilities that are to remain and protect them from damage, reestablishing them if disturbed or destroyed, at no cost to the County.

3. The Contractor shall protect trees, plant growth, and features to remain as final landscape. Branches or roots of any trees that are to remain shall not be disturbed. Adequate guards, fences, lighting, warning signs and similar items shall be provided and maintained as required.

4. The Contractor shall install protection such as fencing, boxing of tree trunks, or other measures as approved by the project engineer.

5. The Contractor shall conduct operations with minimum interference to public or private accesses and facilities, maintain ingress and egress at all times, and clean or sweep any roadways daily or as required by the governing authority. At such times as deemed necessary by the County, dust control shall be provided by water-sprinkling systems or equipment provided by the Contractor or its subcontractor(s).

6. When appropriate, the Contractor shall provide traffic control as required, in accordance with contract documents, the U.S. Department of Transportation "Manual of Uniform Traffic Control Devices" and the Pennsylvania Department of Transportation requirements.

G. Clearing

1. The Contractor shall clear areas required for access to the site and execution of work.

2. Unless otherwise indicated, the Contractor shall remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with the installation of new construction. Removal includes digging out stumps, roots, and root material. Depressions caused by clearing and grubbing operations are to be filled to sub-grade elevation to avoid water pooling. Satisfactory fill material shall be placed in horizontal layers not exceeding eight inches loose depth, and thoroughly compacted per fill requirements of this section and CSI Division 2, *Site Construction*, Section 02200.

3. The Contractor shall remove grass, trees, plant life, stumps, and all other construction debris from the site to a location that is suitable for handling such material according to state laws and regulations.

H. Demolition: The Contractor shall remove existing pavement, utilities, curbing, and shrubbery as necessary for construction of improvements.

I. Topsoil Excavation

1. The Contractor shall strip topsoil from areas that are to be filled, excavated, landscaped, or regraded to such a depth that it prevents intermingling with underlying subsoil or questionable material.

2. The Contractor shall stockpile topsoil in storage piles in areas not scheduled for construction, job trailer location, or equipment laydown, or where directed by the project engineer. Storage piles shall be constructed to freely drain surface water. Storage piles shall be covered as required to prevent windblown dust. Unsuitable soil shall be disposed of as specified for waste material, unless otherwise desired by the County. Excess topsoil shall be removed from the site by the Contractor or its subcontractor(s).

3. Final topsoil coatings shall consist of organic soil applied in depth of not less than six inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects greater than two inches in diameter, as well as weeds, roots, and other objectionable material.

J. Access Roads

1. A 12-foot-wide access road shall be provided from the closest navigable roadway to the fence gate at new sites. For existing access roads, Proposers shall evaluate sufficiency and propose improvements where necessary.

2. Roadbeds shall be prepared, rolled, and provided with six inches of aggregate base course.

3. Roads shall be graded appropriately for proper drainage and minimal erosion.

4. Roads shall be sufficient to support all vehicles required for construction, system maintenance, and emergency services consistent with AHJ requirements.

5.6. FENCING

A. The Contractor shall provide chain-link fencing around the perimeter of all new proposed sites.

B. Framework: Type I or Type II steel pipe

1. Type I – Schedule 40 steel pipe with 1.8 ounces of zinc coating per square foot of surface area conforming to ASTM F1083.

2. Type II – Pipe manufactured from steel conforming to ASTM A569. External surface triple coated per ASTM F1234. Type II pipe shall demonstrate the ability to resist 1,000 hours of exposure to salt spray with a maximum of 5% red rust in a test conducted in accordance with ASTM B117.

3. All coatings are to be applied inside and out after welding.

4. Unless otherwise noted, Type II framework shall be provided.

5. Pipe shall be straight, true to section and conform to the following weights:

Table 4: Type I and Type II Steel Pipe Specifications

Pipe Size Outside Diameter (O.D.)	Type I Weight (Lbs./Ft.)	Type II Weight (Lbs./Ft.)
$1^5/_8$”	2.27	1.84
2”	2.72	2.28
2½”	3.65	3.12
3”	5.79	4.64
3½”	7.58	5.71
4”	9.11	6.56
$6^5/_8$”	18.97	N/A

C. Fabric

1. Aluminized fabric shall be manufactured in accordance with ASTM A491 and coated before weaving with a minimum of 0.4 ounces of aluminum per square foot of surface area. The steel wire and coating shall conform to ASTM A817. The fabric shall be nine-gauge wire woven in a two-inch diamond mesh. The top selvage shall be twisted and barbed. The bottom selvage shall be knuckled.

2. Zinc-coated fabric shall be galvanized after weaving with a minimum of 1.2 ounces of zinc per square foot of surface area, and shall conform to ASTM A392, Class I. The fabric shall be nine-gauge wire woven in a two-inch diamond mesh. The top selvage shall be twisted and barbed. The bottom selvage shall be knuckled.

D. Fence Posts

Table 5: Fence Post Specifications

Fence Posts Type I - II		
Fabric Height	Line Post O.D.	Terminal Post O.D.
Under 6’	2”	2½”
6’-9’	2½”	3”
9’-12’	3”	4”

E. Gate Posts

Table 6: Gate Posts Specifications

Gate Posts Type II		
Single Gate Width	Double Gate Width	Post O.D. Type II
Up to 6’	Up to 12’	3”
7’ to 12’	13’ to 25’	4”

F. Rails and Braces: $1^{5}/_{8}$-inch O.D.

G. Gates: Frame assembly of two-inch O.D. pipe (Type I or Type II) with welded joints. Weld areas shall be repaired with zinc-rich coating applied per manufacturer's directions. The fence fabric shall match the fence posts, gateposts, and gates. Gate accessories, hinges, latches, center stops, keepers, and necessary hardware shall be of a quality required for industrial and commercial application. Latches shall permit padlocking. Proposers shall provide one padlock for each gate with four keys for each padlock. All padlocks shall be keyed alike.

H. Installation

1. General – Fence installation shall conform to ASTM F567, *Standard Practice for Installation of Chain-Link Fence*.

2. Height – Fence height shall be as indicated on contract drawings. If no height is indicated, the fence shall be seven-feet high, plus one foot for barbed wire.

3. Post Spacing – Line posts shall be uniformly spaced between angle points at intervals not exceeding ten feet.

4. Bracing – Gate and terminal posts shall be braced back to adjacent line posts with horizontal brace rails and diagonal truss rods.

5. Top Rail – The top rail shall be installed through the line post loop caps, connecting sections with sleeves to form a continuous rail between terminal posts.

6. Fencing shall have a bottom rail instead of a tension wire.

7. Fabric – The fabric shall be pulled taut with the bottom selvage two inches above grade. The fabric shall be fastened to the terminal posts with tension bars threaded through mesh and secured with tension bands at maximum 15-inch intervals. The fabric shall be tied to the line posts and top rails with tie wires spaced at a maximum of 12 inches on posts and 24 inches on rails. The fabric shall be attached to the bottom rail with top rings at maximum 24-inch intervals.

8. Barbed Wire – Barbed wire shall be anchored to the terminal extension arms, pulled taut and firmly installed in the slots of the line post extension arms.

9. Valleys – Should the fence cross a ditch or drainage swell, ⅜-inch diameter aluminum alloy rods shall be driven vertically 18 inches into the ground on four-inch centers and woven through the fence fabric to provide security for these areas.

10. Vegetation stop and aggregate shall be applied to the entire compound area (the area inside the fencing) and six inches beyond the fencing. Vegetation stop shall be constructed with weed barrier geotextile and aggregate shall be applied three inches in depth and consist of American Association of State Highway and Transportation Officials (AASHTO) #10 coarse aggregate.

5.7. VIDEO SURVEILLANCE (OPTIONAL)

A. Proposers shall propose a surveillance system for each site.

B. Fixed position, color, digital security cameras are to be installed at various locations inside and outside of the equipment shelters. The cameras shall have the ability to capture and store

images from cameras digitally to a digital video recorder (DVR) as specified below. Proposers shall include two cameras per radio site.

C. DVR systems shall include the following:

1. Monitor placed within the shelter.
2. Ability to record all cameras simultaneously with a storage capacity for a minimum of six months of recording and expandable by three cameras.
3. Ability to permit simultaneous recording and live viewing of cameras both offsite via password-protected internet access and onsite via the provided monitor.
4. Ability to permit multiple camera angles to be viewed simultaneously on a single monitor.
5. Capability to be securely managed remotely over the internet through a web browser.
6. Standard, regularly manufactured materials and equipment; all systems and components shall be thoroughly tested and proven in actual field use
7. IP-based and adhere to H.264 compression standards, and record in Common Intermediate Format (CIF), 2CIF, and 4CIF resolution.
8. Have archive/export capability to a digital video disc (DVD) and external USB device.
9. Feature a standard format that can be viewed on a laptop PC with the Microsoft® Windows operating system.

D. Cameras shall:

1. Be high-resolution; Proposers shall provide the image resolution of each camera proposed.
2. Be enclosed in a weatherproof housing that incorporates vandal-resistant features (for those to be installed outdoors).
3. Have day/night viewing capabilities.

6. DISPATCH CONSOLES

6.1. GENERAL REQUIREMENTS AND FEATURES

A. The 911 center, both primary and backup, currently use Avtec consoles (15 consoles at the primary 911 center and eight at the backup center; both recently updated). The County expects to be able to reuse its console system with the new proposed radio network. Proposers shall indicate the features and functionality specified in this section that will be provided through the Console Subsystem Interface (CSSI).

B. Proposers shall indicate the features and functionality that will not be provided with the Avtec console via CSSI.

6.2. TRUNKED REQUIREMENTS FOR EXISTING CONSOLES

A. Dispatch consoles shall be compatible with a proposed P25 trunked radio system. Dispatch consoles shall directly interface with the trunked system controllers and shall allow interoperability between trunked and non-trunked channels in the system.

B. Dispatch consoles shall be able to monitor and transmit on all proposed trunked systems. Backward compatibility with the existing trunked system for ease of cutover is desired, but not required.

C. To enhance dispatcher effectiveness in a PTT-ID system, the various display modes available shall interact as follows:

1. An operator shall have the capability of setting up (and subsequently knocking down) an emergency call from the dispatch console position.

2. The system shall allow private communication between a dispatch console operator and a radio user. Once the operator is involved in a private call on a specific resource, the operator shall not receive audio from another radio attempting to call on that same resource.

3. An option shall be provided that assigns priority to associated talkgroups. The dispatcher shall have the choice between normal preset priority and tactical priority, with tactical being the second-highest priority for a talkgroup in a system.

D. In the cases of multi-talkgroup transmit or talkgroup patch, the use of more than one trunked repeater shall not be allowed; the talkgroups shall be merged on a single repeater to conserve repeaters.

E. It shall be possible to temporarily mute unselected talkgroups. The unselected audio will un-mute automatically after a programmable preset time. Mute shall be 20 dB minimum.

F. Dispatch consoles shall have the capability to patch together two or more talkgroups so that users may communicate directly.

G. If the dispatcher attempts to make a call on a trunked radio system connected to the dispatch consoles and all trunked channels are busy, visual and audible alerts will be initiated at the dispatch consoles.

6.3. CONVENTIONAL REQUIREMENTS

A. Dispatch equipment shall include an instant transmit switch for each conventional repeater channel and/or base station.

B. On conventional resources capable of operating on multiple frequencies/modes, a control/indicator shall be provided to select the desired transmit frequency/mode (select channel). The select-channel function shall cause the associated channel to switch frequencies/modes. Once a channel has been selected, the operator shall be able to transmit on this channel by pressing the footswitch or transmit button.

C. A transmit-audio-level meter shall be provided that indicates the level of transmitted voice. This meter also shall indicate the level of receive audio present on the selected channel.

D. Operator positions shall have the ability to independently set each channel's volume level. Minimum audio levels shall be capable of being set to avoid missed calls.

E. A control/indicator shall be provided to allow the operator to mute or unmute audio from unselected channels. Selected audio and unselected audio shall be audible from separate speakers.

F. A control/indicator shall be provided that enables the operator to select multiple channels, which in turn gives the dispatcher the ability to broadcast to several channels at once.

G. Operators shall have the ability to patch two or more conventional repeaters and/or base stations together so that users may communicate directly. Operator positions shall be equipped such that a minimum of eight simultaneous patches shall be available.

H. To aid dispatchers in a busy system, a list of the last 15 radio IDs shall be available in a "recent calls" list.

6.4. PAGING REQUIREMENTS

A. Consoles support current signaling methods as well as the proposed paging format. Additional features shall be described. The infrastructure will be capable of supporting the Avtec consoles with the features that follow.

1. Proposers shall describe the following paging formats supported:
   a. Quick Call I
   b. Quick Call II

c. Dual-tone multi-frequency (DTMF)
d. MDC-1200 selective call
e. Trunking call alert
f. Post Office Code Standardization Advisory Group (POCSAG) 512/1200/2400 bits
g. 2-Tone over P25 – This feature alerts the selected groups of responders' radios in the field before a voice transmission of the incident by the dispatcher

2. Preprogrammed pages and groups shall be created and modified using the console alias database program.

3. A manual page feature shall be provided.

4. A list of standard pages shall be created to enable the operator to select or stack pages to be sent to multiple recipients.

5. An instant page feature shall allow operators to send multiple pages with the single press of a button.

6. Consoles shall be capable of transmitting at least three distinctive alert tones indicating to field units the priority or type of dispatch to follow.

6.5. SYSTEMS INTEGRATION

A. The console system shall integrate with an adequate number of conventional channels as used by the County at the 911 centers.

B. The dispatch console system shall support interfaces with the CAD system in use by County to provide the ability for the CAD systems to automatically select recommended stations for dispatch.

C. The dispatch console system shall support connections to both existing resources and conventional resources as determined by the County.

6.6. LOGGING RECORDER (OPTIONAL)

A. Proposers shall propose a logging recorder interface solution that will interface with the County's existing recording system used for 911 telephony. The proposal must be consistent with the County's current operations to include recording of telephony, consoles, and radios.

B. The logging recorder shall be provided for each talkgroup used for primary dispatch and select tactical talkgroups, as well as selected receive audio and the operator's transmit audio for each dispatch position. The recorder shall support recording the maximum number of proposed simultaneous talk paths, plus audio from the proposed console positions at the dispatch centers.

C. The County desires a logging recorder link that will support a direct connection without requiring a conventional interface. Proposers must include any required API associated with completing the connection. Proposers shall identify within their proposals all replay requirements necessary to complete the interface.

7. WARRANTY, MAINTENANCE, AND SUPPORT

7.1. WARRANTY

A. The proposed communications system shall have a warranty period of at least one year. The one-year or more warranty period shall commence upon final acceptance.

B. All services identified in Section 7.2, Maintenance, shall be included within the warranty period.

C. Proposers shall provide a single toll-free telephone number that answers 24/7/365 for service requests and warranty claims.

D. Proposers shall state in their proposals the name, address, and capabilities of the service facility(ies) providing warranty service.

E. The following procedures shall be followed during the warranty period:

1. Warranty maintenance shall be performed 24 hours a day with no additional charges for work on critical infrastructure outside of normal 8:00 a.m. to 5:00 p.m. business hours.

2. The service facility shall provide prompt repair service, with service personnel arriving onsite within two hours after a service request by the County and returning the system to service within four hours after a service request by the County.

3. On-call County technical personnel shall be notified when service personnel have been dispatched and be given the opportunity to accompany the warranty provider.

4. The County shall be provided with written documentation indicating the cause of the service outage, the resolution, and all post-repair testing procedures to ensure proper operation. In the event County-owned spares are used to complete the repair, the model and serial number of both the defective unit and the spare shall be noted in the documentation.

5. For all equipment needing factory or depot repairs, a comprehensive tracking system shall be put in place by the Contractor to track units to and from the factory/depot.

7.2. MAINTENANCE

A. The Contractor shall maintain and repair all systems, equipment, hardware, and software throughout the implementation, migration, and warranty periods. The County reserves the right to have technical staff onsite to witness, and if desired, assist in the maintenance and troubleshooting procedures. This does not relieve the Contractor from its warranty and maintenance responsibilities as defined in this document.

7.2.1. General Requirements

A. The approach to maintenance of this system shall be one of preventive maintenance.

B. Comprehensive maintenance services shall be proposed for each system.

C. Maintenance plans should be based on the quantities of equipment included in the proposed system. Plans shall include yearly pricing for years 2 through 15 following system acceptance (year 1 is provided under warranty). Pricing shall be broken out according to each of the services defined below. These plans shall include:

1. Fixed equipment onsite service
   a. Two-hour response time, four-hour restoration time

2. Fixed equipment mail-in board repair
   a. Emergency response: next day

3. All fixed equipment maintenance plans shall provide 24-hour system support so that users can dial one toll-free number to report problems and/or receive technical support.

4. The Contractor's staff will dispatch the proper technician in the prescribed response time to resolve the problem, if the Contractor is unable to resolve the problem through telephone consultation.

5. Maintenance plans shall include a semiannual preventive-maintenance check to include a retune of all RF components, including base stations, subscriber radios, and microwave radios. The retune should restore components to manufacturer specifications.

6. Maintenance plans shall include 24/7 system monitoring and dispatch services.

7. Maintenance plans shall include the regular update of antivirus software on all servers and workstations.

7.2.2. Maintenance Standards

A. Replacement parts used in repairs shall be equal in quality and ratings to the original parts.

B. Equipment shall be maintained in a clean condition. Oil, dust, and other foreign substances shall be removed on a routine basis.

C. Equipment and system performance shall be maintained at the level initially described in these equipment and systems specifications. The service organization shall maintain records to confirm this has been done at intervals defined by the County.

D. Proposers shall provide only factory-trained and -authorized maintenance personnel. All Contractor employees or Contractor's subcontractors providing services under an agreement or responding to the County's request for service shall have a factory maintenance certification for the equipment being maintained, repaired, or serviced.

1. In support of the above request, Proposers shall provide written documentation of training for their authorized service personnel, listing the type and length of the course(s) and date taken.

E. If fixed equipment or a fixed equipment module fails more than twice during the acceptance test or twice during the first year, the Contractor shall meet with the County to discuss and explain such failures. If, in the opinion of the County, these failures indicate that the equipment is potentially prone to continuing failures, the Contractor shall replace it at no cost to the County.

F. Automatic system alerts generated via email or SMS and sent to maintenance personnel that indicate system impairment shall constitute an actionable event requiring technician response.

7.3. PARTS AVAILABILITY

A. From the date of final acceptance to the seventh anniversary of the date of final acceptance, the Contractor shall maintain replacement parts for all delivered equipment.

B. In the event the Contractor plans to discontinue stocking any part required for maintenance after the seventh anniversary of final acceptance, the Proposer shall send written notice to the County 24 months prior to the date of discontinuance to allow for last time buys and replenishment.

C. In the event the Contractor plans to discontinue manufacturing any part required for maintenance, the Contractor shall notify the County within one week following the publication of the cancellation notice. The manufacturer shall sufficiently stock the parts to be made available to the County for a minimum period of five years following cancellation.

D. All parts ordered on a priority basis shall be delivered within 24 hours after placing an order. Proposers shall provide year-round, 24-hour ordering facilities via telephone, Internet, email, and fax service.

7.4. SPARE EQUIPMENT

A. Proposers shall propose recommended spare parts for the system, subsystems, and individual equipment in their proposals.

B. The list of spare parts shall include the following, at a minimum:

1. Any vendor-identified field-replaceable units (FRUs)
2. Any infrastructure component that does not have FRUs that can cause a critical failure if it were to fail (e.g., base station antennas and other non-modular components)
3. Power supplies
4. Spares for less-critical items

C. The list 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 the component level when a critical unit has failed).

D. The quantities of spares in the list shall be appropriately sized to accommodate equipment quantities in the system.

E. The list shall define the primary equipment category each spare kit supports (e.g., transceiver board for a repeater, interface board for a console, etc.).

F. The system engineering design documentation shall include a narrative on the Proposer's ability to replace failed units from stock, as well as the process and timing to repair, replace, and return failed units delivered for repair.

G. System engineering design documentation also shall include the lifecycle of equipment, parts, and other maintenance support for the system.

H. Spares shall be included in any system update to keep them current.

7.5. LIFECYCLE COST

A. Proposers shall propose an extended warranty for additional years beyond the initial warranty, renewable annually. Pricing shall be provided for years 2 through 15 following system acceptance (year 1 is covered under warranty).

B. Proposers shall propose a complete hardware and software maintenance package that provides a complete cost of ownership for the system(s) being offered to the County. The package should include system release updates, and hardware updates for those components that reach their end of life (EOL) within the support period. Costs associated with the cost of ownership should be provided for years 4 through 15 following system acceptance.

C. Proposers shall fully describe the terms and conditions of the extended maintenance plan in their proposals.

8. SYSTEM IMPLEMENTATION, TESTING, AND ACCEPTANCE

8.1. GENERAL

A. The Contractor shall attend biweekly project and construction meetings as deemed necessary by the County prior to and during installation. Additional meetings may be scheduled at the discretion of the County.

B. If any changes in the overall timeline occur, the Contractor shall update the project schedule for discussion during these project meetings.

C. The Contractor shall provide written minutes of all meetings no later than five business days after the meeting.

8.2. SYSTEM INSTALLATION

A. Installation shall include a complete, tested system to include placement of associated cabling, appropriate system layout, and terminal connections. The Contractor shall provide associated power supplies and any other hardware, adapters, and/or connections to deliver a complete operable system to the County at the time of acceptance.

B. All installations shall be performed by factory-authorized or Proposer-affiliated service shops. Other shops or installers may be used upon mutual agreement between the County and the Contractor. Qualified, adequately trained personnel familiar with this type of work shall perform all installations. Proposers shall provide the names of the service shops, their qualifications, a description of their certified training on the proposed system, a summary of their experience and a list of five references (minimum) for each proposed shop.

C. All personnel intended to perform any work within any County public safety center or other high security area shall undergo security clearance screening, including but not limited to fingerprint analysis and/or criminal history background checks and will be approved or disapproved at the discretion of the agency head.

D. Prior to the start of system installation, the Contractor shall participate in a mandatory project site survey with the County or County's representative to confirm actual equipment location within each space. At that time, the exact equipment locations shall be determined and documented by the Contractor.

E. The Contractor shall coordinate with others, as appropriate, to confirm that any preparation work that affects the installation of the base station equipment, such as tower work, coring, bracing, conduit, electrical, etc., is complete before final inspection.

F. The Contractor shall provide and pay for all materials necessary for the execution and completion of all work. Unless otherwise specified, all materials incorporated into the permanent work shall be new and shall meet the requirements of this specifications document. All materials furnished and work completed shall be subject to inspection by the County or the County's representative.

G. Equipment supplied as spare equipment shall not be used for installation of the proposed system. All spare equipment shall be supplied in an unused condition.

H. All equipment and devices shall be cleaned internally and externally, and all damaged finishes shall be repaired.

I. Worksites shall be left neat and be broom swept upon completion of work each day. All shelter floors will be cleaned thoroughly, and all scuff marks and abrasions shall be removed prior to acceptance. All trash shall be removed weekly.

J. Inspection

1. The County shall conduct an inspection of the installations upon substantial completion. Any deficiencies shall be documented on a single punch list and provided to the Contractor for resolution.

2. Final acceptance testing shall not commence until all punch-list items are resolved.

8.3. CUTOVER PLAN

A. The Contractor shall be responsible for planning and coordinating the implementation of all equipment, subsystems, and the overall system.

B. Execution of the cutover plan shall ensure that new systems are brought online with minimum interruption to all existing systems and communications.

C. During final design, the Contractor shall deliver a preliminary cutover plan describing how the radio system will be phased into a fully operational system.

1. The Contractor shall successfully complete all tests and training prior to the actual cutover of systems.

2. The Contractor shall provide the necessary labor to cut over from the existing systems to the new system.

3. The plan shall include the schedule and procedures associated with the transition of each operational user group. The plan shall specifically address how the existing users will begin using the new system with minimal operational impact.

4. The plan shall provide detailed component or subsystem cutover plans, and specifically delineate between systems that affect and do not affect ongoing operations.

5. The plan shall include contingencies.

6. The County reserves the right to approve and change the cutover plan as it relates to any or all system components.

8.4. STAGING

A. Each individual assembly or equipment unit shall undergo factory testing prior to shipment.

B. Standard factory test documentation, documenting the tests performed and indicating successful completion of testing, shall be submitted to the County.

C. System Staging

1. The complete system shall be staged and tested at the factory, in the United States, to the greatest extent practical. The intent of the staging tests is to demonstrate to the County that the system is ready for shipment and installation. The Contractor shall provide travel expense coverage for six County personnel and two engineer/consultants to participate in the SATP.

2. The Contractor shall provide all necessary technical personnel and test equipment to conduct staging tests. All deviations, anomalies, and test failures shall be resolved at the Contractor's expense.

3. The Contractor shall use an approved SATP. It is expected that a preliminary SATP has been performed and all tests have been successful before the County witnesses the official SATP. The SATP shall be signed and dated by the Contractor and County representatives and engineers/consultants following completion of all tests. All tests in the SATP shall be marked as either pass, fail, or pass qualify.

4. Failed tests shall be documented, corrected, and retested. All defective components shall be replaced and retested. Defective components that cannot be corrected shall be replaced at the expense of the Contractor.

5. Retest of individual failed SATP tests or the entire plan shall be at the County’s discretion.

6. The fully executed and completed SATP document shall be provided to the County.

7. Major subsystems, such as the microwave system, may be tested at a different facility, at a different time, from the radio system. However, all items identified above shall apply if the subsystems are staged at different locations and times.

8.5. COVERAGE TESTING

A. Proposers shall submit a preliminary CATP with their proposals. The final CATP shall be submitted during the final design stage of the project. Both the preliminary and final CATP will be representative of the maps and coverage guarantees. If maps are presented with no retries, the test will be performed without retries.

B. The coverage guarantee will be based on the map and the test plan. They must all match before an award.

C. The CATP shall consist of the following tests for all proposed antenna systems utilizing the specified behavioral and operational guidelines of radio usage defined in this document:

1. On-street testing includes:
   a. Automated objective mobile drive testing
   b. Non-automated subjective DAQ testing (intelligibility testing)

D. CATP – On-Street Testing

1. The CATP shall be consistent with the procedures and guidelines outlined in TIA TSB-88, latest revision.

2. The *only* retries allowed will be if there is a proven equipment failure or human error. If all procedures are followed, no retries are allowed for failed grids.

3. Coverage testing shall commence only after the radio system is fully tested and aligned. Changes to the system by the Contractor that could potentially change coverage shall require retesting of coverage at the County's discretion, and at no cost to the County.

4. The Contractor shall perform two types of round-trip coverage testing. Each type of test will include an inbound test and an outbound test. If a grid from either or both fails, the test grid fails. Data will be presented for both inbound and outbound to understand the coverage. Both types of testing shall be complementary and serve to fully verify that coverage requirements are met both technically and operationally.
   a. Automated objective mobile drive testing
   b. Automated or non-automated subjective DAQ testing (intelligibility testing)

5. In the interest of avoiding large system dead spots, the failure of five or more adjoining grids shall deem the coverage test a failure. Retesting of the entire coverage area shall

only be performed after the Contractor has demonstrated corrective action to address the coverage gap.

6. Test Configurations

   a. Testing configurations for the objective and subjective testing shall represent typical operating configurations to the greatest extent possible, using portable and mobile radio equipment to be used with the system.

   b. Automated Objective Mobile Drive Testing

      i. The Contractor shall test both the signal level and BER, as applicable, at a statistically significant number of test locations throughout the county utilizing automated test equipment.
      ii. Both outbound (talk-out) and inbound (talk-in) BER testing shall be conducted. Since this is a roundtrip test, if either fails, the grid fails.
      iii. The County requires BER testing conducted at a failure rate of 2% for FDMA and 2.4% for TDMA.
      iv. For testing purposes, the county shall be divided into ¼-square-mile bins (½-mile by ½-mile). The Contractor or its subcontractor(s) may subdivide grids if necessary.
      v. The Contractor shall complete the "estimate of proportions" test identified in TSB-88 to validate that ½-mile by ½-mile grids yield sufficient test points to achieve statistical significance, accounting for inaccessible grids. If there are an insufficient number of grids, then smaller grid sizes shall be proposed.
      vi. Inaccessible grids shall not count as either a pass or fail in the statistical analysis.
      vii. The Contractor shall not be allowed to retest any failed grids without authorization from the County.
      viii. The Contractor shall develop a link budget to ensure that the receiver used in the automated drive testing receives the equivalent signal strength of the specified coverage configuration (i.e., portable radio worn at hip level). The Contractor shall use attenuators to properly account for gains and losses of the testing setup, plus any required in-building losses.
      ix. All test equipment must be calibrated prior to testing, and signal losses through each component must be tested.
      x. The Contractor shall provide an NMO adaptor to test signal losses through the testing antenna port and cable.

   c. Non-automated Subjective DAQ Testing

i. Non-automated subjective DAQ coverage testing shall be conducted using typical portable radios supplied with the system.
ii. Talk-out and talk-in performance shall be documented.
iii. The Contractor shall provide a standardized test form for testing.
iv. Retries are not permitted.
v. Automatic audio capture shall be an acceptable method of completing this test and is preferred if available.

d. The Contractor shall guarantee coverage for both subjective and objective drive testing at the levels specified.

e. Both the objective and subjective tests must independently yield a ratio of passing grids to total grids tested greater than the mandated coverage percentages.

E. CATP – VHF Paging System On-Street and In-Building Testing

1. Proposers shall submit a preliminary CATP with their proposals. The final CATP shall be submitted during the final design stage of the project. Both the preliminary and final CATP will be representative of the maps and coverage guarantees.

2. The CATP shall consist of testing generally described as automated signal strength ("automated") and DAQ voice test. Successful completion of all testing is required as a part of system acceptance testing. In all instances, however, minimum received signal level (MRSL) and DAQ testing shall prevail as the determining criteria in the derivation of specific service area coverage reliabilities to gauge the Contractor's compliance with the coverage specifications and shall constitute coverage acceptance.

3. The CATP shall be consistent with the procedures and guidelines outlined in TIA TSB-88, latest revision.

4. The MRSL for pager on-hip outdoors shall be -89.7 dBm.

5. The MRSL for pager on-hip inside 12 dB buildings shall be -77.7 dBm.

6. Use a Minitor VI for verification of the DAQ voice test in each test grid.

8.6. 30-DAY OPERATIONAL TEST

A. The Contractor shall perform a 30-calendar day operational test of the system to ensure that all hardware and software defects have been corrected prior to entering final proof-of-performance testing. The fully integrated operation of the system, including all individual subsystems, shall be demonstrated during these tests. The tests shall be designed to demonstrate the reliability, long-term stability, and maintainability of the systems. A failure of any critical component of the system during this test will cause the test to restart after the repair is completed. The Contractor and the County shall agree on what constitutes a critical failure prior to commencing this test.

B. The Contractor shall provide a 30-day operational test plan during the preliminary design phase.

8.7. TRAINING

A. The Contractor shall develop and conduct training programs to allow personnel to become knowledgeable with the system, subsystems, and individual equipment.

B. The Contractor shall provide complete and comprehensive system management training for up to 12 staff charged with managing the system. This training shall include the following, at a minimum:

1. System theory of operation
2. Monitoring and managing the system's performance (system manager level)
3. System monitoring techniques
4. Writing and printing system reports

C. The Contractor shall provide complete and comprehensive operational training for up to 50 user agency dispatchers on the provided dispatch console systems. This training shall include the following, at a minimum:

1. Setup and use of all functional elements and features included in the consoles
2. All graphical user interface (GUI) elements, manipulation, function, and use
3. Patching and multiple talkgroup operation
4. Use of headsets, microphones, speakers, and mouse controls

D. The Contractor shall provide operator train-the-trainer for up to 100 end-user personnel on the proper operation and care of assigned mobile and portable radio equipment. This training shall include the following, at a minimum:

1. Proper microphone technique

2. Button, knob, and keypad functionality as programmed for that agency
3. Proper battery maintenance
4. Screen icon interpretation and meaning

E. Radio System Maintenance Training

1. The Contractor shall provide onsite, customized training for up to five people. Training shall include system orientation, management, operation, and maintenance of all system infrastructures and associated system equipment provided. The training shall include education on the theory of operation and practical maintenance procedures for the entire system infrastructure and all systems contained therein. This training shall be designed primarily for technical and telecommunications personnel within the County that may require sufficient education to assist in the restoration of the system during a failure.

2. The training shall be designed so that upon completion a technician will be qualified to perform all levels of installation/setup, optimization, troubleshooting, and maintenance of the system infrastructure and subscriber units to the board level. The Contractor's highly skilled personnel shall conduct the training. Instruction material should be included as a part of each course and will become the property of the County. Since this training is customized to the County's proposed system design, the Contractor shall provide technicians from the assigned local maintenance service provider shop to attend this training at no additional cost to the County.

3. The Contractor shall provide one set of training and maintenance manuals per student plus an additional six sets of maintenance manuals. Additionally, all maintenance manuals shall be provided in an electronic version such as *.pdf and readable with the Adobe Acrobat Reader software. Six flash drives shall be provided as well with all maintenance manuals provided in both original file format (e.g., MS-Word, Excel, Visio, AutoCAD, etc.) and in *.pdf format. There shall be no restrictions or licensing requirements for information provided as reference or used for training.

4. The course content shall include the following, at a minimum, for all network subsystems:

   a. As-built documentation structure, numbering system, and configuration control system
   b. Principles of digital transmission and RF troubleshooting
   c. Level setting
   d. Network traffic analysis and bandwidth utilization measurement
   e. Block diagram and circuit description – all units
   f. Installation and turn-on procedure

g. Service alignment and testing procedures
h. Troubleshooting and fault diagnosis to unit and board level
i. Test equipment configuration and usage
j. Unit replacement procedures
k. Operating and safety procedures
l. Subscriber equipment repair and programming
m. NMS design and use
n. Network security
o. Client/server architecture and network administration
p. Database maintenance and optimization
q. Software refresh and flash upgrades
r. System restoration and failure modes
s. Shelter subsystems maintenance and operation
t. In-building systems (if used)
u. Traffic continuity procedures

5. Proposers shall provide a list of courses required along with the duration (hours, days, weeks, etc.) and cost for each course. Whenever possible, training should be conducted with substantial hands-on involvement using the County's system/equipment.

F. Microwave System Maintenance Training

1. The Contractor shall provide onsite microwave backbone system training for up to five people, which shall be coordinated with the comprehensive radio system maintenance training.

2. Training shall include system orientation, theory of operation, management, customized operation, and maintenance of all system infrastructures, and associated proposed subsystem equipment. The training shall include education on the theory of operation and practical maintenance procedures for the entire microwave system infrastructure and all ancillary subsystems contained therein.

3. The Contractor shall provide five sets of training and maintenance manuals for the training course. Additionally, all manuals shall be provided in an electronic version such as *.pdf, readable with the Adobe Acrobat Reader software. Five flash drives shall be supplied as well with all training and maintenance manuals provided in both original file format (e.g., MS-Word, Excel, Visio, AutoCAD, etc.) and in *.PDF format. There shall be no restrictions or licensing requirements for information provided as reference or used for training.

4. The customized course content shall include the following, at a minimum for all microwave subsystems:

    a. As-built documentation structure, numbering system, and configuration control system
    b. Principles of digital microwave transmission and loop microwave topology
    c. Block diagram, wiring, and circuit description – all units/subsystems
    d. Level setting and RF troubleshooting
    e. Router provisioning, cross-connects, and configuration
    f. Installation and turn-up procedures
    g. Test equipment configuration and usage
    h. Alignment and testing procedures
    i. Troubleshooting and fault diagnosis to unit and board level
    j. Unit replacement procedures
    k. Preventive maintenance procedures
    l. Orderwire (if applicable), DC plant, pressurization operation, and troubleshooting
    m. Operation and safety
    n. Failure mode analysis
    o. Traffic continuity

5. Proposers shall provide a list of courses required along with the duration (hours, days, weeks, etc.) and cost for each course. Whenever possible, training should be conducted with substantial hands-on involvement using the County's actual system/equipment.

G. Proposers shall fully describe all proposed training programs in their proposals detailing how the Proposer intends to provide training. The training description shall include the following:

1. A list of all subjects with a description of each
2. Class materials to be provided by the Proposer
3. Number of classes
4. Class duration
5. Need for recurring training
6. Class size
7. Class cost

H. All operator training shall be conducted at "to be determined" locations within Washington County. System management training shall be provided on the County system where practical. Technical training requiring lab and live system training may be scheduled at the Contractor's training facility. The Contractor shall coordinate with the County regarding the number of attendees and schedule at least one month prior to the first scheduled class.

I. Classes shall be scheduled as near to system cutover as possible. The Contractor shall work with the County to develop the schedule.

J. The Contractor shall provide all instructional materials, including printed manuals, audiovisual presentations, interactive self-paced PC programs, and complete equipment operating instructions for all technical and operational training classes.

1. The actual and/or exact model and series of equipment being delivered shall be made available for hands-on use and operation during training.

2. All instructional materials shall be subject to the approval of the County and shall become property of the County.

3. Additional training courseware and related media to be used in future academy training and refresher training shall be provided in a reproducible format with no limitation on the number of copies to be reproduced for training use. At least one hard copy and an electronic copy (on compact disc [CD] or USB stick) of all materials shall be provided.

8.8. FINAL ACCEPTANCE TESTING

A. Prior to final acceptance testing, the Contractor shall verify and document that all equipment, hardware, and software are upgraded to the latest factory revision including subscribers. Multiple revision levels among similar equipment are not acceptable. An FATP may not proceed without an agreed-upon final acceptance plan. This plan will be submitted to the County at least 45 days before testing. No testing may begin without County approval of the plan. The County shall be given two weeks' written notice that the system is ready for final acceptance testing.

B. FATP

1. The Contractor shall use the completed and approved FATP. It is expected that a preliminary FATP has been performed and all tests have been successful before the County witnesses the official FATP. The FATP shall be signed and dated by the Contractor and County representatives following completion of all tests. All tests in the FATP shall be marked as either pass, fail, or pass qualify.

2. The Contractor shall provide all necessary technical personnel and test equipment to conduct FATP tests. All deviations, anomalies, and test failures shall be resolved at the Contractor's expense.

3. Failed tests shall be documented, corrected, and retested. All defective components shall be replaced and retested. Defective components that cannot be corrected shall be replaced at the Contractor's expense.

4. Retest of individual failed FATP tests or the entire plan shall be at the County's discretion.

5. The fully executed and completed FATP document shall be provided to the County.

8.9. AS-BUILT DOCUMENTATION

A. At the completion of the installation 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. Cabling and terminations
4. Block and system-level diagrams
5. Programming
6. Setup and alignment information
7. Successfully completed, signed, and dated SATP

8.10. SYSTEM ACCEPTANCE

A. The County shall deem the system ready for final acceptance following successful completion and approval of the following:

1. Final design submittals
2. SATP
3. System installation
4. Final inspection and punch-list resolution
5. As-built documentation
6. FATP, including CATP
7. 30-day operational test completion
8. Training

9. SUBSCRIBER EQUIPMENT

9.1. OVERVIEW

A. Subscriber equipment includes all non-fixed user equipment, such as:

1. Portable radios
2. Mobile radios
3. Control stations

B. There are an estimated 2,238 subscriber radios (portables, mobiles, and control stations) that will need to be replaced across primary system users to ensure compliance with a 800 MHz P25 system. While the County intends to directly purchase all subscribers required for system deployment, subscriber radio proposals submitted in response to this solicitation must permit direct purchasing by any municipality, local government, or public safety entity on the County system, at the discounted pricing levels provided. The pricing shall remain active for a period of two years from final acceptance. The County reserves the right to award multiple subscriber Proposers a contract to support different agencies within the county.

C. Given the large number of subscriber radio replacements required, Proposers are encouraged to provide competitive pricing and bulk-purchase discounts and incentives. However, first responders may elect to purchase subscriber radios from different manufacturers. Bulk purchases shall be based on the quantities listed in Appendix F, Subscriber Radios – Proposed P25 System.

D. Proposers shall provide unit pricing for all user subscriber equipment and accessories. Pricing information shall be provided for the full range of installation configurations offered by the Proposer, with the specific installation costs for each.

9.2. GENERAL REQUIREMENTS

A. All subscriber equipment shall be of high quality and intended to provide high reliability under heavy use in severe environments. Equipment shall be type-accepted by the FCC in accordance with the Commission’s Part 90 Rules and Regulations.

B. All subscriber equipment shall meet MIL-STD-810 C, D, E, and F.

C. All subscriber equipment shall be software programmable.

D. To the greatest extent possible, all equipment assemblies and subassemblies shall be shielded to minimize electromagnetic interference that may be caused to/by electrical equipment co-located and/or adjacent to this equipment.

E. All subscriber equipment shall support the following operating modes:

1. Conventional analog FM network
2. Conventional analog FM off-network (talkaround)
3. Conventional P25 Phase 1 network
4. Conventional P25 Phase 1 off-network (talkaround)
5. Trunked P25 Phase 2 network

F. All equipment shall be programmed for operation on the proposed system that will be procured through this RFP.

G. Proposers shall propose a comprehensive subscriber maintenance program that includes provisions for subscriber repair and preventive maintenance on annual and biannual schedules.

9.2.1. Portable Radios

A. Proposers shall provide pricing for portable radios in the pricing forms found in the pricing workbook. The distribution and quantity of the portable radios is shown in Appendix F for the purposes of the proposal; however, unit pricing shall be included for the all models as well as all available feature sets. The municipality, local government, or public safety entity will select the desired model and feature(s). As an option, multiband portable radios should also be offered.

B. Proposers shall include unit programming.

C. As an option, Proposers shall propose radios certified as intrinsically safe.

D. Proposers shall provide the highest-tier product available, highly reliable, and intended for mission-critical operations. Pricing shall be provided for a minimum of three models or tiers with minimum requirements as follows:

1. Model 1: Basic Tier – Digital Portable
   a. Operable in the proposed radio band
   b. Up to 500 modes/channels available
   c. One-line eight-character backlighted alphanumeric display

d. No keypad
e. Emergency button
f. P25 Phase 2 CAI
g. Wi-fi
h. Able to provide GPS location

2. Model 2: Mid-Tier – Digital Portable
   a. Operable in the proposed radio band
   b. Up to 1,000 modes/channels available
   c. Two-line ten-character backlit alphanumeric display
   d. Limited keypad
   e. Emergency button
   f. Status icon
   g. P25 Phase 2 CAI
   h. Wi-fi
   i. Able to provide GPS location
3. Model 3: High Tier – Digital Portable
   a. Operable in the proposed radio band
   b. Up to 2,000 modes/channels available
   c. Two-line ten-character backlighted alphanumeric display
   d. Full button keypad
   e. Emergency button
   f. Status icons
   g. Adaptive power control
   h. Intrinsically safe operation option
   i. Ruggedized/submersible option
   j. P25 Phase 2 CAI
   k. Enhanced background noise cancelling and higher-level audio output (adjustable)
   l. Wi-fi
   m. Able to provide GPS location

E. Features

1. Full compliance with P25 features and operation
2. PTT button
3. Top-mounted on/off volume knob
4. Talkgroup/channel selector
5. Emergency button, protected from inadvertent activation
6. Alphanumeric display (on applicable models), minimum of eight characters
7. Transmit indicator

8. OPTIONAL – Intrinsically safe operation
9. OPTIONAL – Ruggedized/submersible
10. OPTIONAL – Digital AES with multiple key encryption supported
11. OPTIONAL – Enhanced background noise cancelling and higher-level audio output (adjustable)
12. OPTIONAL – OTAP and associated fixed equipment
13. OPTIONAL – OTAR and associated fixed equipment
14. OPTIONAL – Subscriber radio GPS and associated fixed equipment
15. OPTIONAL - 2-tone paging over P25 – The Contractor shall ensure both high and low tones are decoded accurately. If the high tones cannot be reconstructed due to an insufficient sampling rate or other P25 vocoder issues, the Contractor shall change the subscriber radios to the lower tones. Proposers must indicate and describe if capability for initiating the page from certain radios in the field is available.

F. Battery

1. Proposers shall provide pricing for a battery sized to support a 12-hour shift.

2. Proposers shall propose batteries certified as intrinsically safe as an OPTION.

3. Batteries shall provide a minimum operational use of 12 hours based on a 5-5-90 duty cycle.

4. Recharge time to full capacity shall not exceed one hour.

5. Lithium-ion batteries are required.

6. Power loss and/or replacement of the portable unit's battery shall not alter the operating software and/or configuration parameters. Radios shall be optionally equipped to operate with "smart battery technology". Proposers shall describe their smart battery technology. The County requires any proposed radio and battery technology to optionally meet the factory mutual rating for intrinsically safe operation. The County requires Proposers to supply the highest capacity battery, appropriate for the type of agency (i.e., public safety, public works, etc.) that operates within the County operating environment, for each proposed variety of subscriber radio.

7. Proposers shall provide detailed specifications for all batteries proposed, including the following, at a minimum:
   a. Battery life
   b. Total battery lifecycle expectancy

c. Recharge time
d. Dimensions
e. Weight
f. Warranty

G. Accessories: Proposers shall provide, as a base proposal, wired remote speaker microphones for law enforcement with a standard swivel case and single charger. Optional pricing for all accessories, including the following, shall be provided at a minimum:

1. AES encryption
2. Data cables
3. Battery chargers
   a. Single-bay battery charger
   b. Multiple-bay battery charger
   c. Vehicular charger
4. Alternate antennas
5. Remote speaker microphone
6. Remote speaker microphone with antenna
7. Wireless remote speaker microphone
8. Large/rugged remote speaker microphone for high-noise environments
9. Headset
   a. Wired
   b. Wireless/Bluetooth
10. Carrying cases/belt clips
11. Other options such as man-down emergency activation switch, bone microphones, and temple transducers.

H. Proposers shall provide detailed equipment specifications for all proposed portables and accessories, including the following information:

1. Radio dimensions
2. Radio weight with battery
3. Antenna type
4. Frequency channel capacity
5. General features, transmit/receive parameters, and mechanical specifications

I. Multiband portable radios

1. As an OPTION, Proposers shall provide multiband portable radios capable of operating in the following frequency bands:
   a. VHF: 136–174 MHz
   b. UHF[5]: 380–520 MHz
   c. 700/800 MHz: 762–870 MHz

2. Proposers shall provide detailed specifications for radios and all accessories.

9.2.2. Mobile Radios/Control Stations

A. Proposers shall provide pricing for mobile radios and control stations in the pricing workbook. The distribution and quantity of the mobile and control station radios is shown in Appendix F for the purposes of the proposal; however, unit pricing shall be included for all models, for remote and dash-mount, dual control heads, as well as all available feature sets.

B. Mobile transceiver radios shall support weatherproof dual-control heads, siren/public address (PA) assemblies, and motorcycle configurations. The radio cabinet(s), control heads, and ancillary installations must be a package that can be mounted inside or outside of the vehicle without restricting the use of the front seat by a driver and one passenger or interfere with air bag deployment. Mobile and portable transceiver radios shall be inherently compatible with optional handheld control heads and vehicular repeater assemblies as required.

C. Proposers shall describe variations for shock mounting, stabilization, tilts and swiveling with locks, and customized mounting for different vehicle models and types. Prior to the deployment of any radio subscriber equipment, the Contractor is responsible for developing County-approved installation prototype(s) for each unique radio configuration. The Contractor is solely responsible for providing all necessary labor and services associated with the installation and programming of all subscriber radios. The Contractor is solely responsible for all subscriber equipment installation, programming, and flash upgrading required to remedy any hardware or software defect or bug encountered at any time throughout project implementation. All radio installation and programming activities shall be performed in a facility approved by the County to simplify equipage and deployment logistics. The Contractor is responsible for the removal and inventory in conjunction with the County of all legacy County subscriber units following a successful system cutover and reliability test period as defined by the County.

[5] Ultra-high frequency

D. Pricing shall include installation and programming. Proposers shall separately delineate the costs of installation per radio and the costs of de-installation/removal per vehicle.

E. Proposers shall provide the highest-tier product available, highly reliable, and intended for mission-critical operations. Pricing shall be provided for a minimum of three models or tiers with minimum requirements as follows:

1. Mobile Radios

a. Model 1: Basic Tier – Digital Mobile
   i. Operable in the proposed radio band
   ii. Up to 500 modes/channels available
   iii. One-line eight-character backlighted alphanumeric display
   iv. Selector/rotary knob, no keypad
   v. Emergency button
   vi. P25 Phase 2 CAI

b. Model 2: Mid-Tier – Digital Mobile
   i. Operable in the proposed radio band
   ii. Up to 1,000 modes/channels available
   iii. Two-line ten-character backlit alphanumeric display
   iv. Limited keypad
   v. Emergency button
   vi. Status icon
   vii. P25 Phase 2 CAI

c. Model 3: High Tier – Digital Mobile
   i. Operable in the proposed radio band
   ii. Up to 2,000 modes/channels available
   iii. Two-line ten-character backlighted alphanumeric display
   iv. Full keypad
   v. Emergency button
   vi. Status icon
   vii. P25 Phase 2 CAI

2. Control Stations
   a. Model 1: Basic Tier – Digital Control Station
      i. Operable in the proposed radio band
      ii. Up to 500 modes/channels available
      iii. Eight-character alphanumeric display

iv. Limited front panel keypad
v. Local control
vi. P25 Phase 2 operation
vii. Conventional analog operation
viii. External 110 VAC power supply
ix. Desktop microphone
x. Internal speaker

b. Model 2: Mid-Tier – Digital Control Station
i. Operable in the proposed radio band
ii. Up to 1,000 modes/channels available
iii. Two-line ten-character backlit alphanumeric display
iv. Limited front panel keypad
v. Local control
vi. P25 Phase 2 operation
vii. Conventional analog operation
viii. External 110 VAC power supply
ix. Desktop microphone
x. Internal speaker

c. Model 3: High Tier – Digital Control Station
i. Operable in the proposed radio band
ii. Up to 2,000 modes/channels available
iii. Two-line ten-character backlighted alphanumeric display
iv. Full front panel keypad
v. Local and remote control
vi. P25 Phase 2 operation
vii. Conventional analog operation
viii. Integrated 110/220 V power supply
ix. Desktop microphone
x. Internal speaker
xi. Cross-mute functionality
xii. Integrated dispatch headset connection
xiii. Integrated wireline control
xiv. Integrated clock
xv. Integrated volume unit (VU) meter
xvi. 2-tone paging over P25 – The Contractor shall ensure both high and low tones
xvii. OPTIONAL – PTT foot switch
xviii. OPTIONAL – Over-the-air alert tones

F. Mobile radios shall be supplied complete with microphone, external speaker, cables, fusing, mounting hardware, coaxial cable, and antennas to provide for a complete installation.

G. Control station radios shall be supplied complete with desk microphone, speaker, cables, coaxial cable, and omnidirectional antennas to provide for a complete installation. Control station refers to a radio with a user interface consisting of a microphone and speaker, and that is equipped with a power supply and antenna network. These stations are either remotely controlled, locally controlled, or both. Control stations may be wall-mounted, rack-mounted, placed on an equipment rack shelf, or used on a tabletop or desk. Some of these stations will be controlled/operated by the individual radio communications dispatch centers, whereas others may be controlled by a "remote controller" or directly by an operator using the associated microphone and controls directly on the unit (local control). "Remote controller" refers to a desktop unit/controller/deskset interfaced to the control station by some means of connectivity.

H. All control stations to be installed in a fire station must have the ability to be alerted from the dispatch console by call alert and 2-tone paging over P25. In addition, when either alert method is used, control stations must have a dry contact relay output available to connect external accessories such as a bell or buzzer. Proposers can still meet the request by ensuring its technology can perform the function or provide a vendor's radio that can provide for the request.

I. Control station configurations shall be offered with both digital remote controller(s) setup with built-in power supply and as a mobile radio with a DC power supply.

J. Proposers shall provide pricing for remote-mounted units.

K. Features

1. Full compliance with P25 features and operation
2. Remote speaker microphones
3. Front-mounted on/off volume knob
4. Talkgroup/channel selector
5. Emergency button, protected from inadvertent activation
6. Alphanumeric display
7. Transmit indicator
8. Dash- and remote-mount configurations
9. OPTIONAL – OTAP and associated fixed equipment
10. OPTIONAL – OTAR and associated fixed equipment
11. OPTIONAL – Digital AES with multiple key encryption supported

12. OPTIONAL – Subscriber radio GPS and associated fixed equipment
13. OPTIONAL – Control station combiners for configurations supporting 4/8/12/16/32 ports

L. Accessories: Proposers shall provide optional pricing for all accessories, including the following, at a minimum:

1. AES encryption
2. Cables
   a. Data cables
   b. Extension cables
   c. Adapters
   d. Power cables
3. Antennas
4. External speakers
5. Public address kits
6. Remote speaker microphones
7. Desktop microphone (control stations only)
8. GPS functionality and associated fixed network hardware
9. Mobile data interface
10. Surveillance mobile package
    a. Disguise antenna
    b. One-hand control head microphone

M. Proposers shall provide detailed equipment specifications for all proposed mobiles and accessories, including the following information:

1. Radio dimensions
2. Radio weight with battery
3. Antenna type
4. Frequency channel capacity
5. General features, transmit/receive parameters, and mechanical specifications

N. Multiband mobile radios

1. As an OPTION, Proposers shall provide multiband mobile radios capable of operating in the following frequency bands:
   a. VHF: 136 – 174 MHz
   b. UHF: 380 – 520 MHz
   c. 700/800 MHz: 762 – 870 MHz

2. Proposers shall provide detailed specifications for radios and all accessories.

9.2.3. Fleet Mapping

A. The Contractor shall develop the actual fleet map with input and direction from the County. The fleet map shall contain at a minimum:

1. Talkgroup ID
2. Agency
3. Emergency actions
4. Encryption capability
5. Roaming capability
6. Priority
7. Scan

B. The Contractor also shall develop subscriber unit programming templates. These templates shall have the basic features and functions defined for a particular subscriber unit and user type. Templates shall be developed on a per-agency basis.

C. Once the fleet map and templates are approved and completed, the Contractor shall use these for installation of subscriber units and for further configuration of the system. The Contractor shall submit these with the final as-built documentation.

9.2.4. Handheld Encryption Key Fill Device

A. Manual encryption key distribution also shall be available using a handheld, battery-operated, password-protected key fill device. The County requires five units.

9.3. SUBSCRIBER WARRANTY AND MAINTENANCE

9.3.1. Subscriber Warranty

A. Proposers shall offer a subscriber radio warranty that commences on final acceptance of the County's P25 system or upon delivery of the radios, whichever is later; any subsequent purchases shall include warranty periods of at least one year that co-terminate with the warranty or maintenance periods of any previously purchased radios, unless otherwise agreed by the purchasing entity. The warranty shall include the repair of any radio that fails due to manufacturer defects within the warranty period, at no additional cost to the owning agency.

9.3.2. Subscriber Maintenance

A. Proposers shall offer subscriber maintenance plans on a recurring fee structure to provide added services and coverage beyond the initial warranty period. Proposers shall provide pricing in the pricing workbook for the following subscriber maintenance packages:

1. Extended warranty beyond the initial warranty period for failures that occur due to manufacturer defects or normal wear and tear

2. Preventive maintenance plan to restore the radios to the manufacturer's specifications at the following recurring intervals:
   a. One year
   b. Two years

3. Accidental damage replacement plan to cover the repair or replacement of radios that have failed due to accidental damage, at no additional cost to the owning agency

B. Proposers shall offer subscriber maintenance pricing on a per-request fee structure to provide added services and coverage beyond the initial warranty period. Proposers shall provide pricing in the pricing workbook for the following subscriber maintenance services:

1. Factory repair of a radio that has failed due to manufacturer defects or normal wear and tear

2. Preventive maintenance to restore the radios to the manufacturer's specifications

3. Factory repair of a radio that has failed due to accidental damage

4. Programming of a radio to update the radio's programming parameters

5. Programming of a radio to update the radio's firmware (firmware purchased separately)

GLOSSARY OF TERMS AND ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
AC	Alternating current
agency	Term that applies generically to any local, state, federal entity or organization, such as: a department, division, city/town, or bureau. Includes: government, quasi-government and private groups
ANSI	American National Standards Institute
APCO	Association of Public-Safety Communications Officials–International
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing Materials
ATPC	Automatic transmit power control
ATS	Automatic transfer switch
AWG	American wire gauge
backhaul	The transporting of radio communications traffic between distributed sites (typically access points) and more centralized points of presence.
Bandwidth	The capacity of a channel to carry signals. The amount of spectrum required to transmit a signal without distortion or loss of information.
BER	Bit error rate; a measure of the number of errors in received transmissions when compared to the original transmission, frequently expressed as a percentage.
bit	Binary digit
BTU	British thermal unit
CAI	Common air interface
CATP	Coverage acceptance test plan
C	Celsius
CFR	Code of Federal Regulations
channel	The route through which a message is sent. A connection between initiating and terminating nodes of a circuit. A single path provided by a transmission medium via an electrical separation, such as by frequency or frequency pairs.

communications	Information transfer among or between users. In public safety communications, the ability of public safety agencies to talk across agencies.
connectivity	The complete path between two terminals.
Contractor	Any individual or entity selected from among all Proposers to supply products and services in response to this RFP.
conventional	A radio system with dedicated, single-purpose channels (can be shared between several users with different operational needs; *e.g.,* fire and police). A user must select the specific channel to be used.
coverage	The geographic area included within the range of a wireless radio system.
CPC	Channel performance criterion
CSI	Construction Specifications Institute
CSSI	Console subsystem interface
DAQ	Delivered audio quality
dB	Decibel
dBm	Decibel referenced to one milliwatt. (zero dBm)
DC	Direct current
digital	Radio transmission method that replaces analog systems and transmits its signal in binary 1s and 0s the same as a computer. One major difference is that digital signals do not degrade gradually the way analog signals do as the distance between the transmitter and receiver increases.
DS-0	A basic digital signaling rate of 64 kilobits per second (kbps), corresponding to the capacity of one voice-frequency-equivalent channel. The DS-0 rate, and its equivalents E-0 and J-0, form the basis for the digital multiplex transmission hierarchy in telecommunications systems used in North America.
DS-1	Digital Signal, Level 1
DTMF	Dual-tone multi-frequency
EIA	Electronic Industries Alliance
EMI	Electromagnetic interference
encryption	The reversible transformation of data from the original (plain text) format to a difficult-to-interpret format as a mechanism for protecting its confidentiality,

	integrity and sometimes its authenticity. Encryption uses an encryption algorithm and one or more encryption keys.
ERP	Effective radiated power
F	Fahrenheit
FAA	Federal Aviation Administration
FATP	Final acceptance test plan
FCC	Federal Communications Commission
FDMA	Frequency division multiple access
first responders	The first professionals called to an incident or emergency that provides immediate support services during prevention, response, and recovery operations.
FM	Frequency Modulation; a signal transmission with constant signal strength, where the center frequency varies in proportion to the voice being transmitted. FM signals are not susceptible to most interference sources. Radio systems operating on FM are being replaced by digital systems.
frequency	The number of cycles or events of a periodic process in a unit of time.
frequency bands	The spectrum of transmission space where mobile radio systems operate in the United States. They are (from low to high): High HF (25-29.99 MHz) Low VHF (30-50 MHz) High VHF (150-174 MHz) Low UHF (450-470 MHz) UHF TV Sharing (470-512 MHz) 700 MHz (764-776 and 794-806 MHz) 800 MHz (806-869 MHz) 2.4 GHz 4.9 GHz
FRU	Field replaceable unit
gateway	A device that can transparently interconnect radio audio paths so that agencies can patch into each other's radio channels in real time. This can be done at the baseband

	level or using IP. A gateway provides interconnection between two networks with different communications protocols.
GFI	Ground fault interrupter
GHz	Gigahertz (1 billion hertz)
GoS	Grade of service
GPS	Global Positioning System; a U.S. satellite system that lets persons or systems determine their position with extreme accuracy using GPS receivers.
GUI	Graphical user interface
HVAC	Heating, ventilation, and air conditioning
Hz	Hertz (same as cycles per second)
ID	Identification
IEEE	Institute of Electrical and Electronic Engineers
infrastructure	Dedicated telecommunications networks; the hardware and software needed to complete and maintain a public safety communications system.
interference	Extraneous energy, from natural or man-made sources, that impedes the reception of desired RF signals.
interoperability	The ability of diverse systems and organizations to work together (interoperate). In public safety, the ability of personnel to exchange voice and data communications with staff from other agencies, on demand and in real time.
intranet	A private computer network that uses Internet technologies to share an organization's information or operational systems with its employees in a secure manner.
IP	Internet Protocol
ISSI	Inter-RF subsystem interface
kHz	Kilohertz (1000 hertz)
kVA	Kilovolt ampere
kW	Kilowatts
LAN	Local-area network
LCD	Liquid crystal display

LED	Light-emitting diode
LMR	Land mobile radio; a public or private radio service providing two-way communication, service paging and radio signaling on land.
Mbps	Megabits per second (1 million bits per second)
MHSB	Monitored hot standby
MHz	Megahertz (1 million hertz)
modem	An acronym for modulator/demodulator, which is a device that translates digital signals coming from a computer into analog signals that can be transmitted over standard telephone lines. The modem also translates the analog signals back into digital signals that a computer can understand.
MPE	Maximum permissible exposure
MTBF	Mean time between failures
NAD	National American Datum
NEBS	Network Equipment Building System
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NiMH	Nickel-metal hydride
NMI	Network management interface
NMS	Network management system
NMT	Network management terminal
NPSPAC	National Public Safety Planning Advisory Committee
NRTL	Nationally recognized testing laboratory
O.D.	Outside diameter
OET	Office of Engineering & Technology
OSHA	Occupational Safety and Health Administration
OTAP	Over-the-air programming

P25 or APCO 25	Project 25; a suite of standards for digital radio communications for use by federal, state/province and local public safety agencies in North America to enable them to communicate with other agencies and mutual-aid response teams in emergencies.
PC	Personal computer
Proposer	Any individual or entity bidding on the right to supply products and services in response to this RFP.
psig	Pounds per square inch gauge
PTT	Push to talk
Public safety spectrum	Specific bands of frequencies set aside by the FCC for use by public safety agencies. They are: Low Band (25-50 MHz) VHF High Band (150-174 MHz) 220 MHz Band (220-222 MHz) UHF Band (450-470 MHz) 700 MHz Band (764-776 and 794-806 MHz) 800 MHz Band (806-824 and 851-869 MHz) 4.9 GHz Band
QA/QC	Quality assurance/quality control
receiver	The component(s) of a radio device that converts the radio waves into audible signals.
repeater	A special receiver/transmitter combination that receives a signal on one frequency and retransmits a new signal on another frequency, usually within the same frequency band, sometimes referred to as a relay station.
RF	Radio frequency
RFI	Radio frequency interference
RFP	Request for proposals
RTU	Remote terminal unit
SATP	Staging acceptance test plan

SoR	Statement of requirements
spectrum	The range of electromagnetic radio frequencies that can be decomposed into frequency components, used in the transmission of sound, data and television.
subscriber	User/customer on a network.
subscriber unit	User's equipment (usually a mobile or portable radio)
talkgroup	An assigned talk path similar to a channel on a conventional system.
TDMA	Time division multiple access
TDMM	Telecommunications Distribution Methods Manual
Telco	Telecommunications company
TIA	Telecommunications Industry Association
trunked	A radio system with a group of channels available and assigned as needed to specific "groups" or operations. The channels are programmed for automatic system assignment while in use, and then released for other users. A trunked system maximizes channel utilization.
TSB	Telecommunications Systems Bulletin
TTA	Tower-top amplifier
turnkey	Entire system with hardware and software assembled and installed by a vendor and sold as a package.
TVSS	Transient voltage surge suppression
UHF	Ultra-high frequency
UL	Global safety certification company; formerly known as Underwriters Laboratories
UPS	Uninterruptible power supply
USGS	U.S. Geological Survey
VHF	Very-high frequency
VSWR	Voltage standing wave ratio
Voting receiver	Multiple remote receivers tied together through a comparator device at a transmitter site to improve portable coverage; signal strength is compared from each receiver, and the best receiver becomes the receiver during a specific transmission.

V_{ult}	Ultimate Design Wind Speeds (3-second gust)
WAN	Wide-area network
WBS	Work breakdown structure

APPENDIX A-1: TOWER SITES – CURRENT SYSTEM

Currently, the VHF radio system (FCC call signs KNJN428, WPNP403, KGF358, KGF398, WPKT967, and WPAU478) uses the sites in three zones. The sites are a combination of County-owned, municipality-owned, and leased. The sites and associated information are shown in the table below. A system map is also included at the end of this appendix.

Site Name	Address	Municipality	Latitude	Longitude	Zone 1	Zone 2	Zone 3	Antenna Height AGL (Ft)	Antenna
Scenery Hill	13 School Alley, Scenery Hill	North Bethlehem Township	40° 05' 16.08" N	080° 04' 15.77" W			√	130	SD210-HF2P2LDF
Mount Wheeler	183 High Flight Drive, Washington	North Franklin Township	40° 07' 51.81" N	080° 14' 31.00" W	√			130	SD210-HF2P2LDF
Washington Park	285 Dunn Avenue, Washington	Washington City	40° 10' 20.55" N	080° 13' 07.55" W	√			130	SD210-HF2P2LDF
Claysville	30 Ashbrook Acres Lane, Claysville	Donegal Township	40° 07' 08.67" N	080° 25' 14.62" W	√			130	SD210-HF2P2LDF
Smith Township	322 Point Pleasant Road, Bulger	Smith Township	40° 25' 01.14" N	080° 21' 29.52" W		√		130	SD210-HF2P2LDF
Mount Pleasant	86 Bowen Road, Midway	Mount Pleasant Township	40° 21' 10.51" N	080° 17' 11.58" W		√		130	SD210-HF2P2LDF
North Strabane	172 Lindley Road, Canonsburg	North Strabane Township	40° 14' 05.63" N	080° 11' 18.17" W		√		130	SD210-HF2P2LDF

Site Name	Address	Municipality	Latitude	Longitude	Zone 1	Zone 2	Zone 3	Antenna Height AGL (Ft)	Antenna
McMurray	2791 Locust Drive, Pittsburgh	Peters Township	40° 17' 56.11" N	080° 05' 00.76" W		√	√	130	SD210-HF2P2LDF
Donora	25 5th Avenue, Donora	Carroll Township	40° 10' 51.47" N	079° 52' 24.37" W			√	130	SD210-HF2P2LDF
California	1018 Highpoint Drive, Coal Center	California Borough	40° 04' 58.65" N	079° 53' 42.82" W			√	130	SD210-HF2P2LDF
East Beth	50 Overlook Drive, Labelle	Luzerne Township, Fayette County	39° 59' 43.29" N	079° 59' 10.73" W			√	130	SD210-HF2P2LDF
McDonald	340 Profio Road, McDonald	Cecil Township	40° 21' 17.40" N	080° 13' 59.80" W		√		310	SD210-HF2P2LDF
West Finley	236 Chambers Ridge Road, West Alexander	West Finley Township	40° 03' 27.55" N	080° 30' 35.85" W	√			130	SD210-HF2P2LDF
East Finley	369 Newland School Road, West Finley	East Finley Township	40° 00' 06.65" N	080° 24' 15.49" W	√			130	SD210-HF2P2LDF
Cross Creek (Proposed)	722 Parker Road, Burgettstown	Cross Creek Township	40° 19' 22.40" N	080° 25' 07.76" W	√			130	SD210-HF2P2LDF

Site Name	Address	Municipality	Latitude	Longitude	Zone 1	Zone 2	Zone 3	Antenna Height AGL (Ft)	Antenna
Charleroi	601 Oakland Avenue, Charleroi	Charleroi Borough	40° 08' 09.61" N	079° 54' 20.81" W			√	130	SD210-HF2P2LDF
Mingo	195 Lanik Road, Bentleyville	Somerset Township	40° 10' 33.09" N	080° 02' 20.38" W		√	√	130	SD210-HF2P2LDF
Allenport	100 Summit Road, Belle Vernon	Washington Township, Fayette County	40° 06' 34.18" N	079° 50' 26.86" W			√	130	SD210-HF2P2LDF
Backup PSAP	150 Airport Road, Washington	South Franklin Township	40° 08' 02.23" N	080° 17' 12.89" W	√			130	SD210-HF2P2LDF
Union Township	2200 W of Int of LR02040 & T608	Monongahela	40° 15' 09.84" N	079° 57' 00.87" W			√	130	SD210-HF2P2LDF
CHS/Primary PSAP	100 West Beau Street Washington PA 15301-4432	Washington	40°10'12.54"N	80°14'49.88"W	√			100	SD210-HF2P2LDF

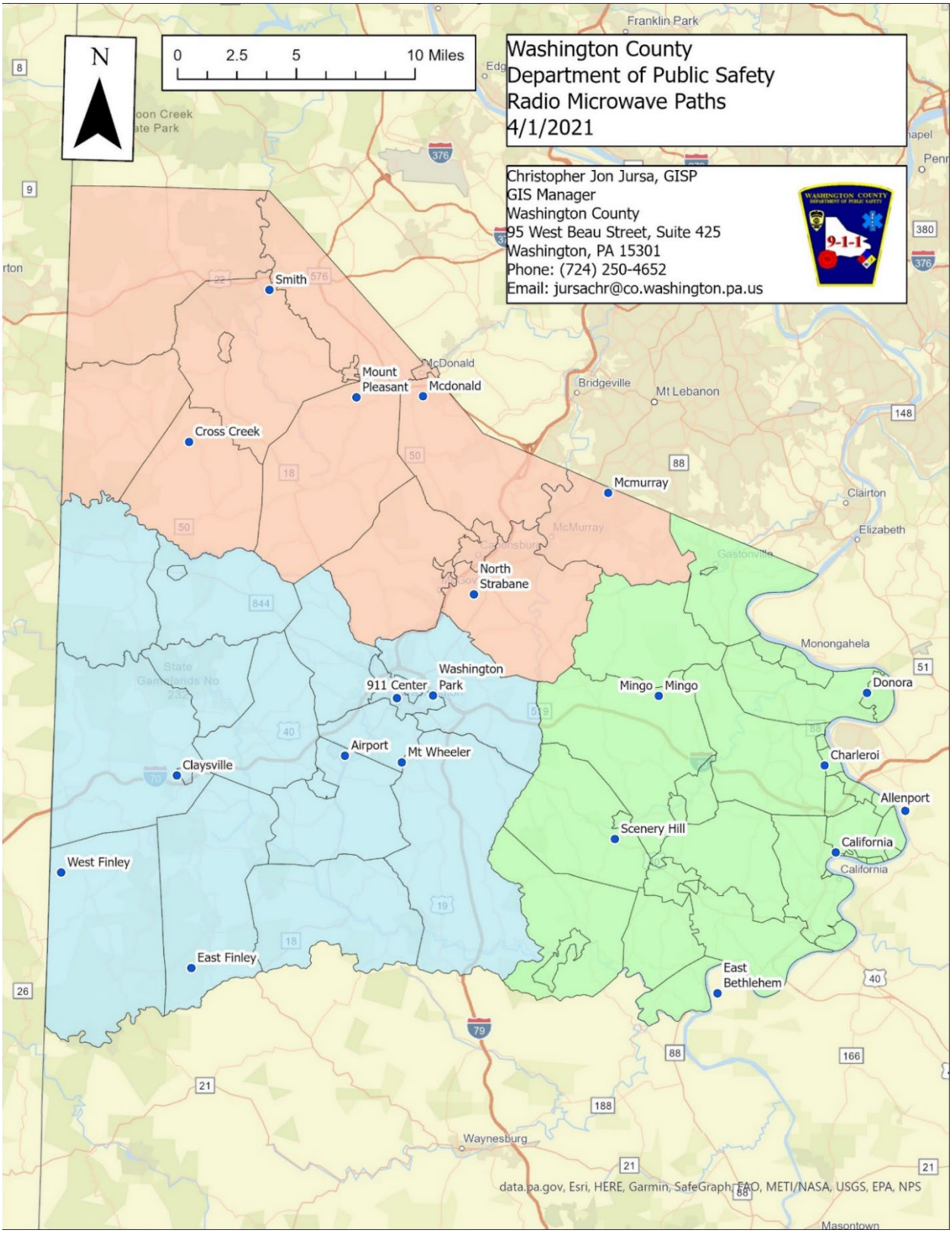


Figure 1: Radio Site Locations

APPENDIX A-2: CURRENT RADIO SITES CONFIGURATION – BEFORE AND AFTER PLANNED IMPROVEMENTS

Current System Transmitter/Receiver Configuration Before Planned Improvements

Site	Scenery Hill	Mount Wheeler	Washington Park	Claysville	Smith Township	Mount Pleasant	North Strabane	McMurray	Donora	California	East Beth	McDonald	West Finley	East Finley	Cross Creek PROPOSED	Charleroi	Mingo	Allenport	Airport/Backup PSAP	CHS/Primary PSAP
Primary Zone	3	1	1	1	2	2	2	2	3	3	3	2	1	1	1	3	3	3	1	1
Law (TX, RX, or TX/RX)	Z3 Rx/Tx, Z1 Rx, Z2 Rx	Z1 Tx/Rx	Z1 Tx/Rx, Z2 Rx, Z3 Rx	Z1 Rx	Z2 Rx		Z2 Tx/Rx, Z1 Rx	Z2 Rx, Z3 Rx	Z3 Tx/Rx	Z3 Tx/Rx	Z3 Rx	Z2 Tx/Rx				Z3 Tx/Rx		Z3 Tx/Rx		Z1 Rx
Fire (TX, RX, or TX/RX)	Z3 Rx/Tx	Z1 Tx/Rx	Z1 Tx/Rx	Z1 Tx/Rx	Z2 Tx/Rx		Z2 Tx/Rx	Z2 Rx, Z3 Rx	Z3 Tx/Rx	Z3 Tx/Rx	Z3 Tx/Rx	Z2 Tx/Rx	Z1 Tx/Rx							
EMS (TX, RX, or TX/RX)	Tx/Rx	Tx/Rx	Tx/Rx		Tx/Rx		Tx/Rx	Tx/Rx	Tx/Rx			Tx/Rx					Tx/Rx			

Current System Transmitter/Receiver Configuration After Planned Improvements

Site	Scenery Hill	Mount Wheeler	Washington Park	Claysville	Smith Township	Mount Pleasant	North Strabane	McMurray	Donora	California	East Beth	McDonald	West Finley	East Finley	Cross Creek PROPOSED	Charleroi	Mingo	Allenport	Airport/Backup PSAP	CHS/Primary PSAP
Primary Zone	3	1	1	1	2	2	2	2	3	3	3	2	1	1	1	3	3	3	1	1
Law (TX, RX, or TX/RX)	Z3 Rx/Tx	Z1 Tx/Rx	Z1 Tx/Rx	Z1 Tx/Rx	Z2 Tx/Rx		Z2 Tx/Rx	Z2 Tx/Rx, Z3 Tx/Rx	Z3 Tx/Rx	Z3 Tx/Rx	Z3 Tx/Rx	Z2 Tx/Rx	Z1 Tx/Rx	Z1 Tx/Rx		Z3 Tx/Rx	Z2 Tx/Rx, Z3 Tx/Rx	Z3 Tx/Rx		
Fire (TX, RX, or TX/RX)	Z3 Rx/Tx	Z1 Tx/Rx	Z1 Tx/Rx	Z1 Tx/Rx	Z2 Tx/Rx		Z2 Tx/Rx	Z2 Tx/Rx, Z3 Tx/Rx	Z3 Tx/Rx	Z3 Tx/Rx	Z3 Tx/Rx	Z2 Tx/Rx	Z1 Tx/Rx	Z1 Tx/Rx		Z3 Tx/Rx	Z2 Tx/Rx, Z3 Tx/Rx	Z3 Tx/Rx		
EMS (TX, RX, or TX/RX)	Tx/Rx	Tx/Rx	Tx/Rx	Tx/Rx	Tx/Rx		Tx/Rx	Tx/Rx	Tx/Rx	Tx/Rx		Tx/Rx					Tx/Rx			

Mount Pleasant site will be upgraded with new microwave and available for deployment
Cross Creek site remains in lease uncertainty, deployment pending
CHS/Primary PSAP site is equipped with control stations for failover, full site can be deployed if coverage is necessary
Airport/Backup PSAP site is equipped with control stations for failover, full site can be deployed if coverage is necessary

APPENDIX A-3: CANDIDATE TOWER SITES FOR THE PROPOSED P25 SYSTEM

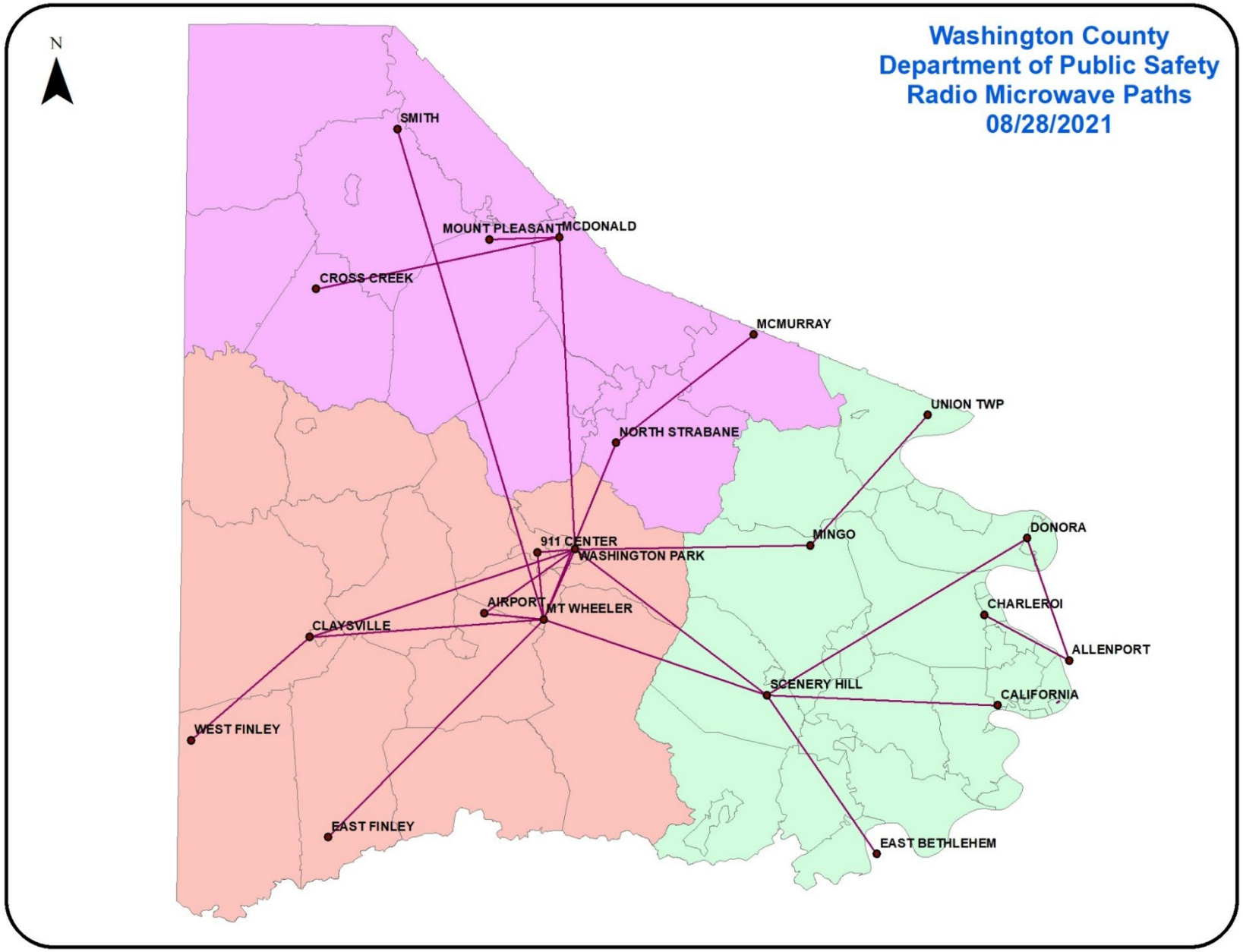
Site Name	Address	Municipality	Latitude	Longitude
Scenery Hill	13 School Alley, Scenery Hill	North Bethlehem Township	40° 05' 16.08" N	080° 04' 15.77" W
Mount Wheeler	183 High Flight Drive, Washington	North Franklin Township	40° 07' 51.81" N	080° 14' 31.00" W
Washington Park	285 Dunn Avenue, Washington	Washington City	40° 10' 20.55" N	080° 13' 07.55" W
Claysville	30 Ashbrook Acres Lane, Claysville	Donegal Township	40° 07' 08.67" N	080° 25' 14.62" W
Smith Township	322 Point Pleasant Road, Bulger	Smith Township	40° 25' 01.14" N	080° 21' 29.52" W
Mount Pleasant	86 Bowen Road, Midway	Mount Pleasant Township	40° 21' 10.51" N	080° 17' 11.58" W
North Strabane	172 Lindley Road, Canonsburg	North Strabane Township	40° 14' 05.63" N	080° 11' 18.17" W
McMurray	2791 Locust Drive, Pittsburgh	Peters Township	40° 17' 56.11" N	080° 05' 00.76" W
Donora	25 5th Avenue, Donora	Carroll Township	40° 10' 51.47" N	079° 52' 24.37" W
California	1018 Highpoint Drive, Coal Center	California Borough	40° 04' 58.65" N	079° 53' 42.82" W
East Beth	50 Overlook Drive, Labelle	Luzerne Township, Fayette County	39° 59' 43.29" N	079° 59' 10.73" W
McDonald	340 Profio Road, McDonald	Cecil Township	40° 21' 17.40" N	080° 13' 59.80" W
West Finley	236 Chambers Ridge Road, West Alexander	West Finley Township	40° 03' 27.55" N	080° 30' 35.85" W

Site Name	Address	Municipality	Latitude	Longitude
East Finley	369 Newland School Road, West Finley	East Finley Township	40° 00' 06.65" N	080° 24' 15.49" W
Cross Creek	722 Parker Road, Burgettstown	Cross Creek Township	40° 19' 22.40" N	080° 25' 07.76" W
Charleroi	601 Oakland Avenue, Charleroi	Charleroi Borough	40° 08' 09.61" N	079° 54' 20.81" W
Mingo	195 Lanik Road, Bentleyville	Somerset Township	40° 10' 33.09" N	080° 02' 20.38" W
Allenport	100 Summit Road, Belle Vernon	Washington Township, Fayette County	40° 06' 34.18" N	079° 50' 26.86" W
Backup PSAP	150 Airport Road, Washington	South Franklin Township	40° 08' 02.23" N	080° 17' 12.89" W
Union Township	2200 W of Int of LR02040 & T608	Monongahela	40° 15' 09.84" N	079° 57' 00.87" W
Crown Castle ASR1050307	Whippoorwill Road Burgettstown	Burgettstown	40-23-45.9 N	080-30-23.6 W
TrueNorth Development ASR 1297004	0.17 NM East of PA Route 331 Claysville	Claysville	40-12-07.4 N	080-26-59.3 W
SBA ASR1290603	East Finley Drive "EAST FINLEY" Claysville	Claysville	40-03-44.4 N	080-23-45.7 W
Crown Castle ASR104931	200 Dividing Ridge Road Washington	Washington	40-00-32.5 N	080-10-32.5 W
SBA ASR1204911	Off of School Court Road Avella	Avella	40-16-17.0 N	080-27-55.0 W

Site Name	Address	Municipality	Latitude	Longitude
STARNet Burgettstown Wash53	Off Goodwill Hill Road Burgettstown	Burgettstown	40-24-20.6 N	080-24-34.5 W
STARNet Claysville Wash03	Off Knox Road, Claysville	Claysville	40-05-30.3 N	080-25-49.2 W
STARNet McDonald Wash39	Skyline Drive McDonald	McDonald	40-19-37.6 N	080-12-44.4 W

APPENDIX A-4: CURRENT RADIO SITES INTERCONNECTIVITY

The microwave radio paths are shown on the following page.


N
Washington County
Department of Public Safety
Radio Microwave Paths
08/28/2021
SMITH
MOUNT PLEASANT
MCDONALD
CROSS CREEK
MCMURRAY
UNION TWP
NORTH STRABANE
MINGO
DONORA
911 CENTER
WASHINGTON PARK
AIRPORT
MT WHEELER
CHARLEROI
CLAYSVILLE
ALLENPORT
SCENERY HILL
CALIFORNIA
WEST FINLEY
EAST FINLEY
EAST BETHLEHEM

APPENDIX B: COMPLIANCE MATRIX

The Compliance Matrix is provided below for review. A separate Excel spreadsheet will be provided for completion.

APPENDIX C: PROPOSAL PRICING INSTRUCTIONS

The Pricing Workbook, a separate Excel document, has been developed to foster conformity of Proposers' pricing proposals and aid in evaluation of these proposals. The price sheets are designed to provide justification for a Proposer's pricing proposal and evaluation criteria.

Detailed line-item pricing for all material and services is requested. Proposers may add lines to the worksheets to accommodate their in-depth pricing details in support of their project approach.

The sum of the costs provided on the sheets shall total the cost of a Proposer's proposal before any incentive discounts are applied.

Any optional equipment or services shall be clearly marked "OPTIONAL" so as not to be included in the project cost calculation.

A separate worksheet should be generated for each tower site and equipment location, including, but not limited to, the core controllers, simulcast cell controllers, each site where RF equipment is located, and dispatch locations.

Antenna systems for LMR and microwave systems should be listed on the worksheet page for that site. Additional lines may be inserted as needed.

Subscriber pricing sheets shall include the full list of radios, software options, and accessories included within a Proposer's base proposal. Separate sheets shall be provided for any alternate radio models, options, and accessories not included in a Proposer's base proposal.

The 15-year cost of ownership should include all services available from the Proposer.

Pricing for generator replacement, including ATS equipment, is to be on a separate pricing workbook page in case the County needs to delete for funding issues. The separate pricing shall include the corresponding engineering and project management services.

APPENDIX D: AVAILABLE VHF FREQUENCIES FOR VHF PAGING PROPOSAL CONSIDERATION

Frequency	Current Use	Licensee
151.0625	Fire 2 RX	Licensed by WCDPS
151.19	Unused	Licensed by WCDPS
151.2425	North Strabane	Current system user, need commitment
151.265	Washington Fire	Current system user, need commitment
151.325	Unused	Licensed by WCDPS
151.3475	Fire 3 RX	Licensed by WCDPS
151.43	Fire 1 RX	Licensed by WCDPS
151.49	Ops 5	Licensed by WCDPS
151.715	W&J	County police agency, may commit if integrated into new system
152.87	Cal U	County police agency, may commit if integrated into new system
153.785	Unused	Licensed by WCDPS
153.83	Ops 1	Licensed by WCDPS
153.845	Peters Police	Verbal commit from Peters
153.935	North Strabane	Current system user, need commitment
154.13	Peters Fire	Verbal commit from Peters
154.235	Unused	Licensed by WCDPS
154.265	Ops 3	Licensed by WCDPS
154.3625	Peters	Verbal commit from Peters
154.415	Canonsburg Fire	Current system user, need commitment
154.8075	Peters	Verbal commit from Peters
155.01	Index	Licensed by WCDPS
155.07	Police 3 TX	Licensed by WCDPS
155.145	Cal U	County police agency, may commit if integrated into new system
155.25	Police 1 RX	Licensed by WCDPS

Frequency	Current Use	Licensee
155.295	EMS	Licensed by WCDPS
155.34	EMS Natl	Licensed by WCDPS
155.475	PD Natl	Licensed by WCDPS
155.625	Old Canonsburg	Licensed by WCDPS
155.64	Police 3 RX	Licensed by WCDPS
155.775	SWAT	Licensed by WCDPS
155.865	North Strabane	Current system user, need commitment
155.895	Fire 1 TX	Licensed by WCDPS
155.925	Peters Police	Verbal commit from Peters
155.97	Police 2 TX	Licensed by WCDPS
156.0525	Washington Fire	Current system user, need commitment
156.075	Ops 6	Licensed by WCDPS
158.34	Cal U	County police agency, may commit if integrated into new system
158.73	Police 1 TX	Licensed by WCDPS
158.79	Old Canonsburg	Licensed by WCDPS
158.835	Unused	Licensed by WCDPS
158.8425	Unused	Licensed by WCDPS
158.88	Cal U	County police agency, may commit if integrated into new system
158.9175	Ops 2	Licensed by WCDPS
159.03	Peters Fire	Verbal commit from Peters
159.06	Peters	Verbal commit from Peters
159.075	Peters	Verbal commit from Peters
159.105	Ops 4	Licensed by WCDPS
159.165	Police 2 RX	Licensed by WCDPS
159.2025	Fire 3 TX	Licensed by WCDPS
159.3825	Fire 2 TX	Licensed by WCDPS

Frequency	Current Use	Licensee
159.435	Unused	Licensed by WCDPS
159.4425	Unused	Licensed by WCDPS
159.45	Unused	Licensed by WCDPS
159.465	Unused	Licensed by WCDPS

Additional Available Frequencies		
Agency / Use	Transmit MHZ	Receive MHz
HOUSTON FIRE	153.08	
CECIL RD DEPT	151.025	156.060
MT PLEASANT RD	155.145	
PETERS RD. DPT	159.120	156.135
TALK AROUND	155.865	
CHARTIERS RD DPT	155.715	
S.STRABANE RD DPT	156.165	158.985
CANONSBURG RD	155.835	
DONEGAL RD DEPT	155.595	
CLAYSVILLE RD DPT	155.370	
JEFFERSON RD DPT	159.135	
MIDWAY RD DEPT	155.025	
N.FRANKLIN RD	156.240	
SMITH TWP RD	155.805	
DONORA RD DEPT	153.920	
CANTON TWP RD	154.055	
WASH CO CONSTBL	151.805	

Additional Available Frequencies		
Agency / Use	Transmit MHZ	Receive MHz
MON VALLEY DIVERS	156.800	
NORTH BETH	155.220	
NST/NOTTINGHAM	153.935	

APPENDIX E: BACKUP CONTROL STATIONS AT PSAPS

PSAP	Backup Control Station									
	Model 1 Control Station / Digital Remote Controller		Model 2 Control Station / Digital Remote Controller		Model 3 Control Station / Digital Remote Controller		Existing Equipment Upgrade to P25 P2		Add Options	
	Control Station	Digital Remote Controller	Control Station	Digital Remote Controller	Control Station	Digital Remote Controller	Control Station	Digital Remote Controller	AES Encryption	OTAR
Washington County Main 911 Center					15					
Washington County Backup 911 Center					8					
Total	0	0	0	0	23	0	0	0	0	0

APPENDIX F: SUBSCRIBER RADIOS – PROPOSED P25 SYSTEM

Bulk purchases shall be based on the quantities listed below.

1. Portables:
    a. 1,481 — Model 2 – Single Band, Non-Encrypted

2. Mobiles:
    a. 617 — Model 2 – Single Band, Non-Encrypted

3. Control Stations:
    a. 140— Model 2 - Single Band, Non-Encrypted

APPENDIX G: WASHINGTON COUNTY TERMS AND CONDITIONS

NONDISCRIMINATION CLAUSE

During the term of this contract, Contractor agrees as follows:

1. Contractor shall not discriminate against any employee, applicant for employment, independent contractor, or any other person because of race, color, religious creed, handicap, ancestry, national origin, age, or sex. Contractor shall take affirmative action to ensure that applicants are employed, and that employees or agents are treated during employment, without regard to their race, color, religious creed, handicap, ancestry, national origin, age, or sex. Such affirmative action shall include, but is not limited to: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training. Contractor shall post in conspicuous places, available to employees, agents, applicants for employment, and other persons, a notice to be provided by the contracting agency setting forth the provisions of this nondiscrimination clause.

2. Contractor shall, in advertisements or requests for employment, placed by it or on its behalf, state that all qualified applicants will receive consideration for employment without regard to race, color, religious creed, handicap, ancestry, national origin, age, or sex.

3. Contractor shall send each labor union or workers' representative with which it has a collective bargaining agreement or other contract or understanding, a notice advising said labor union or workers' representative of its commitment to this nondiscrimination clause. Similar notice shall be sent to every other source or recruitment regularly utilized by Contractor.

4. It shall be no defense to a finding of noncompliance with this nondiscrimination clause that Contractor had delegated some of its employment practices to any union, training program, or other source of recruitment which prevents it from meeting its obligations. However, if the evidence indicates that the Contractor was not on notice of the third-party discrimination or made a good faith effort to correct it, such factor shall be considered in mitigation in determining appropriate sanctions.

5. Where the practices of a union or any training program or other source of recruitment will result in the exclusion of minority group persons, so that Contractor will be unable to meet its obligations under this nondiscrimination clause, Contractor shall then employ and fill vacancies through other nondiscriminatory employment procedures.

6. Contractor shall comply with all state and federal laws prohibiting discrimination in hiring or employment opportunities. In the event of Contractor's noncompliance with the nondiscrimination clause of this contract or with any such laws, this contract may be terminated or suspended, in whole or in part, and Contractor may be declared temporarily ineligible for further Commonwealth contracts, and other sanctions may be imposed and remedies invoked.

7. Contractor shall furnish all necessary employment documents and records to, and permit access to its books, records, and accounts by the contracting agency for purposes of investigation to ascertain compliance with the provisions of this clause. If Contractor does not possess documents or records reflecting the necessary information requested, it shall furnish such information on reporting forms supplied by the contracting agency.

8. Contractor shall actively recruit minority and women subcontractors or subcontractors with substantial minority representation among their employees.

9. Contractor shall include the provisions of this nondiscrimination clause in every subcontract, so that such provisions will be binding upon each Subcontractor.

10. Contractor obligations under this clause are limited to the Contractor's facilities within Pennsylvania or, where the contract is for purchase of goods manufactured outside of Pennsylvania, the facilities at which such goods are actually produced.

ANTI-COLLUSION AFFIDAVIT
WASHINGTON COUNTY, PA

The undersigned deponent, deposes and says that he is the of the bidder/proposer; that he is authorized to make this statement on behalf of the bidder, and he hereby certifies on behalf of the bidder/proposer that:

(1) The price(s) and amount of this bid/proposal have been arrived at independently and without consultation, communication or agreement for the purpose of restricting Competition with any other contractor, bidder/proposer or potential bidder/proposer.

(2) Neither the price(s) nor the amount of this bid/proposal, and neither the approximate price(s) nor approximate amount of this bid/proposal, have been disclosed to any other firm or person who is a bidder or potential bidder/proposer, and they will not be disclosed before bid/proposal opening.

(3) No attempt has been made or will be made to solicit, cause or induce any firm or person to refrain from submitting a bid or proposal offer on this project, or submit a bid/proposal higher than this bid/proposal, or to submit any intentionally high or noncompetitive bid/proposal or other form of complementary bid/proposal.

(4) The bid/proposal submitted by the bidder/proposer is made in good faith and not pursuant to any agreement or discussion with, or inducement from, any firm or person to submit a complementary or other noncompetitive bid/proposal.

(5) The bidder/proposer has not offered or entered into a subcontract or agreement regarding the purchase of materials or services from any firm or person, or offered, promised or paid cash or anything of value to any firm or person, whether in connection with this or any other project, in consideration for an agreement or promise by any firm or person to refrain from submitting a bid/proposal or to submit a complementary bid/proposal on this project.

(6) The bidder/proposer has not accepted or been promised any subcontract or agreement regarding the sale of materials or services to any firm or person and has not been promised or paid cash or anything of value by any firm or person, whether in connection with this or any other project, in consideration for my firm's submitting a complementary bid,/proposal or agreeing to do so on this project.

(7) I have made a diligent inquiry of all members, officers, employees, and agents of the bidder/proposer with responsibilities relating to the preparation, approval or submission of my firm's proposal on this project and have been advised by each of them that he/she has not participated in any communication, consultation, discussion, agreement, collusion, act or other inconsistent with any of the statements and representations made in this Statement.

(8) No attempt has been made to take any action in restraint of free competitive bidding in connection with the bid/proposal.

(9) It is understood that if any incidents resulting in conviction or being found liable are, set forth in (10) below, the Pennsylvania Anti Bid Act, 73 P.S. 1611 et seq. provides that it does not prohibit a governmental agency from accepting a bid from or awarding a contract to that person, but may be a ground for administrative suspension or debarment at the discretion of a government agency under rules and regulations of that agency (language omitted).

(10) _____ its affiliates,
(NAME OF BIDDER/PROPOSER)
subsidiaries, officers, directors and employees are not aware that they are currently under investigation by any governmental agency and have not in the last three years been convicted or found liable for any act prohibited by State or Federal law in any jurisdiction, involving conspiracy or collusion with respect to bidding on any public contract, except as follows:

I hereby state that_____
(BIDDER/PROPOSER)
understands and acknowledges that the above representations are material and important, and will be relied on by Washington County, Pennsylvania in awarding the contract(s) for which this bid/proposal is submitted. I understand that any misstatement in this affidavit is and shall be treated as fraudulent concealment from the Washington County, Pennsylvania of the true facts relating to the submission of bids/proposals for this contract.

_____
(BIDDER/PROPOSER)

By:_____

Sworn to and subscribed before me the undersigned notary public this
_____day of _____, 20_____.

_____
(NOTARY PUBLIC)

My Commission Expires:

Contractor:
By: _____

Printed Name:_____

Title:_____

REQUIREMENTS FOR VENDORS DOING BUSINESS WITH WASHINGTON COUNTY

The awarded vendor must furnish and keep in full force, during the term of this contract, the following insurances:

Unless waived by the County in writing, Contractor shall obtain insurance of the types and in the amounts described below:

(1) Commercial General and Umbrella Liability Insurance.
(a) Contractor shall maintain Commercial General Liability (CGL) and, if necessary, Commercial Umbrella Insurance with a limit of not less than $1,000,000 each occurrence unless specified on addendum XXX. If such CGL insurance obtains a general aggregate limit, it shall apply separately to this location or project. CGL insurance shall be written on ISO occurrence form (or substitute form providing equivalent coverage). County of Washington shall be included as an insured under the CGL, using ISO additional insured endorsement CG2026 or a substitute providing equivalent coverage, and under the Commercial Umbrella, if any. This insurance shall apply as primary insurance with respect to any other insurance or self-insurance programs afforded to County of Washington. There shall be no endorsement or modification of the CGL policy which limits coverage for liability arising from claims based on sexual abuse or molestation. If such an endorsement has been added to the Contractor's CGL insurance, Contractor shall be required to obtain separate insurance coverage for claims based on sexual abuse or molestation.
(2) Business Automobile and Umbrella Liability Insurance.
(a) Contractor shall maintain Business Automobile Liability, and if necessary, Commercial Umbrella Liability insurance with a limit of not less than $1,000,000 each accident. Such insurance shall cover liability arising out of any automobile, including owned, hired and non-owned automobiles. Business automobile coverage shall be written on ISO form CA0001 or a substitute form providing equivalent liability coverage. If necessary, the policy shall be endorsed to provide Contractual Liability coverage equivalent to that provided in the 1990 and later editions of CA0001.

(3) Workers Compensation Insurance.
Contractor shall maintain Workers Compensation and Employers Liability Insurance.
(a) The Employers Liability and/or Umbrella Liability limits shall not be less than $100,000 each accident for bodily injury by accident, $100,000 each employee for bodily injury by disease, $500,000 policy limit for bodily injury by disease.

(4) Insurance Requirements for all Policies.
(a)Contractor waives all rights against County of Washington and its agents, officers, directors, and employees for recovery of damages to the extent these damages are covered by the Commercial General Liability, Automobile Liability, or Umbrella Liability Insurance maintained pursuant to previous paragraph of this agreement.

(b) By requiring insurance herein, County of Washington does not represent that coverage and limits will necessarily be adequate to protect contractor, and such coverage and limits shall not be deemed as a limitation on Contractor's Liability under the indemnities granted to County of Washington in this contract.
(c) If Contractor's Liability does not contain the standard ISO separation of insured's provision, or a substantially similar clause, they shall be endorsed to provide Cross-Liability coverage.
(d) Prior to the commencement of terms of this contract, contractor shall furnish County of Washington with a certificate of insurance, executed by a duly authorized representative of each insurer, showing compliance with the insurance requirements set forth above.
(e) All certificates of insurance shall provide for 30 days' written notice to County of Washington prior to the cancellation or material change of any insurance referred to therein. (f) Failure of County of Washington to demand such certificate or other evidence of full compliance with these insurance requirements or failure of County of Washington to identify a deficiency from evidence that is provided shall not be construed as a waiver of contractor's obligation to maintain such insurance.
(g) Failure to maintain the required insurance may result in termination of this contract or other punitive measures, such as withholding payments or denying access to the premises at County of Washington's option.
(h) The contractor must agree to hold harmless and indemnify Washington County and its officials from and against any and all liability arising out of any action, claimed demand, suit, or cause of action which may be made or asserted against the County of Washington and its officials by reason of any acts of the agency, or its performance of the services contemplated by this contract. The contractor insurance policy including: Commercial General Liability, Automobile Liability, or Umbrella Liability Insurance must be endorsed to include the County of Washington as additional insured.
(i) Certificates of Insurance must be delivered to Washington County within five (5) days after the award evidencing these coverages.
(j) Insurance as required in the foregoing paragraphs shall be placed with an insurer acceptable to the County with a Best Rating of A- or better.

Contractor:

By:_____

Printed Name: _____

Title:_____ _____

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____
Name of Contractor

_____
Address of Contractor

a _____, hereinafter called the Principal, and
Corporation, Partnership or Individual

_____
Name of Surety

_____
Address of Surety

hereinafter called Surety, are held and firmly bound unto _____

_____
Name of Owner

_____
Address of Owner

hereinafter called Owner, in the penal sum of _____

_____ Dollars, ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the PRINCIPAL has submitted a BID to the OWNER dated _____,

_____ to perform certain work in connection with the construction of _____

_____ pursuant to plans, specifications and other related documents constituting the CONTRACT DOCUMENTS as prepared.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety and during a ONE YEAR guaranty period, and if he shall satisfy all claims and demands incurred under such contract and shall fully indemnify and save harmless the Owner form all costs and damages which it may suffer by reason of failure to do so, and shall reimburse any repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to work to be performed thereunder, or the specifications accompanying the same, shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each (number)
one of which shall be deemed an original, this _____ day of _____,

_____.

_____
Principal

ATTEST:

_____ By_____
Principal Secretary

SEAL

_____ _____
Witness as to Principal Address

_____ _____
Address

_____ _____
Surety

ATTEST:

_____ _____
Surety Secretary Attorney-in-Fact

SEAL

_____ _____
Witness as to Surety Address

_____ _____
Address

_____

NOTE: Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

(ATTACH POWER OF ATTORNEY WITH COMPLETED CERTIFICATE)

APPENDIX H: WASHINGTON COUNTY PROPOSAL FORM

CONTRACT: **#062524-Radio RFP** PUBLIC SAFETY RADIO SYSTEM DATE:

TO: WASHINGTON COUNTY COMMISSIONERS

In accordance with the advertisement of the Washington County Commissioners, Courthouse Square, inviting SEALED PROPOSALS from qualified consultants to provide assistance with "Public Safety Radio System" for the Washington County Public Safety., Washington, Pennsylvania, having examined the attached specifications and understanding the same, the undersigned proposes to furnish and comply with all of said specifications:

LUMP SUM AMOUNT: _____

_____ _____
Name of Bidder Address

_____ _____
Signature of Bidder

_____ _____
Typed Name of Bidder (MUST BE AN OFFICER)

FAX NO._____ Phone No._____

E-MAIL ADDRESS:_____

THIS FORM MUST BE RETURNED WITH PROPOSAL

GENERAL REQUIREMENTS

1. Invoices to be billed to
   Washington County Controllers,

   100 West Beau Street, Ste 403,

   Washington PA 15301.

   Invoices must reference Contract **#062524-Radio RFP**

2. Insurance

   Please see attachment for Insurance Requirements.

3. Discrepancies and Addenda
   Interested parties may email any written **request for clarifications or information** to the Washington County Purchasing Office to Dalton Thompson at dalton.thompson@co.washington.pa.us or to Randy Vankirk at vankirkr@co.washington.pa.us. Any requests for clarifications are due to be received no later than **June 14th, 2024 2:00p.m**. Inquiries will not be accepted orally or via phone. Requests for Information (RFI's) will be distributed and responded to in the timeliest manner available and in question-and-answer form. Responses will be posted to the County website as listed herein in the form of an addendum by **June 18th 2024**.
   Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under this bid as submitted. All addenda so issued shall become part of the Contract Documents.

4. Bidder Qualifications

   A. Owner may make such investigations as he deems necessary to determine the ability of the bidder to perform the work, and bidder shall furnish to Owner all such information and data for this purpose as the Owner request. Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is reputable, ethical and is properly qualified to carry out the obligations of the Agreement, and to complete the work contemplated therein. As a minimum, the bidder is required to furnish evidence that he, as "Contractor" has successfully completed work similar in size, scope and content to that herein advertised and specified; and, when specifically requested by the Owner, a detailed financial statement.

   B. A conditional or qualified bid will not be accepted. Award will be made as a whole to one bidder.

5. Disqualification of Bidders

Any One or More of the following causes may be cause for the disqualification of a bidder and the rejection of his bid or bids:
Evidence of collusion among bidders.
Lack of responsibility as revealed by either financial, experience or equipment statements as submitted.
Lack or experience as shown by past work and judged from the standpoint of workmanship and performance history. Uncompleted work under other contracts which, in the judgement of the owner, might hinder or prevent the prompt completion of this project.