AECOM
TECHNOLOGY SOLUTIONS

Marin Emergency Radio Authority

NextGen Project

Proposal – Public Safety Wireless Consulting

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February 18, 2020

Table of Contents

February 14, 2020

Marin Emergency Radio Authority
c/o Town of Corte Madera
300 Tamalpais Drive – Corte Madera, CA 94925
Attn: Ms. Maureen Cassingham, Executive Officer

Re: Request for 3rd Party Wireless Communications Consulting Services for the Marin Emergency Radio Authority Next Generation Communications System

Dear MERA Governing Board,

AECOM Technical Service, Inc. (AECOM) presents the enclosed response to Marin Emergency Radio Authority's (MERA) request for consulting services supporting the next generation radio system project.

We are well qualified to support MERA with a highly experienced consulting team, including team members who have specific past experience assessing, understanding, and supporting the implementation of similar public safety communications system projects. We have worked with MERA in the past as your consultant (via Marin County) to help assess and recommend the future requirements of your replacement system. We will strive again to be an excellent partner to review your system planning for a new 700 MHz P25 Phase 2 platform.

AECOM has a 30+ year history of providing public safety land mobile radio system implementation services for county, municipal, and state government agencies, plus many other public and private clients. We understand the challenges of migrating legacy shared public safety radio systems to new P25 Phase 2 simulcast technology platforms, and have supported similar initiatives with systems supplied by Motorola Solutions, Inc.

We have prepared our response pursuant to our understanding of the agreed upon scope requirements. We confirm our commitment to delivering the professional services as described in the scope requirements outline within our proposal and working collaboratively with your project team to meet your goals and objectives.

We will serve as your advocate, looking out for your best interests, providing expert advice, watching for risk areas and identifying ways to mitigate that risk. We will fill in the gaps where you may not have the necessary internal expertise, or where you simply do not have the capacity to take on this extra effort on your own.

AECOM will provide the same qualified, responsive technical and subject matter experts named in this proposal reporting to the MERA Governing Board Executive Officer. AECOM's proven track record of completing similar projects within budget and on time, together with our financial stability and depth of resources, makes us a best choice to address the challenges you face.

As an officer of AECOM, I am authorized to legally bind AECOM, and I will negotiate on behalf of AECOM. If you have any questions while reviewing our submittal, please do not hesitate to contact me at 202-369-5281.

We are enthusiastic about the opportunity to work with you and are prepared to begin immediately upon your notice to proceed. I am personally committed to making sure AECOM resources are available as needed to make your project successful.

Sincerely,

Darren L Vican
Vice President,
Director of Technology Solutions
AECOM

EXECUTIVE SUMMARY:

Project Understanding

AECOM will Perform an independent 3rd party review of the Customer Design Review (CDR) documentation provided by Motorola Solutions, Inc. that details the design, technical components and implementation plans of the NextGen Communications System Project.

Identify potential issues that could result in delays, increased costs or failure of the system to conform to the requirements and provide recommendations to correct or mitigate these areas of concern. AECOM will perform this independent CDR review as a parallel workflow with that of Federal Engineering, while performing our due diligence to provide an accurate timely completion of same.

SCOPE OF SERVICES:

A. CDR DESIGN AND SCHEDULE REVIEW:

AECOM Activities:

- Once Under Contract AECOM will at the start of this review, attend an on-site visit to meet with key stakeholders of the project to obtain a first-hand understanding of the important needs and constraints for the new system. One of the goals of this meeting will be to prioritize the areas of the CDR documentation to be reviewed.
- AECOM will review and compare Motorola's CDR documents to the 2016 MERA Request for Proposals (RFP) and the 2017 Radio Communications System Agreement including Contract Change Orders to date (vendor contract) for compliance.
- The focus of this review would include, and is limited to the:
    - Radio System and Microwave System Design
    - Implementation and Cutover Plans
    - Project Schedule
    - Acceptance Test Plans
    - System and Subscriber Equipment
- The CDR documentation, vendor contract and RFP will be made available to perform this review.
- Identify items found from the review of the CDR material that do not conform to the requirements and intent of the RFP and the vendor contract.
- Consider input and understanding of the goals of the project gained from on-site meetings with key stakeholders to identify any important areas that may not have been fully addressed in the RFP or vendor contract.
- Provide questions to Motorola as needed in order to obtain explanation on items from the CDR that may be missing or need clarification.
- Identify potential issues or areas of concern that could result in delays, increased costs, or failure to conform to the project. Note: Any issues found can be provided to the Project Oversite Committee point of contact as they are identified. Describe the potential impact that could result from these issues to the successful delivery of the project.
- Provide to the Project Oversight Committee recommendations to correct or mitigate the identified areas of concern.

Deliverables

☒ Following each working session, AECOM will issue meeting minutes summarizing the information exchanged along with identified and resolved issues.
☒ A Summary Report of the independent review performed that will include the list of CDR documents and requirements reviewed, identified areas of concern, explanation and impact of these areas of concern, and go-forward recommendations.

One (1) In person Project Review and Kick off meeting. (Two (2)Consultants up to three days plus travel).
Eight (8) progress meetings via teleconference (up to two (2) hours each).

B. Project Schedule

Project Schedule/Duration

The project will start once AECOM receives Task order/PO from MERA.

- Kick off meeting with Client and stake holders, Site Surveys – 1 week
- Analysis of the CDR documentation, vendor contract, RFP, and project schedule – 12 weeks

The durations listed above are approximate and some tasks may be completed simultaneously when possible. A final project schedule will be developed once the project is started and completion dates on dependent tasks are identified. Planned effort expires 05-22-2020.

C. PRICING:

The following fees are projected costs associated with the size and complexity of your project. The attached spreadsheets contain the estimated resource allocation that fee and Scope of Services is based on. Client directed modifications to the Scope of Services will require AECOM to re-evaluate our service fees or will be provided as an additional service.

If we have misinterpreted the scope or intent of any of the sections estimated below and more details are provided during the interview process, these figures will be adjusted accordingly – either at a higher or lower cost than provided below. It is AECOM's intent to bill the time and effort complete to include cost of expenses incurred purchased and labor provided.

AECOM's professional fees are based on the level of experience and time of personnel needed to complete the proposed engagement outlined in this proposal. AECOM will provide the professional services on a Time and Material not to exceed price basis. This pricing is subject to change pending any revisions to the project scope or system requirements as outlined in this proposal.

MERA Next Gen P25 Design and Schedule Analysis	FEE
Review of CDR Documentation review, analysis and final report.	$192,792.00
PROJECT TOTAL	**$192,792.00**

FEE Breakdown

MERA P-25 3rd Party Consulting Project	Principal in Charge	Project Manager	SR RF Consultant's	Sr. Project Engineer - SME	Comm. Engineer	Telecomm. Specialist	Project Coordinator	Estimated Manhours
Deliverable								
Hourly rate	$261.00	$208.00	$193.00	$208.00	$175.00	$154.00	$136.00	
Task 1.1 – On site Kickoff and stake holder Meeting, bringing AECOM team up to date with current project status.	4	24	24	24	6	12	8	105
Task 1.2 – 3rd Party review of Motorola CDR documents, Schedule analysis.	8	65	380	115	38	38	20	684
Task 1.3 – Prepare report and deliver to client..	4	48	72	42	12	24	40	245
Sub Total	4,336.00	$28,496.00	$91,868.00	$37,648.00	$9,800.00	$11,396.00	$9,248.00	**$192,792.00**

Prepared by:
Michael Soderman
Wireless Practice Group Leader - Consultant
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AECOM Technical Services Inc.
2000 K Street NW
Washington, DC 20006
aecom.com

D. PROJECT TEAM:

Mike Soderman

Wireless Technology Leader, Senior Manager

Years of experience	Registrations/Certifications
25+	Project Management Business
Years with AECOM	Certification
1	

Clients, contractors, & design team members value my ability to build and retain relationships and trust through thorough communication. Additionally, my employees and contractors recognize one of their own who has been in the field and understand the challenges of merging wireless technology and difficult environments.

Professional history

Mike is a seasoned wireless technology and senior program and construction delivery manager with over 25 years of experience in Construction, Program management, & Wireless telecommunications design, bolstering an extensive portfolio of projects for the US government. With a great deal of experience designing various wireless communications networks, he also specializes in project and construction management wireless and IT systems. Mike manages the day-to-day activities of all Wireless technology Design and Consulting and Technology Delivery services and works closely with quality control managers to ensure compliance with standards.

Selected project experience

Coral Gables Public Safety Building, Coral Gables FL (Senior Manager)

Supporting the Wireless Technology Team who are providing consulting, design and ca support services for the public safety, wireless and cellular DAS installation.

George Washington Carver Center Renovation, US Department of Agriculture, Beltsville, Maryland. (Senior Manager)

Technology and security senior manager providing support services for the preparation of architectural/engineering fast track renovation design plans for interior renovations and roof replacement for the George Washington Carver Center in Beltsville, Maryland.

Cannon House Office Building OUC OIS DAS Design-Build Phase 2, US House of Representatives Office of the Chief Administrative Officer, Washington, District of Columbia. (Senior Manager)

Wireless Technology senior manager providing services, under a design-build delivery method, for a new OUC (DCFD) and OIS (USCP) in building DAS in all phases of the Cannon House Office Building Renovation project.

Support Services, US Federal Reserve System Board of Governors, Washington, District of Columbia. (Senior Manager)

Wireless Technology senior manager providing IT,AV,RF and security infrastructure design services to support the integration of technology solutions for the US Federal Reserve System.

Cannon House Office Building Renovation, Verizon Wireless, Washington, District of Columbia. (Senior Manager)

Wireless Technology senior manager providing services associated with design and installation of the cellular distributed antenna systems for the Cannon House office building renovation.

Cannon House Office Building Renovation, US House of Representatives, Washington, District of Columbia. (Senior Manager)

Wireless Technology senior manager providing services associated with design and installation of the DCFD and USCP distributed antenna systems for the Cannon House office building renovation.

Emergency Radio Communications, Alleghany County, Alleghany County, Virginia. (Senior Manager)

Technology and security senior manager providing support, implementation, inspection, and testing services for a P25 Phase 2 simulcast UHF trunked radio system.

800 MHz Public Safety Radio, Albemarle County, Lynchburg, Virginia. (Senior Manager)

Technology and security senior manager provided services associated with a wireless system for an 800 MHz public safety radio.

Radio System Needs Assessment, City of Amarillo, Amarillo, Texas. (Senior Manager)

Senior Manager finalized the radio system needs assessment which included procurement, specifications, and implementation.

Radio Communication System Replacement, Albemarle County, Albemarle County, Virginia. (Senior Manager)

Senior Manager oversaw services to replace the Motorola SmartZone 4.1 800 MHz trunked radio infrastructure with an APCO Project 25 (P25) trunked digital radio system.

Network Technology Solutions Support, AARP, Washington, District of Columbia. (Senior Manager)

Technology and security senior manager provided a broad range of services, under a multi-phased contract, to support deployment of a passive optical local area network, equipment purchase, and warranty support for AARP.

***Visitor Center - House of Representatives Neutral Host Distributive Antenna System, US Architect of the Capitol, Washington, District of Columbia. (Technology Program/Construction Manager)**

Wireless communications program manager responsible for the design, build, installation, and continuing maintenance, monitoring, and repairs campus wide.

***US Capitol Building Wireless, US Senate, Washington, District of Columbia. (RF Communications CM/PM)**

RF Communications CM/PM provided project oversight for cellular, USCP and Wi-Fi reinforcement infrastructure design and installation in the 920,000-square-foot US Capitol Building.

***Herbert C. Hoover Building, Department of Commerce, Washington, District of Columbia. (Project Manager)**

Project manager provided overall delivery of services for an 1,800,000-square foot, eight-phased modernization project scheduled over a 12-year period, including full systems upgrades to MEP and fire and life safety systems, perimeter security design full exterior restoration and cleaning, and modern interior office environments for the DOC's 3,200 employees. The project also included new workplace strategies that would reduce space utilization rates and consolidate federal agencies to meet new GSA real estate reduction mandates.

*Prior to AECOM

AECOM Imagine it. Delivered.

Kevin Uhl, PMP

Senior Communications Consultant

Education
BSEE, Electrical Engineering
Rensselaer Polytechnic Institute
MEA, Engineering Administration
The George Washington University

Years with AECOM
6
Years of experience
30+

Areas of Expertise
Public Safety Radio Systems
Specifications & Procurement
Customer Interface
APCO P25 Phase 1 & 2
Project Management (PMP Certification)
Radio System Vendor Management
Implementation & Verification

Mr. Uhl has helped clients to successfully complete all facets of implementation of major radio system procurements, from planning and design, through implementation, verification testing and final system signoff.

Professional history

Mr. Uhl is a Senior Communications Consultant with over 30 years of experience in project management and systems engineering management and consulting. More than 20 years of that experience has been in the specification and implementation of land mobile radio (LMR) systems for public safety cities, counties and transportation systems throughout the U.S.

Selected project experience

Washington Metro Area Transportation Authority (WMATA), Washington, D.C. Senior Consultant Consultant assisting WMATA with the implementation of several elements of the 28-site 700 MHz P25 simulcast radio system serving transportation operations for the Federal government and National Capital Region. AECOM's technical support also includes the build-out and commissioning of a below ground system of bi-directional amplification and fiber for the Authority's underground metro stations and tunnels, and ISSI interoperability with neighboring jurisdictions.

City of Amarillo, Texas – Public Safety Radio System (Project Manager – Consultant)
Provided project and implementation oversight of a new city-wide 800 MHz P25 radio system. After performing a detailed needs assessment of the City's radio users, he and his engineering team developed detailed specifications for the new system. AECOM supported the City with the procurement and selection of a radio system provider and the negotiations with the system vendor for a multi-million dollar contract. After completion of tower and equipment installations, AECOM provided inspection and verification support of the radio site and dispatch center implementations, and performed city-wide coverage acceptance testing of the new system prior to final acceptance and successful cutover of the new system.

Alleghany County, Virginia, Public Safety Radio System (Project Consultant)AECOM performed a needs assessment and developed conceptual designs for a new public safety radio system. Mr. Uhl led the project team to develop creative alternatives and recommend a cost effective solution that met the communication needs of the County's public safety agencies and personnel. AECOM provided detailed system specifications, vendor selection and negotiations support to achieve a contract with the vendor. AECOM is currently providing oversight during implementation and inspection of the new P25 radio communications system for the County.

FirstNet Reconfiguration Project for Virginia Statewide Radio System (STARS) (Project Manager) The reconfiguration of radio equipment across the Virginia Commonwealth to rebrand 700 MHz frequencies for use by FirstNet LTE and AT&T. AECOM performed state-wide outreach to the Virginia State Police and 18 government agencies to locate and coordinate the update of approximately 6,500 vehicle repeaters and portable radios. This effort involved extensive frequency planning with neighboring states as well as testing of radio programming software changes prior to the reconfiguration effort.

Randall County, Texas – Public Safety Radio System Needs Assessment and System Procurement (Project manager) Performed a needs assessment for a new P25 radio system for the County. After completion of the needs assessment and initial design, AECOM developed detailed system specifications to ensure that the County's new system will meet the performance and reliability needs of its users. AECOM performed technical and pricing reviews of the vendor's proposal and supported the County's negotiations for a final contract with the system provider.

Nevada Statewide Radio System (NSRS) Project (Consultant) AECOM performed a statewide needs assessment for the Nevada DOT and NSRS Statewide Public Safety Radio system. In this important effort, Mr. Uhl researched the current needs of the consortium of major state, local and energy partners, and provided recommendations for the replacement of the current system with a new P25 radio system platform.

California Department of Corrections (Project Manager) Engineering effort to perform feasibility studies for facility wide wireless fire alarm reporting systems for several of the state's prison campus facilities. His team performed both initial planning and on-site radio testing at these facilities. Recommendations and system requirements were provided for new wireless fire alarm reporting systems for the several DoC campuses.

San Francisco Public Utilities Commissions (SFPUC), Radio System Migration Study, San Francisco, CA. (Senior Engineer) AECOM wireless project team that performed an assessment of the various radio communications systems for the public utilities in the San Francisco and Hetch-Hetchy areas. Recommendations and a system migration plan were provided for the region which considered various radio system options and cost benefit factors.

Manager – Program Management Central Office, Harris Corporation, Public Safety and Professional Communications – Lynchburg, VA Prior to joining AECOM, Mr. Uhl worked at a major radio system provider. His most recent assignment at Harris Corporation was manager of the PM central office that tracked project metrics and provided project logistics support and training to the radio project teams globally to implement large-scale land mobile radio systems for public safety.

Manager, Systems Engineering – US West Region Tyco Electronics, Private Radio Systems – Lynchburg, VA Mr. Uhl led a system engineering team that implemented major land mobile radio systems in the US West Region for public safety and utilities customers. Radio systems implemented under his leadership include Denver, Albuquerque, Honolulu, San Antonio and Oklahoma City.

AECOM Imagine it. Delivered.

Mark Hannah, PMP
Telecommunications

Education
BSEE, Electrical Engineering
Bradley University

MBA, Business Administration
Lynchburg College

Years with AECOM
10

Years of experience
36

Areas of Expertise
Trunked Radio Systems
Interoperability
Policies and Procedures
Project Management (PMP Certification)
Microwave Communications design and implementation
Communication System design and implementation
APCO P25 Phase 1 & 2
APCO/NENA NG9-1-1 workgroup co-chair
Single & Multi-Site Systems / Multicast & Simulcast
Console Systems / IP Networks

Mr. Hannah brings 36 years of experience in telecommunication system design and implementation management, including microwave networks.

Professional history

Mr. Hannah has over 25 years of experience in project management in the Public Safety and Utilities industry. At AECOM he leads technology teams in the development, design, and implementation of complex public safety systems for Land Mobile Radio, microwave networks, and technology infrastructure for critical public safety facilities, including Emergency Communications Centers and Emergency Operations Centers.

Mr. Hannah's experience also includes subcontractor evaluation, bid analysis, project cost management, and contract negotiations for multi-million dollars projects. His career has included design of complex analog and digital LMR systems. At Harris Microwave Communications (now Aviat Networks) as a Program Manager, he led the design and implementation of point to point microwave networks for Public Safety and Federal clients around the world.

Selected project experience

Washington Metropolitan Area Transit Authority, Washington, DC. Hannah is providing microwave design guidance as their subject matter expert to support the design and implementation of multiple network enhancement projects using microwave radio links to improve system reliability. Efforts include path studies, site walks, and contractor implementation oversight.

DENCO Area District 9-1-1 Annex Project, Lewisville, TX. Mr. Hannah in the role of Project Manager coordinated the design and construction of an ICC-500 rated tornado shelter facility to house the District's 9-1-1 call routing equipment and provide secure space for backup call taking and dispatch functionality should the need arise. Aspects of this project involved coordinating building design, permitting, and contractor selection as well as network design impacts to existing fiber and microwave systems as well as accommodation of ongoing operational needs.

Oregon Wireless Interoperable Network, Statewide Radio Communications System, Oregon. Communications manager responsible for providing coordination between AECOM and the client to perform a detailed cost analysis for each vendor to ensure a fair and unbiased comparison. As part of the technical evaluation, prepared a site by site comparison against OWIN's preferred site lists to gauge the impact each proposal had on the site build plans. Served as peer reviewer for the lead project engineer and presented alternative approaches for consideration where it was deemed to be in the best interest of the state.

Oregon Statewide Radio Project. Mr. Hannah in the role of Integration Manager coordinated the design of a P25 Trunked Radio

system with an existing Narrow Band VHF network. Aspects of this project involved Radio coverage analysis, using in house tools, for both analog and Digital modulation, VHF simulcast design considering existing licenses grandfathered with FCC, network design impacts to existing microwave system and operational needs.

Harrisonburg + Rockingham ECC Radio Upgrade Project, Virginia. Mr. Hannah as Project Manager assisted the client in final contract negotiations, implementation, and acceptance testing of a radio system upgrade to P25 including coordinating the preparation of FCC form 601, for signature and submission, with FCC license modifications necessary to operate the new radio system with P25 Phase 2 modulation. Also, he reviewed proposed microwave path studies and prepared alternative paths after identifying a partially obstructed path that would not provide the reliability needed for Public Safety communications.

San Mateo County Emergency Dispatch and Response Facility Design, Redwood, California
Mr Hannah coordinated the technology team developing the detailed design documentation for a new Emergency Communciations Center building that house the Emergency Communications Center (E911), the County Emergency Operations Center, and the county Data Center that will support the critical communcations needs for San Mateo County CaliforniaTechnologies involved were a consolidated data center with two physically isolated server spaces, CAD system relocation, back up radio systems, physical security integration with County standard, redundant links to existing County radio system networks and IT networks.

Davidson County, North Carolina - Emergency Communications Network Upgrade – P25 Phase 2. AECOM provided conceptual system designs, architectures, and budget estimates in 2005. In 2015 Davidson County requested AECOM's assistance in the evaluation and negotiation of a vendor proposal. After evaluation, AECOM determined the County needs were not fully addressed in the proposal and subsequently developed a set of requirements through interviews, surveys, and discussions with stakeholders that set forth a clear definition for a county-wide P25 trunked radio system. This set of requirements included site development, coverage requirements, and coverage acceptance testing. AECOM was able to negotiate a design that fully met the County's needs at a significant discount than what was initially proposed by the vendor.

City of Raleigh Critical Public Safety Facility Design, Raleigh, North Carolina. Mr. Hannah managed the technology team developing the technical specifications for a new Critical Public Safety Facility building to support the Raleigh-Wake Emergency Communications Center (911), a new City of Raleigh Emergency Operations Center, the City of Raleigh Data Center, and the City of Raleigh Traffic Control Center, coordinating the technology requirements across multiple technology team and engineering disciplines. Technologies involved included, New ECC console positions, CAD relocation, Backup radio system design, Microwave link design, New 300 foot tower, Structured cabling design with multiple physical networks, Audio Video System design supporting video walls, and various conferencing facilities, Security system design included CCTV, News media briefing center design with support for news trucks, including microwave path analysis to receive locations, integration of new building into existing City standard Building Management System. Some of the features in the building included fully redundant Power systems with N+2 Generator backup, Redundant HVAC, and geographically diverse network entry points.

Makkah Area Crisis and Disaster Management Center, Jeddah, Saudi Arabia. Mr. Hannah managed the team developing technical specifications for a new Emergency Operations Center to facilitate collaboration between the various Ministries and emergency response teams. Functional Specification Documents were created detailing advanced audiovisual, microwave links, interoperable radio systems, IT infrastructure, redundant power systems including UPS's and backup Generator, and a new 300' tower and RF building. AECOM also provided construction management services for all systems.

Idaho Statewide Interoperable Radio Assessment, Boise, Idaho. Mr. Hannah analyzed two deep canyon areas identified by the State where radio communications are particularly difficult or non-existent then prepared a report which described the level of the problem together with alternative approaches to improve the radio performance. The report also identified potential locations where existing equipment could be redeployed and backhaul consolidation methods that could be employed to save on capital expenditure and operating costs.

Loudoun County Radio Communication Consulting Services, 800 MHz Trunking and P25 Upgrade, Virginia. As Program Manager, Mr. Hannah was responsible for designing, negotiating, and supplying the microwave network to support the LMR multi agency system as well as the data communications needs of the county. Delivery time of the microwave network was compressed to allow the old microwave network to be removed to make space for the new LMR system to be installed and tested before foliage loss**.** [Prior to AECOM]

Nassau County, New York Regional Public Safety Communications System Design, New York. Program manager responsible for designing, negotiating, and implementing a regional 31-site system that will allow multiple public safety and governmental agencies located across Nassau County on Long Island to communicate within their own jurisdictions, and with other agencies in emergencies. [Prior to AECOM]

City of New York Department of Information Telecommunications and Technology, New York. As Program Manager, Mr. Hannah was responsible for surveying, designing, and supplying the microwave network to support the LMR systems for FDNY as well as the associated data communications needs of the Department. Delivery of the microwave network was coordinated with LMR systems to minimize impacts to traffic in the city and comply with various building owner restrictions**.** [Prior to AECOM]

Northrop Grumman customer in North Africa (confidential) – Microwave network
As Program Manager, led a cross functional team to design a 60 plus site microwave network, creating a multiple ring network with Tellabs Multi Service Router equipment and Harris Microwave radios to support LMR, Video, VOIP, and Data traffic for different organizations. Sites were located throughout the Atlas Mountains from the coast to the edge of the Sahara Desert requiring careful path engineering to meet required performance levels. This effort involved extensive coordination and communications with internal resources, vendors, and the customer to resolve the evolving functionality requirements. Project was completed in time to meet the sailing date for container ship. Mr. Hannah also coordinated the delivery of on-site training and startup supervision for installation of the network. [Prior to AECOM]

US Air Force, Site Surveying, Colorado, Nebraska, and Wyoming. Program manager responsible for coordinating path surveys to mountain top sites under winter conditions, the delivery and installation of equipment to MAF sites and Department of Energy wide area network sites, which are high security locations. Mr. Hannah coordinated the approval of equipment for operation on new frequency bands due to recently changed National Telecommunications and Information Administration rules. [Prior to AECOM]

US Department of Justice, Confidential Project, Nationwide, Program manager responsible for surveying, designing and implementing microwave networks in major cities across the country. Responsible for scheduling and maintaining communications with the customer on progress, establishing communications plans, and holding regular meetings and teleconferences to ensure progress was maintained. [Prior to AECOM]

David Anderson
Project Manager / Radio Engineer

Education
MSEE, Electrical Engineering
Virginia Tech
BS, Electrical Engineering Technology
Virginia Tech
AS, Electrical Engineering Technology

Years with AECOM

17

Years of experience
39

Areas of Expertise
System Architectures
Radio Coverage Design
Radio Traffic Analysis
Project Management
Specifications & Procurement
APCO P25 Phase 1 & 2
Customer Interface
P25 Phase 1 & 2
Cellular & Broadband Data
Dispatch Systems

Mr. Anderson's broad experience working with public safety operations enables him to understand client's needs and transform those needs into realistic and practical communications solutions.

Professional history

Mr. Anderson has 39 years of engineering, R&D and radio applications experience. He has experience in project management, needs assessment, systems architecture and design, dispatch console design, radio traffic analysis and coverage design, specification development and procurement, proposal technical analysis and system performance evaluation, cellular and broadband data. His areas of expertise also include mobile data systems, microwave networks, conventional radio, SCADA, voice encryption, paging and industrial control systems. He has successfully completed background checks for previous projects.

Selected project experience

Oregon Department of Transportation (ODOT). Mr. Anderson served as a console specialist understanding ODOT's console customizations and developing console procurement specifications for the needed P25 functionality. Mr. Anderson was part of an AECOM team designing and implementing the Oregon Wireless Interoperability Network (OWIN) a statewide radio system serving ODOT, State Police, Corrections, and Forestry.

Pima County Wireless Integrated Network, Pima County, AZ - 800 MHz P25 Radio Project. Pima County Wireless Integrated Network (PCWIN), AZ. AECOM provided the County with needs assessments, conceptual system designs, simulcast architectures, and specifications for the hardware and software necessary to implement this large P25 public safety communications system. Once the 800 MHz P25 Phase 2, 29-site, RF and console design was completed; Mr. Anderson assisted the County with project implementation. The major components, radio, dispatch consoles, network backbone, and tower site facilities, were procured separately as a cost-savings strategy.

AECOM also provided a coverage acceptance test using AECOM's patented RaCE coverage test equipment tool.

Spotsylvania County, Virginia 800-MHz P25 Phase 2 Radio System Project, VA. AECOM designed and oversaw implementation of Spotsylvania County's 800-MHz P25 radio project. AECOM performed a functional needs analysis and proposal review to replace the system. Mr. Anderson completed a needs assessment covering public safety and service users, conceptual design, cost estimates, and project planning. Special considerations included maintaining regional interoperability, acquisition of additional frequencies, high-capacity service in urban areas, and seamless service in rural areas for firefighting. A competitive procurement resulted in reselecting Harris for the P25 Phase 2 upgrade, and the system is installed and functional. Mr. Anderson assisted with site acquisition, permitting, and licensing.

Arlington County Public Safety Network Design Project, Virginia. Arlington County desired to achieve excellent regional interoperability and correct poor radio coverage, and following AECOM's recommendation, implemented an 800 MHz Project 25 radio system upgrade and ECC relocation with new consoles. Mr. Anderson architected a three-way mobile data network; UHF private channels, Wi-Fi hotspots, and commercial broadband services, with automatic network selection. He developed the specifications, oversaw implementation, and evaluated delivered performance. project involved 800 MHz trunked radio, and integration with existing VHF radio, and extensive microwave network, and many existing dispatch centers.

Albemarle County, Virginia. Albemarle County, Charlottesville VA, and the University of Virginia are upgrading legacy trunked radio systems to Project 25 technology. Mr. Anderson serves as the County's project manager preforming the needs assessment and developing the RFP. He has evaluated operational and technical needs and developed a system and console upgrade to reliably support operations for the next 15 years. The project involves the addition of a backup dispatch center and integration with Vesta CAD. Mr. Anderson is currently assisting the County with overseeing construction of the new Harris system, including acceptance testing, and transition.

State of Idaho, Statewide Interoperable Radio Communications, Idaho. As Project Manager, Mr. Anderson led a comprehensive needs assessment and feasibility study for a statewide public safety radio system. He assisted the Idaho Statewide Interoperability Executive Council (SIEC) with developing a statewide interoperable communications system. In the assessment phase, he analyzed various options for a statewide system, then developed the conceptual design for a shared, statewide, radio communications network. Once the plan was complete, he developed specifications which enabled the state to pursue competitive procurements and implement the total project in phases as funding became available. He developed the 121-site conceptual design that integrates advanced Project 25 features, new consoles, 700 MHz spectrum, and mobile data with the special needs of fire service for VHF channels and everyday communications with federal agencies. The conceptual design included cost estimates with phased funding and rollout plans.

San Bernardino County ECC/EOC and Radio Studies, CA. San Bernardino County, California, contracted with AECOM to provide professional consulting services to evaluate and design new communications centers for the largest county in the continental U.S. The County's goal is to prepare for all major system upgrades and have a fiscally feasible and responsible plan for successful implementation. The technology solutions experts of AECOM performed the ECC/EOC needs assessment and provided the Concept of Operations, recommendation, and systems design. Mr. Anderson completed needs assessment covering public safety and service users, P25 radio conceptual design, cost estimates, and project planning. Special considerations included maintaining regional interoperability, acquisition of additional frequencies, high capacity service in urban areas, and seamless service in rural areas for firefighting. A

phased strategic plan was developed in coordination with upgraded dispatch centers and included a financially feasible rollout plan.

WMATA Communications System Support, Washington, DC. WMATA is upgrading its 10-site T-Band Motorola Astro radio system to a 31-site, 700 MHz P25 system. AECOM is serving as the radio consultant and Mr. Anderson is the lead consulting engineer. The system utilizes an MPLS connectivity system via fiber and leased lines. About 150 consoles are included in the design, located at separate bus and rail dispatch facilities. AECOM evaluated before/after coverage predictions and helped evaluate the need for additional tower sites. Other work includes evaluating the below ground bi-directional amplification system to be used for cellular broadband, reviewing traffic loading, creating radio system test procedures and designing/ procuring security camera systems. Mr. Anderson is currently assisting with oversight of Motorola's detailed design and installation of additional fiber.

Albuquerque Flood Monitoring Telemetry Project (AMAFCA). Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) required a radio telemetry design for a flood early warning system. Mr. Anderson conducted an assessment and provided input for the telemetry and instrumentation portion of the project. He provided the wireless options, designs, specifications, and cost estimates for the selected Cellular technology capable of transmitting data from depth sensors, rain gauges, and video cameras at 7 basins/arroyos to AMAFCA headquarters. He worked with the instrumentation and civil teams to complete the bid package. Mr. Anderson anticipates performing construction oversight and system performance testing.

Ahmed Chohan
SR Radio Frequency Engineer

Education
BSc, Computer Engineering, University of Arizona, 2007

Years with AECOM
1

Years of experience
12

Registrations/Certifications
ION-U Installation and Commissioning, CommScope MA1000/2000
Commissioing Course, Corning
TEKO DAS Installation and Commissioning, JMA Wireless
iBwave Design - Level 1, iBwave
PIM Test Certification - Level 1, Smiths Microwave

Ahmed is a seasoned professional with extensive experience in wireless system design, implementation, optimization and maintenance / monitoring.

Professional history

Ahmed is a senior radio frequency engineer with extensive experience in wireless system design, implementation, optimization, and maintenance/monitoring for small to large scale facilities and campuses. He develops strategies and road maps for implementation of wireless networks, which include cellular coverage augmentation (multi-carrier) distributed antenna systems (DAS), 802.11a/b/g/n Wi-Fi networks, and public safety LMR wireless networks

Selected project experience

Cannon House Office Building Renovation, Verizon Wireless, Washington, District of Columbia. (Lead Engineer)

Lead engineer providing services associated with design and installation of the cellular digital antennae system as part of the Cannon House office building renovation to optimize wireless coverage throughout the existing facility.

Emergency Radio Communications, Alleghany County, Alleghany County, Virginia. (Engineer)

Engineer providing support, implementation, inspection, and testing services for a P25 Phase 2 simulcast UHF trunked radio system.

Radio Communication System Replacement, Albemarle County, Albemarle County, Virginia. (Wireless Consultant)

Wireless consultant provided detailed design, installation, and acceptance testing oversight services for the wireless system for a new P25 public safety network to provide coverage throughout the county for county police, emergency, and fire & rescue departments. The entire system consists of ten towers/monopoles locations connected via fiber and microwave backhaul.

Corning Mobile Access DAS System Maintenance and Monitoring, US House of Representatives, Washington, District of Columbia. (Wireless Consultant)

Wireless consultant provided monitoring and maintenance services for the existing Corning Mobile Access DAS system which provides coverage to over a million square feet of the House of Representatives. The system provides signal enhancement for Verizon, AT&T, Sprint, and T-Mobile.

Coral Gables Public Safety Building, Coral Gables FL

Senior RF Engineer responsible for review of the design, submittal review and CA support for the public safety, cellular and two-way radio DAS.

***Baltimore County Government Digital Antenna System Design and Installation, Verizon, Baltimore, Maryland. (Lead Engineer)**

Lead engineer provided services for design and installation of digital antennae systems (DAS) in a historic courthouse made entirely of concrete with minimal wireless signal inside the building. Responsibilities included the installation of a DAS system to provide coverage to the entire building. Cable installation was restricted through specific areas in this historical building influencing innovative design solutions during the install.

***Fort Lee Military Base Radio Frequency Coverage, US Army, Colorado Springs, Colorado. (Project Lead)**

Project lead provided design services for a Wi-Fi system to integrate with the existing WLAN system and upgrade current Aruba WLAN installation to support 802.11n expanding coverage into two new buildings and other outdoor designated sections of the Valley BCT area for all identified requirements.

***Daimler Truck Campus, Sprint, Cleveland, North Carolina. (Lead Engineer)**

Lead engineer provided design services for the implementation of a mobile access-based DAS in a challenging radio frequency environment for the manufacturing plant of Daimler Truck in Cleveland, North Carolina.

***Sanford Stadium Hybrid System, University of George, Athens, Georgia. (Lead Engineer)**

Lead engineer provided design services for a cost-effective hybrid system for Verizon Wireless using Ericsson Small Cell, used for 700 and 2100 LTE coverage with 50 sectors, combined with 850 and 1900 CDMA signal broadcasted over solid DAS equipment that provides coverage for over 92,000 seating capacity.

***Baltimore/Washington International Airport - Bi-Directional Amplifier, US Airways, Hanover, Maryland. (Lead Engineer)**

Lead engineer provided services for the design of a CDMA & iDEN BDA based distributed antenna system for over 133,000 square feet of office space, including a crew and maintenance area at BWI airport in Maryland.

***Ericsson LAA Radios System Design, Georgia World Congress Center, Atlanta, Georgia. (Design Engineer)**

Design engineer worked in collaboration with the center to identify the areas with the most foot traffic and designed a system with Ericsson LAA Radios to increase Verizon wireless capacity on those areas for the Georgia World Congress Center, which hosts more than a million visitors each year and, with 3.9 million feet in exhibition space, is the third-largest convention center in the US.

***Corning Mobile Access DAS Installation Design, American University, Washington, District of Columbia. (Lead Engineer)**

Lead engineer provided services for design and management of the installation of a multi-carrier Corning Mobile Access DAS in 62 buildings of the private research university campus, which spans 90 acres, with 9 sector designs.

***432 Park Avenue, Confidential Client, New York, New York. (Design Engineer)**

Design engineer provided design services for a multi-carrier distributed antenna system (DAS) for Sprint, Verizon, AT&T, T-Mobile, 800/900 PS, and VHF/UHF using solid technologies fiber DAS equipment for a new 860,000-square-foot, 84-story tall hotel/condominium building at 432 Park Avenue.

***US Steel Digital Antenna System Design and Installation, Verizon, Pittsburgh, Pennsylvania. (Design Engineer)**

Design engineer provided design services for a system to cover eight steel floors, while overcoming the macro signal and providing good SiNR. Responsibilities included the development of a robust design for a carrier wave test to measure the loss through the steel walls and collected data for macro signals. The collected data was added to iBwave software to create a robust design. Due to the strong signal from macro in some parts of the building and high losses through the walls, it was recommended that the digital antennae system only cover specific sections to overcome the macro signal and create a vertical boundary between the DAS and macro signal for good performance. Verizon agreed to the recommendation and approved the design for implementation.

***National Gallery of Arts, Verizon, Washington, District of Columbia. (Field Engineer)**

Field engineer provided services to modify the design, move antennas, and change their tilts and azimuth to provide a clean system and address many issues, including cable route, antenna install, remote install, and fiber paths which required redesign of the building. The biggest concern was the lay light area which had PIM issues caused by metal. The National Gallery of Arts is the largest museum in North America, which includes the original neoclassical west building, linked underground to the modern east building, and the 6.1-acre sculpture garden.

***Thompson Reuters, Sprint, Washington, District of Columbia. (Lead Engineer)**

Lead engineer designed and managed the implementation of one of the first WiMAX BTS based MIMO digital antennae systems over a 60,000-square-foot office building providing optimal data speed solution over the entire building. Responsibilities also included management of construction of new cable pathways.

***Summa Hospital, Sprint, Akron, Ohio. (Lead Engineer)**

Lead engineer designed and implemented a Mobile Access TSX cabinet-based digital antennae system compromised of 75 antennas providing coverage to Sprint customers at this 747,052-square-foot, level 1 trauma center through optical fiber connectivity between various telco/data closets. Responsibilities also included management of construction of new cable pathways; however, due to the old construction of the building, most of the cable paths were full and had to be updated while staying in budget and providing desired coverage.

***Marriott Ritz Carlton, Sprint, McLean, Virginia. (Engineer)**

Engineer provided design services to implement an LGC Fusion-based digital antennae system with 18 RAUs to provide coverage throughout the 500,000-square-foot facility, including suites, guest rooms, and restaurants. Challenged by old construction consisting of concrete walls that interfered with cable paths inhibiting coverage to the entire hotel building, plots were created in iBwave to demonstrate 90% coverage of the buildings in accordance to the restrictions, with the least cable usage and provide coverage all over the hotel. ATP tests were performed to document and verify efficient functioning of the network throughout.

***Ambassadors Facility United Arab Emirates Government, McLean, Virginia. (Project Lead)**

Project lead designed a multi-carrier system using Solid Alliance DAS equipment to provide coverage to two buildings occupied by the ambassador, consisting of 147,052 square feet, over fiber. Responsibilities also included management of construction of new cable pathways, per the requirements and updated design as changes occurred during construction. Worked with carriers (T-Mobile & AT&T) to plugin to the solid DAS using off air signal for the Ambassador's house, which lies in an area near DC where minimal wireless coverage is available due to the terrain.

***Prior to AECOM**

Justin Sison

Senior Radio Frequency Engineer

Education
BS, Electrical Engineering,
New Jersey Institute of Technology

Years of Experience Total Years: 7
With AECOM: 1

Licenses/Certifications
iBwave Level III
Corning Optical Communications Wireless Level I – ONE Platform & & Level II – MA1000/2000/HX Platform
JMA Wireless Teko DAS

Installation and Commissioning & Connector and Cable Installation
Comba Critical Point Fiber DAS
Public Safety Installation and Commissioning

Justin is a Senior RF Engineer with experience in a wide range of projects from cellular & public safety Distributed Antenna Systems (DAS), Land Mobile Radio (LMR), Wi-Fi, and Real- Time Location Systems (RTLS) in commercial, workplace, government, healthcare, and public venues.

Justin Sison has seven years of experience with design, implementation, testing, maintenance, and monitoring systems across the continental U.S.

Professional history

Coral Gables Public Safety Building, Coral Gables FL
Senior RF Engineer responsible for review of the design, submittal review and CA support for the public safety, cellular and two way radio DAS.

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Verizon, AT&T, Sprint, and T-Mobile.

Dick's Sporting Goods Park, Commerce City, CO*
Wireless Engineer for DAS design. The project included Verizon Corning HX DAS in the home of Colorado Rapids 27,000-seat soccer stadium.

The Schottenstein Center, Columbus, OH* Wireless Engineer responsible for DAS design, installation & commissioning and live walk tests during events. The stadium is also known as the Value City Arena at the Ohio State University in Columbus, Ohio. The project included Neutral host DAS with AT&T and Verizon anchor carriers. 19,000 seating capacity.

M&T Bank Stadium, Baltimore, MD* Wireless Engineer responsible for the Design of Verizon LTE upgrade. The project included Verizon DAS in the 71,000-seat home of the Baltimore Ravens.

Kentucky Speedway, Sparta, KY* Wireless Engineer for the DAS design. The project included neutral host DAS in the 107,000 seat, 1.5-mile track in Sparta, KY.

* experience prior to joining AECOM

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