Annex A – Ten-Year Technology Refresh Program

Ten-Year Technology Refresh Program

County of San Bernardino

NA170303-47226

Release 1.6
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This Annex A – Ten Year Technology Refresh Program (hereinafter “Annex A””) to the Aviat US - San Bernardino County Technology Refresh Purchase Contract (hereinafter “Contract”) is hereby incorporated into the Contract.

1. OVERVIEW

Aviat is pleased to present this Annex A ten-year technology refresh program for the County’s microwave system. We understand the County’s biggest challenges: existing microwave system nearing technology obsolescence, funding approval bureaucracy, and identifying reliable long-term support. Our proposal addresses an end-to-end ‘lifecycle’ solution ensuring an up-to-date microwave system, maintaining high reliability, and detailed cost benefit analysis to assist the County in acquiring the funding needed for updates of the County’s microwave system.

Identified negative impacts occurring by obsolete technology:

1) Inability to support the business and end users
2) Security vulnerabilities
3) Network downtime
4) Poor performance
5) High variable cost
5) Lack of skills and support from vendors
6) Higher OPEX and complex sparing
7) Compliance issues

The solution to these negative impacts is AviatCare Lifecycle Support. This technology refresh program is designed to augment land mobile radio lifecycle solutions for a full end-to-end network solution.

AviatCare Lifecycle Support Provides:

- **Less Downtime:** Ensuring the microwave network has the latest hardware, software, and features ensuring the lowest probability of failures in the network. Decreasing interoperability and security vulnerabilities, AviatCare Lifecycle Support optimizes uptime and network stability. Additionally, full 24/7 support with performance monitoring plays a huge role in ensuring the microwave network runs smoothly.
- **Better Performance:** Having access to the latest capacity, security, reliability and interoperability features ensures the County’s microwave network performs optimally. The microwave network can keep up with the growing demands for more data at greater overall network uptime.
- **Lower/Fixed Costs:** With this solution, County of San Bernardino receives financial and operational stability to focus on its critical mission of safety throughout the region. That means budgeting for long-range support over the entire time span of the network’s operational life. It means providing all required performance monitoring, maintenance, and

sustainment of the network. And it means full protection against technology obsolescence. New funding is seldom available when upgrades are required or desirable, so AviatCare Lifecycle Support offers stability without surprise add-on expense.

Maintenance Tech Refresh Program

To keep the County's microwave system up-to-date Aviat US includes a complete package of hardware, software and implementation services to update the County's microwave system regularly to a level consistent with the latest systems leaving the factory. This service includes planning, scheduling, and managing the installation of the radios and software, including technical assistance, network engineering, project management, and frequency protection support.

The Extended Warranty provided under the separate, existing Aviat U.S., Inc. – San Bernardino Contract 13-1006 (dated 12/17/2013) will remain in effect through the duration of this Annex A until its expiration planned for December 2028. This will be implemented by;

1) Continuing the warranty for all equipment and software covered under that existing Extended Warranty until such equipment and software is replaced by refresh equipment per this Annex A.
2) At that point, the new, refresh equipment and software provided under this Annex A will be covered under the Extended Warranty through the duration of this Annex A., while the replaced equipment and software will be removed from the Extended Warranty coverage.

The key to this implementation is that the existing Extended Warranty under the existing Aviat U.S., Inc. – San Bernardino Contract 13-1006 (dated 12/17/2013) will be treated by Aviat US as coterminous with this Annex A through December 31, 2028.

2. ESTIMATED COST ANALYSIS BENEFITS

Aside from addressing the funding requirement of the technology upgrade, there are also estimated cost benefits in this ten year technology refresh program:

1. One-time management discount of $1,259,614.00
2. Estimated savings on the services for the hardware upgrade amounting to $1,061,946
3. Estimated savings on the services for the DS1 to IP migration amounting to $129,628
4. Estimated savings on County labor in securing funding, RFB preparation, issuance, and evaluation ~$150,000.00
5. Estimated savings on the hiring of the consultant for the RFB ~ $250,000.00
6. Estimated savings on the 3rd party L3/MPLS Routers and support ~ $2.64M

Total estimated savings is $5.49M

3. PAYMENT PLAN

The total contract amount for this Contract is **$13,195,778 (Thirteen Million, One Hundred Ninety-Five Thousand, Seven Hundred Seventy-Eight Dollars)**.

$1,319,577.80 (One Million, Three Hundred Nineteen Thousand, Five Hundred Seventy-Seven Dollars and 80 cents) will be spread over 10 equal payments and is due annually in advance starting from the Effective Date of this Contract.

Year	Payment
1	$1,319,577.80
2	$1,319,577.80
3	$1,319,577.80
4	$1,319,577.80
5	$1,319,577.80
6	$1,319,577.80
7	$1,319,577.80
8	$1,319,577.80
9	$1,319,577.80
10	$1,319,577.80
TOTAL	$13,195,778

The break-down of the cost are as follows:

Description	Amount ($)	Percentage
Equipment	$8,531,290	59.01%
Services	$5,843,658	40.43%
Freight	$80,444	0.56%
Total	**$14,455,392**	**100.00%**
One-Time Management Discount	($1,259,614)	8.71%
Grand Total After Discount	**$13,195,778**	

4. STATEMENT OF WORK

The ten-year technology refresh program includes the following work for the County's microwave system. Aviat proposes to start the field implementation of this Annex A on August 6. 2019 and complete it by August 5, 2029. The Software Defined Networking (SDN) and Segment Routing (SR) features are not included under this Annex A. All decommissioned radios will be transported to the County's warehouse. Work will be conducted in three phases, including the following:

Aviat US will furnish the equipment, materials and services ("Services") outlined in this Annex A as may be required from time to time for the period specified in the Contract. The Services will be provided in conformity with the terms, conditions, specifications and other requirements of this Contract, and each request for Services will be governed by the terms and conditions stated in this Contract.

This Annex A covers only the Aviat US Products which are enrolled at the start of the Contract, or added periodically as part of the replacement/technology refresh covered by this Annex A. This Annex A does not apply to any non-Aviat US products, which may be purchased under separate contract/agreement by County.

Table 4.1

Ten-Year Technology Refresh Program											
YEAR		Monthly Performance Monitoring	Frequency Protection	Firmware/SW upgrade (As Required)	Network Engineering	Project Management	TDM to IP/MPLS Transition	Network Optimization and Test	Upgrade of 38 Loop Links to NEXT GEN IRU600 and RACxx	Training	Upgrade of 72 Spur Links to NEXT GEN IRU600 and RACxx
I	1	x	x	x							
	2	x	x	x	x	x	x				
II	3	x	x	x	x	x	x	x		x	
	4	x	x	x	x	x	x	x			
	5	x	x	x	x	x		x	x	x	
	6	x	x	x	x	x		x	x		
	7	x	x	x	x	x		x			x
	8	x	x	x	x	x		x			x
	9	x	x	x	x	x		x			x
III	10	x	x	x	x	x		x		x	

Note: For Extended Warranty information regarding the work in Table 4.1, refer to the last paragraph of Section 1 – Overview above.

Phase I

- **<u>Years 1~10</u>:** The program starts by providing monthly performance monitoring by Aviat US, frequency protection plan and field software upgrades (as required). As part of this service, for the first two years, Aviat US will work side by side with the County to develop the migration plan of the legacy traffic to IP. Once the migration plan is in place, program management and field support will be provided for the implementation. The migration plan will consider the least outage time to ensure the County's end users will have minimal impact by the migration. The timing of the implementation will be aligned to when Motorola will stop supporting the DS1s. When this is accomplished, the County will have an all IP system.

- **Years 1 to 10 (Firmware Upgrade (as required) and Start of Frequency Protection Services):** Aviat US will deploy one (1) Network Integrator (NI) to download and test the latest version of the radio firmware for the duration of the contract. Frequency protection services will start with contract signature and NTP.

- **Year 2 (2nd Half CY): (MPLS Engineering and Ordering of MPLS routers)**
  - Aviat US will discuss with the county and Motorola on detailed P25 IP/MPLS transportation network requirement such as traffic plan and pattern, capacity requirement, latency, jitter and re-convergence requirement etc.
  - Aviat US will also discuss design with the county on any other value-added services such as remote surveillance traffic transportation over IP/MPLS network.
  - Based on information collected, Aviat US will perform the IP/MPLS network design and Layer3 router (CTR series) configuration, get approval from the county and Motorola.
  - Aviat US will start Layer3 router manufacturing and factory integration test of qty 44 routers. These routers will be shipped before end of year 2 (CY) and will be installed at the start of year 3.

Phase II

- **Years 3 and 4: Transfer P25 transportation network from TDM to IP/MPLS on existing microwave radios.**

  Aviat US will deploy two (2) Network Integrators (NIs) to install and test Aviat provided routers on a hop basis and perform all work as outlined in the Statement of Work. Although MPLS engineering and the ordering and shipment of the qty 44 routers will start at the beginning of the 2nd half of year 2, deployment of the routers will start in year 3 and will end in year 4. This phase of the contract is expected to start in January of 2021 and end in December of 2022. Below are system wide design and preparation steps:

  - Aviat US will start the deployment of the qty 44 MPLS routers that were ordered at the start of year 3.
  - Aviat US will continue to discuss with the county and Motorola on detailed bP25 IP/MPLS transportation network requirement such as traffic plan and pattern, capacity requirement, latency, jitter and re-convergence requirement etc. for the remaining 260 routers.
  - Aviat US will also to continue discuss design with the county on any other value-added services such as remote surveillance traffic transportation over IP/MPLS network for the remaining 260 routers.
  - Based on information collected, Aviat US will continue to perform the IP/MPLS network design and Layer3 router (CTR series) configuration for the remaining 260 routers, get approval from the county and Motorola.

- Aviat US will start Layer3 router manufacturing, factory integration test, and deployment for the remaining 260 routers.

Steps below will follow for field implementation. To minimize down time and visits to each site, Aviat US suggests completing the procedure below for each and every site following certain site orders. The detailed order will be determined after discussion with the county and Motorola based on final traffic structure/pattern and site readiness. But as a general rule, ring sites should happen before spur sites, Mountain desert loop should happen before Needles loop.

- Motorola is to make P25 Master sites (usually two) ready for IP/MPLS cut-over.
- Start with the first remote site on cut-over list agreed by all parties.
- Install routers at the site on existing racks.
- Remove the existing/temporary ethernet traffic on GE3 cards, recover the factory default configuration, so GE3 card will provide transparent point to point ethernet connection over each microwave path.
- Make connection from routers to GE3 cards.
- Verify the routers are configured properly at each site.
    - While T1 traffic is working, use the excess bandwidth in MW radio system to test MPLS based traffic for that single site to P25 master sites, including Y1564 test.
    - Note in above step, T1 and MPLS traffic are running in parallel. After everything working as designed, then Motorola can move traffic at this site from T1 to MPLS transportation. Aviat will work closely with Motorola and the county to move traffic.
    - Release the capacity from this site originally assigned to T1. It can be used for future cut-over.
    - Move to next site and repeat the same procedure.
    - With this approach, the cut-over will be in managed and controlled manner which causes almost no outage.

Initial detailed schedule for this phase is outlined below, it is subject to further discussion with the county and Motorola on final traffic pattern and each party's schedule.

- Information collection and network design, one quarter
- Router manufacturing and factory configuration/test, one quarter
- Mountain Desert loop cut-over, one quarter
- HDGC loop cut-over, one quarter
- Aerojet loop and Sunset loop cut-over, one quarter
- Needles loop cut-over, one quarter
- Spur paths cut-over, two quarters

- **<u>Years 5~6:</u> Upgrade Loop Hops (38) - Capacity Upgrade via Modulation upgrade to 1024QAM with Higher power radios (EHP radios and RACxx), and completely removal of INUe.)**

  Aviat US will engage two (2) Network Integrators (NIs) to upgrade radios to EHP/RACxx on a hop basis and perform all work as outlined in the System Summary above. This

phase of the contract is expected to start in January of 2023 and end in December of 2024.

This phase will happen after all TDM traffic is removed from the network, including spurs.

- The purpose is to increase capacity with existing antenna infrastructure and frequency resources.
- Cut-over involves replacement of existing IRUV3 with next generation EHP radios if needed, inserting RACxx into CTR routers, connecting RACxx to next generation IRU, removing disconnected IRUv3 and INUe.
- Aviat will provide additional breakers and cables if needed.
- Planning stage (a quarter)
    - Aviat US will re-run path calculation with EHP radios and RACxx with existing dishes for all loop hops.
    - Aviat US will discuss calculated performance with County and resolve any potential issues.
    - Aviat US will file PCN modification based on new parameters for each hop.
    - Aviat US will generate material list and get approval from county.
- Manufacturing and factory test (a quarter)
- Mountain Desert loop cut-over (two quarters)
    - Cut-over details are to be discussed with customer. Aviat strongly suggest cut-over is to be performed strictly follows clock-wise or counter-clockwise site by site.
    - The loop topology is to be used to minimize the cut-over down time.
    - Dual channel on this loop can also be used to minimize cut-over down time per planning.
- HDGC Loop cut-over (one quarter)
- Aerojet Loop cut-over and Sunset Loop path cut-over (one quarter)
- Needles Loop cut-over (one quarter)
- Final cleaning up (one quarter)

- **Years 7~9: Upgrade 38 Loop Links with CTR) & Upgrade Spur Hop (72) with next generation IRU radios and RACxx**

  Aviat US will engage two (2) Network Integrators (NIs) to upgrade Loop hops to CTR routers on a hop basis and perform all work as outlined in the System Summary above. This phase of the contract is expected to start in January of 2025 and end in December of 2026.

    - The purpose is to increase capacity with existing antenna infrastructure and frequency resources.

- Cut-over involves replacement of existing IRUV3 with next generation EHP radios if needed, inserting RACxx into CTR routers, connecting RACxx to next generation IRU, removing disconnected IRUv3 and INUe.
- Aviat will provide additional breakers and cables if needed.
- Planning stage (a quarter)
    - Aviat US will re-run path calculation with EHP radio and CTR with existing dishes for all loop hops. The objective is to use the same dish and frequency resources but achieve higher throughput and/or performance.
    - Aviat US will discuss calculated performance with County and resolve any potential issues.
    - Aviat US will file PCN modification based on new parameters for each hop.
    - Aviat US will generate material list and get approval from county.
    - Aviat US will discuss with county on order of cut-over.
- Manufacturing and factory test (a quarter)
- 15 hops cut-over and test in each quarter.
- Final clean up.

- **<u>Years 9~10</u>: Upgrade 72 Spur Links with next generation IRU radios and CTR**
  Aviat will engage two (2) Network Integrators (NIs) to upgrade Spur hops to the next generation radios and CTRs on a per link basis and perform all work as outlined in the System Summary above. This phase of the contract is expected to start in January of 2027 and end in December of 2028.

    - For spur cut-over, CTR and IRU upgrade will be conducted at the same time for a hop. This will minimize the down time and cut-over cost.
    - Aviat will conduct meetings with county to determine the order of spur cut-over.
    - It should happen after all T1s are decommissioned from the whole network.
    - Planning stage (a quarter)
        - Aviat US will re-run path calculation with EHP radio and CTR with existing antennas for all loop hops. The objective is to use the same dish and frequency resources but achieve higher throughput and/or performance.
        - Aviat US will discuss calculated performance with the County and resolve any potential issues.
        - Aviat US will file PCN modification based on new parameters for each hop.
        - Aviat US will generate material list and get approval from the County.
        - Aviat US will discuss with the County on order of cut-over.
    - Manufacturing and factory test (a quarter)
    - 15 hops cut-over and test in each quarter
    - Final clean up.

On top of the above planned activities, the county will also receive monthly network performance reporting and consulting to make sure the system is always working at its optimum level proactively. Aviat will provide a frequency protection plan to protect the system from interference by external systems. Of course, under this technology refresh contract, the system will have access to the latest software versions of the radios and the ProVision network management system as needed, 24/7 Aviat Technical Assistance Center (TAC) support, standard repair and return, advance replacement, and logistics support.

Phase III

- **Year 10 (Close out)**
  Aviat US project manager will oversee the activities in this phase and work with the County to bring this project to a successful close. This phase of the contract is expected to start in January of 2028 and end in December of 2028.

  The Aviat US Project Engineer will develop a Method of Procedure (MOP) on a hop basis to provide detailed guidance on technology refresh. Additionally, the Network Management System (NMS) software will be upgraded and all new elements will be programmed into it for complete system visibility and monitoring.

5. FIELD IMPLEMENTATION

The Aviat US Project Engineer will develop a Method of Procedure (MOP) on a hop basis to provide detailed guidance on technology refresh. Additionally, the Network Management System (NMS) software will be upgraded and all new elements will be programmed into it for complete system visibility and monitoring.

Aviat US proposes to start the field implementation of technology refresh and upgrade in August of 2019 and complete it by December of 2028.

All decommissioned radios will be transported to the County's warehouse.

6. ANTENNA SYSTEM

Aviat US assumes that antennas, transmission lines and pressurization equipment are in proper alignment and properly set for optimal link and system operation, hence Aviat US has excluded work related to antenna systems and pressurization equipment from the technology refresh scope. Aviat US recommends the testing of the existing antenna and waveguide systems to make sure they are in good working condition. Aviat US can quote this additional scope upon request from the County.

Frequency Protection

The duration of this service will be 10 years from date of Contract award.

Aviat US' subcontractor, Comsearch, will provide the following services:

- Perform an annual system review to confirm the protected operating characteristics of the County's system.

- Notify all licensees and coordination companies located within the coordination contours of the County's communications facilities that Aviat US' subcontractor, Comsearch is the County's frequency protection agent. Notification will shift the flow of Prior Coordination Notices (PCNs) from the County's office to Aviat US' subcontractor, Comsearch.
- Enter all applications or coordinations involving communications facilities into Aviat US' subcontractor, Comsearch, database and Coordination Tracker Database (CTD). CTD is an automated record keeping and tracking system, which automatically updates the status of each request as it is received, analyzed and answered.
- Aviat US' subcontractor, Comsearch, will analyze each coordination or application and perform a technical review to determine its potential interference impact on the County's facilities within 30 days of receipt.
- Respond directly to the applicant or coordinating company on the County's behalf. Aviat US' subcontractor, Comsearch will copy the County on any replies sent detailing potential interference cases found.
- Act as the County's technical liaison with the applicant or the coordinating company to resolve potential interference cases. Aviat US's subcontractor, Comsearch will copy the County on any correspondence concerning resolution of potential interference cases.
- Aviat US' subcontractor, Comsearch will monitor all Public Notices containing applications accepted by the Federal Communication Commission (FCC), to ensure that all filings have been successfully coordinated with the County's protected system. If an application appears on Public Notice that may cause interference, Aviat USs subcontractor, Comsearch will notify the County.

7. DC POWER SYSTEM

Aviat US assumes that existing DC Power Systems will remain in service.

8. FREQUENCY PROTECTION

The duration of this service will be 10 years from date of contract award.

Aviat US' subcontractor, Comsearch, will provide the following services:

- Perform an annual system review to confirm the protected operating characteristics of the County's system.
- Notify all licensees and coordination companies located within the coordination contours of the County's communications facilities that Aviat US' subcontractor, Comsearch is the County's frequency protection agent. Notification will shift the flow of Prior Coordination Notices (PCNs) from the County's office to Aviat US' subcontractor, Comsearch.
- Enter all applications or coordinations involving communications facilities into Aviat US' subcontractor, Comsearch, database and Coordination Tracker Database

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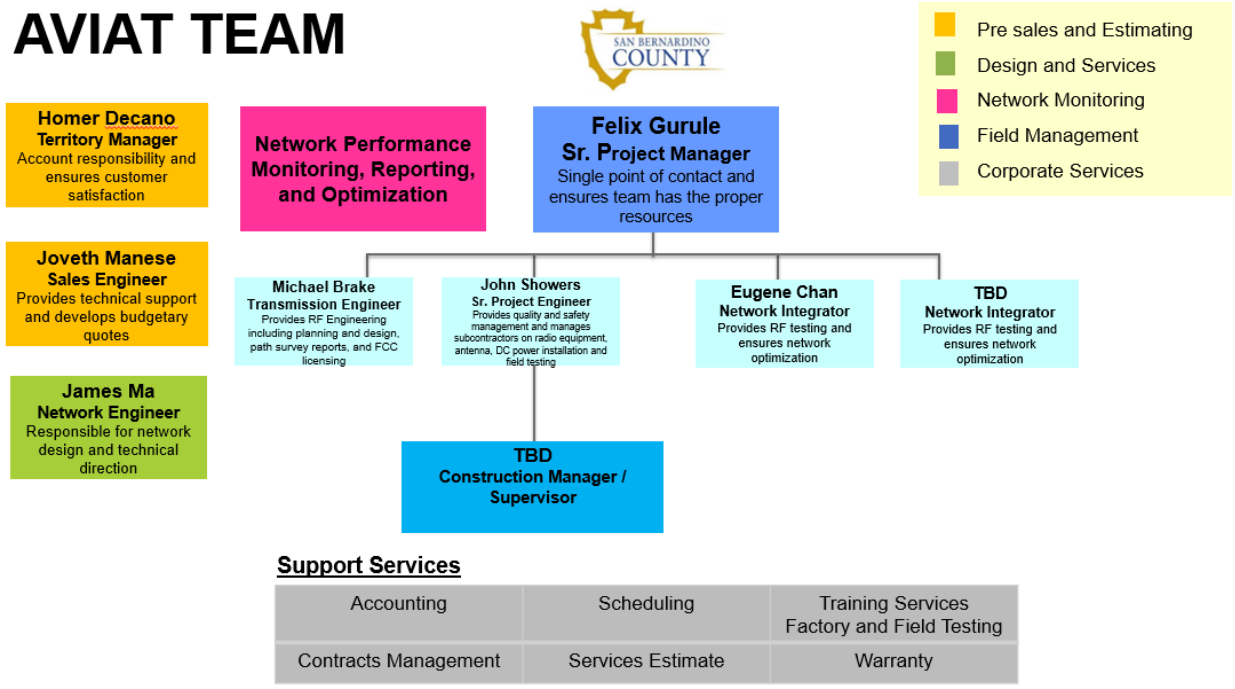
9. PROJECT MANAGEMENT



Aviat US will assign an Aviat US representative to be the primary point of contact for this Contract ("Project Manager") for the duration of the project. The Project Manager will work with the County to facilitate effective resource management, escalations, approval processes, scheduling, communication, and reporting with Aviat US engineers and other designated vendors as needed. The Project Manager is responsible for maintaining control of the project

and assuring compliance with the project and the County specifications. Aviat US will not be responsible for the resolution of the County vendor issues affecting the completion of the project. Any documentation and standards not listed in this Contract will default to Aviat US standards, where applicable.

Although face-to-face communication and on-site meetings with the County are essential elements of the service, some activities that do not require face-to-face contact will be performed in the Project Manager's Aviat US office in order to reduce travel and living costs. These activities are at the discretion of the Project Manager.

Project Schedule

The project schedule for Aviat US engineers, Aviat US sub-contractors, and for the County's supporting vendors will be developed (or updated if a schedule is included with this proposal) and maintained in Microsoft Project and will identify project deliverables, key milestones, resource assignments, and track project progress against each milestone. The County and Aviat US agree to collaboratively review and agree to the project milestones and deliverable dates prior to the execution of any services on the project. A copy of the project schedule will be available upon request in .pdf or .mpp format.

It will be the responsibility of the County to track and deliver against all the County internal (including the County sub-contractors) milestones. The overall project plan generated by the Aviat US Project Manager will show major deliverable milestones, but not internal milestones of the County or their contractors. Tracking of the County and the County's contractor internal milestones will remain the responsibility of the County.

Communications Plan

Establishment of a communications plan will be done in accordance with the principals of project management established by the Project Management Institute (PMI®) unless otherwise agreed to. The plan will involve representatives from Aviat US and the County and any other entities as mutually agreed between the parties for project kickoff meetings, periodic progress meetings, or problem escalations as needed. The plan will include the location and frequency of any such meetings, the format for formal communication and meeting minutes, attendee or distribution lists with contact details, methods of communication, and escalation and management level lists.

The County will make appropriate staff available for regular consultation and meetings with the Aviat US Project Manager. County's failure to attend regular meetings or respond to Aviat US questions in a timely manner could result in a delay of the project deliverables and a billable change order.

Change Management Plan

Establishment of a change management plan will be done in accordance with the principals of project management established by the Project Management Institute (PMI®) and will include confirmation from Aviat Networks and the County's understanding of the process. Each party

will work closely with the other to manage any scope changes through the term of the project and understand their impact on the project performance from a cost, quality, and schedule perspective. Any such change may be subject to a change order fee and will be communicated to the County prior to the implementation of the change. Any change order approvals will be submitted in writing.

Quality Standards and Procedures

Quality standards and procedures documents will be provided by the County prior to execution of this Contract. If no documentation is provided by the County prior to execution of this Contract, the standards and procedures will default to Aviat US best practices guide.

Resource Management Plan

Establishment of a resource management plan will be done in accordance with the principal of project management established by the Project Management Institute (PMI®), identifying principal team members by function, including backup resources (if required).

Closeout Activities

During the project closeout, all quality photos will be reviewed, completion documents will be signed with no exceptions, RMA completed, and final billing and invoicing released. It is recommended that the County provide Aviat US with performance feedback during this time to promote continuous improvement within Aviat US.

The County's Responsibilities

The County shall:

- Provide details of the County's principal team members by function during the project kickoff meeting.
- Provide details of the County's single point of contact for Aviat US during the project kickoff meeting.
- Provide access to sites, shelters, buildings, enclosures, facilities or any other areas as required.
- Provide updates as necessary of any site readiness issues to be resolved prior to start of work.
- Provide access to pertinent databases, planning requirements, including strategic plans, expansion scenarios, growth projections, introduction of new services and wireless technology.

10. NETWORK ENGINEERING

Microwave System and Network Design

The Aviat US representative who oversees the network ("Network Engineer") will provide the overall technical direction of the system design and will work with the County to insure system integrity, verify that all sub-systems and Aviat US furnished OEM equipment is compatible, and that the desired performance of the system is realized.

The network design portion of the project consists of two phases:

1. Final design
2. Design freeze

Design Finalization Phase

After receipt of the order and the project kickoff meeting, Aviat US and the County enter the design finalization phase. During this phase, the Network Engineer will run path calculations with the new radio hardware and software and determine if any of the hops will have to change to high power.

During this phase, the County may also request changes to the system design if the changes fall within the original scope and hours of the projects. Any changes outside of the original scope or agreed schedule are subject to review and acceptance by Aviat US to determine the impact and cost on the overall project.

Aviat US will provide a formal submission detailing the final system design and equipment list and highlight changes needed to the preliminary design. The County shall review the data and schedule a meeting, if necessary, to discuss any concerns. If no concerns are noted, it is the County's responsibility to approve the final design in writing (email is acceptable) before the design is frozen and equipment is placed on order (unless otherwise agreed to in this Contract or with the Project Manager). Any delay in the approval of the final design could result in a delay in material delivery to the field. This might require a review by the County and Aviat US of the project schedule and deadlines.

Design Freeze Phase

As part of the Design Finalization Phase, a date will be set for the design freeze at which the final design and all changes must be approved and accepted by both parties. Following the design freeze, the Bill of Materials and documentation will be submitted to the Aviat US factory and the system will be scheduled for manufacturing. The Network Engineer will concurrently review all design documents and finalize any traffic plans, NMS plans, synchronization plans, traffic cutover requirements, as well as any special factory and field acceptance testing requirements for the project. During the Design Freeze Phase, the design is frozen and no further changes to the system design will be accepted without a formal change order and reevaluation of the project and delivery schedules. Refer to the project schedule for details on the planned start and finish dates for each of these phases.

Deliverables

- The equipment list refers to the final bill of material ("BOM").
- The design freeze package refers to the final path calculations, path profiles, rack profile and system drawings, traffic plans, IP plans, NMS plans, and/or DC power calculations.

11. TRANSMISSION ENGINEERING

Microwave Path Design

The Aviat US representative who oversees transmission ("Transmission Engineer") ensures the delivery of the best possible network solution by providing the technical direction for the over-the-path RF performance of Aviat US system implementation. This includes:

- Path calculations and profiles.

Microwave Frequency Planning and Licensing

This shall include the following services:

- Perform frequency coordination based on available FCC records to reduce the potential for interference between internal or external radio sources on a given system or network.
- Aviat US, upon receipt of the County's authorization, will prepare the FCC License Application Form 601 with the appropriate technical data. Information such as site location, radio type, and frequency will be listed. Aviat US will complete and submit the Construction Complete Form 601 on line via FCC Universal Licensing System ("ULS").
- File Antenna Structure Registration ("ASR") form for towers over 200 feet.

Microwave path performance calculations and warranties

The microwave path design models most frequently employed within the industry (e.g., Vigants, and ITU-R P-530) provide a reasonably accurate (and therefore usually guaranteed) estimate of the cumulative time a path will be out of service due to random atmospheric multipath fading under normal atmospheric conditions. **These models do not (and cannot) accommodate abnormal, unusual, anomalous, or otherwise unpredictable conditions of weather or atmospheric refractivity**.

Microwave frequency engineering/inter-system interference analysis

Aviat US will partner with Comsearch, a CommScope company, to provide cost-effective frequency planning and FCC licensing services for radio communications systems (if required). The planning software used, considers specific operating parameters of both the proposed microwave system and the environment microwave systems (license and proposed) to properly consider the interference potential of the new path or system. Parameters and data elements incorporated into the modeling include, but are not limited to:

- Antenna type, antenna height, elevation, antenna radiation pattern
- Receiver filter performance
- Terrain
- Radio modulation
- Path orientation
- Receiver threshold

These elements are required to accurately predict specific interfering levels into and from the existing microwave systems. The accuracy of the calculations is ensured by real-time maintenance of the Comsearch point-to-point microwave, earth station, radio equipment, antenna, interference objective, and contact database.

Microwave frequency selection

The interference analysis performed on the microwave system identifies available frequencies considering existing and proposed systems found in the Comsearch database. When applicable, an analysis of the systems in the adjacent bands can be done to ensure the microwave system does not receive unwanted threshold degradation. In bands shared with satellite systems, an analysis of potential interference with earth stations and with the geo-stationary satellite orbit can also be done. Additionally, co-located or nearby transmitters already licensed in the required frequency band can be identified in order to reduce the possibility of "bucking" an existing high/low frequency plan that could increase the possibility of receiver overload or reflective interference from a nearby system.

Microwave frequency coordination and FCC licensing

The majority of microwave bands subject to FCC Rule Part 101 require prior coordination with existing licensees. Aviat US will partner with Comsearch to perform the frequency coordination and FCC licensing on behalf of the County (if required). The procedure will include notification of the technical parameters of the proposed system to all existing and proposed licensees in the area and frequency band of operation. Frequency coordination will also be performed with Canadian and Mexican authorities in border areas when necessary. By FCC rule, recipients are given 30 days to respond, or in some cases an expedited response can be requested.

Upon completion of the prior coordination process, documentation required to satisfy FCC Rule Part 101.103 (d) can be prepared on behalf of the County. This will include any necessary exhibits, including supplemental showings required upon submittal of the requested license application. The FCC filing process includes:

- Filing of the FCC Form 601 microwave application upon written approval from County and providing an electronic copy of the application to County via email.
- Tracking the status of the application until the license is granted by the FCC. Amendments will be handled expeditiously on behalf of County for any questions or concerns from the FCC.
- Email notifications to the licensee when the license is granted by the FCC.
- Filing of the required completion of construction notification with the FCC upon written approval from the licensee and notification of the filing via email.

Special Considerations

On all microwave radio paths traversing urban areas there exists the possibility of multiple on- and off-path structural reflections which generate long-delayed echoes, as well as terrain scatter RF intra- and inter-system interference. Long delayed, low-level echoes have no effect on digital radio performance; however, the terrain scatter mechanism cannot be accurately predicted nor

precisely measured without an extensive and expensive field trial. Consequently, this mechanism is specifically excluded from all current industry-wide path survey and frequency coordination performance guarantees.

The structure supporting the microwave antenna can take many forms. The antenna is most often mounted on a tower but can be mounted on a variety of structures such as roof tripods, penthouse wall, wooden telephone pole, or metal monopole. It is recommended that County conduct a structural analysis of the support structure to determine if the structure will support the additional loading imposed by the antenna and its mount. The structure must also meet the twist and sway requirements per EIA/ANSI 222G.

FCC Rules for Filing Accuracy

CFR 47, Part 1.929 specifies that filing accuracy for site coordinates shall be (+/-) 1” latitude and longitude, and for ground elevation (+/-) 1 meter (3.28 ft.). Part 1.929(k) (covering modification of FCC licenses) specifies that any change in site coordinates >5” latitude or longitude shall require prior authorization and re-coordination. Therefore, wherever our survey results deviate more than (+/-) 5” latitude or longitude, or more than +3.28 ft. site elevation, frequency re-coordination will be recommended.

12. PROJECT ENGINEERING

Field Installation Management

Aviat US will manage the day-to-day activities of the field installation with support from the County to ensure the project remains on schedule as per the agreed project schedule.

Aviat US project engineer is responsible for developing the installation specification to guide the field network integrator on a step by step basis to perform the radio and software upgrades. The installation specification contains installation checklists, radio site and hop test data sheets, rack profile, and wiring diagrams. The project engineer is also responsible for working with the field network integrators to ensure project is progressing per the mutually agreed upon schedule and provides assistance to remove any roadblocks encountered during the field implementation phase.

Closeout package is completed and delivered to the County at the conclusion of all field activities.

13. INSTALLATION, INTEGRATION & TESTING

The installation, integration, and testing services include design-supported methodologies, product expertise, and field-proven processes to help ensure a quality installation and testing of critical system paths and hardware so that the network performs according to its design. Aviat US will designate a primary point of contact to answer any the County questions, provide guidance, and address issues specific to this service.

This Contract is based on an Aviat US standard installation schedule of 8-hour days, 5 days per week. Aviat US will adjust this Contract for work week schedules outside of Aviat US' standard. All work will be done in accordance with Aviat US' best practices guide.

Scope

Delivery of this service will utilize the design documentation developed as part of the planning and design phase. Field crews will utilize this documentation to:

- Replacement of indoor microwave radios
- Upgrade of radio and NMS software
- Perform system integration
- Perform system testing

System implementation is predicated upon complete site readiness. ***It is recommended that*** the County ***provide maintenance technicians during any service affecting work***.

The successful completion of all technology refresh services is based on uninterrupted, contiguous-site installation and testing. Additional mobilizations are not included in the pricing and project schedule. If installation is delayed due to inclement weather, inaccessible site(s), incomplete site preparation, or construction, the following charges may apply and will be billed to the County as a billable change order:

- Standby time for radio teams will be charged at a rate of $1,550 per person per day.
- If re-mobilization of the installation crew is necessary, then a two-week advance notice is required.
- Re-mobilization will be billed on a time-and-expenses basis.
- Service costing assumes use of 4-wheel drive vehicles for all project related vehicles. Additional requirements such as ATVs may require additional service costs.
- If the field crew(s) is required to work out of contiguous sequence due to conditions beyond the control of Aviat US, a charge equal to one day for each crew person will be assessed to the County for each occurrence.

Site Access

Access to work sites will be made available by the County for a minimum of 8 hours per day, 5 days per week or per the agreed schedule in the project plan. All roads leading to work sites shall not require more than a 4-wheel drive vehicle unless stated otherwise is this Contract and agreed to by both the County and Aviat US. Any delays or additional cost caused by poor road conditions or site access issues not discussed prior to the start of the installation, integration or testing services will be billed to the County as a billable change order and could have a negative impact on the project completion schedule.

All radios will be stored by Aviat US in a secure location at the site or at Aviat US controlled warehouse.

An inspection will be performed with the County after completing the physical installation. Workmanship deficiencies will be noted on a punch list for immediate correction. This inspection is not intended to verify operation of the new system or suitability of components, but rather to inventory and document that all equipment and materials from the schedule of values are installed to acceptable workmanship quality standards. Site drawings will be reviewed and red-lined to reflect the installed condition.

Testing

Test crews will begin work immediately after installation is complete. Testing, based on a standard set of Aviat US test cases, will be performed on all provided equipment to confirm configuration, operation and manufacturer's specifications. Test data will be recorded on field test sheets, by technical field personnel who will also be responsible for documenting test results and any changes made to the design documentation.

The test crews will be trained on the equipment and utilize test equipment to perform all tests. Test equipment will have valid calibration certifications, which can be verified prior to commencing any tests. It is recommended that the County take the opportunity to have their maintenance technicians witness or participate in field commissioning testing to gain on-the-job training and experience on the new system components.

Commissioning tests will consist of a set of standard Aviat US test cases and include turn-up and performance verification tests and circuit tests to verify end-to-end continuity and equipment operation as well as any other tests documented in the field acceptance test plan. The field acceptance test plan shall be approved and agreed to by Aviat US and the County prior to test execution. Test results will be recorded on field test data sheets and submitted to the County. Refer to the field acceptance test document for details on the test to be performed.

System tests will be performed on a logical section/loop of the system. The system tests will be designed to demonstrate performance and functionality of system features as-well as end-to-end operation of individual circuits/services. System test results will establish benchmark system performance and operation prior to cut-over and acceptance. The test data sheets prepared during commissioning and system testing will become the base line document for maintenance and performance evaluation of the system over an extended period of time. The County will be required to review the commissioning and acceptance testing and results and red-lined drawings and provide approval of the data and authorization to proceed with cut-over activities.

Traffic Cut-over

Cut-over activities are anticipated to occur as radios are replaced. The Commissioning and system-level test activities verify that the new system is ready to accept traffic. Preparation, planning, logistics, and technical support are the critical elements in transferring existing

services to new radios. The County infrastructure is utilized for control of mission critical infrastructure; therefore, processes must also be put in place to minimize interruptions as well as to restore the original service in the event of unforeseen situations.

Safety

The health and safety of all individuals, whether in the field, plant or office, takes precedence over all other concerns. Management's goal is to prevent accidents and to reduce personal injury and occupational illness and comply with all safety and health standards. A code of safe conduct is important to the efficiency of operations. To the greatest degree possible, the County will provide physical safeguards required for personal safety and health in keeping with the highest standards. Aviat US requires a written report from County for all accidents and incidents, no matter how small.

Safety and first aid material and supplies will be provided to all Aviat US construction and installation personnel or made available at each site for the duration of this project. All safety and first aid material will be stocked at acceptable levels and will have not exceeded the expiration dates where applicable. The County will be responsible for providing Aviat US with the location and phone numbers of all local emergency agencies.

14. NETWORK PERFORMANCE MONITORING, REPORTING, AND OPTIMIZATION

Aviat US will provide remote performance monitoring, reporting, and optimization services to proactively identify areas of improvement from the County’s baseline network design. This service is designed to provide the County with the information needed to keep the network performing at the optimum level while leveraging the capacity it was designed to provide. As part of this service the County will have a designated consultant to supplement your team with expert advice and best practices surrounding continuous optimization.

This high-level system review provides analysis & recommendations via data provided by ProVision. The County will receive a monthly report on network performance and optimization metrics, quarterly business reviews, and monthly analysis of areas that need attention. Monthly areas of focus include highlight the 10 worst performing links, specific recommendations on areas in need of attention, guidance on corrective action and pointers on prioritizing actions. The quarterly business review is a scheduled conference call to debrief on the last quarter’s performance including a comparison of quarter over quarter degradation and/or improvements, checks to ensure monthly guidance on corrective action has been followed with the goal is to maximize traffic availability and continually keep the County network operating at the baseline.

15. SUPPLEMENTAL TERMS AND CONDITIONS FOR ANNEX A

These supplemental terms and conditions apply specifically to this Annex A and take precedence over any conflicting terms elsewhere in this Contract.

PRICES/PAYMENT/TAXES/SHIPPING

Payment is due annually in advance starting from the Effective Date of this Contract. All payments shall be made via bank transfer to the accounts specified on the invoice, in full in Advance of the commencement of each year of service/coverage. The total amount is due and payable to Aviat Networks within sixty (60) days of the invoice date.

All prices are exclusive of all sales, use, excise, and other taxes, duties or charges. Unless evidence of tax exempt status is provided by County, County shall pay, or upon receipt of invoice from Aviat US, shall reimburse Aviat US for all such taxes or charges levied or imposed on County, or required to be collected by Aviat US, resulting from this Contract or any part thereof.

POTENTIAL SUBSTITUTION

Because of the possibility that there might be a significant time frame between when this Contract is executed and when the Services are performed, Aviat US may substitute any of the promised equipment or software so long as the substitute is equivalent or superior to the initially promised equipment or software.

ACCEPTANCE

Acceptance of the technology refresh aspect of the Services will occur as each element of the upgrade equipment, software and services under this Annex A are delivered or performed. Services indicated as annual in nature will be considered as completed at the end of the annual period inherent to such Services.

SERVICES WARRANTY

Notwithstanding any other warranty provisions in this Contract's governing documents, the Services performed under this Agreement (including installation services) are warranted to have been performed in a good and workmanlike manner for one (1) year from performance. Any Aviat US Product equipment and software warranties commence upon shipment.

DESIGNATED PROJECT MANAGER

The County will provide a designated project manager for the major system technology refresh under this Annex A, all approvals that are necessary for Aviat US to perform its work at the work sites; and access to the work sites as reasonably requested by Aviat US so that it may perform its duties in accordance with this Annex A. The County will ensure that all work sites it provides will be safe, secure, and in compliance with all applicable industry standards. To the extent applicable, the County will ensure that these work sites have adequate physical space; air conditioning and other environmental conditions; electrical power outlets, distribution, equipment and connections; and adequate telephone or other communication lines.