Alaska Land Mobile Radio Communications System

Cooperative Agreement Appendix D

Service Level Agreement

Alaska Land Mobile Radio Communications System

System Description

Version 7

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Acronyms and Definitions

ACP: administrator control panel

AEB: ambassador electronics bank

Alaska Federal Executive Association (AFEA): federal government entities, agencies and organizations, other than the Department of Defense, that operate on the shared ALMR system infrastructure.

Alaska Land Mobile Radio (ALMR) Communications System: the ALMR Communications System, which uses but is separate from the State of Alaska Telecommunications System (SATS), as established in the Cooperative Agreement.

Alaska Municipal League: a voluntary non-profit organization in Alaska that represents member local governments.

Anchorage Wide Area Network (AWARN): the 700 MHz Anchorage node of ALMR. AWARN will make up Zone 4 of the System.

BDA: bi-directional amplifier

BIM: base interface module

CEB: central electronics bank

Department of Defense – Alaska: Alaskan Command, US Air Force and US Army component services operating under United States Pacific Command.

DS0: Digital Signal 0 – the lowest Digital Signal or Data Service level having a transmission rate of 64,000 bits per second (64 kb/s), intended to carry one voice channel (a phone call).

Executive Council: the ALMR Executive Council which is made up of three voting members and two associate members representing the original four constituency groups: the State of Alaska, the Department of Defense, Federal Non-DOD agencies (represented by the Alaska Federal Executive Association), and local municipal/government (represented by the Alaska Municipal League and the Municipality of Anchorage).

Key Management Facility (KMF): allows for secure re-keying of radios over the air.

Local Governments: those Alaska political subdivisions defined as municipalities in AS 29.71.800(13).

Member: a public safety agency including, but not limited to, a general government agency (local, tribal, state or federal), its authorized employees and personnel (paid or

volunteer), and its service provider, participating in and using the System under a Membership Agreement.

Municipality of Anchorage (MOA): the MOA covers 1,951 square miles with a population of 300,000 plus. The MOA stretches from Portage, at the southern border, to Knik River at the northern border, and encompasses the communities of Girdwood, Indian, Anchorage, Eagle River, Chugiak/Birchwood, and the native village of Eklutna.

NMT: network management terminals

OMC: Operations Management Center

Operations Manager: the Operations Manager represents the User Council interests and makes decisions on issues related to the day-to-day operation of the system and any urgent or emergency system operational or repair decisions. In coordination with the User Council, the Operations Manager establishes policies, procedures, contracts, organizations, and agreements that provide the service levels as defined in the ALMR Service Level Agreement.

P25 Radio: a Project 25 compliant control station, consolette, mobile or portable radio assigned to the System that has a unique identification number.

PSTN): Public Switched Telephone Network

Radio: a Project 25 compliant control station, consolette, mobile or portable radio assigned to the System that has a unique identification number.

RGU: radio gateway unit

RF: radio frequency

Service Level Agreement (SLA): the Service Level Agreement outlines the operations and maintenance services as required by the User Council membership for the sustainment and operations of the ALMR infrastructure. The performance metrics contained in the SLA describes the maintenance standards for the ALMR system infrastructure. ALMR cost share services are also outlined in the SLA.

SIP: session initiation protocol

State of Alaska (SOA): the primary maintainer of the SATS (the State's microwave system), and shared owner of the System.

State of Alaska Telecommunications Systems (SATS): the State of Alaska statewide telecommunications system microwave network.

System Management Office (SMO): the team of specialists responsible for management of maintenance and operations of the System.

User/Member: an agency, person, group, organization or other entity which has an existing written Membership Agreement with one of the Parties to the Cooperative Agreement. Terms are synonymous and interchangeable.

User Council: the User Council is responsible for recommending all operational and maintenance decisions affecting the System. Under the direction and supervision of the Executive Council, the User Council has the responsibility for management oversight and operations of the System. The User Council oversees the development of System operations plans, procedures and policies under the direction and guidance of the Executive Council.

WAN: wide area network

Zone: a grouping of channels within the radio

1.0 Introduction

The Alaska Land Mobile Radio (ALMR) Communications System is a digital, trunked wide-area network (WAN), shared system between the State of Alaska (SOA), the Department of Defense (DOD), the Alaska Federal Executive Association (AFEA), the Alaska Municipal League (AML), and the Municipality of Anchorage (MOA). The communications transport network, supporting sites and site support equipment are components of the System.

The fundamental objective of the System is to provide reliable and secure interoperable communications for first responders, not only day to day, but also during critical emergency situations, exercises and multi-agency, multi-jurisdictional responses.

This document identifies components making up the ALMR System and their functions.

2.0 System Description

The System is a Motorola™ ASTRO 25™ Digital Trunking WAN SmartZone solution that consists of the System infrastructure and multiple subsystems, as follows.

2.1 System Equipment

The System is a multiple-zone design that is divided into four zones. All sites south of the Denali Highway are in Zone 1, while those sites north of the Denali Highway are in Zone 2. The Municipality of Anchorage (MOA) encompasses Zone 4 with a 700MHz subsystem. Zone 3 is reserved for possible expansion in Southeast Alaska.

2.1.1 Master Sites

Each zone has a Master Site and a number of radio frequency (RF) sites. The Master Site for Zone 1 is located in Anchorage at Tudor Road. The Master Site for Zone 2 is located in Fairbanks at Birch Hill on Fort Wainwright. The Master Site for Zone 4 is located in Anchorage at the Fire Station 12 (FS12) municipal facility.

The Tudor Road Master Site serves as a core network center for the entire SmartZone system. The Birch Hill Master Site serves as a core network center for all Zone 2 sites. The FS12 Master Site serves as a core network center for Zone 4 sites. Data packets from the various ALMR System sites, not including AWARN, are routed through and processed from the Tudor Road network center.

Equipment associated with each Master Site includes a primary and redundant Zone Controller; the main Ethernet switch; core, gateway and exit routers; zone database; and system level and network security servers. All Master Sites include a console subsystem consisting of a Motorola™ Gold Elite® Gateway (MGEG) an ambassador

electronics bank (AEB), and a central electronics bank (CEB) with associated base interface module (BIM) cards.

2.1.2 Radio Frequency Site Equipment

The radio frequency (RF) site equipment includes a quantity of Motorola™ Quantar® or GTR8000 IntelliSite Repeaters, redundant site controllers, redundant Ethernet switches and routers to interface the data packets to the SmartZone® Master Sites. The RF equipment includes the associated multi-coupler, combiner, antenna system, Motorola™ System Control and Data (MOSCAD) fault alarm system and 48 VDC power supplies. This category also includes the associated RF antenna systems consisting of transmit and receive antennas, coaxial cables, lightning arrestors, grounding kits and mounting brackets/other fasteners.

2.2 Subsystem Equipment

Subsystem equipment connects directly to the System equipment or enhances the System functionality. These subsystems can include dispatch consoles and CEBs, Key Management Facilities (KMFs), Network Management Terminals (NMTs), telephone interconnect systems, logging recorders, data servers and bi-directional amplifiers (BDAs).

2.2.1 Console System

Console systems are made up of remote or local dispatch console positions and the CEB. The console positions can be connected to a CEB located at the zone controller or a CEB at the agency location. It takes one T1 (24 Digital Signal 0s, i.e. DS0s) to connect a CEB to the AEB at the zone controller. It takes three DS0s per remote console position to connect to the CEB. An additional ten DS0s are required for console programming regardless of the CEB location.

Some agencies have chosen to install bulk encryption equipment to encrypt the links between the CEB and the console positions, and the CEB and AEB. This equipment does not increase the bandwidth requirement.

The BIM cards installed in the CEB allow conventional radio resources like base stations and air-to-ground radios to be used by the console dispatcher along with trunked talk groups. This capability provides System interoperability with conventional radio systems through a patch, or by communicating directly with non-System radio systems.

Tie trunks are connections between two BIM cards in different CEBs. These can be permanent or temporary patches that link different dispatch systems and their associated resources.

2.2.2 Key Management Facility

The Motorola™ ASTRO 25® system allows two-way radio transmissions to be encrypted and secure. The Key Management Facility (KMF) is a solution for centralized key management and over-the-air-rekeying (OTAR). The KMF equipment includes a KMF application server, KMF database server and KMF client.

2.2.3 Network Management Terminals

Network Management Terminals (NMTs) are consoles that connect to the System. The NMT is used by agency System Managers and technologists to manage their radio system fleet, subscriber units and configurations. The System Management Office (SMO) oversees the operation of all NMTs. NMTs can be used by individual agencies to manage their individual radio systems. In the event that interoperability between participating agencies is required, the SMO can enable interoperability between multiple agency NMTs.

2.2.4 Telephone Interconnect

The telephone interconnect subsystem provides a means to connect the System with the Public Switched Telephone Network (PSTN) allowing properly programmed System subscriber radios to initiate and receive half-duplex telephone calls. Telephone interconnectivity is not considered a critical service. The telephone interconnect system is located at the Zone 2 Master Site at Birch Hill.

2.2.5 Logging Recorder

Voice logging recorders are directly associated with the console system at a particular dispatch location.

2.2.6 Data Server

Includes all equipment associated with the integrated voice and data servers which can provide data over the internet protocol (IP) network.

2.2.7 Bi-Directional Amplifier

Bi-directional amplifiers (BDAs) extend coverage into, or within, a particular facility or tunnel by repeating transmissions to and from an available donor RF site. BDAs for infrastructure sites are addressed under the RF site equipment category.

2.3 MotoBridge® Gateway System

The Motorola™ MotoBridge® gateway network that was installed by the DOD and SOA has connectivity to System talk groups, but it is separate from the ALMR System network. It is on a State of Alaska local area network (LAN) with connectivity through the State of Alaska Telecommunications System (SATS).

The MotoBridge® system, known as the Alaska Interoperability Network (AIN), provides interoperability between various communications networks. Central management of the AIN is provided by dual-redundant management servers located in Fairbanks and Anchorage. Other components consist of dispatch positions with Work Station Gateway Units (WSGU) and computer consoles for linking conventional and trunked two-way radio systems together, and Radio Gateway Units (RGU) that physically tie the dissimilar radio resources to the network.

2.3.1 Operations Management Center Server

The Operations Management Center (OMC) Server is the main management server in the System and a central repository where all System users and resources (i.e., administrators, dispatchers, and radios) are registered, and where System-wide information (i.e., active patches and conferences, security parameters, etc.) is stored. The OMC Server runs on the Red Hat Linux operating system. A user-level interface to the OMC Server is provided by the Administrator Control Panel (ACP) Client PC. The primary OMC Server is located in Zone 1 at the Anchorage Emergency Operations Center (EOC) and the secondary OMC Server is located in Zone 2 at the Fairbanks EOC.

2.3.2 Administrator Control Panel

The administrator control panel (ACP) Client PC allows an administrator, located anywhere in the System, to perform management activities for the System. The ACP Client PC runs on the Microsoft XP® operating system. An ACP Client PC is located with each of the OMC servers.

2.3.3 Session Initiation Protocol Proxy Server

The session initiation protocol (SIP) proxy server is a signaling server for establishing talk paths (calls) across the System. The SIP proxy server complies with international standards for multimedia call routing and telephony services in the Internet. The SIP proxy server interacts with the gateway units in the System, which implements the SIP agent portion of the standard. The SIP proxy server runs on the Red Hat Linux operating system.

2.3.4 Radio Gateway Units and WorkStation Units

The gateway units are based on one hardware platform, which can be configured to serve as either a radio gateway unit (RGU) or a workstation gateway unit (WSGU). The

RGU connects radio equipment to the System. The WSGU interfaces with the Dispatch Console PC to provide the MotoBridge® dispatch position used by the public safety interoperability dispatcher.

2.3.5 Dispatch Console Personal Computer

The dispatch console personal computer (PC) enables a dispatcher to activate the WSGU, which allows control over a large number of connected remote radios, intercom connections, audio conferences and phone calls. The dispatch console PC runs on the Windows 7® operating system.

2.4 Site Equipment

A major component of the System is the remote equipment sites. Without appropriate site and supporting equipment, the System will not function properly. The supporting site equipment includes shelters, towers, site/backup power, site physical area and equipment and site grounding.

2.4.1 Shelters

This category includes all stand-alone shelters, both pre-fabricated and stick-built used for housing System and associated communication equipment. For areas within existing buildings, this also includes required improvements to the rooms where the System and associated communications equipment is housed. Components in the shelters include racks, internal wiring, external ice bridges, foundations and leveling, interior/exterior lighting, air conditioners, louvers, fans and door locks.

2.4.2 Towers

This category includes all components of the tower including the frame and ladders, painting, guys (as applicable), beacons, foundations and anchors.

2.4.3 Site/Back-Up Power

This category includes the distribution panel for external power, inverters, battery plants, battery chargers, transfer switches and generators. Also included are generator fuel tanks, generator enclosures and exhaust piping. This category also includes uninterrupted power source (UPS) systems associated with the zone controllers.

2.4.4 Site Physical Area

This category includes all activities for the right-of-way and the area surrounding the structure for which the System is responsible. This would include grading, plowing and graveling access roads, brushing, mowing and fencing around the area where the shelter and tower are located (as appropriate).

2.4.5 Equipment and Site Grounding

All site equipment shall be bonded together to form a single common earth ground electrode system as outlined in the Motorola® "R56 - Standards and Guidelines for Communication Systems." All internal and external grounding must be in working order and maintained through the life of System usage.

2.5 Transportable/Deployable Systems

The System includes two transportable/deployable systems. One system is designed to operate in the South Zone (Zone 1), and the other in the North Zone (Zone 2). The transportable systems are the property of US Northern Command (NORTHCOM), and are available to the services to meet their mission needs.

The transportables are designed to function as stand-alone systems or to connect with, and be an integral part of, the ALMR System. The transportable systems are designed to provide three critical functions in support of sustained emergency communications.

First the transportable is designed to "plug" into the existing system to provide emergency replacement, or fill in for site infrastructure that is damaged or down for repair. Second, the design allows for the transportable system to be added to the wide-area system, as needed, to expand the loading capacity at a location where emergency response has overwhelmed the existing capacity. Thirdly, the transportable is designed to provide a stand-alone capability with reach back to the fixed infrastructure and other critical communications capabilities where there is not fixed ALMR infrastructure present to support emergency operations.

Each transportable/deployable consists of multiple modules that can be transported via tractor-trailer, C-130/similar-sized cargo plane, or Chinook/similar-sized helicopter. Transportable Area South (TAS) encompasses the five shelters/skids and the Mesh® Network. Transportable Area North (TAN) does not have a 4.5 Meter C-Band Satellite Earth Station Antenna Skid, a Logistics Skid or a Mesh® Network. Only the modules required for the mission will be transported for set up.

The transportable system has a total bandwidth capacity of 15 T1s. This capacity is provided through various components of the System. The following is a breakdown of the bandwidth capacity provided by each component: the satellite earth-station (2 T1s); high-bit-rate digital subscriber line (1 T1); tactical fiber gigabyte Ethernet (2 T1s); spread spectrum microwave (4 T1s); and digital-to-analog converter (DAC)/ Premisys mux (6 T1s).

2.5.1 Communication Shelter

The Communications Shelter module is approximately 9 feet wide, by 16 feet long, by 9 feet high. It contains a five-channel RF site, satellite control interface, an unlicensed 5.8 GHz microwave radio, a CEB and a 48 VDC battery plant for 8 hours run time. It is air and ground transport ready.

2.5.2 Dispatch Shelter

The Dispatch Shelter is approximately 9 feet wide by 16 feet long by 9 feet high. It contains one Motorola™ Gold Elite console position and a conventional UHF and VHF radios, marine band and air-to-ground radios, a Motobridge® RGU, OMC, ACP, SIP server, WSGU and dispatch position. It is air and ground transport ready.

2.5.3 Tower/Power Skid

The tower/power skid is approximately 9 feet wide by 20 feet long and contains a 35KW self-contained diesel generator and integral fuel tank designed for three continuous days of operation at half load. It also contains a 50-foot, powered crank-up tower. It has permanently mounted antennas for the RF site and two conventional frequencies. It is air and ground transport ready.

2.5.4 C-Band Satellite Earth Station Antenna Skid

A C-Band transportable earth station is provided with an Andrew 4.5 meter tri-fold antenna mounted on a trailer/skid approximately 9 feet wide by 20 feet long. It is air and ground transport ready.

2.5.5 Logistics Skid

The Logistics Skid is utilized to store ancillary equipment that supports the transportable system for and during deployment. It also serves as a facility for maintenance operations while in the deployed state. The Logistics Skid measures 9 feet wide, by 20 feet long, by 9 feet high. It is air and ground transport ready.

2.5.6 Unclassified Deployable Mesh® Network

The unclassified deployable Mesh® (UDM) network includes components which provide a robust wireless communications solution operating in the unlicensed 2.4GHz and the newly licensed 4.9GHz public safety spectrum at the employed site via microwave, fiber or satellite connection, which supports up to four networks in a single access point with a two-mile radius coverage capacity. It also provides WiFi access, license-free mobile broadband, a dedicated licensed network connectivity and security, and real-time video.

Mesh® network technology was originally developed for the military battlefield to provide instant, ad-hoc communication networks where fixed infrastructure was not available or deployable. As a result, users receive a robust mobile broadband

communications network that is self-forming and self-healing. The Mesh® technology is also capable of delivering seamless broadband data connections and real-time video transfers to vehicles moving at highway speeds.

2.5.7 Transporter.

The Transporter is a tracked or wheeled, all-terrain trailer used to transport the modules short distances, move the modules from hot storage, stage modules for deployment and place the modules back into their original configuration upon redeployment (North and South Zone).

2.5,8 Tug

The Tug is a 2007 Ford™ F350, Bobtail, capable of towing 30k pounds at 25 mph and is used to pull the transporter. Each transportable has an associated tug.

2.5.9 Rapid Deployable System

The rapid deployable System (RDS) shelter provides a fast, durable, and versatile structure perfect for first responders, command posts, operations centers or other remote operations. There is only one and it is located with the TAS.

2.6 Communications Transport Network

All voice and data signals that are carried on the System are transported to the Master Site Zone 1 controller at Tudor Road through SATS. SATS is comprised of multiple methods of network connectivity to include microwave, commercially leased T1s and local fiber networks. In some locations, the connectivity links are encrypted utilizing bulk encryption equipment.

The System channel banks provide a connectivity gateway from the System central controllers to the remote RF sites. The channel banks provide individual channel service units (CSUs) to each remote site location and link them to the prime site controller.

3.0 Administration/Management

To administer and manage the ALMR Communications System, a number of full time permanent employees are required to provide operations management, system management, system monitoring and maintenance, asset management and administrative support for the governance structure. These functions are cost shared between the ALMR cooperative partners.

3.1 General Administration

To ensure the operational integrity of the System and to provide centralized administration and system management, which supports all users, an Operations Management Office (OMO) and a System Management Office (SMO) are cost shared between the cooperative partners. The OMO develops and recommends policies, procedures, plans and guidelines, identifies technology and standards and coordinates intergovernmental resources to facilitate communications interoperability with emphasis on improving public safety and emergency response communications to the User Council for approval. The OMO is the central point of contact for all users concerning the operation of the shared System.

The SMO, which works in coordination with the OMO, includes the System Manager, System Technologists, Asset Management, Help Desk, Security Manager and other contracted maintenance functions. The SMO develops technical processes and procedures related to the shared infrastructure and also provides technical assistance and advice to ALMR users and prospective users. The SMO provides periodic maintenance inspections and repair actions for the System.

3.2 Support

The OMO attends monthly meetings, or as requested, with the User Council (UC), Executive Council (EC) and other designated representatives of System user groups to understand new communication needs, to communicate System information, and address questions, complaints or provide clarification about the System and other topics, as requested.

3.3 Technology Planning

The OMO keeps abreast of new technology developments, advancements, announcements, standards, and operational best practices in LMR-related technology. The OMO reports and meets periodically with the appropriate UC personnel to discuss and evaluate new technology for applicability to the System. The OMO is present during System/equipment testing or product reviews at the designated user facility and facilitates the test plan (if requested), check off procedures and the sign off documents.

An important initial consideration in enhancing the management of an existing wireless network is the condition, design and operations of the current wireless equipment. The OMO will work closely with users to evaluate the current state of operations and equipment capabilities and recommend changes to the UC as necessary for improved management and operations of the System.

The OMO, working with the UC, will assess the goals and objectives of the System, from time to time, to identify the role radio communications play in achieving the desired System operational objectives. Some of the activities that will be involved in the strategic technology planning process include, but are not limited to:

3.3.1 Review currently available wireless technologies in the industry and evaluate their applicability to System functional, technical, and agency requirements.

3.3.2 Evaluate changing technical and applicable user mission requirements to recommend how the System can be used more effectively.

3.3.3 Develop a plan, in cooperation with the User Council, for the necessary modification of hardware/software of the existing wireless system equipment.

3.4. Management Processes

Management and operational processes and procedures required for the smooth operation of the System are developed and administered by the OMO at the direction and approval of UC, on behalf of the user community.

4.0 Conclusion

The User Council shall be responsible for the formal approval of the System Description and any revisions hereafter