MOTOROLA SOLUTIONS

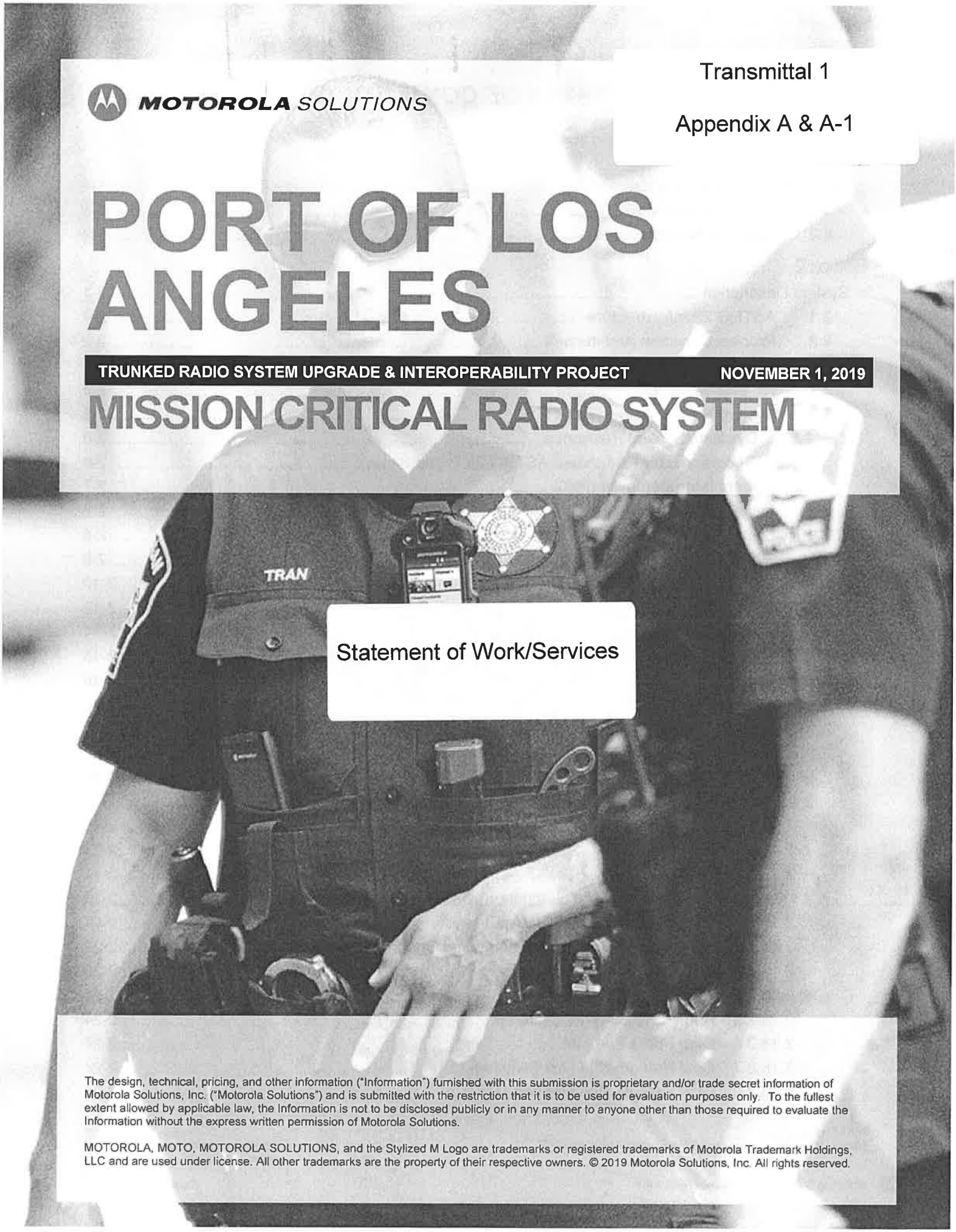
Transmittal 1

Appendix A & A-1

PORT OF LOS ANGELES

TRUNKED RADIO SYSTEM UPGRADE & INTEROPERABILITY PROJECT **NOVEMBER 1, 2019**

MISSION CRITICAL RADIO SYSTEM



Statement of Work/Services

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SECTION 1

EXECUTIVE OVERVIEW

1.1 EXECUTIVE OVERVIEW

As a member of the Los Angeles UASI area the Port of Los Angeles will be upgrading their existing Public Safety radio system to support the same P25 Trunking Radio platform in use throughout the region. The Port of Los Angeles currently operates a Motorola radio system including a core, dispatch consoles, conventional simulcast cell, standalone remote sites, and subscriber radios.

This project will add P25 trunking and data features to the existing core, upgrade the microwave backhaul system, implement a P25 trunking simulcast cell, and expand the capabilities of the existing UHF backup channel. By partnering with Motorola, the Port can leverage its existing investments into the system and subscribers and is able to match the technology platform under implementation across the region.

The system upgrade project will include an Inter RF Subsystem Interface (ISSI) layer that will allow the Port of Los Angeles to directly connect their system to the other City of Los Angeles radio systems along with the LA-RICS regional radio system. This connection will allow Port dispatchers and officers to seamlessly communicate with other dispatchers and officers from the rest of the region.

This project will include the upgrade / implementation of the following major components.

- Adding P25 Trunking and Data Features to the existing system core.
- Implement a 7/800MHz Trunking Simulcast Cell
- Enhance the existing P25 conventional UHF backup channel
- Upgrade and implement additional hops to the existing Microwave System
- Upgrade the software and capacity of the existing Dispatch Consoles
- Add a redundant Core and Comparators to the radio system
- Upgrade two (2) existing BDA's to support 7/800MHz

To meet the UASI grant funding cycles the Port will break the radio system upgrade project into multiple phases. The first phase, covered in UASI 18, is expected to include the implementation of the primary core, backup core, dispatch consoles, data and interoperability features. The second phase, covered in UASI 19, will complete the installation of the trunking upgrade and will include implementation of the 7/800MHz simulcast cell, UHF simulcast cell, additional interoperability connections, system testing, coverage testing, and potential in-building amplifiers.

This multi-phase upgrade project will bring a mission critical, best-in-class trunking radio system to the Port of Los Angeles and will provide the Port with a communication platform that provides direct connection and interoperability with neighboring agencies throughout the county.

1.2 CAPACITY ANALYSIS

In order to meet the voice and data needs for the Port of LA a traffic loading study was conducted by Motorola. As a result, it is recommended the upgraded 700MHz sub-system consist of 8 RF channels / frequencies.

Capacity Analysis Inputs / Goals:

- Bush Hour Voice Users (Including ISSI): 600
- Traffic Loading: 4.994 Erlangs
- 0.4% GoS (Grade of Service)
- Data Users: 500
- Data GPS Cadence: 60 Seconds
- Active Talkgroups: 24
- Data Message Reliability: 95%

Capacity Analysis Results:

- Number of Total Channels: 8
  - Voice Only Channels: 5 (10 Talkpaths)
  - Control Channels: 1
  - Data Protected Channels: 2

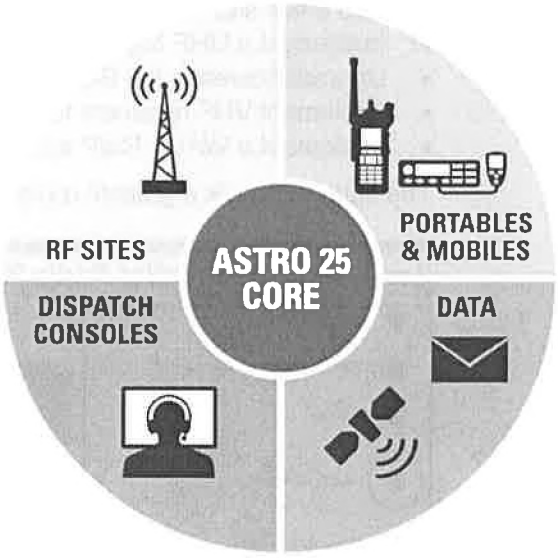
SECTION 2

SYSTEM DESCRIPTION

2.1 ASTRO 25 INFRASTRUCTURE

Motorola Solutions, Inc. (Motorola Solutions) proposes our ASTRO® 25 platform with Integrated Voice and Data (IV&D) to provide secure and reliable communications for the Port of Los Angeles (the Port). ASTRO 25 offers a future-ready, wireless platform that combines uncompromising, real-world performance and reliability.

ASTRO 25 offers the Port a Project 25(P25), standards-based Internet Protocol (IP) solution with a flexible, modular network. ASTRO 25 can expand to accommodate additional radio users, increased geographic coverage, enhanced data applications, and connectivity to other networks, ensuring that the Port will have efficient and cost-effective communications for decades to come.



ASTRO 25 also provides advanced call processing capabilities designed to meet the needs of public safety. On an ASTRO 25 network, first responders can share voice and data communications between members of the same team, across an agency, or among different agencies. In addition, the network's centralized command and control capabilities will enable the Port to deploy resources, track personnel, and maintain communication security more efficiently and effectively.

The system's P25-compliant IV&D operation allows data traffic to travel seamlessly over the ASTRO 25 radio system, improving in-field efficiency and providing a platform for additional capabilities. By creating a data transport layer capable of supporting both industry-standard IP and customer-developed applications, IV&D will provide the Port with a number of important benefits:

- Conserves valuable airtime.
- Increases communications accuracy.
- Allows queries in the field without involving dispatch.

Because ASTRO 25 automatically prioritizes voice communications over data transmissions, the Port's personnel will always be able to transmit and receive mission-critical communications.

2.2 PROPOSED SYSTEM ARCHITECTURE

Motorola Solutions is pleased to provide the Port of Los Angeles with a proposal for upgrading the existing UHF conventional radio system to a P25 trunked 7/800MHz radio system. The new/upgraded system will implement the 700 MHz layer on-top of the existing UHF conventional system. Two backup, single channel, UHF layers will be added to provide the Port with a back-up and city-wide communication plan It will also integrate other subsystems in use at the Port. The proposed system upgrade includes the following major components and services:

- Upgrade Conventional core to a Trunking core at the latest shipping release
  - Add P25 Trunking features to the existing core
  - Add P25 data features to the existing core
  - Add Enhanced data capabilities
- Include a redundant geo-separated core to the system
- Upgrade the existing dispatch positions
- A NICE logger recorder
- Add a five site, 700MHz simulcast cell
- Implement a UHF backup cell
- Upgrade/Increase the Backhaul system to support the new design
- Implement VHF receivers for Marine communication.
- Implement a WAVE RoIP system.

The figure below is a graphic representation of the proposed system upgrade.

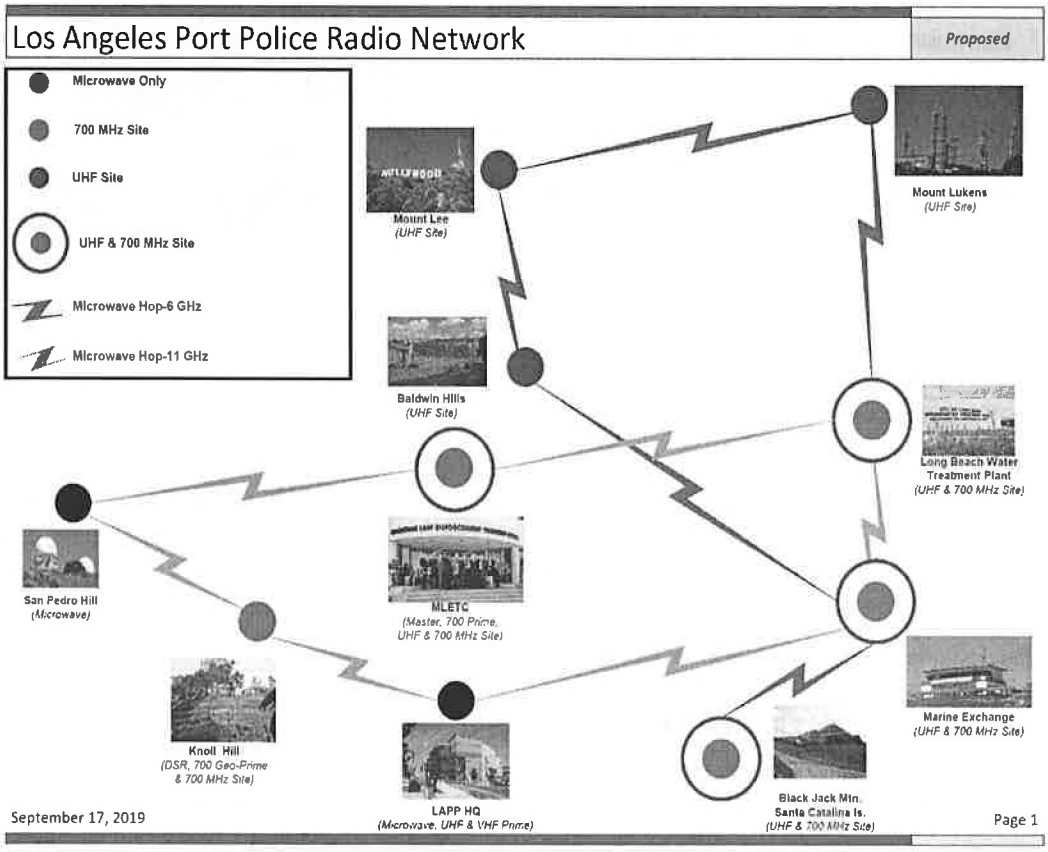


Figure 2-1: System Architecture

The "master site"—where core equipment is located—provides a central point of control for the operation of the radio communication system. From the master site, the Port's system administrators will have access to the hardware and software components that control call processing, network management, and system configuration. Common Server Architecture (CSA) reduces physical space and individual component requirements at the master site by using Virtual Management Servers (VMSs) to host server applications in a Virtual Machine (VM) environment.

The proposed ASTRO 25 Standalone Repeater (ASR) Sites provide base radios to route the Port's voice traffic to the system for distribution to other sites. The base radios also repeat each transmission to support other local user radios. ASR sites support packet data and route data traffic to the site controller. The site controller then routes these data packets upstream to the zone controller for further processing and routing.

The proposed Simulcast Sites provides simultaneous broadcast of the same voice or message from multiple transmitters on the same frequency. Simulcast sites provide consistent communications throughout large geographical areas, such as a large city, metropolitan area, county, or country. The architecture of a simulcast cell includes a simulcast prime site, which controls the cell and communicates with the system's master site, and one or more simulcast remote sites, which provide simulcast coverage to users. Because each simulcast cell operates like a single-site system, the Port's users benefit from simplified roaming and talkgroup configurations.

The proposed ASTRO 25 radio system includes a Digital Conventional Simulcast, which will enable digital simulcast operation with IP transport in the Port's conventional system.

The proposed Conventional Base Radio Sites provides coverage over the distance of the transmitter/receiver signals. A mobile or portable radio within range of the base radio or consolette can communicate with the dispatch operator and other mobile/portable users.

The proposed Voting Sites provide multiple satellite receivers to cover "dead spots" created by buildings or nature. Since the receivers operate on the same frequency, a field radio may simultaneously hit multiple sites when transmitting. A voting comparator compares and selects the best signal. This signal is then forwarded to the transmitter for rebroadcast to the user radios, as well as the console for dispatch operator monitoring.

2.3 CORE UPGRADE

The functionality and features of the Core will include the latest release of the ASTRO P25 systems. Features such as:

- TDMA operation for increased capacity
- Transcoding and Dynamic Assignment to fully utilize TDMA and FDMA resources
- User Login Alias Update for easier user identification
- Provision Management to facilitate additions/modifications to the system
- Enhanced Data to support a richer set of data-driven applications
- Location on PTT to enable tracking of subscribers with minimal system impact
- Key Management Facility to automatically manage and control encryption keys

These features will be described in more detail later in this document.

The new Core configuration also includes Inter-RF Subsystem Interface 8000 (ISSI). With this feature, the Los Angeles Port has the capability and flexibility of connecting to three (3) other

P25 systems, facilitating interoperability. This connection is available to P25 systems operating in different frequency bands, different system releases, or different manufacturers.

Another enhancement to the current system is the implementation of Dynamic System Resilience (DSR). The design includes two Cores, located at different geographical location in the Harbor District. The Primary Core will be located at the Police Headquarters Building and the secondary core will be located at Knoll Hill.This system configuration maintains critical radio communications in the event one core is lost, by immediately switching to the secondary Core. The switch occurs automatically, typically in less than 30 seconds. The fact that each core is at a separate location, enhances the total system resilience.

Geographic redundancy is also applied to the Prime Site for the 700MHz simulcast cell. Prime sites for this cell will be located at both the 300 Water Street location and the Police Headquarters Building. This again enhances system resilience in the same manner as DSR for the core. Switch-over will occur automatically, within 60 seconds but typically in less than 30 seconds.

2.4 RF SUB-SYSTEM DESIGN

The RF design is the base for defining the operational areas with the minimum voice and data guidelines. The goal of the RF design is to maximize the coverage over the operational area, while using the existing assets available to the Port of Los Angeles. The RF design is comprised of three distinct layers:

- One 700 MHz layer
- One UHF Citywide layer

The site and channel distribution for the 700 MHz trunk design is shown in Table 2-1, and its coverage concentrates on the Harbor District. Additional information and coverage maps are included in the 700 MHz Coverage section of the proposal.

Table 2-1: 700MHz Sub-System

Site	Band/Modulation	Channels	Cell
MLETC	Trunk 700 MHZ/TDMA	8	Harbor District
Marine Exchange	Trunk 700 MHZ/TDMA	8	Harbor District
Long Beach Water	Trunk 700 MHZ/TDMA	8	Harbor District
Knoll Hill	Trunk 700 MHZ/TDMA	8	Harbor District
Black Jack	Trunk 700 MHZ/TDMA	8	Harbor District

The site and channel distribution for the conventional, UHF design is shown in Table 2-2.

Table 2-2: UHF Sub-System's

Site	Band/Modulation	Channels	Cell
MLETC	Conventional Digital FDMA	1	Citywide
Marine Exchange	Conventional Digital FDMA	1	Citywide
Long Beach Water	Conventional Digital FDMA	1	Citywide
Black Jack	Conventional Digital FDMA	1	Citywide

Site	Band/Modulation	Channels	Cell
Mt. Lukens	Conventional Digital FDMA	1	Citywide
Mt. Lee	Conventional Digital FDMA	1	Citywide
Baldwin Hills	Conventional Digital FDMA	1	Citywide

The VHF Voting site consists of 3 receiver-only RF locations with a voting site at the Police HQ Building. It is intended to improve inbound coverage of the Marine Band in the Port area. The VHF sites are listed in Table 2-3.

Table 2-3: VHF Voting System

Site	Band/Modulation	Channels	Cell
MLETC	Conventional Analog	1	Marine VHF
Berth 84	Conventional Analog	1	Marine VHF
Gaffey Street	Conventional Analog	1	Marine VHF

2.5 SYSTEM RESILIENCY

2.5.1 Dynamic System Resilience

Dynamic System Resilience (DSR) maintains critical radio system communications in the event in case one core is lost by switching immediately to a second core. Having the cores in different locations further enhances system resilience.

The DSR option maintains full system functionality, including network management features and core component redundancy, assuring your system remains active at your most critical time of need—thus maintaining strategic communications and preserving the safety of your jurisdiction.

MAINTAIN COMMUNICATIONS DURING SYSTEM FAILURES

The switch between master sites is automatic and seamless, with minimal interruption to radio system users. DSR provides redundant data components that switch independently of voice components.

Dynamic System Resilience provides:

- **Real-time synchronization**—Without operator intervention, core configuration data syncs for rapid core switch-over.
- **Fast switchover**—Most systems return to wide-area trunking operation in less than 30 seconds.
- **Geographic Redundancy**—Having cores in two locations provides the highest level of system outage protection to deliver constant communications.
- **Failure testing**—Manual core switching enables periodic testing of failure protection and both cores.

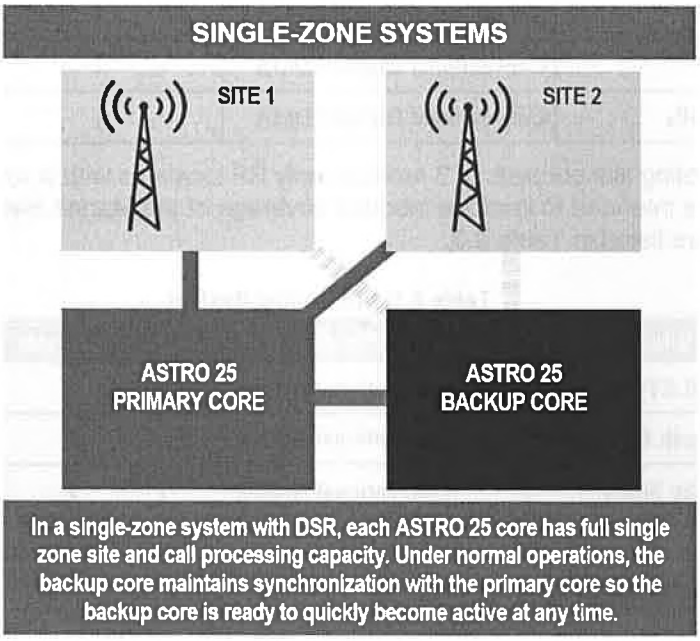


Figure 2-2: Dynamic System Resilience

2.5.2 Geographically Redundant ASTRO 25 Prime Sites

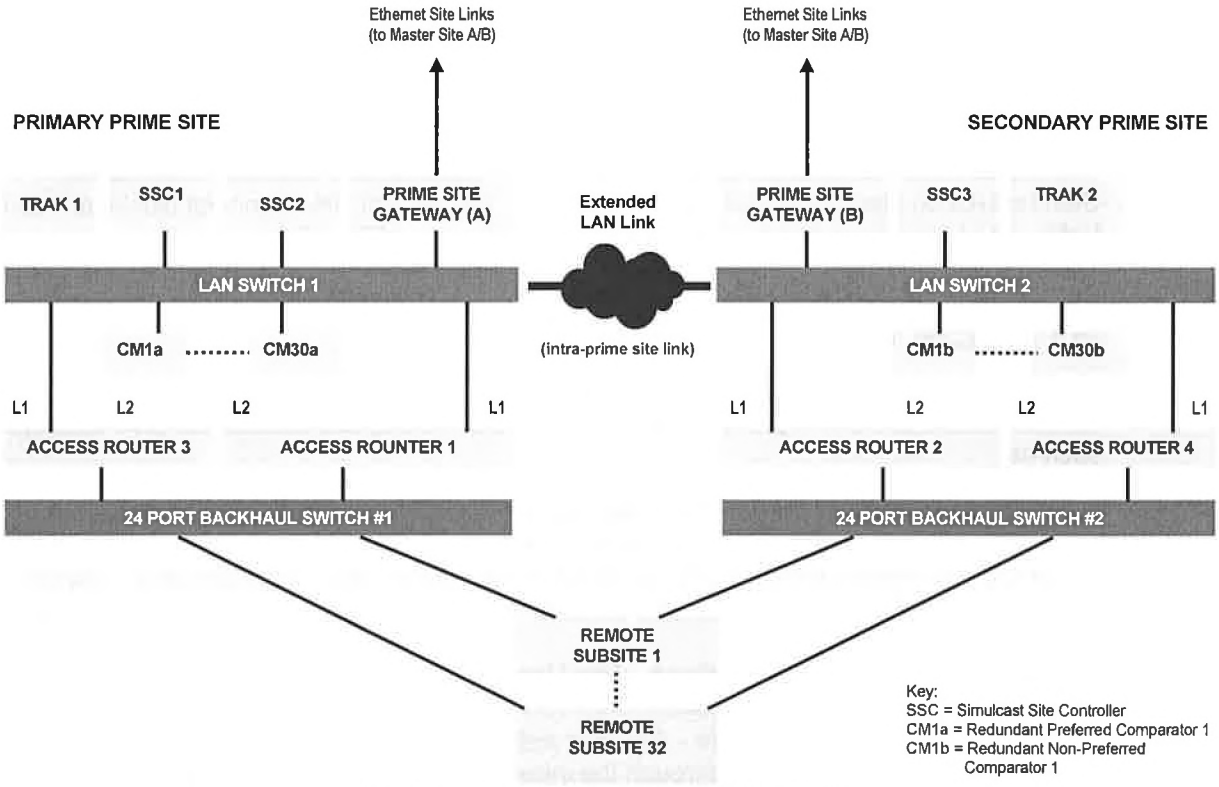
Geographically redundant ASTRO 25 prime sites keep wide-area simulcast subsystems operating even after a catastrophic loss of one of the prime sites. If the prime site becomes unavailable, the system automatically restores wide area operation with the secondary prime site.

SWITCHOVER IS FAST, AUTOMATIC

The ASTRO 25 system keeps users connected through a major catastrophe:

- Full functionality is provided on all the channels at the subsites.
- Redundant systems are easy to operate
  - All equipment is centrally managed
  - Simple, familiar system configuration and maintenance
  - Multiple locations appear to the system as a single prime site

A typical configuration is shown below.



Sample Geographically Redundant Prime Site Configuration

Figure 2-3: Sample Redundant Prime Site Configuration.

2.6 SYSTEM INTEROPERABILITY (ISSI)

Critical communications may come from a variety of sources and equipment. The proposed system will provide the Port with a gradual migration path to future system enhancements by supporting the following legacy Motorola Solutions equipment and technologies:

The proposed solution will provide the Port with extended interoperability features to connect the proposed system with other elements of the Port's communications.

Certain situations require first responders from different departments and jurisdictions to work together. ASTRO 25 provides the interoperability needed to coordinate a multi-agency response and communicate effectively during these mutual aid incidents. Through the Inter-RF Subsystem Interface 8000 (ISSI 8000) feature, the Port will have the flexibility to connect as a node on another P25 network regardless of that other system's radio frequency bands, manufacturer type, and release versions—allowing the creation of regional multi-system communications networks. These larger networks will allow multiple agencies to communicate seamlessly and share the costs of network infrastructure while still maintaining control over their own internal communications.

To enhance the interoperability added through ISSI 8000, the proposed ASTRO 25 radio system includes Inter-System Data to enable data services for radios roaming between systems that are connected through ISSI 8000. With Inter-System Data, the Port's IV&D data users will retain use of data applications and encryption while roaming across an ISSI connection.

2.7 SYSTEM VOICE ENCRYPTION

The proposed system supports end-to-end encryption using the AES encryption algorithm to ensure that only authorized radios can listen to encrypted transmissions on the network.

The **Advanced Encryption Standard (AES)** is an improvement over Data Encryption Standard (DES) algorithms and uses keys of 128, 192, or 256 bits to encrypt blocks of 128-bit traffic. The Motorola Solutions secure voice solution uses a 256- bit key.

2.8 SYSTEM CYBERSECURITY

In addition to system-level security capabilities, ASTRO 25 includes a robust set of cybersecurity service standards that will provide communications continuity and security for the Port's system, such as:

- Centralized Authentication – Provides one control point for identification, authentication, and authorization services, using Centralized Authentication, Authorization, and Accounting (AAA) with Active Directory (AD) for all Windows, Solaris and Linux platforms. Remote Authentication Dial-In User Service (RADIUS) extends the service to infrastructure network devices.
- Secure Network Communications – Provides secure point-to-point connections between two different machines through Secure Shell (SSH).
- Secure Network Management – Secures network traffic between network managers and SNMPv3-enabled elements through the inherent authentication and encryption capabilities of SNMPv3.
- Router Access Control Lists (ACLs) – Ensure that only authorized traffic can traverse the network by filtering traffic at core, exit, gateway, and site routers.
- Ethernet Switch Port Security – Prevents unauthorized access to the system through the ports on a network switch by providing an additional layer of security at the physical location of the equipment.
- Secure Software Download (SWDL) – Ensures that transfer operations are authenticated and encrypted, based on the Secure File-Transfer Protocol (SFTP), impeding interception of transmissions by unauthorized devices.
- Backup and Recovery – Enables the quick restoration of system devices under failure conditions through the centralized management of data backup and restore operations.
- Transparent Element Hardening – Removes nonessential tools, services, and utilities from the Windows Operating System, which could be used by an attacker to gain unauthorized access to system settings or data.

2.9 SYSTEM CAPACITY AND SPECTRUM MANAGEMENT

The level of traffic on the Port's system may vary depending on the time of day, day of the week, and emergency situations. Motorola Solutions takes great care to design systems that can meet peak performance levels without requiring resources that remain unused during slow periods. The proposed ASTRO 25 radio system includes features to ensure that resources are efficiently used.

The proposed system will support both **P25 Frequency Division Multiple Access (FDMA)** and **P25 Time Division Multiple Access (TDMA)** to provide the Port with the efficiency and

interoperability to accommodate a diverse fleet of user and mobile radios. With FDMA, radio frequencies are divided into smaller frequency bands, each with its own carrier frequency. TDMA divides each channel into two time slots, leveraging 2:1 channel efficiency to double talkpath capacity in the same radio frequency bandwidth allocation. Motorola Solutions' TDMA operation complements FDMA operation on the ASTRO 25 platform. Channels can be selectively configured to operate as either TDMA-only or FDMA-only. With TDMA operation enabled, voice calling capacity is increased over FDMA alone, without having to abandon FDMA operational stations and user radios.

Dynamic Dual Mode will enhance the ease of use and system operation for the Port's mixed fleet of P25 FDMA and P25 TDMA user radios. System administrators will not need to pre-assign base stations as P25 TDMA or P25 FDMA, because the system will automatically assign the appropriate station mode based on the needs of the radio user.

Dynamic Transcoding enables communications between the Port's FDMA and TDMA user radios, so that all sites and radios will be able to participate in a call regardless of the originating call type (see figure titled "Dynamic Transcoding" below). The call type is determined on a site-by-site basis, so more sites will operate in TDMA—even in the Port's mixed fleet of FDMA and TDMA radios. Each site operates in the best mode based on the channel resources available and capabilities of the radios at that site. Radio users communicate without a console patch or the need to downgrade the call. Radio users from TDMA-only and FDMA-only sites are able to join a Dynamic Talkgroup without changing the call type at either site, increasing the efficient use of channels and frequencies throughout the system.

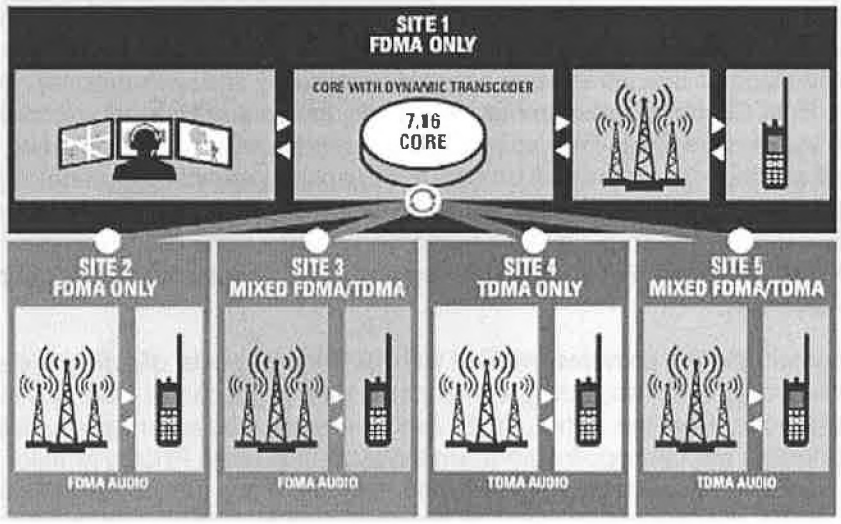


Figure 2-4: Dynamic Transcoding – Enables communications between the Port's FDMA and TDMA user radios, so that all sites and radios will be able to participate in a call regardless of the originating call type.

Dynamic Talkgroup Assignment allows the Port's dispatch operators to automatically coordinate between P25 TDMA radio users and P25 FDMA radio users, with no need to track or patch radio users together. Talkgroups will be automatically assigned as FDMA or TDMA modes depending on the capabilities of the affiliated user radios.

2.10 SYSTEM VOICE COMMUNICATIONS MANAGEMENT

The successful completion of calls is a vital factor in the ASTRO 25 radio system design. Targeting communications is important for both privacy and efficiency. Some information may be sensitive and intended for a specific person, while other information may be important for an entire group of radio users. Communications that are relevant for one group should not distract another group, and some radio users may need priority over other radio users when the system is busy. The proposed system for the Port includes a collection of features to maximize communications availability, target and prioritize communications, and minimize the effort required by radio users to complete calls.

The zone controller manages call processing in the system. If a zone controller failure prevents channel requests from being acknowledged, the Automatic Retry feature will continue sending channel requests from the individual user radio until the request is acknowledged, or until a total of 16 automatic retries occur. If a radio user presses the push-to-talk (PTT) button and fails to find an open channel, Busy Queuing/Call Back will deliver a busy tone and place the call into a busy queue. As channels become available, they will be assigned to calls in the queue using pre-assigned priority levels. Radio users will be notified of the assigned channel through a call-back tone.

To ensure uninterrupted communications, Recent User Priority will give priority over other radio users to radio users who have been recently assigned a voice channel. Recent User Priority will provide priority system access for up to 10 seconds between transmissions to a talkgroup engaged in a conversation. Misdirected Radio Protection uses embedded signaling to ensure a radio from one talkgroup cannot accidentally be assigned to a voice channel being used by a different talkgroup. If a user radio is accidentally assigned to a different talkgroup channel, the radio will recognize that it has been assigned incorrectly and automatically revert to the control channel. With Continuous Assignment Updating, the control channel will continue to transmit the channel assignment for as long as a talkgroup is using an assigned channel. This ensures a radio just coming into service will be sent to the appropriate voice channel to join the rest of its talkgroup. Radio Talkgroup Muting will allow the radio user to mute all voice traffic for the currently selected talkgroup, including emergency voice received. The radio can be automatically unmuted by the dispatch operator or another radio user by sending the muted radio a Call Alert.

The proposed system provides the Port with 10 Priority Levels, allowing system administrators to segment radio users according to their communications needs. Priority 1 is always reserved for emergencies. Priorities 2 through 10 can be assigned on a per radio or talkgroup basis. These priorities are only applicable when the system is busy. Priority Monitor allows the radio user to scan talkgroups in their system, and mark up to two talkgroups in their scan list as Priority. A non-priority conversation will be interrupted by Priority 1 or Priority 2 talkgroup activity.

Dispatch operators can selectively call and carry on a Private Call with another individual radio, as long as that radio is not already engaged in another Private Call. The calling radio receives an acknowledgment of a successful Private Call. If the receiving radio has a display, it shows the calling party's radio ID. To protect channel availability for mainstream operations, Private Call management can control how many resources are dedicated for private calls at a trunking RF site. The system administrator can pre-configure and limit the number of simultaneous private calls that are active at a particular site, or even disallow private calls entirely.

Dispatch operators can make a simultaneous call to multiple talkgroups, with all radios configured for talk-back capability. Dispatchers can program this Multi-Group Call to operate in one of two ways:

1. The requesting radio user waits for all requested talkgroups to finish all calls in progress.
2. The requested call immediately interrupts other conversations in progress without waiting for active radio users to de-key. Radio users who are transmitting on a voice channel do not hear the call until they de-key.

The proposed system provides a dispatch function called Dispatch Console/Talkgroup Merge to allow multiple talkgroups to operate together on one voice channel, improving channel efficiency.

The proposed system allows the Port to establish Conventional Talkgroups to separate voice communications between multiple agencies sharing an RF conventional channel. Radio users and dispatch operators using the same talkgroup can communicate with each other, while radio users from other talkgroups on the same channel cannot hear them. Dispatch Operators receive and transmit only to their associated radio user groups (or agencies), enabling dispatch operators to clear their own emergencies without affecting other talkgroups.

When using an ASTRO 25 radio equipped with GPS, the Geo Select feature dynamically changes that radio's operating talkgroup based on their current location. With Geo Select, dispatch operators can draw a boundary on their MotoMapping application so that radio users in, arriving to, or departing from the defined area are automatically placed in the correct talkgroup. The Geo Select feature will provide the following capabilities to the Port:

- Enables hands free, automatic talkgroup selection and optionally notifies personnel with text message and/or alert tone as they enter and exit designated areas.
- Allows radio users to be shifted to the right talkgroup as they approach incident scenes and worksites.
- Enables radio users to override the assigned talkgroup.
- Supports permanent or dynamic boundaries.

The Enhanced Geo Select feature enables an APX radio to immediately take action upon crossing a defined geographical boundary, or "geofence". This feature allows for quicker incident response times and simplified operations for radio users based on their geographic location. By providing automatic incident alerts and auto talkgroup channel selections, Enhanced Geo Select results in more effective communications and enhanced safety for field personnel.

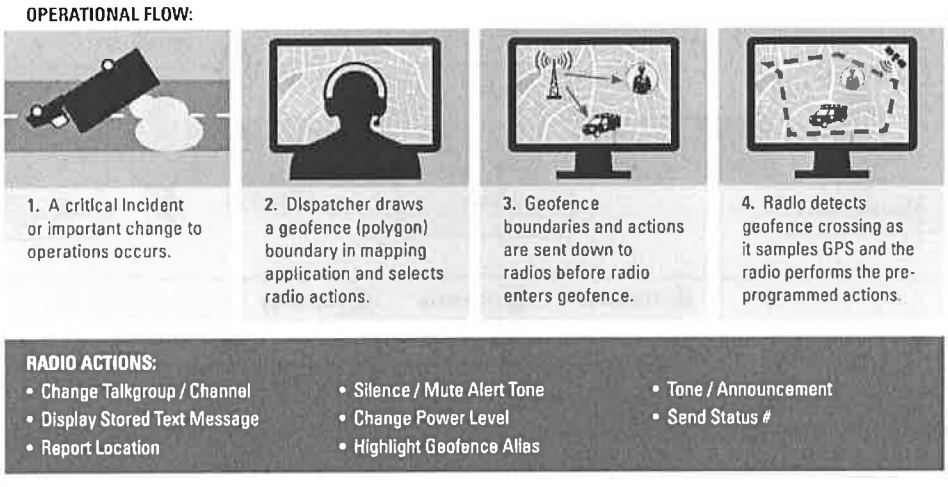


Figure 2-5: Enhanced Geo Select Operational Flow

The proposed system offers the capability to designate certain channels as "Mutual Aid" channels, so that emergency responders can communicate and lend assistance across jurisdictional boundaries. This may be required due to an emergency response that exceeds local resources, such as a disaster

or a multiple-alarm fire. Radio communications between these organizations may be shared on a Mutual Aid radio channel.	PROVIDE SUPPORT ACROSS JURISDICTIONAL BOUNDARIES

Mutual Aid channels have been, and usually still are, conventional analog channels; however, all digital and mixed-mode channels are supported. These conventional Mutual Aid channels count against the overall station count in the overall system channel capacity.

2.11 SYSTEM DATA COMMUNICATIONS MANAGEMENT

The proposed system's Project 25-compliant Integrated Voice and Data (IV&D) operation allows data traffic to seamlessly use the the Port's ASTRO 25 radio system, improving in-field efficiency. The IV&D service creates a data transport layer capable of supporting both industry-standard IP and customer-developed applications.

Over-The-Air Rekeying (OTAR) employs encryption keys to keep communications secure, and updates those keys automatically without the delays, inconvenience, and administrative cost of having radio users bring their radios into the shop for manual reprogramming.

POP25, or Programming over P25, updates the configuration parameters of fielded user radios over-the-air while the radios remain in use, enabling quick reprogramming of the entire fleet of radios with no disruption to operations.

The Over-the-Air (OTA) Software Update feature provides a more efficient way to distribute radio software to an entire fleet of APX radios. This feature allows updates to be sent as a background service over the ASTRO 25 trunking radio system, without interrupting day-to-day operations. The OTA Software Update feature saves time, effort, and expenses related to system updates by eliminating the need to pull radios out of the field and into the shop for manual radio maintenance.

The figure below demonstrates how APX radios receive different types of updates from Radio Management via the OTA Software Update feature.

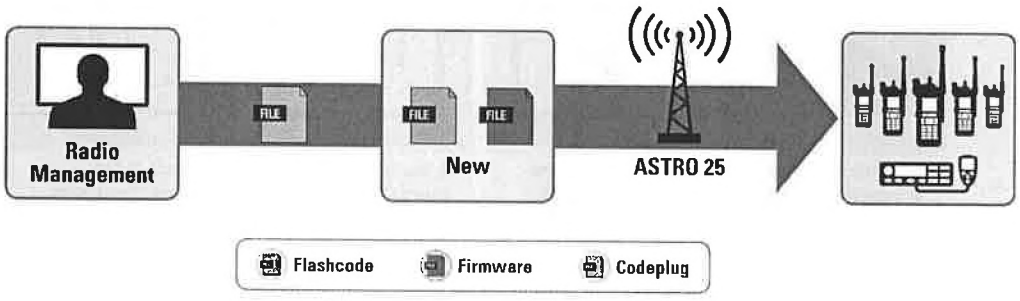


Figure 2-6: Firmware Download Process

Location Capabilities pinpoints the geographic location of user radios, enabling dispatch operators to deploy nearby personnel for quick response and to swiftly aid first responders who are in need of assistance.

The Location on Push-to-Talk (PTT) feature enables ASTRO 25 trunked radio systems to continuously track the location of individual radio users while they are involved in voice

calls. With each transmission, the APX radio with Location on PTT will send its Global Positioning System (GPS) location to the dispatch mapping application. ASTRO 25 Location on PTT provides timely, accurate location information when needed most – during emergencies and critical incidents that require intense voice collaboration.

ASTRO 25 Advanced Messaging Solution helps radio users convey detailed information, offload voice traffic, share knowledge, run queries and communicate with other devices through SMTP email in situations where verbal communication is less desirable because the environment is too loud or radio users do not want to be overheard.

Enhanced Data introduces a new type of data channel to support short, periodic inbound messages, such as GPS location, on APX user radios. Dispatch operators use these inbound messages to track radio users' status and location. ASTRO 25 Enhanced Data provides up to 12 times the capacity of a P25 standard data channel. For agencies using carriers for broadband traffic, Enhanced Data moves the short-burst inbound traffic to the ASTRO 25 network, avoiding carrier charges and coverage limitations. Converting P25 FDMA channels to TDMA makes room for additional channels for voice and data. Channels can be dedicated to data to optimize throughput and access times, while emergency voice traffic continues to automatically take priority. Enhanced Data enables several data-driven applications (i.e. SCADA, geofencing, telemetry, and biometrics) over the ASTRO 25 radio system. When supporting a variety of special-purpose applications, Enhanced Data can help provide a more timely and detailed view of resource locations and conditions.

Transit25 enables the addition of a third-party transit application to the proposed ASTRO 25 IV&D system, in order to transmit messages to a fleet of vehicles. Transit25 can be used to track the location of vehicles that belong to the fleet, and communicate between vehicle and dispatch operator using both data and voice.	**SEAMLESS COMMUNICATION BETWEEN DISPATCH AND YOUR FLEET OF VEHICLES**

Group Services uses talkgroups to broadcast data, sending information to multiple APX radio users simultaneously. Group Services allows APX radios to take advantage of two data features: Talkgroup Text Messaging and Alias Group Download. These functions provide simultaneous, mass transmission of text and alias information to all APX radios in a voice talkgroup. Group Services improves operational efficiency by eliminating the need for texts to be sent one radio at a time and aliases to be entered manually. Group Services works in the background, giving voice traffic priority on the talkgroup.

Alias Group Download allows system administrators to remotely update the push-to-talk (PTT) ID alias information for APX radios that are enabled for Group Services. Alias Group Download eliminates the need for physical access to a radio to do a codeplug update to change the radio PTT ID alias, instead, activating PTT updates the radio's ID alias, saving time and eliminating errors caused by entering the alias information in two places.

AMS Talkgroup Text Messaging improves dispatch operator efficiency and the safety of personnel in the field by sending one-to-many text messages over the voice channel to APX radios that are enabled for Group Services. This ASTRO 25 feature allows dispatchers to quickly broadcast high priority text alerts, including Be On the Look Out (BOLO), AMBER Alert, All Points Bulletin (APB), and Weather Alert.

Text messages can also be used to discreetly advise personnel of sensitive situations, providing incident information in a form that can be quickly referenced. These one-way outbound messages are transmitted simultaneously to the entire talkgroup, rather than being sent individually to each radio user over the data channel.	**ALL RADIOS IN A TALKGROUP RECEIVE TEXT MESSAGES SIMULTANEOUSLY**

This feature helps dispatchers to coordinate field personnel with uniform text messages and alerts. AMS Talkgroup Text Messaging supports text messages from the following sources:

- MCC 7500 and MCC 7100 console positions.
- Advanced Messaging Solution (AMS) through Smart Client, PremierOne CAD, and Mobile Clients.
- Third-party CAD systems.

2.12 LOCATION SERVICES

Location Capabilities pinpoints the geographic location of user radios, enabling dispatch operators to deploy nearby personnel for quick response and to swiftly aid first responders who are in need of assistance.

The Location on Push-to-Talk (PTT) feature enables ASTRO 25 trunked radio systems to continuously track the location of individual radio users while they are involved in voice calls. With each transmission, the APX radio with Location on PTT will send its Global Positioning System (GPS) location to the dispatch mapping application. ASTRO 25 Location on PTT provides timely, accurate location information when needed most—during emergencies and critical incidents that require intense voice collaboration.

The figure below demonstrates how a portable radio sends its location via PTT to a dispatch operator.

Figure 2-7: Location on PTT Over Voice Channels

The Enhanced Geo Select feature enables an APX radio to immediately take action when crossing a defined geographical boundary, or "geofence", allowing for quicker incident response times with automatic incident alerts and auto talkgroup channel selections.

Radios no longer need to send their information to the mapping application and wait for the mapping application to send geofence commands back to the radio, radios respond virtually immediately to new geofence and radio action information.

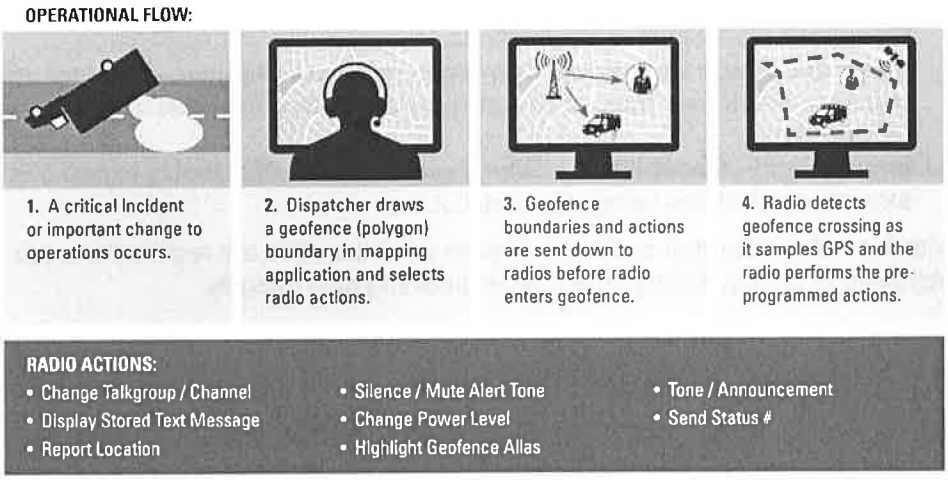


Figure 2-8: Enhanced Geo Select Operational Flow

2.13 SYSTEM CONFIGURATION MANAGEMENT

The ASTRO 25 system will provide the Port's system administrators with a centralized approach to configuring the proposed system.

With the Unified Network Configurator (UNC), the Port's system administrators will be able to configure networks and devices in the ASTRO 25 system through easy editing screens and configuration "wizards." Role-based radio user setup, auto discovery of devices/configurations, and minimized data entry reduces configuration errors and initial configuration time. Personnel can quickly access historical configuration and forensic information, and quickly roll back to previous configuration versions, if necessary.

The UNC can direct comparison between the current system configuration with any planned changes, simultaneously displaying the configurations and enabling the scheduling of any changes for distribution during off hours, minimizing the impact of system changes on communications. The UNC is highly secure, supporting SSH and SNMP passwords and providing an automated mechanism to seamlessly roll passwords and passphrases.

The Provisioning Manager (PM) enables the Port's system administrators to provision the infrastructure and devices in the ASTRO 25 radio system through a GUI. The PM offers a well-rounded set of features:

- **Streamlined Web-Based Graphic User Interface** – Requires fewer keystrokes to manage critical information. Provides a central point for the configuration of operational parameters for mobile and portable radios, dispatch operator positions, and system administrators.
- **Batch Creation of Radios and Talkgroups** – Minimizes data entry and reuses configuration information through "Multi-Instance Creation."
- **Enhanced Agency Partitioning** – Allows system administrators to define data partitions of system management resources among various agencies and radio users.
- **Provisioning Manager Audit** – enables stricter enforcement of system policies and provides an efficient way of troubleshooting configuration issues. Allows the system administrators to navigate between an audit record and the corresponding configuration record.
- **External Provisioning Manager Interface** – Provides an interface that partners with an identified third-party vendor (Genesis, MCM, Premier One, NGI) to provide an integrated

solution for critical customer applications on the system, such as, Asset Management, Billing, and Fleet Mapping applications.

- **Radio and Radio User fields Combined into One Window** – Provides efficient management of user radio provisioning by eliminating the need to enter device information multiple times.
- **Import/Export Capabilities** – Offer a convenient mechanism to export and import data from external applications using .csv protocol.

With the PM's integrated database, system administrators are required to enter data only once, improving accuracy, saving time, and maintaining data integrity.

2.14 SYSTEM PERFORMANCE MANAGEMENT

The ASTRO 25 performance suite will enable the Port's system administrators to monitor, manage, and report on system performance in near real-time, as well as proactively plan for expansion. The performance suite comprises both Motorola Solutions and third-party management applications that are certified, integrated, and supported by Motorola Solutions. Together, these applications provide a complete picture of how the system is operating.

GenWatch3® enables the Port's system administrators to view and monitor live traffic, report on system activity, and manage system resources down to the user-radio level. It provides at-a-glance views of network performance from every angle—system, site, channel, slot, agency, talkgroup, and user radio. GenWatch3 monitors networks from a centralized location and sends alerts during critical system events. Key Performance Indicators display real-time activity on calls, busies, connections, and peak usage.

ZoneWatch is a performance management tool that has customizable displays and grids to monitor real-time communications activity. The information displayed will help the Port's system administrators become proactive in resource planning decisions, such as when additional channels are needed. ZoneWatch also receives fault information related to repeater sites, console sites, and the zone controller from the Unified Event Manager (UEM).

Affiliation Display provides a dynamic view of the affiliated sites for all operating radios, allowing the Port's system administrators to monitor how radio users travel between different sites and communicate with assigned talkgroup members and those outside of their talkgroup. Affiliation Display traces the state/location of each user radio on the system and can also identify each user radio's location and affiliation information by site, console site, radio, channel, and talkgroup.

The Radio Control Manager (RCM) allows the Port's dispatch operators to monitor and manage radio events, issue and monitor commands, and make informational queries of the system database. The RCM allows dispatch operators to perform the following tasks:

- Send commands to radios over the air and monitor their status.
- Check the status of a radio.
- Monitor events sent from radio users in near real time as the information becomes available in the system.

InfoVista will provide the Port with interfaces to obtain data from multiple network devices that support Simple Network Management Protocol (SNMP), including the master site gateways, Ethernet LAN switches, and Cooperative Wide Area Network Routing (CWR). This data includes CPU utilization, memory utilization, buffer utilization, port characteristics, and traffic analysis. In particular, InfoVista performs the following tasks:

- Collects Management Information Base (MIB) data at specified time intervals.
- Reports and graphs MIB data for single or multiple devices, spanning daily, weekly, monthly, and yearly time periods.
- Uses pre-configured report templates to provide customized reports for network transport devices.

InfoVista sends warnings and major traps to the Unified Event Manager (UEM) for the key statistics that it collects. The traps sent to UEM are generated from the daily reports for the individual devices. All key statistics have two thresholds:

- Threshold warning (Tw) – If the statistic exceeds this value, a warning trap is sent.
- Threshold major (Tm) – If the statistic exceeds this value, a major trap is sent.

These warning messages can be acted on immediately or collected into InfoVista performance management reports that can be used to troubleshoot network performance and plan for increases in capacity.

The Software License Manager will provide the Port with a central interface for network management licenses, reducing the time, effort, and complexity of software and license management. The Software License Manager enables the management of system capacity, system features, application user sessions, and trial licenses. A consolidated view of software licenses in the system allows system administrators to view current licenses, determine whether licenses are underutilized, and purchase new features and capabilities.

Flexible Air Traffic Information Access (ATIA) allows an external computer to record and archive air traffic information for all the call processing activities and other site events in the system. ATIA messages include the date, time, and description of the event that occurred, such as a user radio registration, call request, or site handover. This information provides system administrators with details of what is happening on the system. ATIA stream data can be integrated with third-party applications to produce detailed reports custom- built to the Port's specific requirements.

Historical Reports will provide the Port with statistical data that is gathered at specific, predefined time intervals. System administrators can use these reports to monitor and analyze information about sites, channels, talkgroups, and radio users. This data is displayed using predefined report templates and parameters. Historical reports allow system administrators to do long-term analysis of traffic data.

Radio Control Manager (RCM) Reports will allow the Port to create, view, print, schedule, and export standard reports from actual RCM server database information. These reports use a common format so the data can be displayed and manipulated through standard spreadsheet applications. RCM Reports enable system administrators to display and analyze data showing RCM activity on the system.

Dynamic Reports monitor and report usage trends to improve radio and talkgroup system management. System administrators will be able to closely examine what happens during a shift or set period of time, for example, checking the busy count to see if calls are being missed. Through the analysis of data delivered by Dynamic Reports, the Port can develop plans for system expansion and design upgrades to improve communications.

2.15 SYSTEM FAULT MANAGEMENT

System performance depends on the proper functioning of the system's software and components. The proposed system includes the following features to facilitate the detection, isolation, and resolution of events that are reported by system components.

The Unified Event Manager (UEM) provides critical fault management, including processing and presentation of events that are sent by managed devices. Historical and real-time traffic screens will give the Port's system administrators access to radio events, radio status, and any device alarms.

The UEM supports the following main functions:

- **Device discovery** – The UEM is optimized to quickly discover the managed devices in the system.
- **Fault management** – Fault management in the UEM includes processing and presentation of events sent by a managed device.
- **Supervision** – The UEM periodically checks its ability to communicate with the devices it manages.
- **Synchronization** – The UEM performs synchronization automatically, by validating the health of a device with the information stored in the fault management database.

The UEM will provide secure communications with the Port's managed devices. If a loss of communication with a managed device occurs, that failure will be reported to the UEM, which will alert administrators according to the severity of the event. The UEM's alarm view dynamically updates based on the condition of the reported device (that is, the alarm will be cleared from the alarm view when a device sends a clear event to the UEM).

The UEM is the system's main fault manager, aggregating all system health information and managing the status of non-Motorola Solutions equipment through SDM3000 Remote Terminal Units (RTUs). Devices from other manufacturers managed by the UEM include power and security equipment, microwave radios, and environmental alarms for doors, and control tower lights.

UEM Enhanced Navigation enables advanced navigation and data visualization capabilities in the UEM client. The user can navigate through zone and system health information using a drill-down navigation concept, traversing through additional views and visualizing data related to infrastructure health. The enhance navigation enables the following features:

- System Map.
- Site View.
- Network Element View.
- Visualization of RTU Digital Input/Digital Output/Analog Input information.
- Advanced drill-down navigation.

The UEM Microwave View enables an advanced map view of microwave radio infrastructure, enabling system administrators to view the status of all microwave radios in a system on a single map screen. The microwave radios are represented as symbols on a static or geographical map, including the capability to mark the link relation between specific microwave radios.

The UEM Simple Network Management Protocol (SNMP) Element Management Toolkit enables third-party vendors to define SNMP messages between their devices and the UEM, allowing system administrators to monitor faults on critical third-party devices directly from the UEM.

UEM Email Alarm Notifications will allow the Port's system administrators to configure e-mail notifications for events and alarms in the Unified Event Manager (UEM) application. Alarm notifications can also be forwarded to a mobile device such as a cell phone or personal digital assistant (PDA).

North Bound Interface (NBI) describes an interface offered by many Network Management System (NMS) products, such as Unified Event Manager (UEM), which allows for NMS features, functions, and data to be accessible for Operations Support System (OSS) and Manager of Managers (MoM). NBI uses SNMPv3 and the User-Based Security Model (USM) to provide secure communication between the UEM and NMS. NBI offers the following services:

- **NBI Event Forwarding** – The events reported on the UEM are sent to registered NMS products using SNMPv3 traps.
- **NBI Notification Persistence** – The UEM stores the last 300 forwarded events to enable the NMS to quickly retrieve any events it may have missed.
- **NBI Event Synchronization** – The UEM provides the means for the NMS to query and obtain a set of events from the UEM datastore. This feature is typically used to obtain events missed due to lost traps or when connectivity between the UEM and NMS is lost temporarily.
- **Getting QuickSync events** – The UEM provides the means for the NMS to query and obtain a set of events from the UEM datastore. This feature is typically used when the missed trap is within the most recent 300 traps captured in the NMS.
- **NBI Alarm Synchronization** – The UEM provides the means for the NMS to query and obtain a set of alarms from the UEM datastore. This feature is typically used to re-synchronize fault information on the NMS after an extended outage.

2.16 SYSTEM ALERTING CAPABILITIES

Certain circumstances require the immediate alerting of personnel. Whether a specific individual or an entire group of radio users needs to be notified, the proposed system will provide the Port with the capabilities needed to alert dispatch operators and radio users of important information and critical situations.

The Call Alert feature uses the control channel to enable a dispatch operator or radio user to page another dispatch position or individual radio without affecting voice channel capacity. Call Alert sounds a tone on the receiving radio and returns an acknowledgement to the initiating radio. If the receiving radio is in a voice call, the alert tone sounds in the background, so the voice message continues to be clearly heard.

The Emergency Alarm and Emergency Call features provide the alerting capabilities needed for critical situations. With Emergency Alarm and Emergency Call, a radio user can quickly inform the dispatch operator of a life-threatening situation. The simple press of the radio's emergency alarm button sends an audible and visible alarm and the user radio's ID to the dispatch operator and, potentially, other talkgroup members.	**ALERT DISPATCH OF AN EMERGENCY WITH THE PUSH OF A BUTTON**

The dispatch console receives immediate notification, even when the system is busy, and an available channel is assigned immediately to the emergency call. If the system is busy, the Port's dispatch operators will be able to choose between two alternatives for handling emergency traffic:

- **Top of the Queue** – The emergency caller is put at the top of the busy queue. As soon as the first radio user on any channel de-keys, the emergency caller is assigned that channel. This approach prevents contention for the channel.
- **Ruthless Preemption** – The zone controller re-assigns the channel with the lowest priority call to the emergency caller—a feature unique to Motorola Solutions trunking systems.

With Site Selectable Alerts, the proposed ASTRO 25 radio system will allow the Port to customize preconfigured alert tones and voice messages to all APX user radios at selected RF sites. The alert sounds in the background of an active call and on idle radios. User radios display a short message. Up to 15 alerts can be configured in advance, and then selected by user radio to be broadcast once or repeated at a specified cadence. Preconfigured notifications are ideal for alerting team members to take appropriate actions, such as "vacate the area", "move to Stage 3", or "return to the command post".

2.17 SYSTEM BACKHAUL EFFICIENCY

The efficiency, reliability, and capacity of the ASTRO 25 radio system backhaul are crucial to overall network performance. The proposed solution for the Port includes MPLS Routers to efficiently manage and segregate IP traffic between destinations.

2.18 SYSTEM COMPONENTS

An ASTRO 25 radio system is comprised of a master site and one or more radio frequency sites. This section provides descriptions of the components at each location.

2.18.1 Master Site Core Components

The equipment at an ASTRO 25 master site provides an adaptable and affordable platform for mission critical wireless communications in a scalable and virtualized configuration. The master site equipment comprises the system's core components, including a common server architecture (running the applications that provide command and control for the system) and LAN switches (routing information to and from the master site to the radio frequency sites that provide system coverage).

2.18.1.1 Common Server Architecture

A master site's Common Server Architecture (CSA) deploys server applications with the Linux/Windows operating systems on a HP DL380 Virtual Management Server (VMS) host. The VMS hosts the following server applications through VMware in a Virtual Machine (VM) environment:

- **Air Traffic Router (ATR)** – Captures data exhibited by Affiliation Display, Dynamic Reports, Historical Reports, Radio Control Manager (RCM) Reports, and for systems with the Inter-RF System Gateway (ISGW) employing the ISSI 8000/CSSI 8000 feature. The ATR also captures foreign talkgroup and foreign Subscriber Unit Identifier information for ZoneWatch to display.
- **Backup and Recovery (BAR) Server** – Backs up and restores critical data.
- **Core Security Management Server (CSMS)** – Provides antivirus service and multi-factor authentication.
- **User Configuration Server (UCS)** – Stores information about user radios, talkgroups, critical sites, and security information.
- **Zone Database Server (ZDS)** – Exports infrastructure and subscriber information it receives from the User Configuration Server (UCS) to consoles and site gateways (conventional channel interface).
- **Zone Statistics Server (ZSS)** – Provides database storage of statistics and back-end processes required for zone-level functions.

- **Zone Controller (ZC) –** Provides centralized control for call processing and mobility management functions.
- **License Manager** – Stores and manages software licenses.
- **Unified Event Manager (UEM)** – Provides fault management.
- **Unified Network Configurator (UNC)** – Provides controlled and validated configuration management of system devices.
- **Authentication Center (AuC) Server** – Provides key management function in the system and stores authentication keys.
- **Firewall Management Server (FMS)** – Enables ongoing monitoring, management, and resolution of events and alarms generated by the firewalls.
- **Centralized Event Logging Server (Syslog) Server** – Captures Operating System (OS) events generated by most devices in the Radio Network.
- **Unified Network Configurator (UNC) Device Server (UNCDS)** – Enables the UNC to manage up to 15,000 devices.
- **System Statistics Server (SSS)** – Stores and provides statistical data for the system.
- **vCenter Appliance** – Manages all fault tolerant Packet Data Gateways (PDGs) and ATRs.
- **Network Management (NM) Client** – Provides a virtual workstation for system administrators and technicians to use for various system-related tasks.
- **Dynamic Transcoders** – Allows talkgroup calls and radio-to-radio (private) calls to communicate between TDMA channels and FDMA channels at different sites.
- **Intersystem Gateway (ISGW)** – Supports an ISSI interface and a CSSI interface for interconnectivity with P25 compatible systems and consoles.
- **IP Packet Capture (IPCAP)** – Captures transactions between network elements and collects performance data for Virtual Management Servers (VMSs).

2.18.1.2 Firewall

A firewall provides network boundary enforcement and attack detection features. The firewall restricts traffic to known sources, destinations, and protocols, based on the hosts and services that are specified in the firewall configuration. All undefined traffic is discarded.

2.18.1.3 LAN Switches

The master site includes one or more LAN switches. The LAN switches aggregate all the Ethernet interfaces for all servers, clients, and routers at the core.

The proposed system for the Port will include redundant LAN switches for added system resilience.

2.18.2 Radio Frequency Site Component Descriptions

An ASTRO 25 Radio Frequency (RF) site supports a wide variety of configurations to meet critical communications requirements for present and future communication needs. Depending on the RF site configuration, each RF site has several different components. The following components are included in the RF sites provided as part of our solution for the Port.

2.18.2.1 GTR 8000 Expandable Site Subsystem

The GTR 8000 Expandable Site Subsystem (ESS) (see the figure titled "GTR 8000 Expandable Site Subsystem") enclosure integrates reconfigured GTR 8000 base stations, site LAN switches,

and GCP 8000 controllers, along with an optional Radio Frequency Distribution System (RFDS), depending on the needs of the proposed configuration, into a single cabinet.

The ESS provides the following important benefits:

- Integrated design provides a smaller footprint at the site.
- Front/top access design and minimized cabling reduces install and service labor.
- Increased power supply redundancy through common power bus.

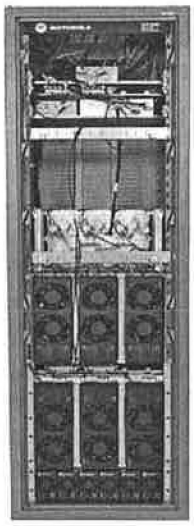


Figure 2-9: GTR 8000 Expandable Site Subsystem – Integrates base radios, site controllers, reference distribution modules, and Ethernet LAN switches in a single cabinet.

Voice traffic is routed from each of the site base stations to the system for distribution to all sites associated with the call.

2.18.2.2 Enhanced GGM 8000 Conventional Channel Gateway

Enhanced Conventional Channel Gateways (ECCGWs) connect dispatch operators to analog or digital conventional channels in the system. Up to 16 conventional channels can be connected to the eight analog and eight V.24 ports on a GGM 8000-based ECCGW in any mixture of analog, MDC 1200 digital or mixed mode.

In addition to the 16 channels supported on the analog and V.24 ports, the ECCGW can support up to 16 digital conventional channels through its IP port. Mixed mode channels must use a V.24 port for the digital portion.

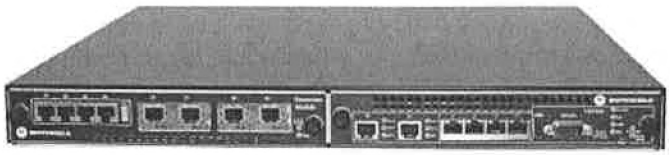


Figure 2-10: Enhanced GGM 8000 Conventional Channel Gateway - Connects dispatch operators to analog or digital conventional channels in the system.

2.18.2.3 G-Series Site Components

G-series site equipment uses a standard chassis (see the figure titled "G-Series Chassis") for individual site components. Six basic modules create the entire G-series platform, resulting in reduced spare parts inventory. Modules have front access to improve serviceability with hot-swap support to ensure channels are back on the air in minimum possible time. Standard battery revert and charging capability is built into every G-series power supply. Integrating these capabilities eliminates the need for a large uninterrupted power supply and saves valuable site space.

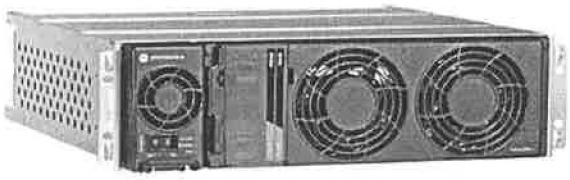


Figure 2-11: G-Series Chassis – A single chassis and six basic modules create the entire G-series platform, resulting in reduced spare parts inventory.

- **GTR 8000 Site Repeater/Base Radio** – The GTR 8000 base radio consists of a transceiver module, power amplifier module, fan module, and power supply. The transceiver module includes the functionality for the exciter, receiver, and station control. The base radio software, configuration, and network management, as well as inbound/outbound traffic handling, are performed through this transceiver module. On-board serial and Ethernet ports are located on this module for local servicing through Configuration/Service Software (CSS). The power amplifier module amplifies the low-level modulated RF signal from the transceiver module and delivers the amplified signal on the path to the transmit antenna. The power supply module supports the transceiver and power amplifier modules, and can also provide auxiliary power to a connected site controller or receive multicoupler/low noise amplifier.
- **GCP 8000 Site Controller** – The GCP 8000 Site Controller is used at an ASTRO 25 trunking site to assign voice and data channels, manage and report alarms on site resources, provide Ethernet switching capability, and provide a frequency reference to GTR 8000 Base Radios. The frequency reference is provided either via a GPS receiver or an ultra high stability oscillator. The nature of these frequency references eliminates or minimizes site visits for frequency tuning servicing.
- **GCP 8000 Conventional Site Controller** – The GCP 8000 Conventional Site Controller provides mission critical call processing and mobility management throughout the ASTRO 25 conventional system. The GCP 8000 interfaces through the Ethernet LAN switch, providing access to the packet switched network through the core gateway. Equipped with a single controller module, the GCP 8000 can support the full set of dispatch consoles, archiving interface servers, and conventional gateways.
- **GCM 8000 Comparator** – The GCM 8000 Comparator supports up to 32 trunking remote sites and up to 64 conventional sites for simulcast or receiver voting. It performs frame-by-frame voting on multiple received signals and recombines the frames to produce a signal with the best possible audio quality. GPS launch-delay timing ensures seamless broadcast of the voted frames from multiple voice signals into one high-quality transmit signal.
- **GPW 8000 Receiver** – In conventional and trunking voting or simulcast voting applications, the GPW 8000 Receiver increases in-bound signal coverage for subscribers. Physical space is optimized at receive-only sites with the GPW 8000 space efficient dual receive module design. The GPW 8000 receiver will allow the Port to reuse legacy receive-only stations.

Trunking GPW 8000 Receivers also support TDMA. A GPW 8000 unit with two TDMA-enabled receive modules supports four simultaneous voice or data streams.

2.18.2.4 Simulcast High Availability (HA)

The Simulcast Prime Site High Availability feature replaces the standard two LAN switch configuration (three switches for more than 15 remote sites) at the simulcast prime site with four LAN switches setup in a mesh configuration. When the same site resources are spread across four LAN switches, the failure of a single switch will remove fewer resources, improving the general availability of resources and preserving redundancy.

2.18.2.5 Prime Site Ethernet Switches

Two paired Ethernet switches form the prime site LAN in a system with IP simulcast sites. They are paired for redundancy so if one of them fails, half of the hosts (site controllers, comparators) on the LAN are still connected to a working Ethernet switch. In addition to these switches, a third Ethernet switch is required for IP simulcast prime sites equipped with more than 15 remote sites.

2.18.2.6 Dual Prime Site Link

In a dual prime site link configuration, there are two prime site routers, each of which is attached to a different prime site LAN switch. This ensures that if either switch fails, there is still a path to a prime site router for connectivity to the master site.

2.18.2.7 Dual Remote Site Link Switches

In a dual remote site link configuration, two switches are used so that there is no single point of failure for the remote site's entire IP network.

2.18.2.8 Dual Remote Site Link Routers

The remote site access routers, located at the prime site, provide the IP network routing interfaces between the prime site and all of the remote sites. In the dual remote site link configuration, two remote site access routers each serve as the endpoint for one of the remote site's Wide Area Network (WAN) links. The remote site access routers support T1, FT1, E1, FE1 and Ethernet links.

2.18.2.9 GGSN Router

Motorola Solutions' General Packet Radio Service (GPRS) Gateway Service Node (GGSN) router provides for the internetworking between the ASTRO 25 data system and the Customer Enterprise Network (CEN), allowing for independent management of IP addresses across networks.

The GGSN router handles the IP routing services in support of end-to-end IP data messaging. These services include Static and Dynamic IP addressing, IP fragmentation, and ICMP error reporting messaging for diagnostics and troubleshooting.

2.18.2.10 SDM3000 Remote Terminal Units (RTUs)

The SDM3000 Remote Terminal Units (RTUs) (see the figure titled "SDM3000 Remote Terminal Unit") enables the Unified Event Manager (UEM) to acquire information regarding the

fault and configuration of elements/devices in sites. Each SDM3000 RTU has a web server that provides service access through a standard web browser. An RTU can retrieve the topology map of the site and alarms stored in the events buffer.

Figure 2-12: SDM3000 Remote Terminal Unit – Enables the UEM to acquire information regarding the fault and configuration of elements/devices in sites.

2.18.2.11 GGM 8000 Gateway

The GGM 8000 core gateways provide routing control of audio, data, and network management traffic for devices that forward packets beyond their local LAN. The gateways replicate packets while achieving the fast access levels required by real-time voice systems.

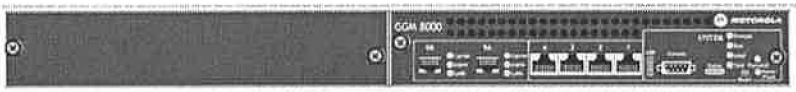


Figure 2-13: GGM 8000 Gateway – Provides routing control of audio, data, and network management traffic for devices that forward packets beyond their local LAN.

Note: Redundant gateways have been provided in the proposed system design.

2.18.2.12 TRAK 9100 Simulcast Site Reference

The TRAK 9100 Simulcast Site Reference (see the figure titled "TRAK 9100 Simulcast Site Reference") is a GPS-based frequency and time reference. The TRAK frequency reference provides the simulcast system 1 Pulse per Second (PPS), 5 Millions of Pulses per Second (MPPS), and 1 PPS + 5 MPPS composite signals. These signals are used to synchronize the simulcast transmissions, improving overall performance and coverage. The TRAK 9100 provides a high-level of redundancy, including redundant GPS receivers, a backup rubidium standard, and redundant power supplies.

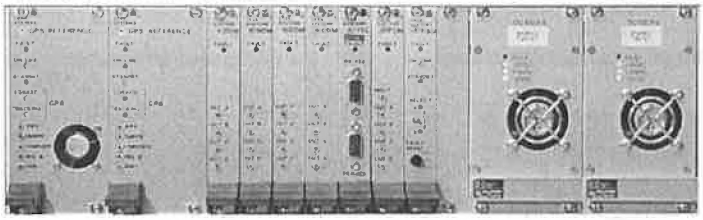


Figure 2-14: TRAK 9100 Simulcast Site Reference – Provides the simulcast system 1 PPS, 5 MPPS, and 1 PPS + 5 MPPS composite signals to synchronize the simulcast transmissions.

2.18.2.13 Radio Frequency Distribution System

The Radio Frequency Distribution System (RFDS) connects base radios and antennas, allowing for a completely contained and more compact installation footprint. For the transmitters, this can include isolators, combiners, TX filters, diplexers, and power monitors. For the receivers, this can include duplexers, site preselectors, and multicouplers.

2.18.2.14 Network Time Protocol Server

The Network Time Protocol (NTP) Server performs time-synchronization of devices on a network. Time synchronization is critical because activities to manage, secure, and troubleshoot network devices often involve determining the timing of the alarms, events, and other information captured by the event logs and software applications that manage and support the system. The NTP can provide synchronization within several milliseconds of Coordinated Universal Time (UTC), and NTP servers often employ Global Positioning System (GPS) receivers to provide time synchronization.

2.18.2.15 Site LAN Switch

The site LAN switch provides a LAN interface for site equipment and a LAN port for the site gateway. Through the switch, the service technicians gain access to service the site, and also access to the system's Graphical User Interface (GUI).

2.18.2.16 Terminal Server

The Terminal Server provides serial access to Network Management (NM) servers and network transport equipment in the Radio Network Infrastructure (RNI). The terminal server has a separate direct RS-232 connection to each of its supported devices. In the event of a major failure, the Terminal Server provides dial-up access for troubleshooting. This interface is intended exclusively for Motorola Solutions Service personnel.

2.18.2.17 KMF Web-Based Thin Client

The Key Management Facility (KMF) is a robust encryption key management solution that supports Motorola Solutions-specific and P25 features, including Over-the-Air-Rekeying (OTAR). Using the KMF Web-Based Thin Client, users can generate detailed reports, receive status updates, and monitor system data visualizations. This information can be created, inventoried, and distributed to encrypted endpoints, including consoles and radios.

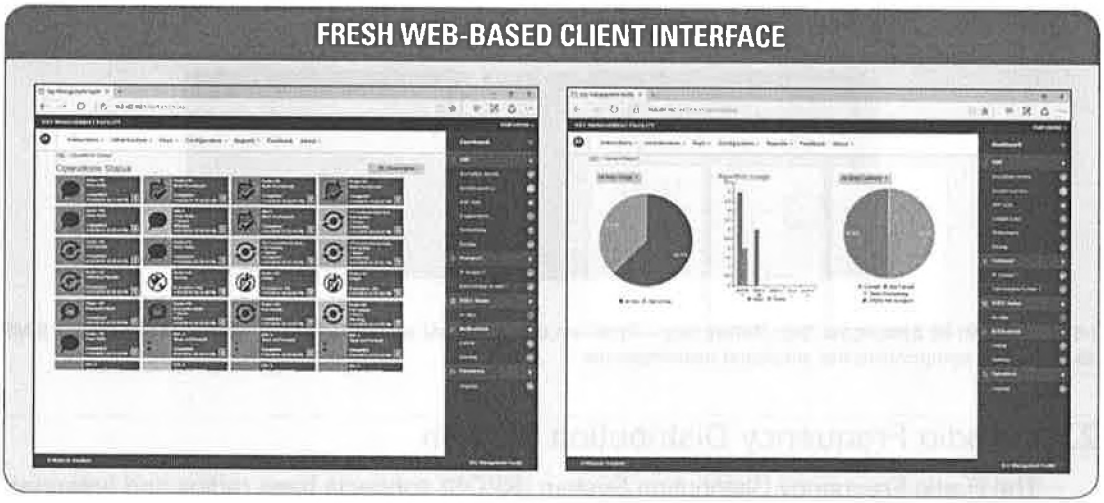


Figure 2-15: KMF Web Based Thin Client Sample Screens

2.18.2.18 KVL 4000 Key Variable Loader

The KVL 4000 (see the figure titled "KVL 4000 Key Variable Loader") is Motorola Solutions' encryption Key Variable Loader for secure-enabled Motorola Solutions products. Equipped with the Motorola Solutions MC55 handheld, the key loader is outfitted with state-of-the-art features and a user interface for increased efficiency and programming flexibility. A large LCD color display, paired with an easy-to-use alphanumeric keypad, enables simple viewing and data entry. Built with legendary Motorola Solutions quality and security, the KVL 4000 withstands everyday use in federal and public safety environments.

Figure 2-16: KVL 4000 Key Variable Loader – Features a large LCD color display and a user interface for increased efficiency and programming flexibility.

2.19 MCC7500 DISPATCH CONSOLES

Motorola Solutions proposes our MCC 7500E dispatch console to provide the Port of LA with the confidence of state-of-the-art secure communications, seamless IP-based connectivity, flexible system architecture with scalable components, and centralized console management.

Motorola Solutions designs its console to help reduce the total cost of owning an IP-based, feature-rich dispatch system without compromising quality and reliability. The console provides the Port of LA with sophisticated network management and easy migration to future capabilities.

2.19.1 Dispatch Console Configuration for the Port of LA

The proposed console will interface seamlessly with the Port's ASTRO® 25 system.

The proposed solution offers the Port 9 dispatch positions. The figure titled "MCC 7500E Dispatch Position" shows an MCC 7500E operator position.

Figure 2-17: MCC 7500E Dispatch Position provides a small form factor, familiar GUI, and advanced features.

The table titled "Dispatch Locations" outlines the number of consoles and their location.

Table 1: Dispatch Locations

Number of Operator Positions	Location Name
7	Primary Dispatch Center
2	Remote Access Consoles

2.19.2 Embracing Interoperability and Integration

Motorola Solutions is an active participant in establishing P25 standards for interoperability. The proposed console is a key component for the interoperability of the ASTRO 25 system. When a situation requires coordination between multiple agencies, the proposed dispatcher can patch

together Mutual Aid radios and required subscribers on the ASTRO 25 system (see the figure titled "Mutual Aid Components").

Incident conversations are seamless from the moment of the patch initiation and can be recorded like any talkgroup conversation within the Land Mobile Radio (LMR) network. The dispatcher can also take part in and monitor conversations for the duration of the incident, as necessary.

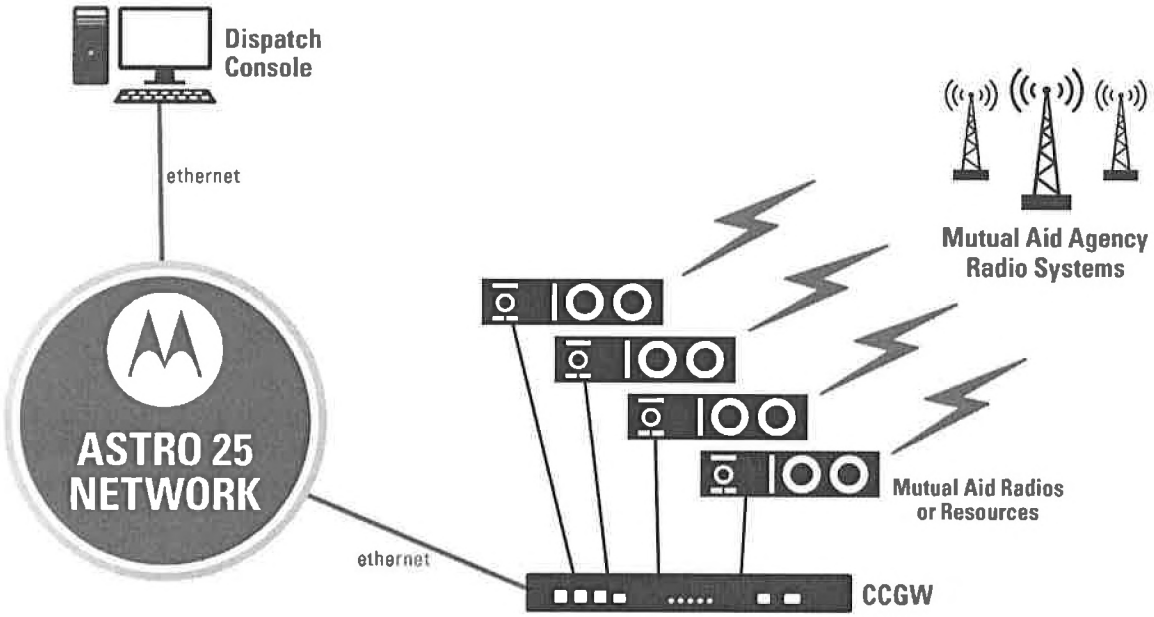


Figure 2-18: Mutual Aid Components - Mutual Aid agency radio systems connect to the ASTRO 25 network through a CCGW.

2.19.2.1 Integration with the ASTRO 25 Network

The proposed dispatch console seamlessly integrates into the Port's ASTRO 25 system without interface boxes, digital voice gateways, or backroom electronics for an integrated, mission-critical network. This tight union between radio infrastructure and console equipment has several operational benefits to the Port of LA.

The physical space to accommodate the proposed console is comparable to that required for a personal computer. The console can access both trunked talkgroups and conventional radio channels over the same network. This architecture reduces overall transport costs and the need for duplicate fixed network equipment.

2.19.2.2 Connection to ASTRO 25 System

The flexibility of the ASTRO 25 system architecture allows the connection of the proposed console to be suited specifically to the Port's needs.

Dual Site Link

The proposed console site for the Port is remote from the core site and features redundant site links to provide path diversity. The console site has two logical connections to the core site with each connection using a different core router.

Each console site gateway provides an interface that handles the following IP traffic between the proposed console center and the Port's ASTRO 25 core site:

- Network management traffic.
- Call control and audio traffic for all the calls being handled by the dispatch positions.
- Aux I/O traffic for the Aux I/Os being handled by the dispatch positions.

The site gateways fragment large IP packets according to industry standards, prioritize packets, and convert Ethernet data to the desired transport medium.

LAN Switches

The site LAN switches provide LAN interfaces for console site equipment and a LAN port for the link to the core site. Through the switch, service technicians can access the system's configuration manager and service the equipment.

Advanced Conventional

This option provides the dispatcher with the ability to control ASTRO 25 conventional channels and/or MDC 1200 channels.

Conventional Base Station Interfaces

The proposed consoles access and control the Port's analog and digital conventional base stations through the use of Enhanced Conventional Channel Gateways (ECCGW). The console processes audio received from the station and controls various features on the stations, such as frequency selection, private line selection, and repeater on/off.

Additionally, the ECCGWs allow for recovery of MDC 1200 and digital signaling, such as unit ID and emergency alarm.

2.19.3 Making Consoles Easy to Operate

Motorola Solutions designs its proposed console to provide mission-critical audio between the dispatcher and users in the field. It is optimized for real-time audio, prioritizing emergency calls over other traffic, and minimizing voice queuing. Using robust error mitigation to maintain call quality even when the system is heavily loaded, the proposed console reduces communication errors that may force dispatchers or radio users to repeat their transmissions.

2.19.3.1 Customizable Dispatch Interface

The proposed console provides dispatchers with a graphical user interface (GUI) that can be customized by agency or by individual users to optimize user efficiency. Based on dispatcher preference, the proposed GUI can be customized to show details of trunked and conventional RF channels on a per-channel basis.

Busy dispatchers can respond to a missed call by simply clicking on an entry in the Activity Log. The number of calls and call information displayed in the Activity Log is customizable to suit the needs of the user. The status of Auxiliary I/Os can be easily interpreted from the GUI with the use of familiar graphical icons, such as a door shown open or closed.

Inbound Event Display

For those users who prefer a call-based GUI, the proposed console supports the Inbound Event Display (IED) GUI. The IED GUI displays incoming radio events in a queue format. The dispatcher can manage and respond to these events directly from the queue.

Filtering and sorting features are available to allow the information in the queue to be tailored to the needs of the dispatcher. The console can be configured to operate in "quiet mode" when using the IED GUI. This is well suited to customers who operate in a Request-To-Talk (RTT) environment.

2.19.3.2 Auxiliary Inputs/Outputs

The proposed console supports Global Auxiliary Inputs/Outputs (Aux I/Os) for remote status indications or remote control through dispatch positions. Global Aux I/Os are typically implemented by hardware that is independent of the dispatch positions in a system and may be accessible to multiple dispatch positions. Aux I/O Servers provide the Aux I/O feature for the consoles.

2.19.3.3 Standard Radio Transmission and Reception

A typical proposed dispatch position has a headset and two speakers. One speaker is for selected audio and the second speaker is for all remaining unselected audio. Additional speakers can be added to a console allowing dispatchers to configure a specific speaker for a set of designated audio sources. This simplifies multitasking between multiple audio sources and allows flexibility in the way the audio is presented to the dispatcher.

Receiving Calls from the Field and Other Dispatchers

The proposed console provides dispatchers with greater flexibility for how to hear calls from field radio users and other dispatchers. Each dispatcher can define his or her own audio reception profile by selecting a single audio source, whether conventional or talkgroup, to be heard on a selected speaker or headset (Single Select). The dispatcher can also define groups of radio resources that can all be heard on a selected speaker or headset (Multi- Select).

Initiating Calls to the Field and Other Dispatchers

The dispatcher has several different ways of initiating a call. In most circumstances, a General Transmit is appropriate. With the General Transmit, the dispatcher selects a resource on the console and activates the transmission through a footswitch, headset transmit button, or a microphone transmit button. If the dispatcher needs to quickly transmit on a resource that is not selected, the dispatcher uses the Instant Transmit function.

An Instant Transmit safety switch prevents accidental activation of functions that may cause negative consequences. The safety switch can be used with Aux I/Os and preprogrammed pages, as well as Instant Transmit switches.

Audio Communication to the Field and Other Dispatchers

The dispatcher can transmit audio in different ways. They can make calls to all users listening to a specific conventional radio resource or a specific trunking talkgroup. When multiple resources are required, the dispatcher can select additional talkgroups and/or conventional channels, as needed using the Multi-Select feature.

The proposed console also enables dispatchers to make private calls to individual field radio users or dispatchers. Once a private call is established, it can be patched in with another resource at the dispatcher's discretion.

Controlling Console Audio

The proposed console offers dispatchers several different ways of controlling or muting the audio on their consoles, such as the following:

- Audio volume can be changed for any specific resource.
- All non-selected resources on the console can be muted for 30 seconds (All Mute) or unmuted, if already muted.
- A dispatcher can transmit on a resource while receiving audio from the same resource or other resources.
- A dispatch position can be configured to automatically mute the other dispatch audio on a shared resource to prevent acoustic feedback when a co-located dispatch position transmits.
- RF Cross Mute automatically mutes the receive audio from a specified channel when the dispatcher transmits on another specified channel to prevent acoustic feedback.

Controlling Network Audio

Dispatchers can control audio on the ASTRO 25 network. The dispatcher can enable or disable radio users to compartmentalize traffic, reduce interruptions, and maintain communications between dispatch and the field. When this function is enabled or disabled, all dispatch consoles with this resource assigned are updated with the current status of the feature. This feature can be controlled from any dispatch position.

2.19.3.4 Emergency Radio Transmission and Reception

As part of a mission-critical communications network, the proposed dispatch console facilitates immediate prioritization and resolution of emergency communications between the Port's dispatch and first responders in the field. This enables dispatchers and first responders to focus on their mission and not their equipment, especially during critical situations.

Receiving an Emergency Call

When a user in the field or another dispatcher initiates an emergency call, the console emits both visual and audible indications (Emergency Alarm). The audible indication alerts the dispatcher that an emergency is underway; the visual indication directs the dispatcher's attention to the specific resource making the emergency call. The dispatcher can immediately reserve a voice channel for the duration of the emergency.

Responding to an Emergency Call

A dispatcher can bypass the standard console interface to auto-open a quick list, which contains specific controls for recognizing an emergency call, initiating an emergency call, and ending an emergency call (Auto-Open of Quick List). The dispatcher can then recognize the emergency call, which ends the audible emergency indication and notifies all dispatchers that the emergency is being addressed (Emergency Recognize).

The audible emergency indication may also be muted by a dispatcher without recognizing the emergency alarm (Mute Tones at a Single Op). This can be used in a situation where one agency is monitoring a channel that belongs to another agency. That channel can be configured to not generate audible and/or visual emergency indications.

Ending an Emergency Call

When an emergency is over, the dispatcher can end the Emergency Alarm. The visual indication on the dispatch position GUI is removed, and the console informs the other dispatch positions that the emergency is over (Emergency End/ Knockdown). The emergency mode remains active on the initiating radio unit until it is ended (reset) by the radio user.

2.19.3.5 Radio Patch Control

The dispatcher can patch communication between trunked and/or conventional radios that are normally unable to communicate with each other due to different features, programming, or even different frequency bands. A patch group is a group of linked resources that can both receive messages from a console and transmit to all other members of the patch group.

Setting up a Standard Patch

Patches are supported between trunked resources and/or conventional resources. After the patch is created, the dispatch position transmits all audio on one resource to all other resources in the patch group. In a patch between trunked resources, patched radio users with displays see the ID or alias of the other patched radio(s), as opposed to that of the console. This minimizes confusion and the need for the dispatcher to intervene in the call. Patches are automatically reestablished, if interrupted, so the dispatcher can concentrate on continuing operations.

Predefined Patches

Patches can be predefined and automatically reinitiated each time a dispatch position computer is restarted (Patch Auto-Start).

2.19.3.6 Call Management and Control

The dispatcher can use the following functionality to manage and control audio for different types of calls between the dispatch position and radio users or other dispatchers.

Automatic Prioritization of Calls

Calls on the dispatch position are prioritized through a transmission hierarchy. Calls from primary supervisors take priority over those from secondary supervisors, which in turn take priority over non-supervisors. Instant Transmit or All-Points Bulletin (APB) transmissions, regardless of whether they are from a supervisor, take priority over general or patch transmissions.

Multiple dispatchers can be designated as primary supervisors on the same system, which is useful when multiple agencies share one system. With the Network Manager Client installed, supervisors can disable and enable dispatch console functionality as needed.

Manual Prioritization of Calls

System Access Priority Select allows a dispatcher to prioritize trunked resources on the system as either normal or tactical. A dispatcher can change the priority of a trunked resource to tactical to give the resource a better chance of gaining communication access on a busy system. Only emergency calls have a higher priority than tactical.

When the System Access Priority Select status of a resource is changed, it is updated at all dispatch consoles in the systems that are monitoring that trunked resource.

Using the Multi-Select Feature

The Multi-Select feature allows a dispatch position to define groups of selected radio resources. When a Multi- Select group is opened, all of the resources in the group are simultaneously selected. Resources can be added or removed from a Multi-Select group while the group is open. The dispatcher can transmit on several resources simultaneously or can listen to multiple resources simultaneously in their headset or select speakers.

Standard Call Indications

The dispatch position indicates the availability of any given resource, regardless of whether the resource is involved in a transmission. An inbound call indication provides the dispatcher with a visual cue of audio activity on a radio resource and allows a dispatcher to see at a glance what the status of a resource is at any moment.

Call Alerting

A dispatcher can use Call Alert to page an unattended radio or dispatch position through a series of beeps and an indication of the sender's ID. When available, the radio user or dispatcher sees the unit ID of the calling dispatch console or radio ID and is able to return the call.

Additionally, a Call Alert can trigger an activity. For instance, a Call Alert may cause a vehicle's horn to sound and its lights to flash. The dispatcher can even send a Call Alert to a user who is involved in voice and data communications over the network.

2.19.4 Capturing and Logging Audio

The proposed console system includes a logging recorder subsystem that enables the recording and replay of audio and other information associated with real-time conversations over the network. These capabilities provide the Port's personnel with clear audio and enough information to easily understand the context and content of any recorded transmission.

This proposal includes logging recorders that record up to sixty (60) simultaneous conversations coming through the Archiving Interface Server (AIS).

In addition to recording audio, the logging recorder has the ability to capture the following information, if supported:

- Talkgroup and channel information
- User identification, such as unit ID and alias
- Call type, such as Talkgroup Call, Telephone Patch Call, and Emergency Call
- Non-voice events, such as Call Alerts, Radio Status Check, and Radio Message

Upon playback, this information can be displayed and searched to retrieve a desired call. The logging recorder's capacity is based on the number of radio transmissions it needs to record simultaneously, not on the number of channels that it can record.

A call can be saved either as a complete call (audio and any information associated with the call) or as a simple .wav file. Files saved as complete calls must be played using the application included with the logging recorder. Files saved as .wav files can be played on any application that supports them.

2.19.4.1 Record and Replay of Archived Calls

The logging recorder for the the Port of LA is an IP-based recorder that can record all IP traffic sent to it. It provides the Port with the capability to record audio at the same level of quality as that heard at the dispatch position. In addition, it can record information associated with the call beyond just the audio.

A replay station can access recordings on multiple recorders, even ones that are not being used with AISs. This provides the user with a complete view of everything being recorded from a single point.

2.19.4.2 Management of Logging Recorder Subsystem

Security and fault management for the logging recorder subsystem are configured and managed by a common administration application, residing on either a playback station or a dedicated PC. Administrative personnel can use the management controls of the logging recorder subsystem to configure how calls are recorded.

On a global level, administrators can define which calls are recorded by which agency or department. On a more granular level, administrators can define the following recording behavior:

- Which talkgroups and conventional resources to record and which resources are critical.
- Whether secure calls are recorded.
- What access rights are assigned to replay station user accounts.
- What operational characteristics are assigned to the recorders (for example watermark limits for the recording media, or what to do when the recording media fills up).

2.19.5 Protecting Consoles and Communications

The console enables end-to-end encryption from the dispatcher to the ASTRO 25 network, so that the Port's communications will not be undermined by unencrypted transmissions. Each dispatcher is able to fully participate in secure communications while being confident that sensitive, vital information is not heard by unauthorized individuals.

2.19.5.1 Secure Access to the Console

To use the dispatch position, a dispatcher must enter a valid radio system user account name and password. The dispatch position validates that information with the radio system's network manager and allows the dispatcher to access only the resources for which the user has access rights. This also applies to third-party applications that use the dispatch console's API.

2.19.5.2 Secure Communications at the Console

The console encrypts and decrypts radio voice messages. Thus, radio voice messages are encrypted from end-to- end between the radio user to the dispatch position. The dispatcher can choose whether to encrypt their transmissions on a particular trunked resource. Dispatchers can interface with agencies that have different encryption configurations without any manual intervention or delay.

2.19.6 Incorporating Console Configuration and Management

The proposed console system is configured and managed by the same configuration manager, fault manager, and performance reporting applications as the radio system. The user can define exactly which resources are available and how they are presented to the dispatcher. This provides the Port with a single point for configuring and managing the entire ASTRO 25 system. Changes are automatically distributed throughout the system.

This centralized approach saves valuable time and effort for system administrators and technicians and reduces the errors that can occur when radio IDs and other data are entered at multiple locations. In addition, call traffic and performance reports for each dispatch position can be generated from the system's network manager, enabling administrators to quickly and easily ensure optimal effectiveness and efficiency.

2.19.7 Dispatch Console Solution Components

The proposed components are connected together and to the rest of the ASTRO 25 system on an IP network through console site routers and switches. The console functions as an integrated component of the total radio system and fully participates in system-level features, such as end-to-end encryption and Agency Partitioning.

The console connects directly to the radio system's IP transport network without gateways or interface boxes. Audio processing, encryption, and switching intelligence for dispatch are performed within each software- based dispatch position without additional centralized electronics.

Since the network is IP-based, the system interfaces and components can be distributed physically throughout the network. Some of the available console components are identified below.

2.19.7.1 MCC 7500E Console Operator Position

The dispatch position supports commercially available accessories, including a USB microphone, USB headset, and USB footswitch, as shown in the figure titled "MCC 7500E Dispatch Position." The following list describes the components included in the proposed configuration.

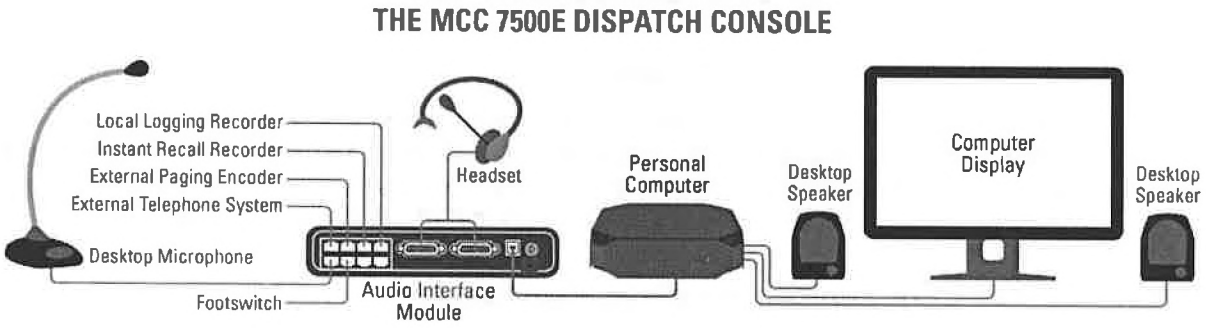


Figure 2-19: MCC 7500E Dispatch Position supports multiple accessories.

Audio Interface Module (AIM)

The USB Audio Interface Module (AIM) acts as an interface between analog devices and the dispatch position and as a general purpose input/output module. The USB AIM supports audio routing between the dispatcher and Motorola Solutions standard peripherals. The USB AIM connects to the MCC 7500E dispatch position with a USB cable.

Personal Computer (PC)

The personal computer included with the dispatch position is Windows-based and certified by Motorola Solutions.

Computer Display

The dispatch position will use a Touch Screen Computer Display.

Enhanced Integrated Instant Recall Recorder (IRR)

The Enhanced IRR is seamlessly integrated with the dispatch position's software, allowing audio and call data from any radio or telephony resource to be recorded and easily played back. Call

data includes PTT IDs, name of resource, start time and date, and stop time and date. Two analog inputs are available for use with recording audio from external devices.

Desktop Speakers

Two (2) speakers have been included with each dispatch position and can be configured to transmit audio from a specific talkgroup or set of talkgroups. Each speaker is a self-contained unit, with individual volume controls, and can be placed on a desktop or mounted on a rack or computer display.

Headset Jack

The dispatch position supports up to two headset jacks, both push-to-talk (PTT) and non-PTT-enabled, for simultaneous use by the dispatcher and a supervisor. The headset jack contains two volume controls for the separate adjustment of received radio and telephone audio.

Headset

The proposed headset consists of two elements. The headset base includes an audio amplifier, a Push-to-Talk switch, and a long cord that connects to the dispatch position. The headset top consists of the earpiece and microphone as well as a short cable that connects to the headset base.

Gooseneck Microphone

The microphone controls the dispatch position's general transmit and monitor features through two buttons on its base. The microphone can be fastened down or left loose. It can be used alone or in conjunction with a headset.

Footswitch

Each dispatch position includes a dual pedal footswitch that controls general transmit and monitor functions.

Telephone Headset Interface Port

The telephone/headset port provides a connection for an external telephone to the dispatch position. This allows the operator to use a single headset to communicate on both the radio system and a telephone system.

Redundant Ethernet Connection

The optional redundant Ethernet connections increase MCC 7500E console availability by protecting against the loss of multiple dispatch positions. In the event of a LAN switch failure, the system will automatically detect and switchover with no manual intervention required. Dispatching operations will not be interrupted.

2.19.7.2 MCC 7500E Dispatch Console Telephony

The MCC 7500E Dispatch Console Telephony is a scalable solution designed for centers with a few lines for call center-style operations. Console telephony is highly customizable, with a robust feature set including features such as global and local phone books, speed dials, call transfer and patching of phone lines to radio resources. Its seamless integration into the MCC 7500E dispatch position makes managing radio and telephony easy and simple.

2.20 APX8500 CONTROL STATION

- The APX 8500 Control Station is a multi-band radio supporting 700MHz, UHF and VHF.
- It requires no separate network connection and can auto-switch to a backup DC power supply (for example a marine-quality battery) to provide seamless communications even when the power has failed.
- Built with the legendary ruggedness of the APX product line, you can be sure that your APX 8500 will not let you down – even when everything else has.
- Six (6) multi-band APX8500 Mobiles are provided covering 700MHz, UHF and VHF.
- The mobiles are configured as Control Stations to allow backup access to all the communications capabilities of the system.

2.21 UHF CONVENTIONAL BACKUP CHANNEL

A single channel, digital, conventional UHF channel is proposed to provide backup communications coverage across the Los Angeles metropolitan area generally and the Harbor District specifically.

2.22 VHF MARINE RADIO SYSTEM INTEGRATION

The VHF Marine Radio receivers will allow the Port of Los Angeles to improve and integrate inbound radio communications coverage along the Port of LA Waterfront and its Waterways for the VHF Marine CH 16 frequency.

This solution provides the Port of LA the ability to monitor traffic on the VHF Marine channel from their existing console positions. This receiver voting network will increase the inbound radio coverage using the addition of three (3) sites located along the port. This receiver voting network will interface to the new trunking system using GPW 8000 Analog receivers, GRV 8000 Analog Comparator and a Conventional Channel Gateway (CCGW).

Coverage enhancement is for Inbound (Talk-In) only.

2.23 WAVE (LMR OVER BROADBAND)

Motorola Solutions' WAVE Workgroup Communications platform offers the Port of LA flexible and affordable push-to-talk (PTT) communications across different devices and networks. By bridging land mobile radio (LMR) networks and private networks (3G, 4G, LTE, and Wi-Fi broadband), the Port's users will have access to a unified, future-ready service where they can communicate instantly and securely via PTT. WAVE is a highly-scalable platform to tackle today and tomorrow's difficult environments.

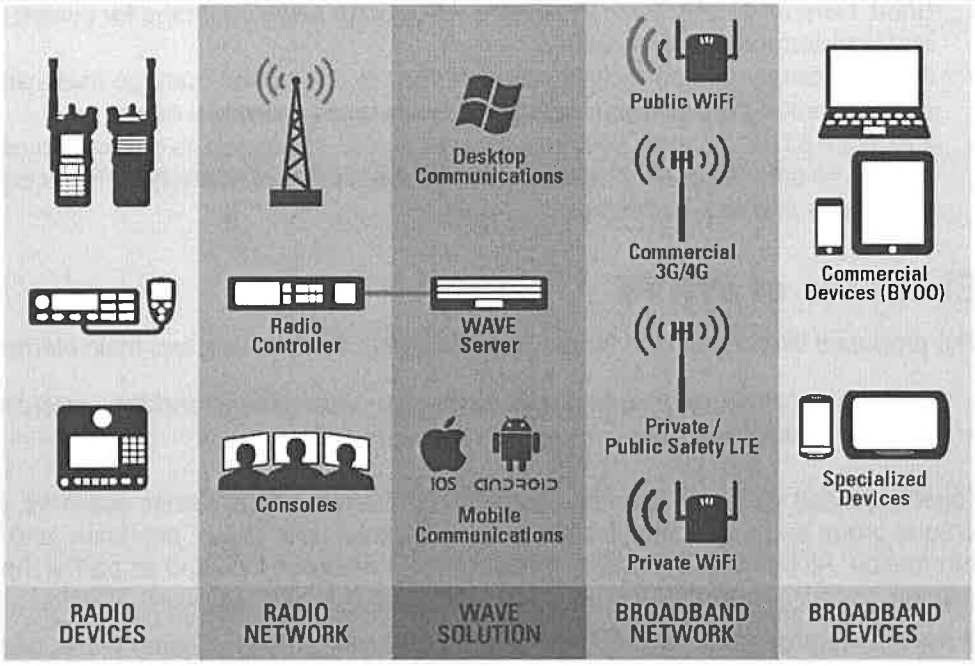


Figure 2-20: WAVE Workgroup Communications Overview – Enables interoperable communications between devices on both radio and broadband networks.

2.23.1 WAVE Solution Overview

The proposed WAVE solution is enterprise-grade PTT enabling the Port's users to communicate on LMR systems using a suite of software clients installed on their mobile devices and laptop/desktop computers. Supporting up to 5,000 active users at a time, these LMR/broadband communications include secure and high-performance PTT services that extend communications beyond the coverage provided by an LMR system itself—a capability useful in a variety of circumstances.

The proposed solution includes the following capabilities:

- Group Call – Make group calls using any WAVE application with talkgroups of LMR and WAVE users, WAVE-only users, and LMR-only users. Users select the talkgroup and PTT just like a radio. All users on a talkgroup hear the speaker's transmission and can reply. Talkgroups and their assigned participants are created and managed by the WAVE Management Server module.
- Individual Private Call (One-to-One) – Make private calls between two WAVE users. A user selects the person they wish to call from a contact list available within the WAVE application. Users communicate by pressing and releasing the PTT button in their application.
- Late Call Entry – Join in-progress talkgroup calls if users miss the start of a call.
- Group Text Messaging – Send and receive group text messages with other WAVE users in a talkgroup.
- Private Text Messaging – Send and receive individual text messages between two WAVE users.
- Status, Presence & Location – See the current status, presence, and location of other WAVE users using any WAVE Communicator. Whether a user shares their location data with other users is configurable in the applications.

- Short Term and Long Term Recording – Supports audio recording for instant recall playback and long-term archival recording.
- System Management – Provides the interface to create and manage users and talkgroups and turn on/off the ability to make private calls on an individual basis.
- Existing ASTRO 25 radio systems can use WAVE to connect to other radio networks (analog or conventional), providing true interoperability to address complex communications challenges and requirements.

2.23.2 Elements of WAVE

The proposed WAVE solution for the Port's includes the following two main elements:

- A communicator loaded onto a user device (i.e. smartphone, desktop computer).
- A server that runs WAVE.

Together, these elements provide a common PTT environment across networks, enabling users to send group and private text messages and transmit user status, presence, and location information. All licenses necessary for operation have been included as part of the Port's WAVE solution.

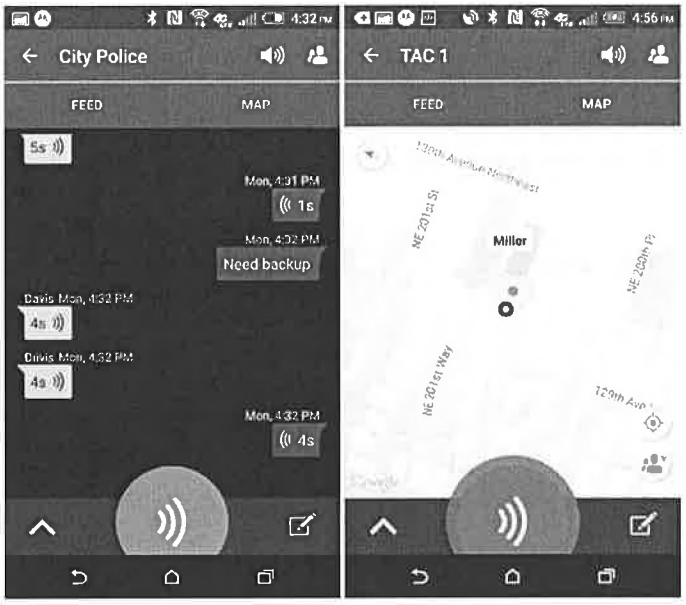
In the following sections, Motorola Solutions details the proposed components included in the Port's solution.

2.23.2.1 Proposed WAVE Communicator Applications

WAVE Communicator applications enable the Port's users to access any authorized talkgroups from their device using a suitable data connection (cellular service or Wi-Fi). With the appropriate WAVE communicator installed on a mobile device, laptop, or desktop computer, users can listen/talk on broadband-only talkgroups and talkgroups interconnected to LMR systems, as well as make and receive private calls with other WAVE users from anywhere with network access (local, regional, or global). The following WAVE Communicator applications are included as part of the Port's solution:

WAVE Mobile Communicator

The WAVE Mobile Communicator transforms users' Android/iOS smart device into a secure, multi-channel PTT handset without the cost of dedicated hardware. Enable instant communications with other individuals on a two-way radio, computer or another smart device. Extend workforce communication to anywhere with mobile broadband access on existing devices with the existing broadband service providers. Know that communication is protected with standards-based encryption and security protocols to provide privacy and data integrity across the WAVE platform.



2.23.2.2 WAVE Server Overview

The WAVE Server includes several software modules that provide the interface to the Port's system and integrate WAVE Mobile Communicators and PC clients to the WAVE system.

The following WAVE servers, installed as Windows-based virtual machines, are proposed as part of the Port's solution:

- Media Server
- Management Server
- WAVE Radio Gateway (WRG) Server
- Proxy Server

The WAVE Server supports PTT communications using commercially available Android and iOS smart devices running over 3G/4G/LTE public/private carrier networks and public/private Wi-Fi networks, and PC clients connecting over WAN/LAN networks.

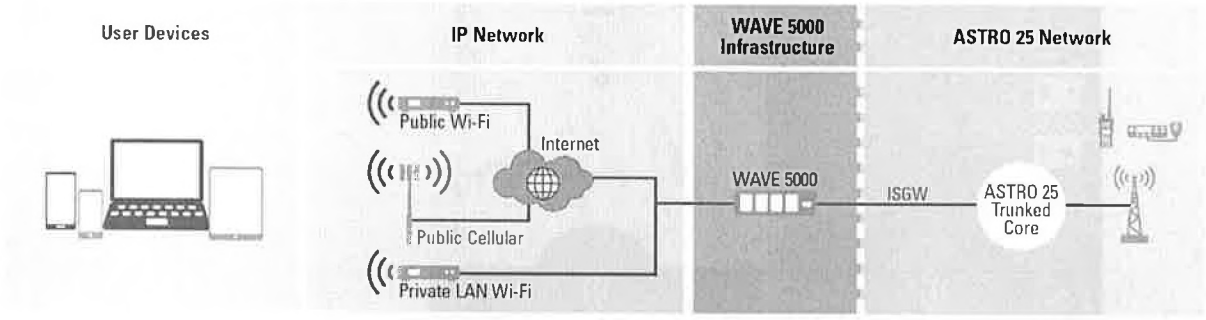
2.23.2.3 WAVE Server and Infrastructure

The WAVE Server is the self-contained central point of the WAVE solution, managing communications between WAVE Communicators/Clients and the WAVE system. The server supports up to 5,000 active users over any Broadband or IP network. The WAVE Server also offers the following key features for the Port:

- **Flexible Client Management:** Using the web-based Provisioning Portal, the Port can manage all aspects of user accounts, from adding/deactivating users, creating or managing talkgroups, and provision private call contacts for each user.
- **Call Logging:** Call logs are maintained on the WAVE server for seven days. Logs can be exported to a file (csv format) for long-term traceability and accountability.
- **Built-In Diagnostics:** Ships with built-in utilities that allow the Port to diagnose and resolve issues in network configuration.
- **Simple Upgrades:** New features and functionality can be added quickly and simply to the WAVE server as the Port grows and evolves.

WAVE for ASTRO 25 Trunked Core

The WAVE Server will directly integrate with the Port's ASTRO 25 Trunked Core directly with an ISGW. This interface will provide an IP-based wireline connection to the ASTRO 25 Trunked Core system for a highly-scalable, reliable, and secure broadband PTT integration. ASTRO 25 encrypted talkgroups to WAVE are also supported, with encryption keys securely stored in the WAVE CRYPTR device.



2.24 MICROWAVE BACKHAUL UPGRADE

2.24.1 Microwave System Design Summary

This project covers deployment of ten (10) Wavence/MPT-HLC Microwave Systems HOPs as part of Motorola's solution in support of Port of Los Angeles, CA microwave network project. Nokia will furnish and install 10 hops of microwave radios. Nokia will install MPT shelves in new relay racks. Nokia will furnish and install the DC power systems for all site locations. Nokia will test and turn-up the newly installed microwave radios. Nokia will complete the microwave radio to transmission line connections and inter-bay cabling. Nokia will install new antennas, standard mounts and transmission lines at all sites that require them. In addition to providing microwave radios, Nokia will provide performance calculations, path and site surveys, path design, site engineering services, closeout documentation that includes radio RFC2544 tests, sweeps for newly installed waveguide runs and as built drawings. Any changes to the scope of this SOW due to the results of actual site surveys and/or customer changes may result in additional charges to the Port of Los Angeles.

2.24.1.1 Equipment and Services in Scope

- Microwave Deployment Services
- 19 x MPT-HL Shelf Kit Single T-R
- 3 x MPT-HL Shelf Kit Dual T-R
- 5 x MPT-HLC XCVR L6 GHz WITH COMBINER (5720 - 6425)
- 5 x MPT-HLC XCVR U6 GHz (6425 - 7125)
- 7 x MPT-HLC XCVR U6 GHz WITH COMBINER (6425 - 7125)
- 9 x MPT-HLC XCVR 11 GHz (10700 - 11700)
- Associated Antenna equipment and cabling

2.24.1.2 Microwave Deployment: Microwave Path Engineering Warranty

FEASIBILITY STUDIES

Nokia provides feasibility studies of microwave radio paths in support of bidding efforts or when purchased. Feasibility studies are performed using information provided by or on behalf of the Port of LA. Results of the feasibility study are provided to the Port of LA and may include (i) a system map, (ii) a path profile, (iii) path performance calculations, and (iv) a technical report.

Feasibility studies are preliminary in nature and are not intended to represent a final design. Therefore, no representations, warranty or guarantee is implied or provided. The Port agrees to assume all risks associated with installing any equipment based on spiderweb maps, preliminary network and system maps, preliminary path profiles (including antenna size and location), path calculations (estimated performance), Google Earth, and topology studies normally presented with a feasibility study.

PATH SURVEYS (DETAILED SURVEY WITH REPORT)

Nokia offers detailed path surveying services to determine or verify site coordinates, site access, location, ground elevation, on-path obstruction location and height, tower information, proposed antenna centerline information, and other parameters required to engineer and implement a microwave radio link.

The present and anticipated future effect of observable on-path obstructions, such as vegetation and buildings, are also evaluated and incorporated into the path design where applicable. Where appropriate, roof top access may be utilized in the survey effort. Existing towers are not climbed as a part of this activity.

The results of the path survey are documented and presented in a formal survey report or technical report, as required, to Motorola. Some items performed and included in a formal survey report may include: site location map, site topographic map, access information, site plot plans, existing tower elevation profile, site photographs, site and path observations, path terrain feature descriptions, critical point data, engineering notes, path profiles, and proposed performance calculations.

For detailed Path Surveys, Nokia warrants that geodetic coordinates are accurate to within +/- 1-second of latitude, +/- 1-second of longitude, ground elevations are accurate to within +/- 1 meter, and that heights of identified on-path obstructions at critical points are accurate to within 5-feet. Nokia warrants only the actual paths surveyed.

PATH DESIGN

Nokia offers path design services. Path design services are based on formal field survey data gathered by Nokia path surveyors and is warranted. Path designs include profiling a path to determine antenna centerline requirements, and path calculations to determine the antenna and radio types necessary to meet Motorola's microwave link performance and availability objectives.

Recommended antenna centerlines are determined for a range of K-factors expected to occur during an average year and by the Fresnel zone clearance criteria stipulated by Bell Laboratories. For areas where poor propagation conditions are known to exist, paths are assessed for susceptibility to obstruction fading outages using the Bell Laboratories Obstruction Fading (OBSFAD) model. Additionally, paths are analyzed for ground-based reflections.

Microwave link availability (path availability) is evaluated using current North American industry accepted models for predicting outage times and diversity improvement factors associated with normal atmospheric multipath fading (flat and dispersive), rain fading, and obstruction fading. Every effort is made by Nokia to anticipate the probable occurrence of abnormal propagation

conditions based on historical documentation, experience, geographical location, and field survey data.

The final path design documentation will include one or more of the following, depending on the services purchased by the Port: (i) a system map, (ii) a final path profile, (iii) final path performance calculations, and (iv) a technical report.

If radio path using Nokia equipment is installed based on Nokia's recommended path design, then Nokia warrants the radio path calculations shall conform to Motorola's availability objective for normal atmospheric multipath fading. Nokia will not be held responsible for excessive outages or degraded performance due to abnormal fading conditions. Abnormal fading conditions include, but are not limited to:

Formation of extreme radio refractivity gradients associated with:

- Exceptionally large temperature inversions
- Abnormal temperature/humidity layers
- Fog formation
- Signal trapping caused by surface or atmospheric ducting
- Reflections from unusual or unidentifiable on-path or off-path terrain features, physical structures, or atmospheric layers.
- Rain fading due to rainfall rates that exceed the published rates or charts used to predict rain induced outages.

If Nokia suspects that abnormal propagation conditions are the cause of degraded system performance, Nokia will assist Motorola in verifying the conditions leading to the degraded system performance. After the problem, has been identified, Nokia will support Motorola in identifying possible solutions to the problem and assess the incremental improvement expected from corrective actions. Any Implementation of corrective action to remedy this type of problem shall be the sole responsibility of the Port of LA.

FREQUENCY PLANNING

Nokia offers frequency planning services including frequency selection, prior coordination process, interference case resolution, and FCC license application documentation preparation and submittal. Nokia warrants that the interference studies will be conducted using industry-accepted North American methods, hardware, software and algorithms; and that the frequency database will be maintained as accurately as possible at the time of the study. Nokia will not be held responsible for interference cases that arise due to errors or omissions in the database. Upon completion of the frequency planning services, some or all of the following documentation is provided to the Port of LA:

- Prior Coordination Notice
- Frequency Coordination Data Sheet
- Supplemental Showing pursuant to FCC Rules Part 101.103(d)
- Completed FCC Form 601 License Application and Preparation

In the event, frequency interference is detected during the implementation of a microwave link in which Nokia provided the frequency planning services, Nokia's total liability is limited to selection of an alternate frequency or frequencies. Should interference occur after the microwave link is deemed operational and accepted, corrective action is the sole responsibility of the Port.

WARRANTY

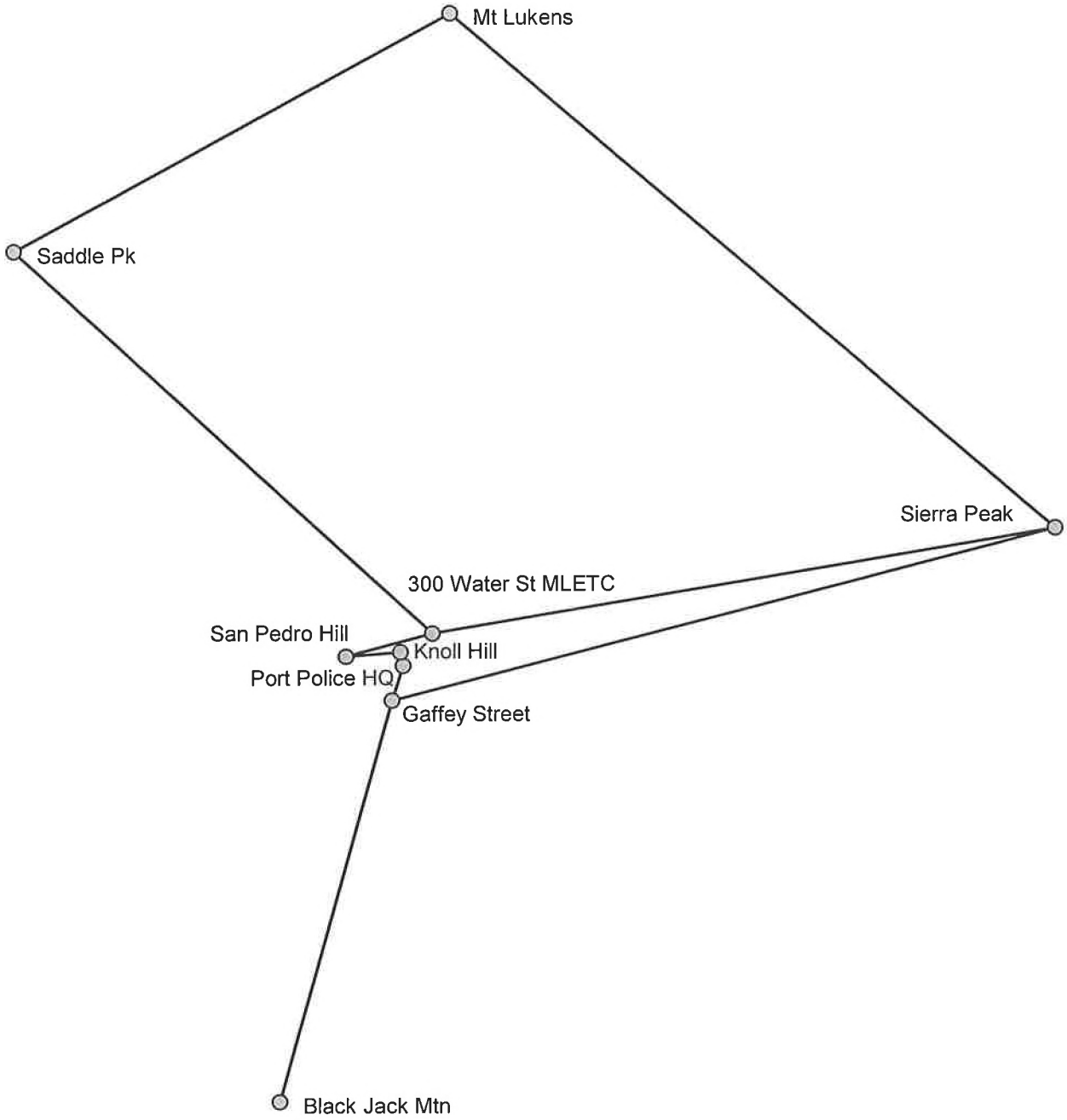
Nokia warrants its path surveys and path designs to be substantially free of engineering defects and errors for a period of 12 months from the date of delivery of the study to Motorola. Nokia warrants its line of sight surveys to be substantially free of engineering defects and errors for a period of 6 months from the date of delivery of the study to Motorola. Nokia warrants its frequency planning and Form 601 License Application preparation to be substantially free of engineering defects and errors for a period of 6 months from the date the path was prior coordinated. In the event that, during the warranty period, a documented defect proven to be responsibility of Nokia, occurs, Motorola's sole remedy under this warranty provisions, shall be that Nokia will provide the incremental labor and material beyond what would have been required during initial installation to correct the particular error in the path survey or path design at no cost of the Port. In no case, shall Nokia be held liable for any indirect damages including but not limited to incidental, consequential or loss of capital, data, revenue or profit. In the event, that such error is not solely and directly related to Nokia's path engineering efforts, expenses for such labor and material shall be borne by the Port.

2.24.1.3 Equipment Decommission

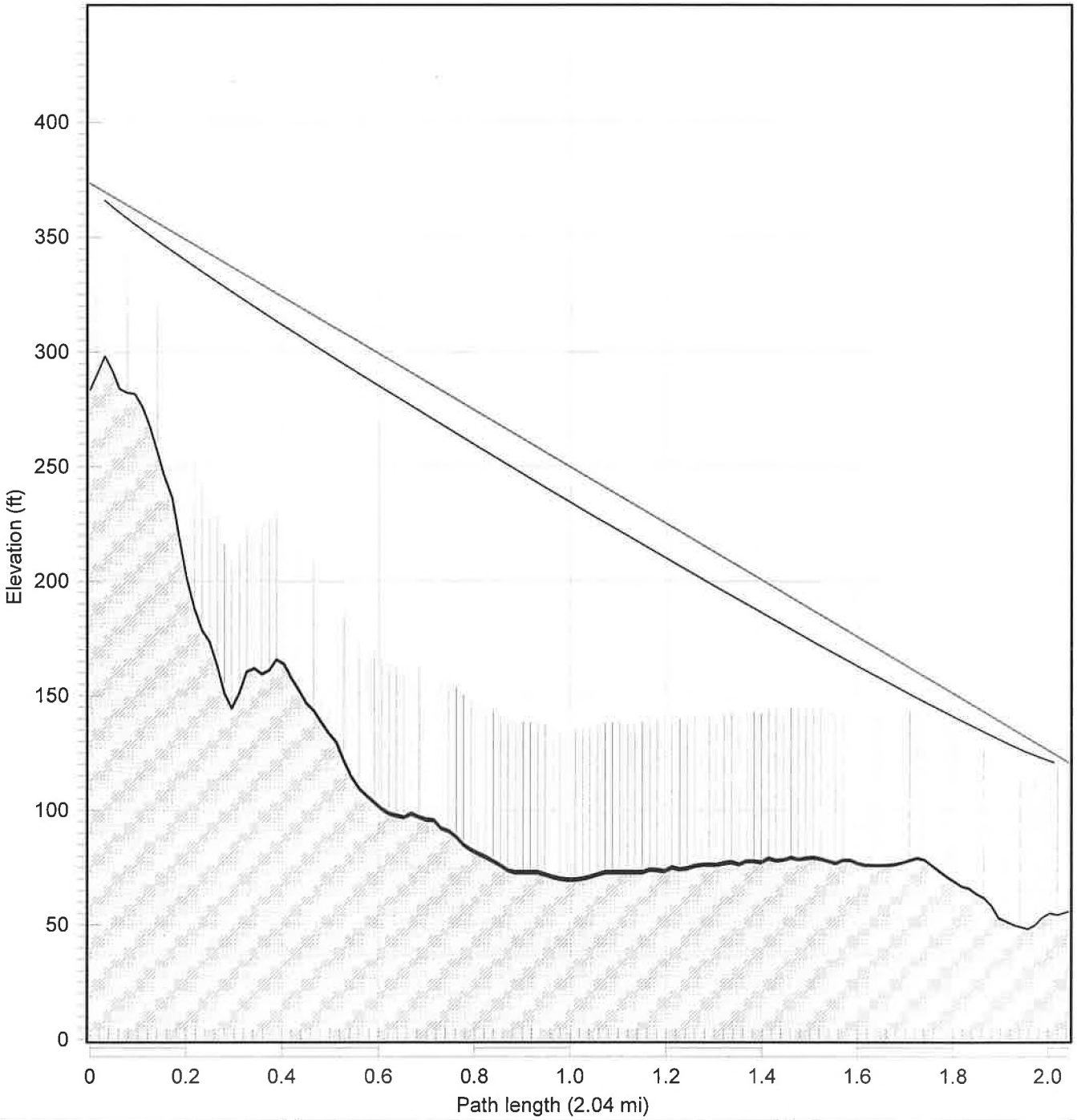
6 antennas with 12 ODU and coax (Note: Port Authority will decommission equipment at Badger Bridge)

- San Pedro Hill (115' coax) to 300 Water St. (120' coax)
  - Both dishes are VHLP4-11 with two coax each (possible 2x2 mimo)
- 300 Water St. (155' coax) facing Badger Bridge
  - VHLP2-23 with two coax (possible 2x2 mimo)
- Gaffey St. (70' coax) facing Badger Bridge
  - VHLP800-11 with two coax (possible 2x2 mimo)
- Gaffey St. (61' coax) to Police HQ (115' coax)
  - Both dishes are VHLP4-11 with two coax each (possible 2x2 mimo)

2.24.2 Microwave Map


Mt Lukens
Saddle Pk
Sierra Peak
300 Water St MLETC
San Pedro Hill
Knoll Hill
Port Police HQ
Gaffey Street
Black Jack Mtn

2.24.3 Microwave Paper Path Studies



Gaffey Street	
Latitude	33 42 43.10 N
Longitude	118 17 38.10 W
Azimuth	17.59°
Elevation	283 ft ASL
Antenna CL	90.0 ft AGL

Frequency (MHz) = 11200.0
K = 1.33, 0.50
%F1 = 100.00

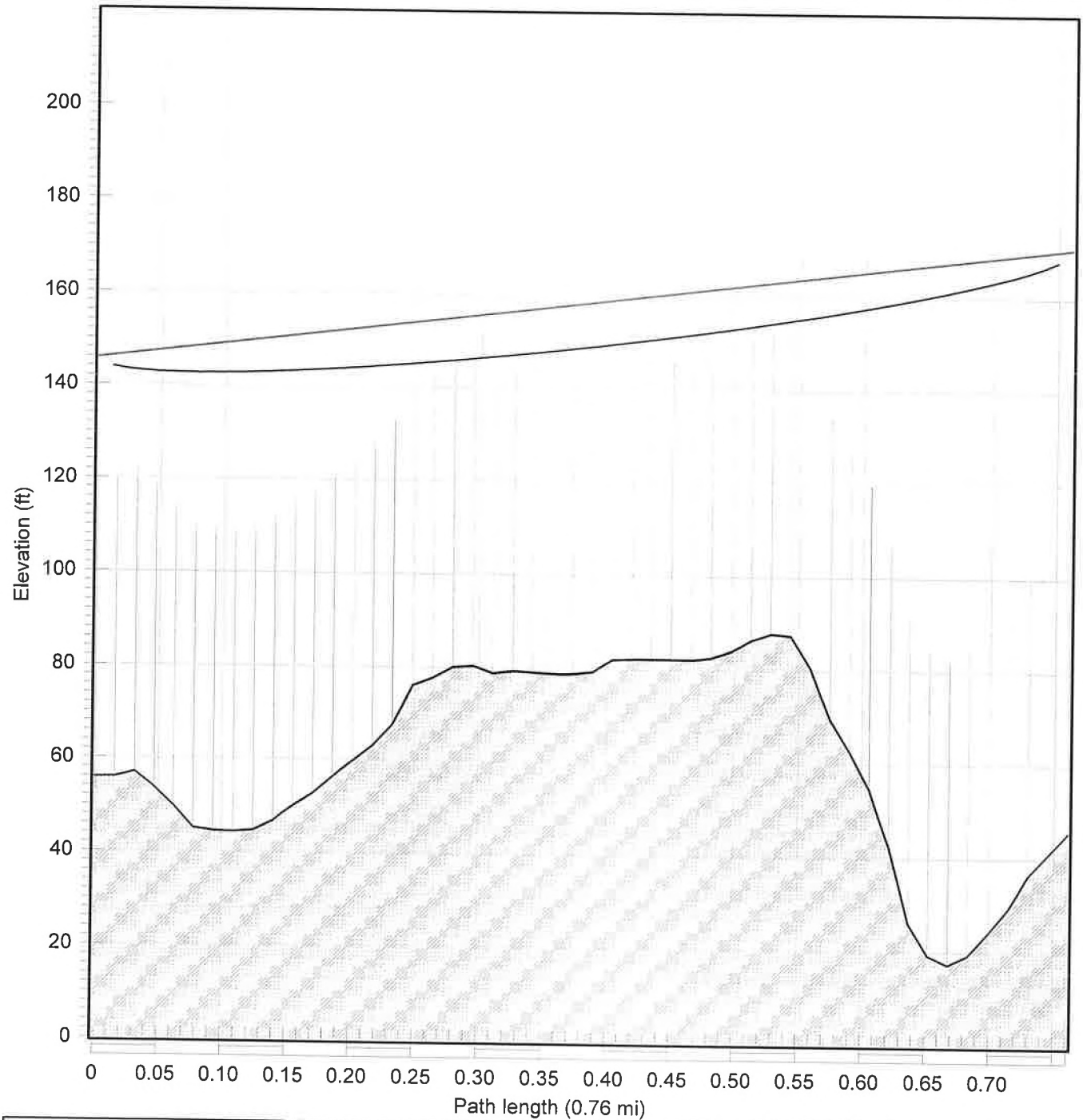
Port Police HQ	
Latitude	33 44 24.80 N
Longitude	118 16 59.50 W
Azimuth	197.60°
Elevation	56 ft ASL
Antenna CL	65.0 ft AGL

Transmission details (Gaffey Street-Port Police HQ.pl5)

	Gaffey Street	Port Police HQ
Latitude	33 42 43.10 N	33 44 24.80 N
Longitude	118 17 38.10 W	118 16 59.50 W
True azimuth (°)	17.59	197.60
Vertical angle (°)	-1.35	1.33
Elevation (ft)	283.46	55.77
Antenna model	SC3-W100A (TR)	SC3-W100A (TR)
Antenna gain (dBi)	38.70	38.70
Antenna height (ft)	90.00	65.00
TX line model	E-105	E-105
TX line unit loss (dB/100 ft)	2.75	2.75
TX line length (ft)	130.00	105.00
TX line loss (dB)	3.58	2.89
Connector loss (dB)	0.20	0.20
TX filter loss (dB)	1.40	1.40
RX filter loss (dB)	1.70	1.70
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	2.04	
Free space loss (dB)	123.79	
Atmospheric absorption loss (dB)	0.05	
Net path loss (dB)	56.40	56.40
Configuration	NSB Diplexer Main	NSB Diplexer Main
Radio model	WVCE11-L-128F10S-52	WVCE11-L-128F10S-52
TX power (dBm)	26.00	26.00
Emission designator	10M00D7W	10M00D7W
EIRP (dBm)	59.53	60.21
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-78.50	-78.50
Receive signal (dBm)	-30.40	-30.40
Thermal fade margin (dB)	48.10	48.10
Dispersive fade margin (dB)	70.00	70.00

	Gaffey Street	Port Police HQ
Dispersive fade occurrence factor	1.00	
Effective fade margin (dB)	48.07	48.07
Climatic factor	2.00	
Terrain roughness (ft)	52.38	
C factor	1.88	
Average annual temperature (°F)	60.67	
Fade occurrence factor (Po)	4.496E-004	
Worst month multipath availability (%)	100.00000	100.00000
Worst month multipath unavailability (sec)	0.02	0.02
Annual multipath availability (%)	100.00000	100.00000
Annual multipath unavailability (sec)	0.07	0.07
Annual 2 way multipath availability (%)	100.00000	
Annual 2 way multipath unavailability (sec)	0.13	
Polarization	Vertical	
Rain region	Los Angeles, California	
Rain rate (mm/hr)	0.00	
Flat fade margin - rain (dB)	48.10	
Rain attenuation (dB)	0.00	
Annual rain availability (%)	100.00000	
Annual rain unavailability (min)	0.00	
Annual rain + multipath availability (%)	100.00000	
Annual rain + multipath unavailability (min)	0.00	

Multipath fading method - Vigants - Barnett
Rain fading method - Crane



Port Police HQ	
Latitude	33 44 24.80 N
Longitude	118 16 59.50 W
Azimuth	348.23°
Elevation	56 ft ASL
Antenna CL	90.0 ft AGL

Frequency (MHz) = 11200.0
K = 1.33, 0.50
%F1 = 100.00

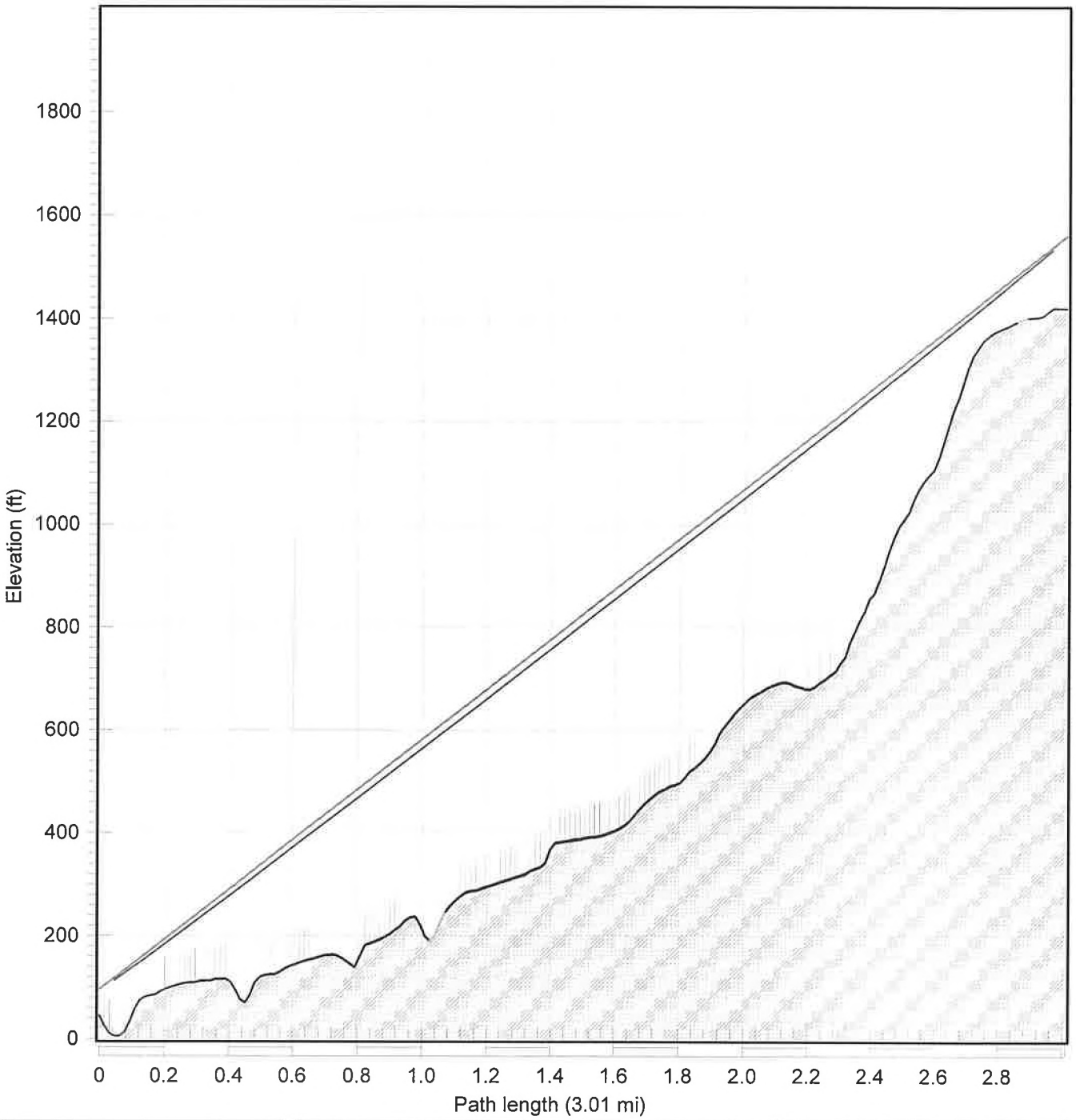
Knoll Hill	
Latitude	33 45 03.70 N
Longitude	118 17 09.20 W
Azimuth	168.23°
Elevation	46 ft ASL
Antenna CL	125.0 ft AGL

Transmission details (Port Police HQ-Knoll Hill.pl5)

	Port Police HQ	Knoll Hill
Latitude	33 44 24.80 N	33 45 03.70 N
Longitude	118 16 59.50 W	118 17 09.20 W
True azimuth (°)	348.23	168.23
Vertical angle (°)	0.35	-0.36
Elevation (ft)	55.77	45.60
Antenna model	SC3-W100A (TR)	SC3-W100A (TR)
Antenna gain (dBi)	38.70	38.70
Antenna height (ft)	90.00	125.00
TX line model	E-105	E-105
TX line unit loss (dB/100 ft)	2.75	2.75
TX line length (ft)	130.00	165.00
TX line loss (dB)	3.58	4.54
Connector loss (dB)	0.20	0.20
TX filter loss (dB)	1.40	1.40
RX filter loss (dB)	1.70	1.70
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	0.76	
Free space loss (dB)	115.21	
Atmospheric absorption loss (dB)	0.02	
Net path loss (dB)	49.44	49.44
Configuration	NSB Diplexer Main	NSB Diplexer Main
Radio model	WVCE11-L-128F10S-52	WVCE11-L-128F10S-52
TX power (dBm)	20.00	20.00
Emission designator	10M00D7W	10M00D7W
EIRP (dBm)	53.53	52.56
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-78.50	-78.50
Receive signal (dBm)	-29.44	-29.44
Thermal fade margin (dB)	49.06	49.06
Dispersive fade margin (dB)	70.00	70.00

	Port Police HQ	Knoll Hill
Dispersive fade occurrence factor	1.00	
Effective fade margin (dB)	49.02	49.02
Climatic factor	2.00	
Terrain roughness (ft)	21.15	
C factor	6.12	
Average annual temperature (°F)	60.57	
Fade occurrence factor (Po)	7.547E-005	
Worst month multipath availability (%)	100.00000	100.00000
Worst month multipath unavailability (sec)	0.00	0.00
Annual multipath availability (%)	100.00000	100.00000
Annual multipath unavailability (sec)	0.01	0.01
Annual 2 way multipath availability (%)	100.00000	
Annual 2 way multipath unavailability (sec)	0.02	
Polarization	Vertical	
Rain region	Los Angeles, California	
Rain rate (mm/hr)	0.00	
Flat fade margin - rain (dB)	49.06	
Rain attenuation (dB)	0.00	
Annual rain availability (%)	100.00000	
Annual rain unavailability (min)	0.00	
Annual rain + multipath availability (%)	100.00000	
Annual rain + multipath unavailability (min)	0.00	

Multipath fading method - Vigants - Barnett
Rain fading method - Crane



Knoll Hill	
Latitude	33 45 03.70 N
Longitude	118 17 09.20 W
Azimuth	265.64°
Elevation	46 ft ASL
Antenna CL	50.0 ft AGL

Frequency (MHz) = 11200.0
K = 1.33, 0.50
%F1 = 100.00

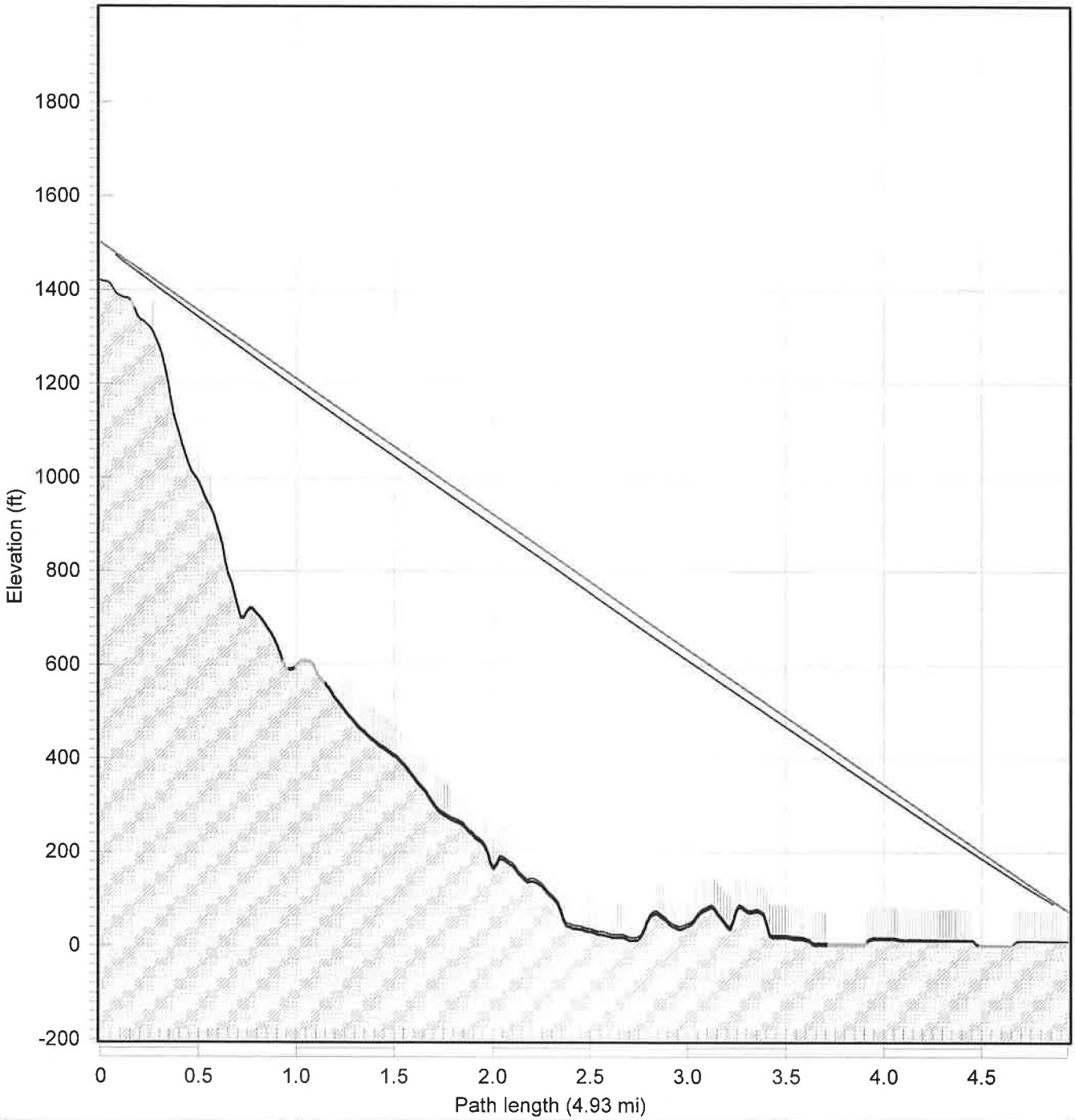
San Pedro Hill	
Latitude	33 44 51.70 N
Longitude	118 20 16.90 W
Azimuth	85.61°
Elevation	1421 ft ASL
Antenna CL	140.0 ft AGL

Transmission details (Knoll Hill-San Pedro Hill.pl5)

	Knoll Hill	San Pedro Hill
Latitude	33 45 03.70 N	33 44 51.70 N
Longitude	118 17 09.20 W	118 20 16.90 W
True azimuth (°)	265.64	85.61
Vertical angle (°)	5.25	-5.28
Elevation (ft)	45.60	1420.87
Antenna model	SC3-W100A (TR)	SC3-W100A (TR)
Antenna gain (dBi)	38.70	38.70
Antenna height (ft)	50.00	140.00
TX line model	E-105	E-105
TX line unit loss (dB/100 ft)	2.75	2.75
TX line length (ft)	90.00	180.00
TX line loss (dB)	2.48	4.95
Connector loss (dB)	0.20	0.20
TX filter loss (dB)	1.40	1.40
RX filter loss (dB)	1.70	1.70
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	3.02	
Free space loss (dB)	127.19	
Atmospheric absorption loss (dB)	0.08	
Net path loss (dB)	60.80	60.80
Configuration	NSB Diplexer Main	NSB Diplexer Main
Radio model	WVCE11-L-128F10S-52	WVCE11-L-128F10S-52
TX power (dBm)	30.50	30.50
Emission designator	10M00D7W	10M00D7W
EIRP (dBm)	65.13	62.65
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-78.50	-78.50
Receive signal (dBm)	-30.30	-30.30
Thermal fade margin (dB)	48.20	48.20
Dispersive fade margin (dB)	70.00	70.00

	Knoll Hill	San Pedro Hill
Dispersive fade occurrence factor	1.00	
Effective fade margin (dB)	48.18	48.18
Climatic factor	2.00	
Terrain roughness (ft)	140.00	
C factor	0.52	
Average annual temperature (°F)	60.60	
Fade occurrence factor (Po)	4.059E-004	
Worst month multipath availability (%)	100.00000	100.00000
Worst month multipath unavailability (sec)	0.02	0.02
Annual multipath availability (%)	100.00000	100.00000
Annual multipath unavailability (sec)	0.06	0.06
Annual 2 way multipath availability (%)	100.00000	
Annual 2 way multipath unavailability (sec)	0.12	
Polarization	Vertical	
Rain region	Los Angeles, California	
Rain rate (mm/hr)	388.65	
Flat fade margin - rain (dB)	48.20	
Rain attenuation (dB)	48.22	
Annual rain availability (%)	100.00000	
Annual rain unavailability (min)	0.00	
Annual rain + multipath availability (%)	100.00000	
Annual rain + multipath unavailability (min)	0.00	

Multipath fading method - Vigants - Barnett
Rain fading method - Crane



San Pedro Hill	
Latitude	33 44 51.70 N
Longitude	118 20 16.90 W
Azimuth	74.86°
Elevation	1421 ft ASL
Antenna CL	80.0 ft AGL

Frequency (MHz) = 11200.0
K = 1.33, 0.50
%F1 = 100.00

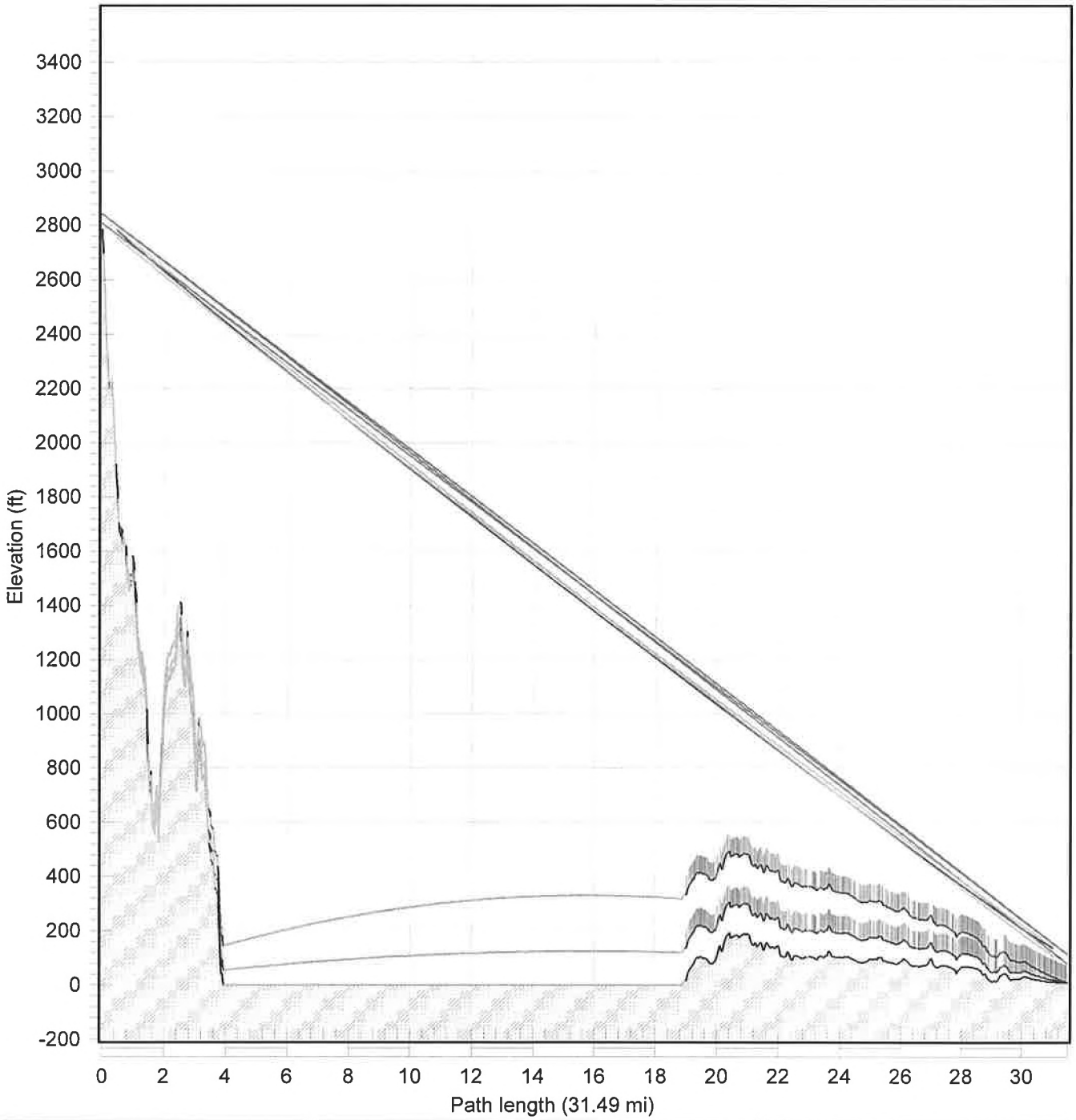
300 Water St MLETC	
Latitude	33 45 58.90 N
Longitude	118 15 19.00 W
Azimuth	254.91°
Elevation	10 ft ASL
Antenna CL	65.0 ft AGL

Transmission details (San Pedro Hill-300 Water St MLETC.pl5)

	San Pedro Hill	300 Water St MLETC
Latitude	33 44 51.70 N	33 45 58.90 N
Longitude	118 20 16.90 W	118 15 19.00 W
True azimuth (°)	74.86	254.91
Vertical angle (°)	-3.16	3.11
Elevation (ft)	1420.87	9.84
Antenna model	SC3-W100A (TR)	SC3-W100A (TR)
Antenna gain (dBi)	38.70	38.70
Antenna height (ft)	80.00	65.00
TX line model	E-105	E-105
TX line unit loss (dB/100 ft)	2.75	2.75
TX line length (ft)	120.00	105.00
TX line loss (dB)	3.30	2.89
Connector loss (dB)	0.20	0.20
TX filter loss (dB)	1.40	1.40
RX filter loss (dB)	1.70	1.70
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	4.94	
Free space loss (dB)	131.46	
Atmospheric absorption loss (dB)	0.13	
Net path loss (dB)	63.88	63.88
Configuration	NSB Diplexer Main	NSB Diplexer Main
Radio model	WVCE11-L-128F10S-52	WVCE11-L-128F10S-52
TX power (dBm)	30.50	30.50
Emission designator	10M00D7W	10M00D7W
EIRP (dBm)	64.30	64.71
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-78.50	-78.50
Receive signal (dBm)	-33.38	-33.38
Thermal fade margin (dB)	45.12	45.12
Dispersive fade margin (dB)	70.00	70.00

	San Pedro Hill	300 Water St MLETC
Dispersive fade occurrence factor	1.00	
Effective fade margin (dB)	45.11	45.11
Climatic factor	2.00	
Terrain roughness (ft)	140.00	
C factor	0.52	
Average annual temperature (°F)	60.54	
Fade occurrence factor (Po)	1.773E-003	
Worst month multipath availability (%)	99.99999	99.99999
Worst month multipath unavailability (sec)	0.14	0.14
Annual multipath availability (%)	100.00000	100.00000
Annual multipath unavailability (sec)	0.52	0.52
Annual 2 way multipath availability (%)	100.00000	
Annual 2 way multipath unavailability (sec)	1.04	
Polarization	Vertical	
Rain region	Los Angeles, California	
Rain rate (mm/hr)	261.81	
Flat fade margin - rain (dB)	45.12	
Rain attenuation (dB)	45.11	
Annual rain availability (%)	100.00000	
Annual rain unavailability (min)	0.02	
Annual rain + multipath availability (%)	99.99999	
Annual rain + multipath unavailability (min)	0.04	

Multipath fading method - Vigants - Barnett
Rain fading method - Crane



Saddle Pk	
Latitude	34 04 32.87 N
Longitude	118 39 30.60 W
Azimuth	132.52°
Elevation	2786 ft ASL
Antenna CL	55.0, 20.0 ft AGL

Frequency (MHz) = 6700.0
K = 1.33, 0.50
%F1 = 100.00, 60.00

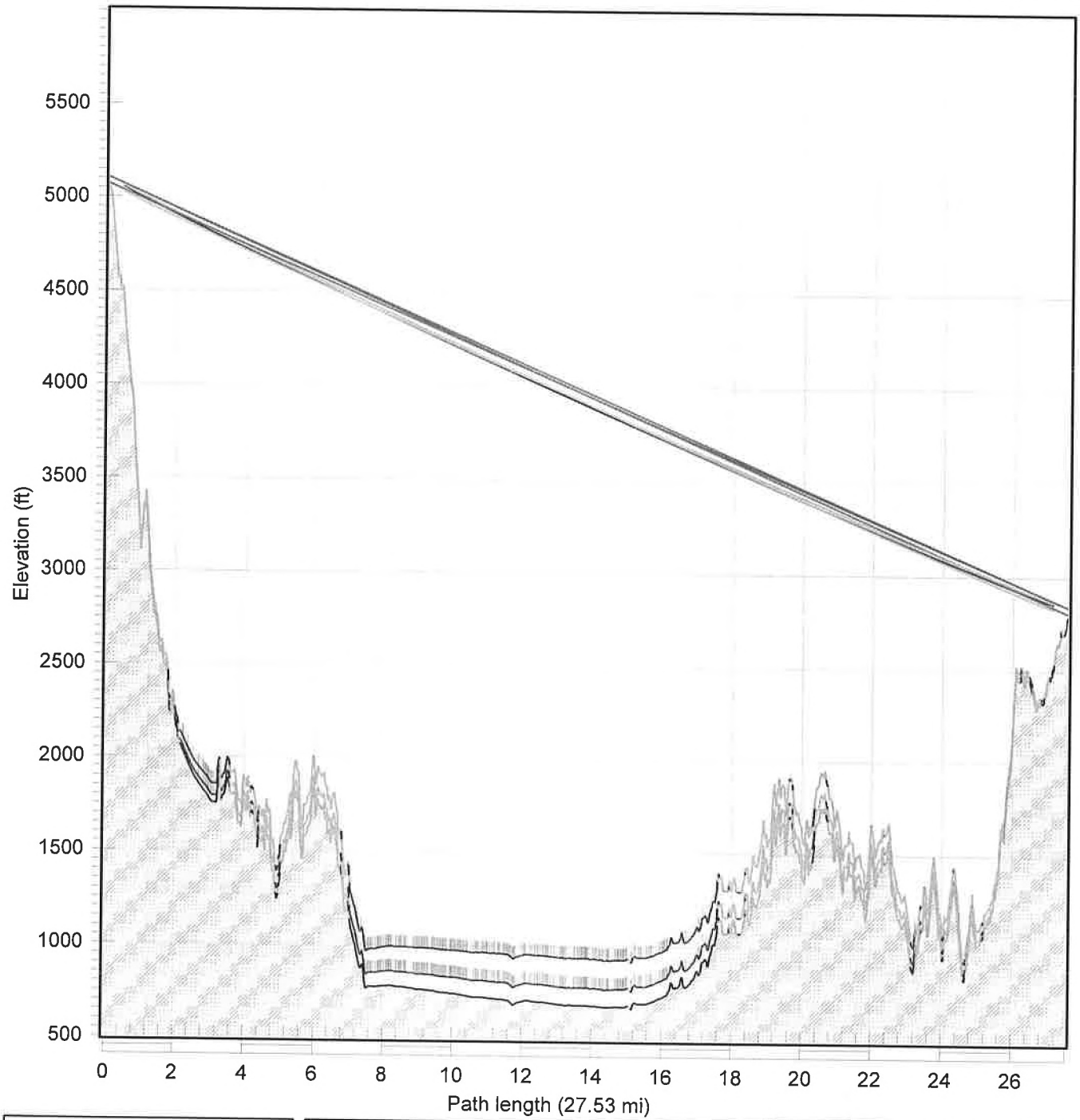
300 Water St MLETC	
Latitude	33 45 58.90 N
Longitude	118 15 19.00 W
Azimuth	312.74°
Elevation	10 ft ASL
Antenna CL	105.0, 70.0 ft AGL

Transmission details (Saddle Pk-300 Water St MLETC.pl5)

	Saddle Pk	300 Water St MLETC
Latitude	34 04 32.87 N	33 45 58.90 N
Longitude	118 39 30.60 W	118 15 19.00 W
True azimuth (°)	132.52	312.74
Vertical angle (°)	-1.11	0.77
Elevation (ft)	2786.30	9.84
Antenna model	PAD6-65B (TR)	PAD6-65B (TR)
Antenna gain (dBi)	39.60	39.60
Antenna height (ft)	55.00	105.00
TX line model	E-65	E-65
TX line unit loss (dB/100 ft)	1.40	1.40
TX line length (ft)	95.00	145.00
TX line loss (dB)	1.33	2.03
Connector loss (dB)	0.20	0.20
TX filter loss (dB)	1.30	1.30
RX filter loss (dB)	2.30	2.30
Antenna model	PAD6-65B (DR)	PAD6-65B (DR)
Antenna gain (dBi)	39.60	39.60
Antenna height (ft)	20.00	70.00
TX line model	E-65	E-65
TX line unit loss (dB/100 ft)	1.40	1.40
TX line length (ft)	60.00	110.00
TX line loss (dB)	0.84	1.54
Connector loss (dB)	0.20	0.20
RX filter loss (dB)	2.30	2.30
Frequency (MHz)	6700.00	
Polarization	Vertical	
Path length (mi)	31.50	
Free space loss (dB)	143.09	
Atmospheric absorption loss (dB)	0.46	
Main net path loss (dB)	72.51	72.51
Diversity net path loss (dB)	72.02	72.02

	Saddle Pk	300 Water St MLETC
Configuration	NSB-SD Diplexer Main	NSB-SD Diplexer Main
Radio model	WVCE67-L-128F10S-52	WVCE67-L-128F10S-52
TX power (dBm)	32.50	32.50
Emission designator	10M00D7W	10M00D7W
EIRP (dBm)	68.87	68.17
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-79.00	-79.00
Main receive signal (dBm)	-40.01	-40.01
Diversity receive signal (dBm)	-39.52	-39.52
Thermal fade margin (dB)	39.48	39.48
Dispersive fade margin (dB)	70.00	70.00
Dispersive fade occurrence factor	1.00	
Effective fade margin (dB)	39.48	39.48
Climatic factor	2.00	
Terrain roughness (ft)	140.00	
C factor	0.52	
Average annual temperature (°F)	60.06	
Fade occurrence factor (Po)	2.745E-001	
SD improvement factor	144.59	144.59
Worst month multipath availability (%)	99.99998	99.99998
Worst month multipath unavailability (sec)	0.56	0.56
Annual multipath availability (%)	99.99999	99.99999
Annual multipath unavailability (sec)	2.03	2.03
Annual 2 way multipath availability (%)	99.99999	
Annual 2 way multipath unavailability (sec)	4.06	

Multipath fading method - Vigants - Barnett



Mt Lukens	
Latitude	34 16 07.18 N
Longitude	118 14 15.40 W
Azimuth	241.25°
Elevation	5049 ft ASL
Antenna CL	55.0, 20.0 ft AGL

Frequency (MHz) = 6700.0
K = 1.33, 0.50
%F1 = 100.00, 60.00

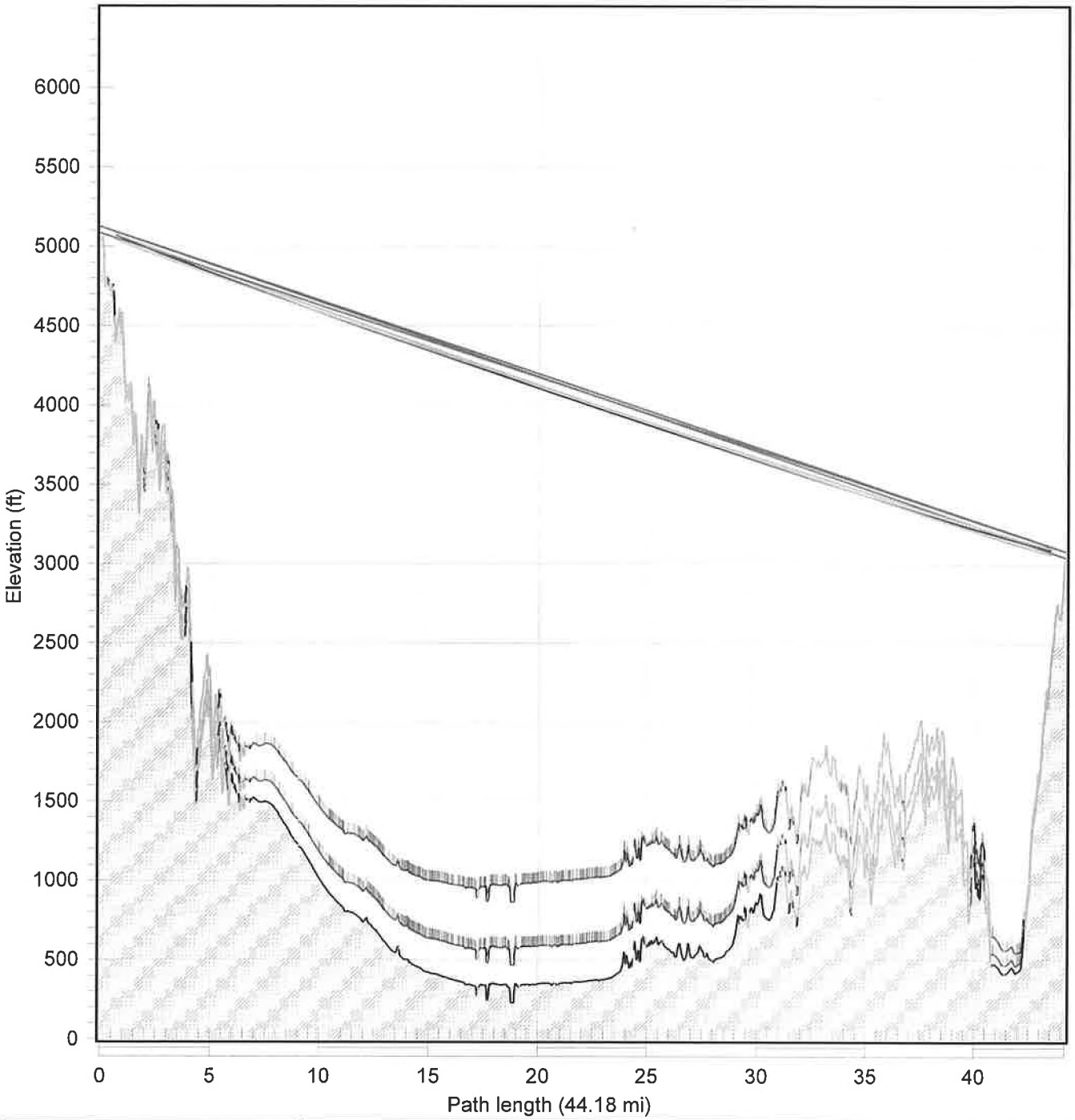
Saddle Pk	
Latitude	34 04 32.87 N
Longitude	118 39 30.60 W
Azimuth	61.01°
Elevation	2786 ft ASL
Antenna CL	55.0, 20.0 ft AGL

Transmission details (Mt Lukens-Saddle Pk.pl5)

	Mt Lukens	Saddle Pk
Latitude	34 16 07.18 N	34 04 32.87 N
Longitude	118 14 15.40 W	118 39 30.60 W
True azimuth (°)	241.25	61.01
Vertical angle (°)	-1.04	0.74
Elevation (ft)	5049.45	2786.30
Antenna model	PAD6-65B (TR)	PAD6-65B (TR)
Antenna gain (dBi)	39.60	39.60
Antenna height (ft)	55.00	55.00
TX line model	E-65	E-65
TX line unit loss (dB/100 ft)	1.40	1.40
TX line length (ft)	95.00	95.00
TX line loss (dB)	1.33	1.33
Connector loss (dB)	0.20	0.20
TX filter loss (dB)	1.30	1.30
RX filter loss (dB)	2.30	2.30
Antenna model	PAD6-65B (DR)	PAD6-65B (DR)
Antenna gain (dBi)	39.60	39.60
Antenna height (ft)	20.00	20.00
TX line model	E-65	E-65
TX line unit loss (dB/100 ft)	1.40	1.40
TX line length (ft)	60.00	60.00
TX line loss (dB)	0.84	0.84
Connector loss (dB)	0.20	0.20
RX filter loss (dB)	2.30	2.30
Frequency (MHz)	6700.00	
Polarization	Vertical	
Path length (mi)	27.54	
Free space loss (dB)	141.92	
Atmospheric absorption loss (dB)	0.40	
Main net path loss (dB)	70.59	70.59
Diversity net path loss (dB)	70.10	70.10

	Mt Lukens	Saddle Pk
Configuration	NSB-SD Diplexer Main	NSB-SD Diplexer Main
Radio model	WVCE67-L-128F10S-52	WVCE67-L-128F10S-52
TX power (dBm)	32.50	32.50
Emission designator	10M00D7W	10M00D7W
EIRP (dBm)	68.87	68.87
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-79.00	-79.00
Main receive signal (dBm)	-38.09	-38.09
Diversity receive signal (dBm)	-37.60	-37.60
Thermal fade margin (dB)	41.40	41.40
Dispersive fade margin (dB)	70.00	70.00
Dispersive fade occurrence factor	1.00	
Effective fade margin (dB)	41.40	41.40
Climatic factor	2.00	
Terrain roughness (ft)	140.00	
C factor	0.52	
Average annual temperature (°F)	58.93	
Fade occurrence factor (Po)	1.835E-001	
SD improvement factor	200.00	200.00
Worst month multipath availability (%)	99.99999	99.99999
Worst month multipath unavailability (sec)	0.17	0.17
Annual multipath availability (%)	100.00000	100.00000
Annual multipath unavailability (sec)	0.62	0.62
Annual 2 way multipath availability (%)	100.00000	
Annual 2 way multipath unavailability (sec)	1.24	

Multipath fading method - Vigants - Barnett



Mt Lukens	
Latitude	34 16 07.18 N
Longitude	118 14 15.40 W
Azimuth	130.62°
Elevation	5049 ft ASL
Antenna CL	75.0, 35.0 ft AGL

Frequency (MHz) = 6700.0
K = 1.33, 0.50
%F1 = 100.00, 60.00

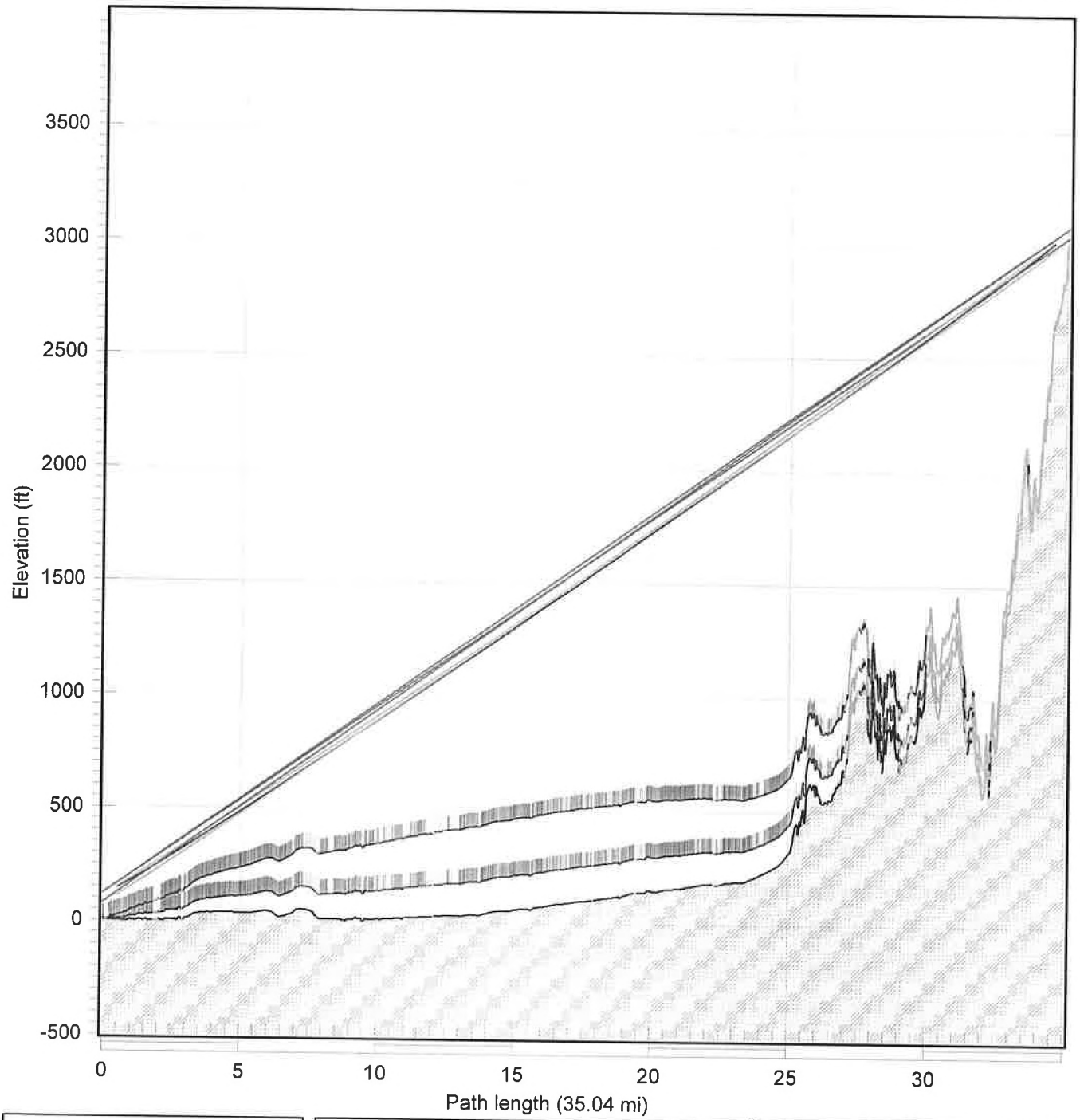
Sierra Peak	
Latitude	33 51 00.03 N
Longitude	117 39 16.30 W
Azimuth	310.95°
Elevation	3021 ft ASL
Antenna CL	60.0, 20.0 ft AGL

Transmission details (Mt Lukens-Sierra Peak.pl5)

	Mt Lukens	Sierra Peak
Latitude	34 16 07.18 N	33 51 00.03 N
Longitude	118 14 15.40 W	117 39 16.30 W
True azimuth (°)	130.62	310.95
Vertical angle (°)	-0.74	0.26
Elevation (ft)	5049.45	3021.42
Antenna model	PAD6-65B (TR)	PAD6-65B (TR)
Antenna gain (dBi)	39.60	39.60
Antenna height (ft)	75.00	60.00
TX line model	E-65	E-65
TX line unit loss (dB/100 ft)	1.40	1.40
TX line length (ft)	115.00	100.00
TX line loss (dB)	1.61	1.40
Connector loss (dB)	0.20	0.20
TX filter loss (dB)	1.30	1.30
RX filter loss (dB)	2.30	2.30
Antenna model	PAD6-65B (DR)	PAD6-65B (DR)
Antenna gain (dBi)	39.60	39.60
Antenna height (ft)	35.00	20.00
TX line model	E-65	E-65
TX line unit loss (dB/100 ft)	1.40	1.40
TX line length (ft)	75.00	60.00
TX line loss (dB)	1.05	0.84
Connector loss (dB)	0.20	0.20
RX filter loss (dB)	2.30	2.30
Frequency (MHz)	6700.00	
Polarization	Vertical	
Path length (mi)	44.18	
Free space loss (dB)	146.03	
Atmospheric absorption loss (dB)	0.65	
Main net path loss (dB)	75.29	75.29
Diversity net path loss (dB)	74.73	74.73

	Mt Lukens	Sierra Peak
Configuration	NSB-SD Diplexer Main	NSB-SD Diplexer Main
Radio model	WVCE67-L-128F10S-52	WVCE67-L-128F10S-52
TX power (dBm)	32.50	32.50
Emission designator	10M00D7W	10M00D7W
EIRP (dBm)	68.59	68.80
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-79.00	-79.00
Main receive signal (dBm)	-42.79	-42.79
Diversity receive signal (dBm)	-42.23	-42.23
Thermal fade margin (dB)	36.77	36.77
Dispersive fade margin (dB)	70.00	70.00
Dispersive fade occurrence factor	1.00	
Effective fade margin (dB)	36.77	36.77
Climatic factor	2.00	
Terrain roughness (ft)	140.00	
C factor	0.52	
Average annual temperature (°F)	58.63	
Fade occurrence factor (Po)	7.578E-001	
SD improvement factor	71.04	71.04
Worst month multipath availability (%)	99.99978	99.99978
Worst month multipath unavailability (sec)	5.90	5.90
Annual multipath availability (%)	99.99993	99.99993
Annual multipath unavailability (sec)	20.74	20.74
Annual 2 way multipath availability (%)	99.99987	
Annual 2 way multipath unavailability (sec)	41.48	

Multipath fading method - Vigants - Barnett



300 Water St MLETC	
Latitude	33 45 58.90 N
Longitude	118 15 19.00 W
Azimuth	80.36°
Elevation	10 ft ASL
Antenna CL	110.0, 70.0 ft AGL

Frequency (MHz) = 6700.0
K = 1.33, 0.50
%F1 = 100.00, 60.00

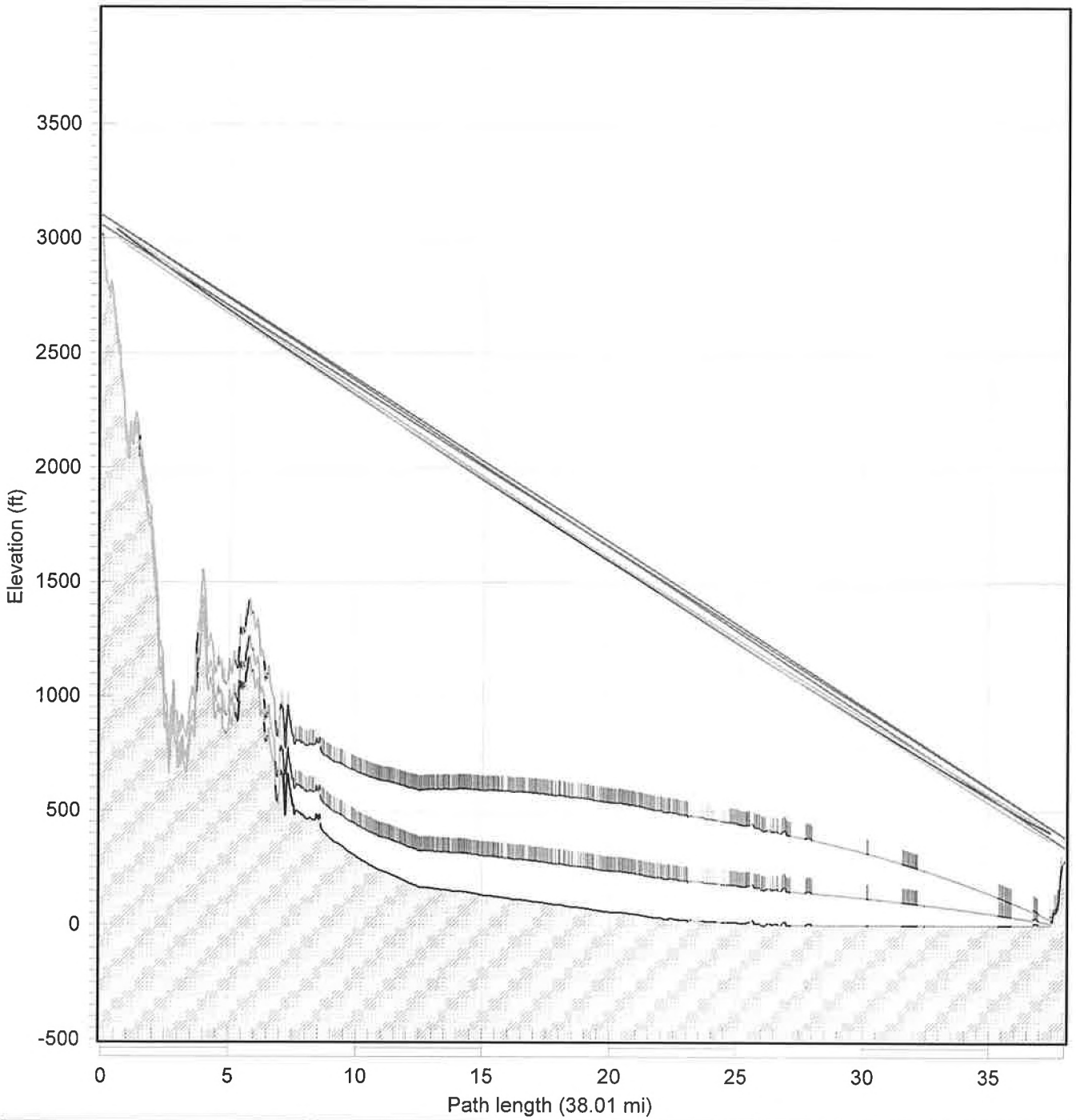
Sierra Peak	
Latitude	33 51 00.03 N
Longitude	117 39 16.30 W
Azimuth	260.70°
Elevation	3021 ft ASL
Antenna CL	60.0, 20.0 ft AGL

Transmission details (300 Water St MLETC-Sierra Peak.pl5)

	300 Water St MLETC	Sierra Peak
Latitude	33 45 58.90 N	33 51 00.03 N
Longitude	118 15 19.00 W	117 39 16.30 W
True azimuth (°)	80.36	260.70
Vertical angle (°)	0.73	-1.11
Elevation (ft)	9.84	3021.42
Antenna model	PAD6-65B (TR)	PAD6-65B (TR)
Antenna gain (dBi)	39.60	39.60
Antenna height (ft)	110.00	60.00
TX line model	E-65	E-65
TX line unit loss (dB/100 ft)	1.40	1.40
TX line length (ft)	150.00	100.00
TX line loss (dB)	2.10	1.40
Connector loss (dB)	0.20	0.20
TX filter loss (dB)	1.30	1.30
RX filter loss (dB)	2.30	2.30
Antenna model	PAD6-65B (DR)	PAD6-65B (DR)
Antenna gain (dBi)	39.60	39.60
Antenna height (ft)	70.00	20.00
TX line model	E-65	E-65
TX line unit loss (dB/100 ft)	1.40	1.40
TX line length (ft)	110.00	60.00
TX line loss (dB)	1.54	0.84
Connector loss (dB)	0.20	0.20
RX filter loss (dB)	2.30	2.30
Frequency (MHz)	6700.00	
Polarization	Vertical	
Path length (mi)	35.05	
Free space loss (dB)	144.01	
Atmospheric absorption loss (dB)	0.52	
Main net path loss (dB)	73.63	73.63
Diversity net path loss (dB)	73.07	73.07

	300 Water St MLETC	Sierra Peak
Configuration	NSB-SD Diplexer Main	NSB-SD Diplexer Main
Radio model	WVCE67-L-128F10S-52	WVCE67-L-128F10S-52
TX power (dBm)	32.50	32.50
Emission designator	10M00D7W	10M00D7W
EIRP (dBm)	68.10	68.80
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-79.00	-79.00
Main receive signal (dBm)	-41.13	-41.13
Diversity receive signal (dBm)	-40.57	-40.57
Thermal fade margin (dB)	38.43	38.43
Dispersive fade margin (dB)	70.00	70.00
Dispersive fade occurrence factor	1.00	
Effective fade margin (dB)	38.43	38.43
Climatic factor	2.00	
Terrain roughness (ft)	140.00	
C factor	0.52	
Average annual temperature (°F)	59.78	
Fade occurrence factor (Po)	3.782E-001	
SD improvement factor	131.13	131.13
Worst month multipath availability (%)	99.99996	99.99996
Worst month multipath unavailability (sec)	1.09	1.09
Annual multipath availability (%)	99.99999	99.99999
Annual multipath unavailability (sec)	3.91	3.91
Annual 2 way multipath availability (%)	99.99998	
Annual 2 way multipath unavailability (sec)	7.81	

Multipath fading method - Vigants - Barnett



Sierra Peak	
Latitude	33 51 00.03 N
Longitude	117 39 16.30 W
Azimuth	255.68°
Elevation	3021 ft ASL
Antenna CL	80.0, 35.0 ft AGL

Frequency (MHz) = 6700.0
K = 1.33, 0.50
%F1 = 100.00, 60.00

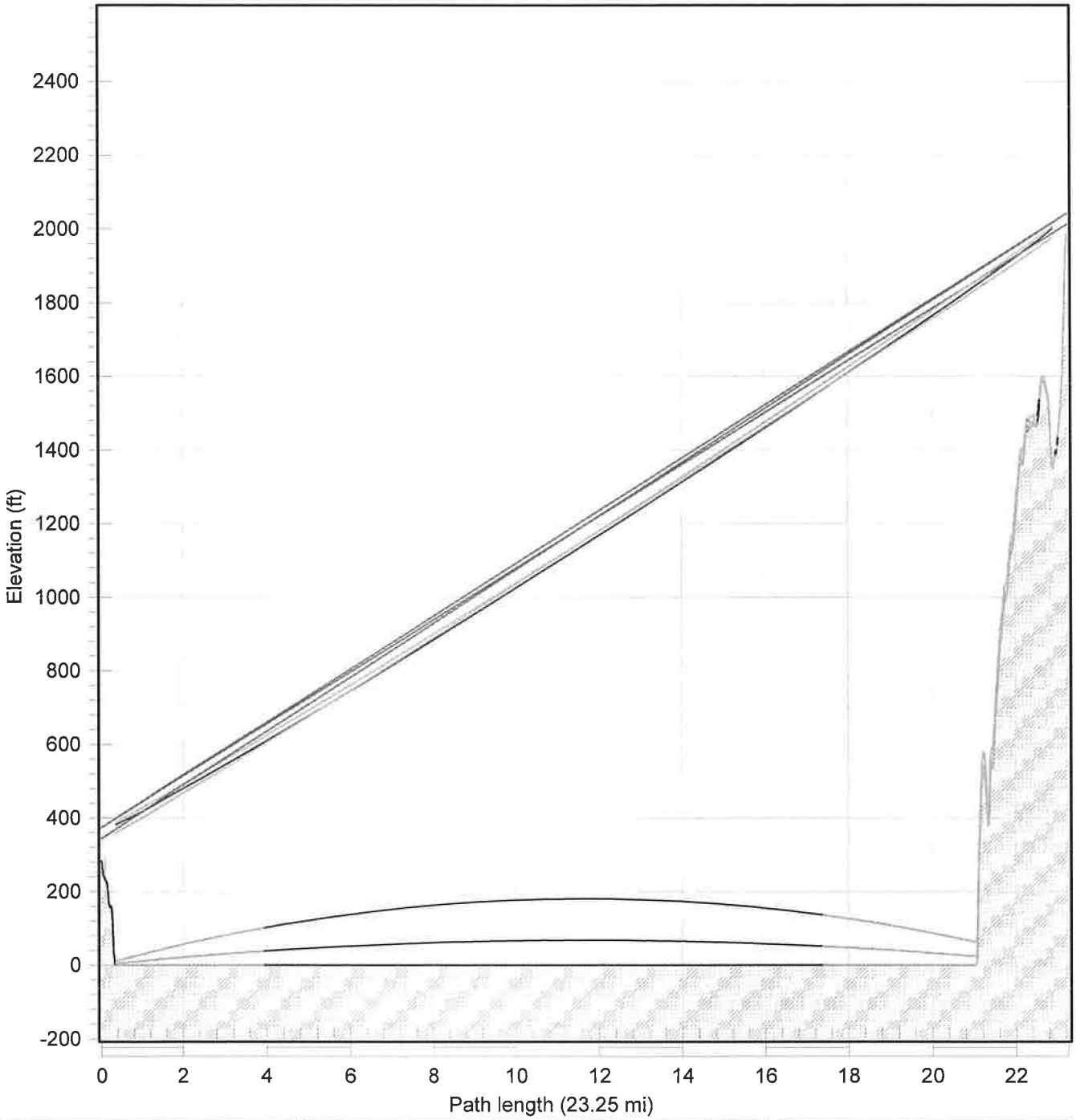
Gaffey Street	
Latitude	33 42 43.10 N
Longitude	118 17 38.10 W
Azimuth	75.33°
Elevation	283 ft ASL
Antenna CL	105.0, 60.0 ft AGL

Transmission details (Sierra Peak-Gaffey Street.pl5)

	Sierra Peak	Gaffey Street
Latitude	33 51 00.03 N	33 42 43.10 N
Longitude	117 39 16.30 W	118 17 38.10 W
True azimuth (°)	255.68	75.33
Vertical angle (°)	-0.98	0.57
Elevation (ft)	3021.42	283.46
Antenna model	PAD6-65B (TR)	PAD6-65B (TR)
Antenna gain (dBi)	39.60	39.60
Antenna height (ft)	80.00	105.00
TX line model	E-65	E-65
TX line unit loss (dB/100 ft)	1.40	1.40
TX line length (ft)	120.00	145.00
TX line loss (dB)	1.68	2.03
Connector loss (dB)	0.20	0.20
TX filter loss (dB)	1.30	1.30
RX filter loss (dB)	2.30	2.30
Antenna model	PAD6-65B (DR)	PAD6-65B (DR)
Antenna gain (dBi)	39.60	39.60
Antenna height (ft)	35.00	60.00
TX line model	E-65	E-65
TX line unit loss (dB/100 ft)	1.40	1.40
TX line length (ft)	75.00	100.00
TX line loss (dB)	1.05	1.40
Connector loss (dB)	0.20	0.20
RX filter loss (dB)	2.30	2.30
Frequency (MHz)	6700.00	
Polarization	Vertical	
Path length (mi)	38.01	
Free space loss (dB)	144.72	
Atmospheric absorption loss (dB)	0.56	
Main net path loss (dB)	74.59	74.59
Diversity net path loss (dB)	73.96	73.96

	Sierra Peak	Gaffey Street
Configuration	NSB-SD Diplexer Main	NSB-SD Diplexer Main
Radio model	WVCE67-L-128F10S-52	WVCE67-L-128F10S-52
TX power (dBm)	32.50	32.50
Emission designator	10M00D7W	10M00D7W
EIRP (dBm)	68.52	68.17
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-79.00	-79.00
Main receive signal (dBm)	-42.09	-42.09
Diversity receive signal (dBm)	-41.46	-41.46
Thermal fade margin (dB)	37.54	37.54
Dispersive fade margin (dB)	70.00	70.00
Dispersive fade occurrence factor	1.00	
Effective fade margin (dB)	37.54	37.54
Climatic factor	2.00	
Terrain roughness (ft)	140.00	
C factor	0.52	
Average annual temperature (°F)	59.93	
Fade occurrence factor (Po)	4.826E-001	
SD improvement factor	122.68	122.68
Worst month multipath availability (%)	99.99993	99.99993
Worst month multipath unavailability (sec)	1.82	1.82
Annual multipath availability (%)	99.99998	99.99998
Annual multipath unavailability (sec)	6.55	6.55
Annual 2 way multipath availability (%)	99.99996	
Annual 2 way multipath unavailability (sec)	13.11	

Multipath fading method - Vigants - Barnett



Gaffey Street	
Latitude	33 42 43.10 N
Longitude	118 17 38.10 W
Azimuth	195.43°
Elevation	283 ft ASL
Antenna CL	90.0, 60.0 ft AGL

Frequency (MHz) = 6700.0
K = 1.33, 0.50
%F1 = 100.00, 60.00

Black Jack Mtn	
Latitude	33 23 12.10 N
Longitude	118 24 03.20 W
Azimuth	15.37°
Elevation	1992 ft ASL
Antenna CL	50.0, 20.0 ft AGL

Transmission details (Gaffey Street-Black Jack Mtn.pl5)

	Gaffey Street	Black Jack Mtn
Latitude	33 42 43.10 N	33 23 12.10 N
Longitude	118 17 38.10 W	118 24 03.20 W
True azimuth (°)	195.43	15.37
Vertical angle (°)	0.65	-0.90
Elevation (ft)	283.46	1991.67
Antenna model	PAD6-65B (TR)	PAD6-65B (TR)
Antenna gain (dBi)	39.60	39.60
Antenna height (ft)	90.00	50.00
TX line model	E-65	E-65
TX line unit loss (dB/100 ft)	1.40	1.40
TX line length (ft)	130.00	90.00
TX line loss (dB)	1.82	1.26
Connector loss (dB)	0.20	0.20
TX filter loss (dB)	1.90	1.90
RX filter loss (dB)	2.30	2.30
Antenna model	PAD6-65B (DR)	PAD6-65B (DR)
Antenna gain (dBi)	39.60	39.60
Antenna height (ft)	60.00	20.00
TX line model	E-65	E-65
TX line unit loss (dB/100 ft)	1.40	1.40
TX line length (ft)	100.00	60.00
TX line loss (dB)	1.40	0.84
Connector loss (dB)	0.20	0.20
RX filter loss (dB)	2.30	2.30
Frequency (MHz)	6700.00	
Polarization	Vertical	
Path length (mi)	23.26	
Free space loss (dB)	140.45	
Atmospheric absorption loss (dB)	0.34	
Main net path loss (dB)	70.07	70.07
Diversity net path loss (dB)	69.65	69.65

	Gaffey Street	Black Jack Mtn
Configuration	HSB-SD Diplexer Main	HSB-SD Diplexer Main
Radio model	WVCE67-L-128F10S-52	WVCE67-L-128F10S-52
TX power (dBm)	32.50	32.50
Emission designator	10M00D7W	10M00D7W
EIRP (dBm)	67.78	68.34
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-79.00	-79.00
Main receive signal (dBm)	-37.57	-37.57
Diversity receive signal (dBm)	-37.15	-37.15
Thermal fade margin (dB)	41.85	41.85
Dispersive fade margin (dB)	70.00	70.00
Dispersive fade occurrence factor	1.00	
Effective fade margin (dB)	41.84	41.84
Climatic factor	2.00	
Terrain roughness (ft)	140.00	
C factor	0.52	
Average annual temperature (°F)	61.55	
Fade occurrence factor (Po)	1.105E-001	
SD improvement factor	200.00	200.00
Worst month multipath availability (%)	100.00000	100.00000
Worst month multipath unavailability (sec)	0.10	0.10
Annual multipath availability (%)	100.00000	100.00000
Annual multipath unavailability (sec)	0.35	0.35
Annual 2 way multipath availability (%)	100.00000	
Annual 2 way multipath unavailability (sec)	0.70	

Multipath fading method - Vigants - Barnett

2.25 MPLS ROUTERS & NETWORK DESIGN

System Description

The Backhaul Network will be an MPLS WAN Backhaul Network using Juniper network elements. The Juniper router family of products will be used to connect the microwave to Motorola Radio Gateways using ASTRO Ethernet Site Links (ESL). The Juniper routers will use MPLS in order to route traffic and maintain redundant links to all sites in the network. A backhaul IP plan, VLAN plan and routing/switching plan will be developed for the backhaul network. These plans are separate from the ASTRO RNI IP plan. A backhaul port layout plan will be developed for the backhaul network. The Juniper network equipment will be installed within the ASTRO equipment racks.

Multiprotocol Label Switching (MPLS) is a method for engineering traffic patterns by assigning short labels to network packets that describe how to forward them through the network. MPLS is independent of routing tables or any routing protocol and can be used for unicast packets. Traffic is engineered (controlled) primarily by the use of signaling protocols to establish label-switched paths (LSPs). The backhaul network will use MPLS to maintain and route traffic over the network architecture. In the event of a site link failure, the routers will reroute the traffic over the redundant links if available to maintain connectivity to all ASTRO radio sites. The traffic rerouting occurs in a small amount of time, so no interruption of service should be experienced.

From a high level, the backhaul network design consists of the Ethernet network, and will use Ethernet Site Links and IP-IP tunnels across the Flexible WAN Backhaul. ASTRO P25 does have specific network requirements and robust protocols should be used to help achieve meeting these network requirements. Spanning Tree Protocol should not be used. The use of the IP-IP tunnels reduces need for dynamic routing protocol interactions outside of the ASTRO P25 solution. QoS must be used to support ASTRO P25 traffic requirements.

Some of the benefits for using Ethernet Site Links (ESL) feature are:

- Ability to use a higher bandwidth to transport ASTRO P25 system traffic
- Ability to have a shared backhaul to transport ASTRO P25 radio communication system traffic with other network traffic from other potential public safety solutions. This has potential cost savings to public safety customers as contrast to having dedicated T1 circuits for all network links. QoS is a very important design consideration when more than just ASTRO P25 traffic will be on the backhaul carrying ESL.

Designing a backhaul network that meets ASTRO P25 requirements is not a trivial task and has higher requirements than typical Ethernet Enterprise style networks. Not having a suitable design and meeting requirements of ASTRO P25 will incur potential system impacts. To reduce potential system impacts, Backhaul Network designs need to address the following areas: Ethernet Link quality, Latency, Jitter and Packet Loss. Fault tolerance and backup network paths that converge quickly enough are also a concern to be addressed. All links must be designed correctly to transport different types of site link traffic and handle dual-site link configurations. There must be a correctly designed QoS plan. Using Motorola's DSR (for backup MASTER) feature adds to the complexity of these requirements. These impacts will result in system access time than can affect voice access time, speech truncation and Audio throughput delay. There can also be data service performance issues with reductions in throughput. Contact your Motorola representative for more details in regard to impact, requirements and constraints for designing a backhaul network. This will lead to the best design and deployment practices for a successful ASTRO P25 solution as per System Releases of 7.11 or better. It is highly recommended that someone has experience with designing and deploying backbone networks that transport ASTRO P25 traffic.

In your design, Motorola's NSE (Network Solutions Engineering team) will be used for the implementation. Motorola's NSE team can handle collaboration with custom network design and deployment to tailor backhaul designs towards specific customer needs. NSE will use their backhaul network best practices in the backhaul design. There are many best practices learned from designing ESL solutions for ASTRO P25, going through CCSi testing and field integrations. NSE will document the ESL BH solution to assist with those that will provide future support. There are many ASTRO P25 requirements and NSE Backhaul Network best practices around custom BH design that address these areas: IP plan, VLAN plan, System Port plan, QoS plan, Route plan, SNMP plan and troubleshooting practices. Inside the ASTRO P25 RNI all of this planning is accounted for and needs to be addressed on the backhaul. Contact your Motorola representative for more details about these services and other network backhaul lifecycle services than NSE can provide.

From a high-level look at our design there are a few areas or demarks to identify:

- **BHWANzone** – this is a network zone that provides site to site connectivity across the backhaul network. ASTRO P25 uses this zone to connect ASTRO sites together.
- **BHNMSzone** - this is network zone that provides secure management of the BH
- **RNI** – This is the inside Radio network that ASTRO operates on
- **CEN** - Customer Network Enterprise zone that carries customer network traffic
- **CNI** - Customer Network Interface is the area that non ASTRO traffic interfaces with ASTRO

The Juniper MX-104 and ACX-1100 have been selected for the Port of Los Angeles Backhaul. A MX-104 routeris used at all ring locations. An ACX-110 is used at spur remote locations. These BH Nodes link the backhaul network to ASTRO radio gateways (GGM).

BHWANzone - Backhaul Nodes - Juniper Routers

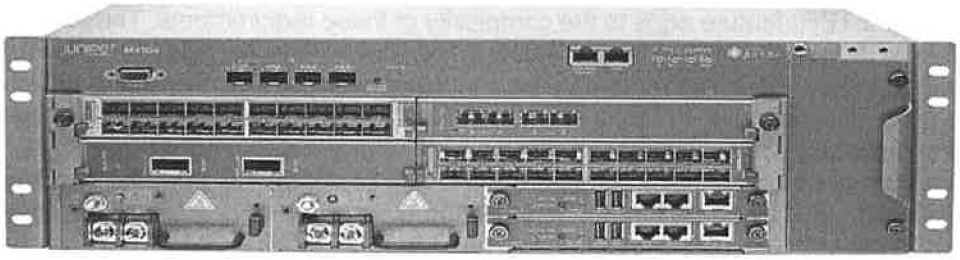
The Juniper MX and ACX Series Services Gateways are high-performance security, routing, and switching, solutions based on Dynamic Services Architecture that provides high port-density, advanced security, and flexible connectivity, in a single, easily managed platform. Consolidated routing, WAN connectivity, switching, and Unified Threat Management (UTM), simplifies deployment and administration, and deliver fast and consistent service quality regardless of user location.

Juniper routers create fast, secure, highly-available, branch networks at enterprise installations. A variety of MX and ACX Series products and options support a wide range of performance, functionality, security, and budget, requirements for networks of up to thousands of users.

Routing protocols include BGP, OSPF, RIP, IPv4, IPv6, MPLS, VPLS, extensive NAT, QoS, performance and SLA monitoring, and flow management.

MX and ACX Series Service Gateways are Junos based and include management tools that simplify deployment, reduce training costs, and promote ease of use.

Juniper MX-104



The SDN-ready MX104 3D Universal Edge Router is a modular, highly redundant, and full-featured MX Series platform built for space- and power-constrained service provider and enterprise facilities.

The MX104 offers 160 Gbps of capacity, a redundant control plane for high availability, as well as four fixed 10GbE ports and four Modular Interface Card (MIC) slots for flexible network connectivity and virtualized network services. Optimized for mobile applications and central office deployments, the MX104 is also ETSI 300 compliant, environmentally hardened for deployment in outside cabinets and remote terminals, and supports advanced timing features.

Powered by Junos OS and the programmable Trio chipset, the MX104 shares the same advanced routing, switching, security, and service features that are available in large MX Series platforms, including support for a wide range of L2/L3 VPN services and advanced broadband network gateway functions.

Deployed in mission-critical service providers and enterprise networks worldwide, the MX104 helps network operators transform their networks—and their businesses—to thrive in our hyper-connected world.It is equipped with a user-configurable Modular Interface Card (MIC) slot for flexible network connectivity and an additional MIC slot in the rear to support a multiservice card for virtualized network services such as Carrier Grade NAT (CGNAT), stateful firewall, and IPsec.

BHNMSzone

The Backhaul Network Management Zone starts with a Fortinet UTM devices that provide secure access to the BH. From within this BHNMSzone will be Juniper EX2200 switches providing layer 2 functions for secure management access into the BHWANzone. From these switches management functions like NSM using SNMP are handled. The BHNMSzone is the recommended location for additional overall management functions to be deployed from. This is not the zone where ASTRO specific management tools are based.

Fortinet UTM/Firewalls assist to help create the BHNMSzone, a Fortinet Firewall will be used to secure this zone. Not only does this create a secure zone to protect management resources, but also provides the ability for secure VPN/SSL remote access to assist in remote troubleshooting and network management. Motorola has extensive experience with using this element.

FortiGate-60D Network Security Appliance Features & Benefits:

- Delivers market-leading 1 Gbps firewall throughput with 2 GbE WAN and 7 GbE switched LAN interfaces
- Rich feature set to protect next generation with application control, built-in wireless controller, local logging, and endpoint policy enforcement
- IPv4 & IPv6-ready platform with strong authentication options for secure network access and security policy compliance

A "single pane of glass" management console makes it easy for you to deploy and manage Fortinet has next generation security devices and virtual appliances are purpose-built to provide essential security services that are certified for government networks. They enable rapid deployment of essential security technologies, and the flexibility to scale with your growing public sector network. Multiple certifications, including Federal NIST, ensure compliance with government standards such as Federal NIAP Certification Support and Common Criteria EAL4+. The U.S. Department of Defense (DoD) Joint Interoperability Test Command (JITC)

certified FortiGate appliances for IPv6 support, and are listed on the DoD's Unified Capabilities Approved Products List (UC APL).

2.26 BI-DIRECTIONAL AMPLIFIERS (BDA) UPGRADES

Motorola has included two BDA's in this proposal to ensure the proposed 700MHz system provides adequate coverage to the Harbor Administration Building and the Port Police Headquarters Building. BDA's backroom equipment will be installed at each facility and RF distribution will be installed in each area throughout the building, as necessary.

The proposed solution and provided pricing assume easily accessible installation locations (e.g. drop ceilings, conduits between rooms, etc.)

LOCATION	SQUARE FOOTAGE	FLOORS
Port Police Headquarters – 700 MHz	192,000	B1, B2, B3, 1, 2, 3
Harbor Administration Building – 700 MHz	165,000	1, 2, 3, 4, 5

2.26.1 BDA Coverage Requirement:

-95 dBm coverage over 95% of the facilities.

2.26.2 Location Photos

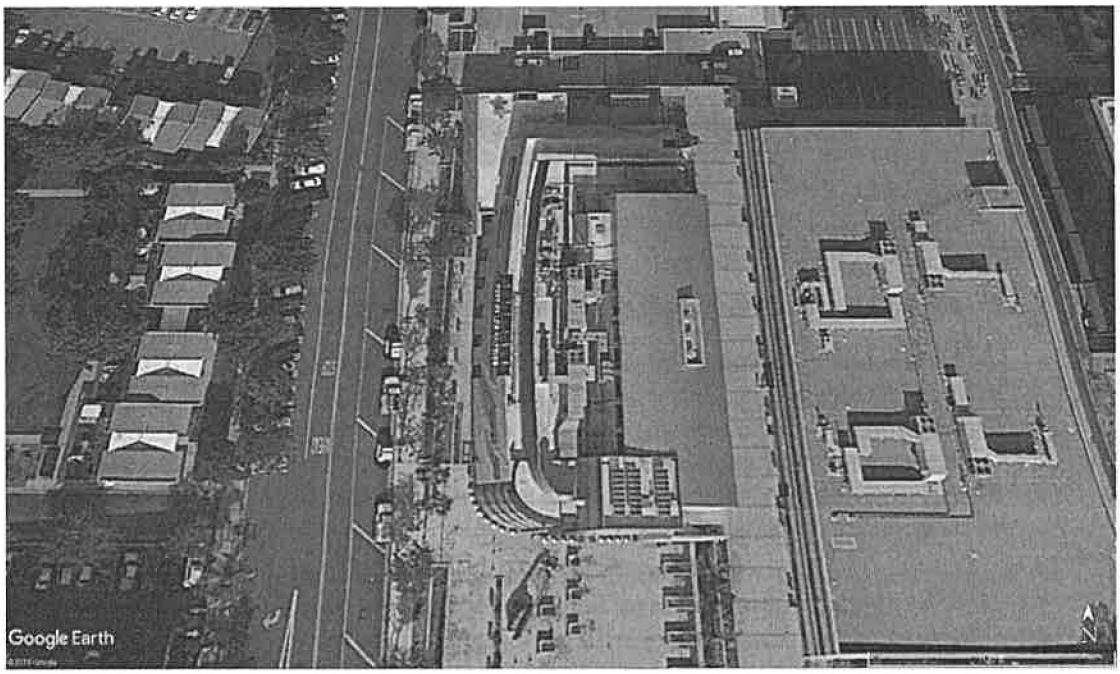


Figure 2-21: Port PD Headquarters

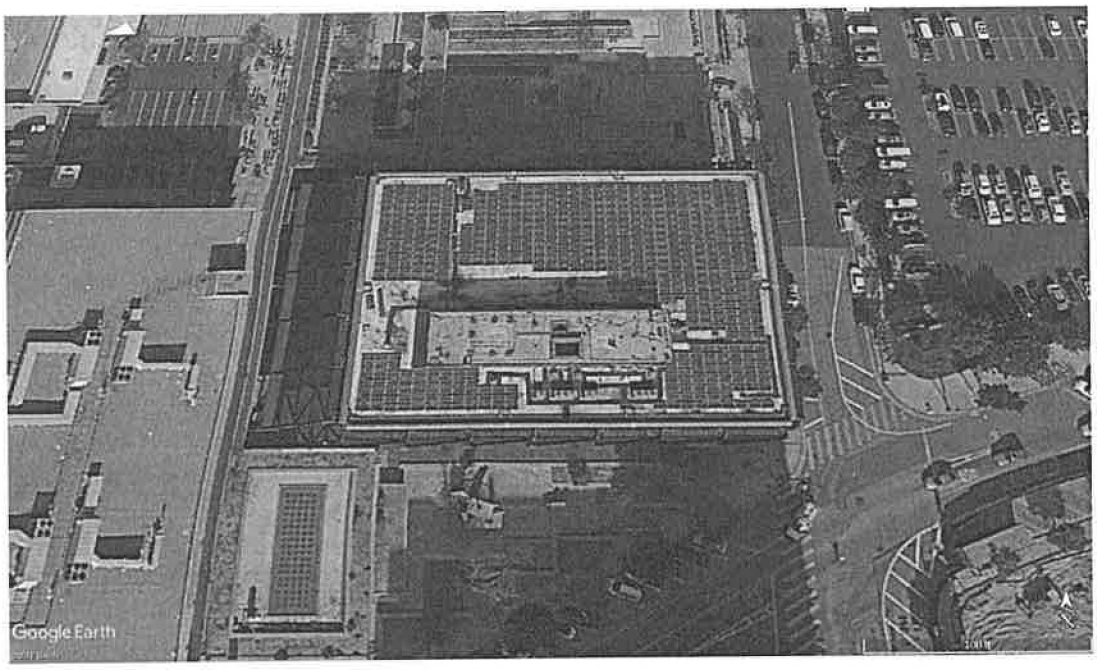


Figure 2-22: Harbor Administration Building

2.27 APX PORTABLE & MOBILE UPGRADES & PROGRAMMING.

To support the advanced features included in the proposed system upgrade Motorola has included the following feature upgrades to the ports existing APX radio fleet.

Quantity	Feature
320	ADD: ENHANCED DATA
320	ADD: GROUP SERVICES FLP

As part of the new system deployment Motorola has included a single-touch programming effort into the proposal. Existing APX Portable and Mobile implemented by the Port of LA will be reprogrammed to operate on the newly implemented sub-systems and will include an update to the latest firmware.

2.28 DESIGN ASSUMPTIONS

Motorola has based the system design on information provided by the Port and an analysis of their system requirements. All assumptions have been listed below for review. The Pricing provided is based upon these following assumptions. Modifications to these assumptions, equipment list, or scope of the project after contract will require a change order.

- All work by the Motorola team is to be performed during normal work hours, Monday through Friday 7:30 a.m. to 5:00 p.m. Modification to these times, either overall or on a case by case basis, is possible with agreement between both Motorola and the Port of LA.
  - Exceptions can be made as needed to ensure minimal impact to Port of LA operations.
- Motorola is not responsible for interference caused or received by the Motorola provided equipment except for interference that is directly caused by the Motorola-provided transmitter(s) to the Motorola-provided receiver(s). Should the Cities system experience interference, Motorola can be contracted to investigate the source and recommend solutions to mitigate the issue.
- All of sites in the proposal have sufficient space available for the system described.
  - This includes available spaces for proposed cabinets, cables, and cable entry ports.
- All existing towers at the proposed site locations have enough space to accommodate the new RF equipment. Any tower upgrades are the responsibility of the Port.
  - Motorola will work with the Port to temporarily mount new antennas in the event tower space is limited.
- All existing sites and equipment locations will have adequate electrical power and site grounding suitable to support the requirements of the system described.
- Any site/location upgrades or modifications to the existing sites are the responsibility of the Port.
- The Port is responsible for identifying and licensing all radio system frequencies.
  - Identifying includes providing a list of licensable, available, and viable 7/800MHz frequencies for analysis by Motorola to determine most optimal simulcast cell for implementation.
- Any necessary FCC licensing will be provided by the Port. Motorola Solutions will assist the Port of LA in preparing the required documentation to submit to the FCC and Regional Planning Committee.
- The Port will obtain any local, state, or federal permits required for the installation and operation of the proposed equipment.
- All Ethernet, microwave, and other necessary site connectivity will be provided by the Port. This excludes the MPLS routers configured previously by Motorola in Phase 1B.
- All civil site work at the proposed sites is the responsibility of the Port.
- Other than then APX subscriber's upgrades included here, no portable subscribers, mobile subscribers, or consolettes have been included in this proposal.

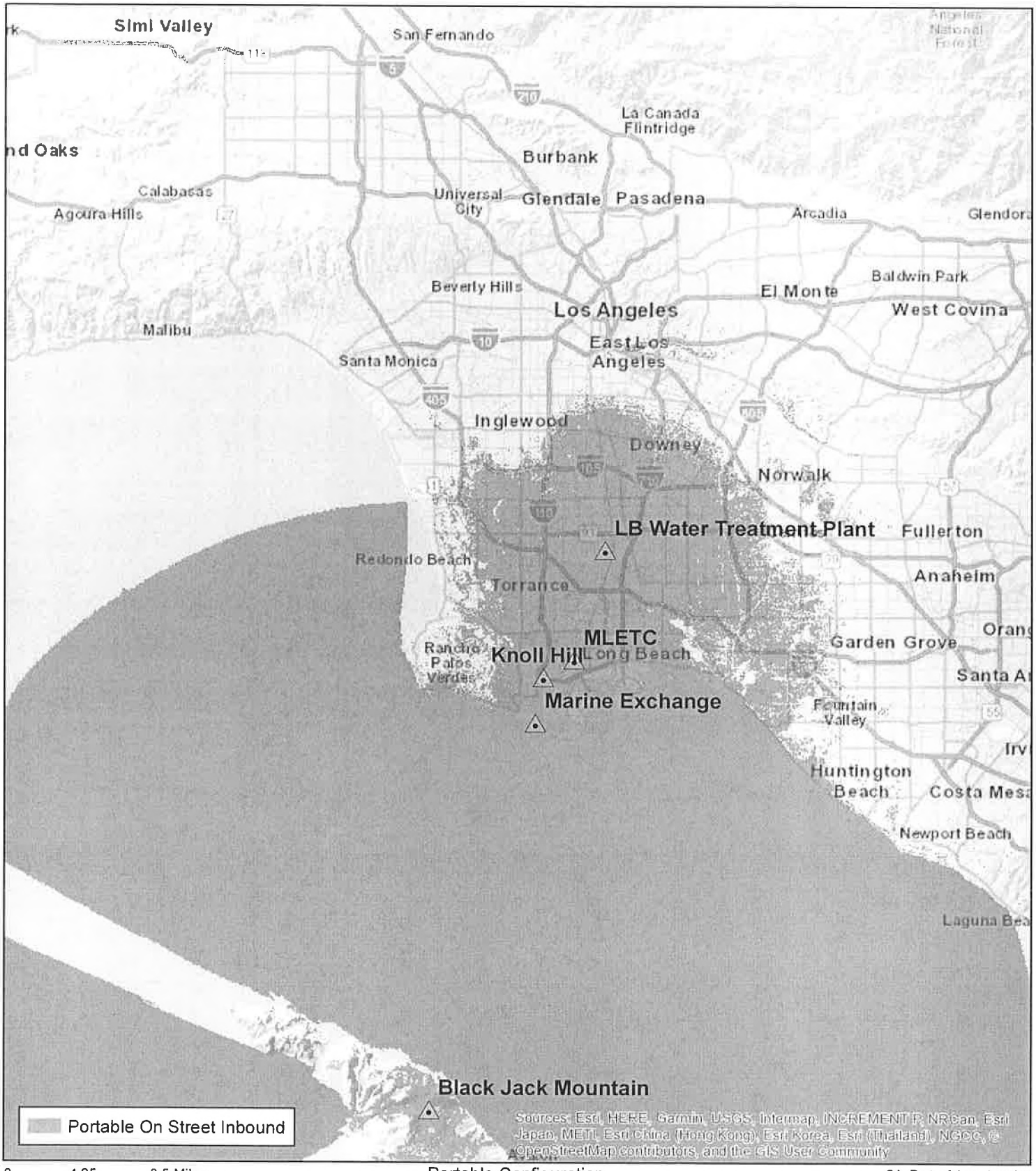
2.29 7/800 MHZ COVERAGE MAPS

MOTOROLA SOLUTIONS

POLA, CA

For Information Only

5-Site ASTRO P25 700MHz TDMA 1-Cell Simulcast System
Shaded Area Represents 95% Covered Area Reliability at DAQ 3.4



0 4.25 8.5 Miles

1 in = 7 miles

Portable Configuration
APX 8000, 2.5W, Dual band antenna
Tx/Rx at hip (3.3') in swivel case and RSM

CA_Port_of_Los_Angeles
CA_Port_of_LA
Design 52
TBXG34, CCDTLAB-800

Oct 04, 2019
Hydra Stratus 2.6.7

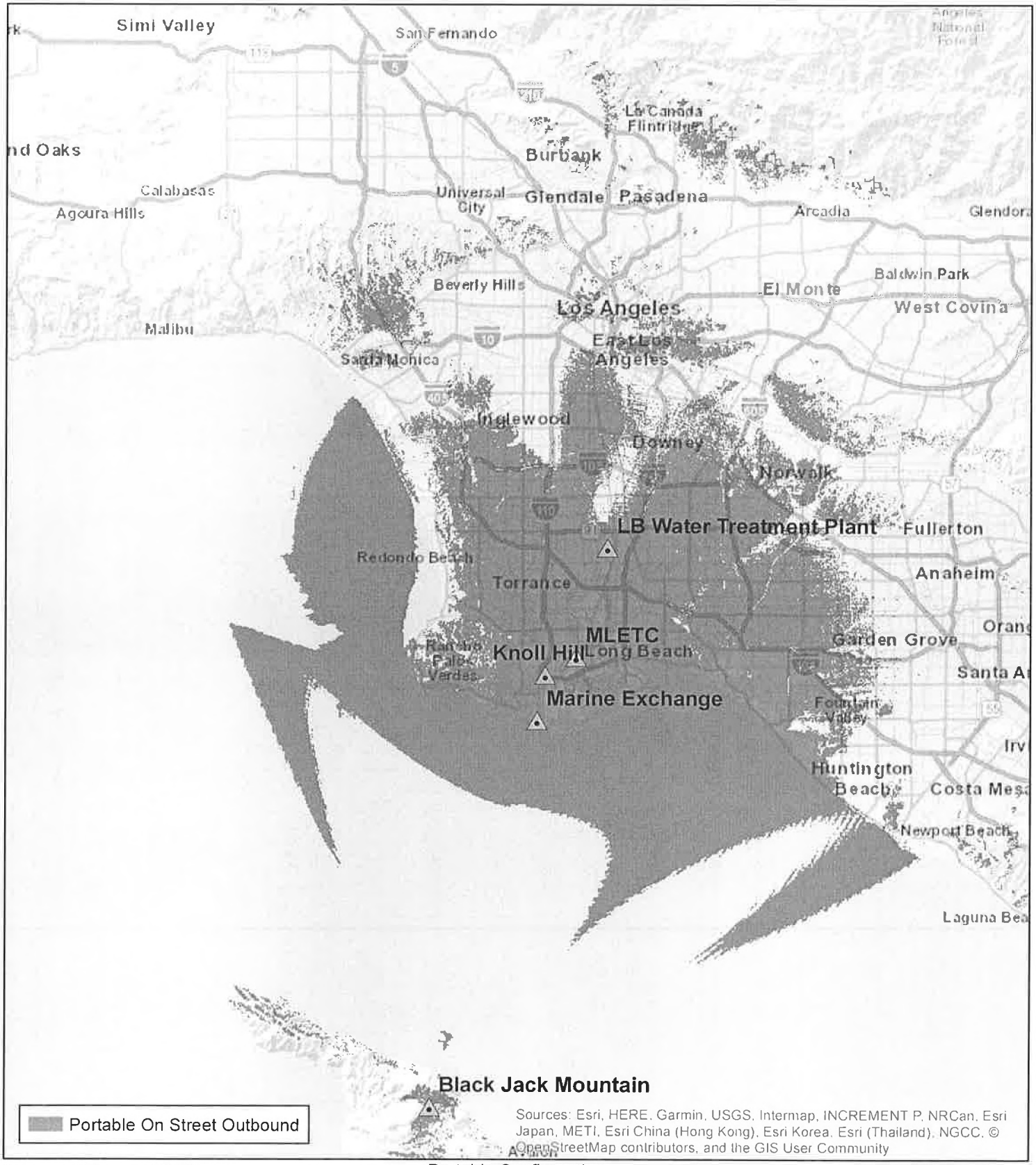
Map 3

MOTOROLA SOLUTIONS

POLA, CA

For Information Only

5-Site ASTRO P25 700MHz TDMA 1-Cell Simulcast System
Shaded Area Represents 95% Covered Area Reliability at DAQ 3.4



0 4.25 8.5 Miles

1 in = 7 miles

Portable Configuration
APX 8000, 2.5W, Dual band antenna
Tx/Rx at hip (3.3') in swivel case and RSM

CA_Port_of_Los_Angeles
CA_Port_of_LA
Design 52
TBXG34, CCDTLAB-800

Oct 04, 2019
Hydra Stratus 2.6.7

Map 4

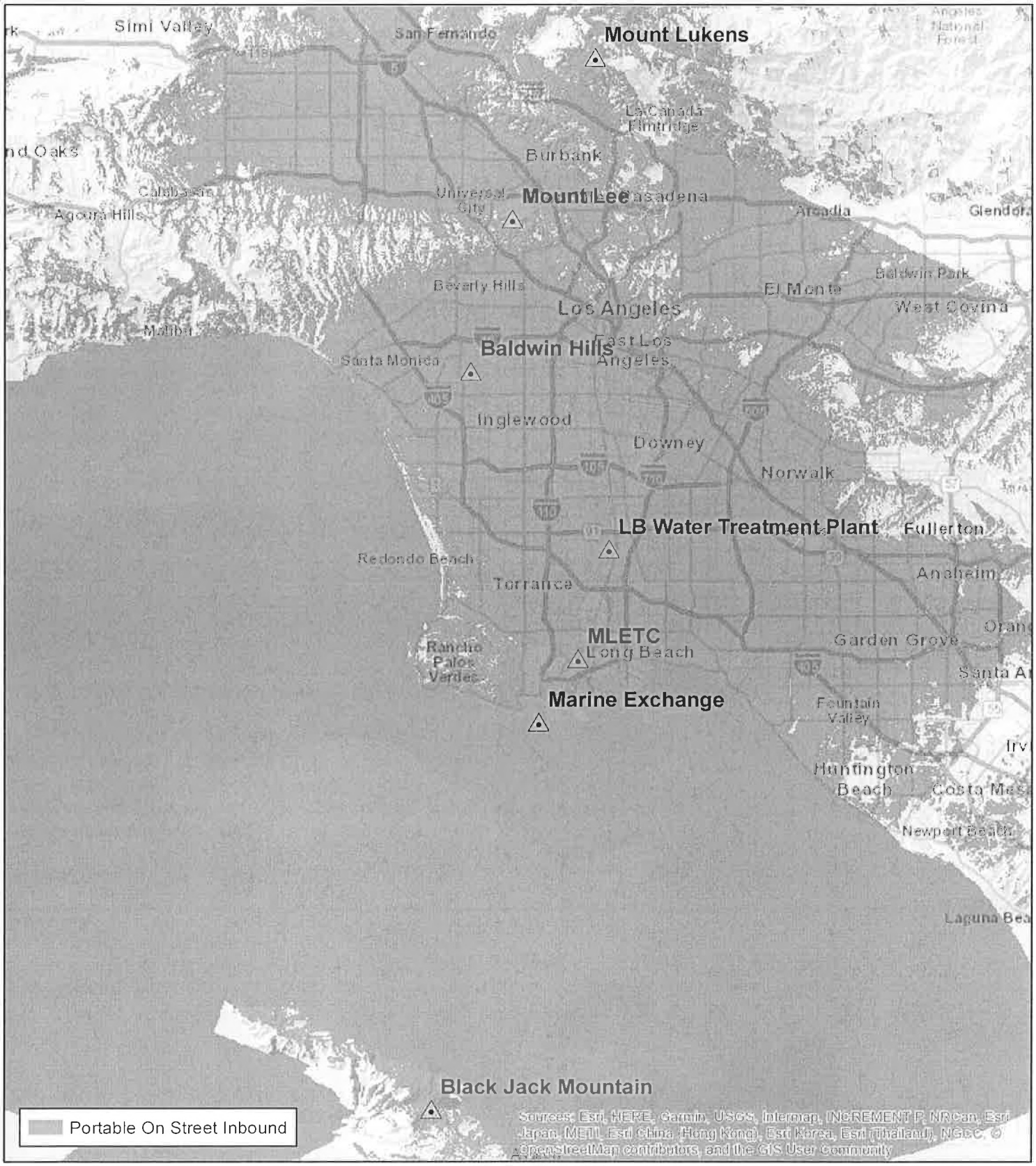
2.30 UHF CITY-WIDE OVERLAY COVERAGE MAPS

MOTOROLA SOLUTIONS

POLA, CA

For Information Only

7-Site ASTRO P25 UHF LSM 1-Cell Simulcast System
Shaded Area Represents 95% Covered Area Reliability at DAQ 3.4



0 4.25 8.5 Miles

1 in = 7 miles

Portable Configuration
APX 8000, 5W, Standard wideband
Tx/Rx at hip (3.3') in swivel case and RSM

CA_Port_of_Los_Angeles
CA_Port_of_LA_UHF_digital
Design 57
TBXG34, CCDTLAB-800

Oct 04, 2019
Hydra Stratus 2.6.7

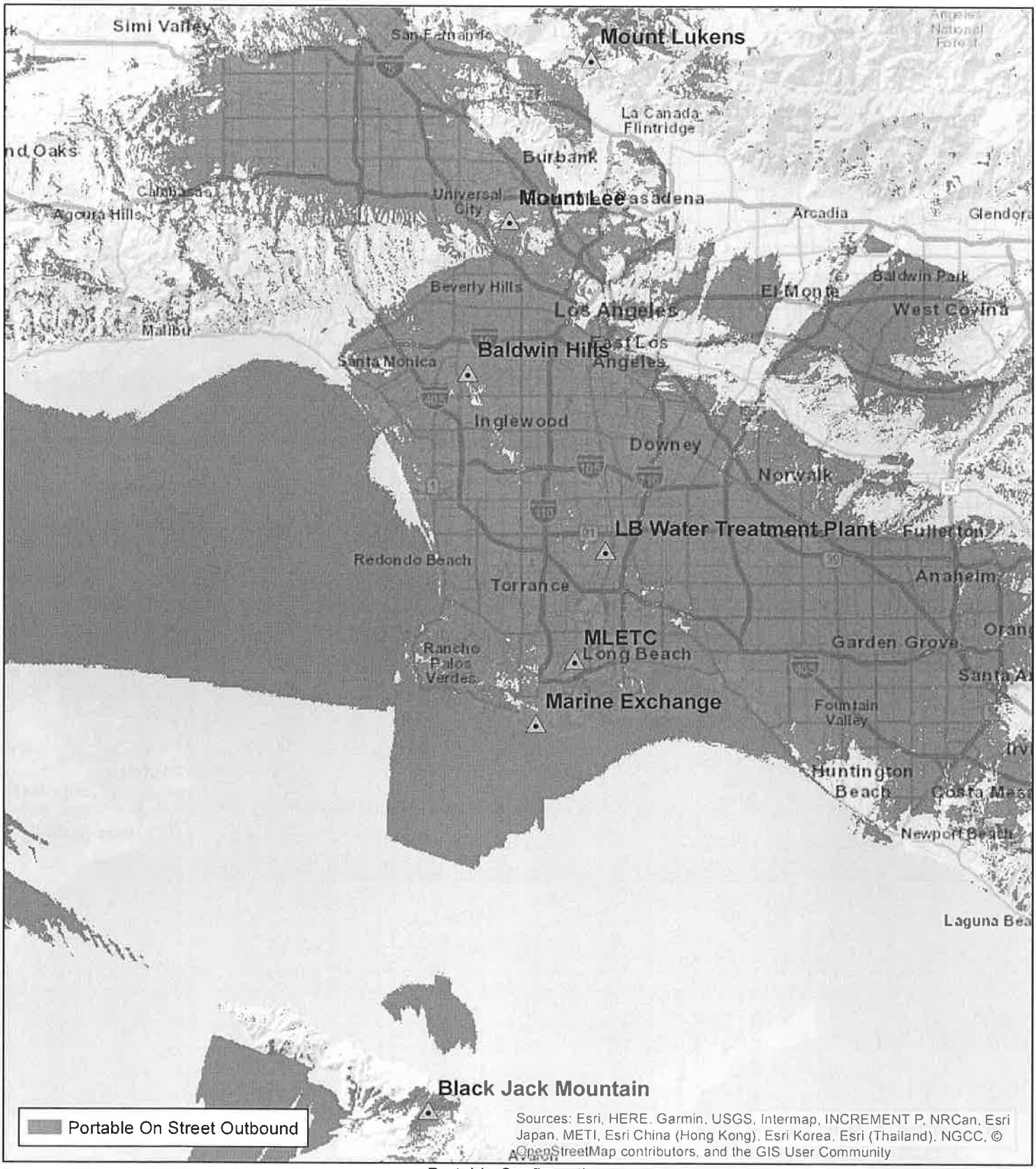
Map 1

MOTOROLA SOLUTIONS

POLA, CA

For Information Only

7-Site ASTRO P25 UHF LSM 1-Cell Simulcast System
Shaded Area Represents 95% Covered Area Reliability at DAQ 3.4



0 4.25 8.5 Miles

1 in = 7 miles

Portable Configuration
APX 8000, 5W, Standard wideband
Tx/Rx at hip (3.3') in swivel case and RSM

CA_Port_of_Los_Angeles
CA_Port_of_LA_UHF_digital
Design 57
TBXG34, CCDTLAB-800

Oct 04, 2019
Hydra Stratus 2.6.7

Map 2

2.31 CATP COVERAGE & GRID MAPS

Note: The CATP Coverage Grid Maps will be completed and provided during the post-contract Design Review period.

2.32 SYSTEM BLOCK DIAGRAMS

Los Angeles Port Police Radio Network

Proposed

- Microwave Only
- 700 MHz Site
- UHF Site
- UHF & 700 MHz Site
- Microwave Hop-6 GHz
- Microwave Hop-11 GHz

Mount Lee
(UHF Site)

Mount Lukens
(UHF Site)

Baldwin Hills
(UHF Site)

Long Beach Water Treatment Plant
(UHF & 700 MHz Site)

San Pedro Hill
(Microwave)

MLETC
(Master, 700 Prime, UHF & 700 MHz Site)

Knoll Hill
(DSR, 700 Geo-Prime & 700 MHz Site)

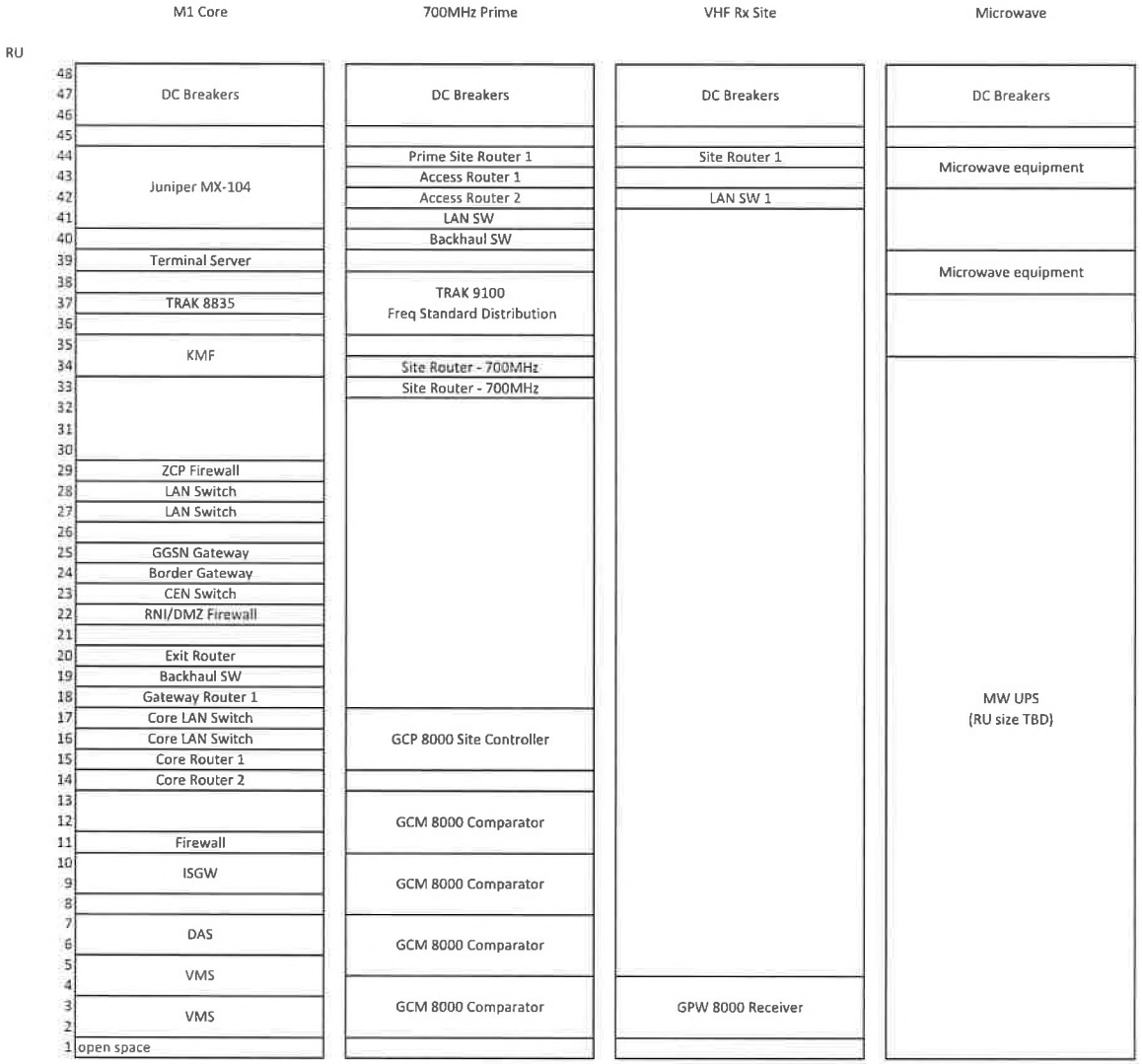
LAPP HQ
(Microwave, UHF & VHF Prime)

Black Jack Mtn. Santa Catalina Is.
(UHF & 700 MHz Site)

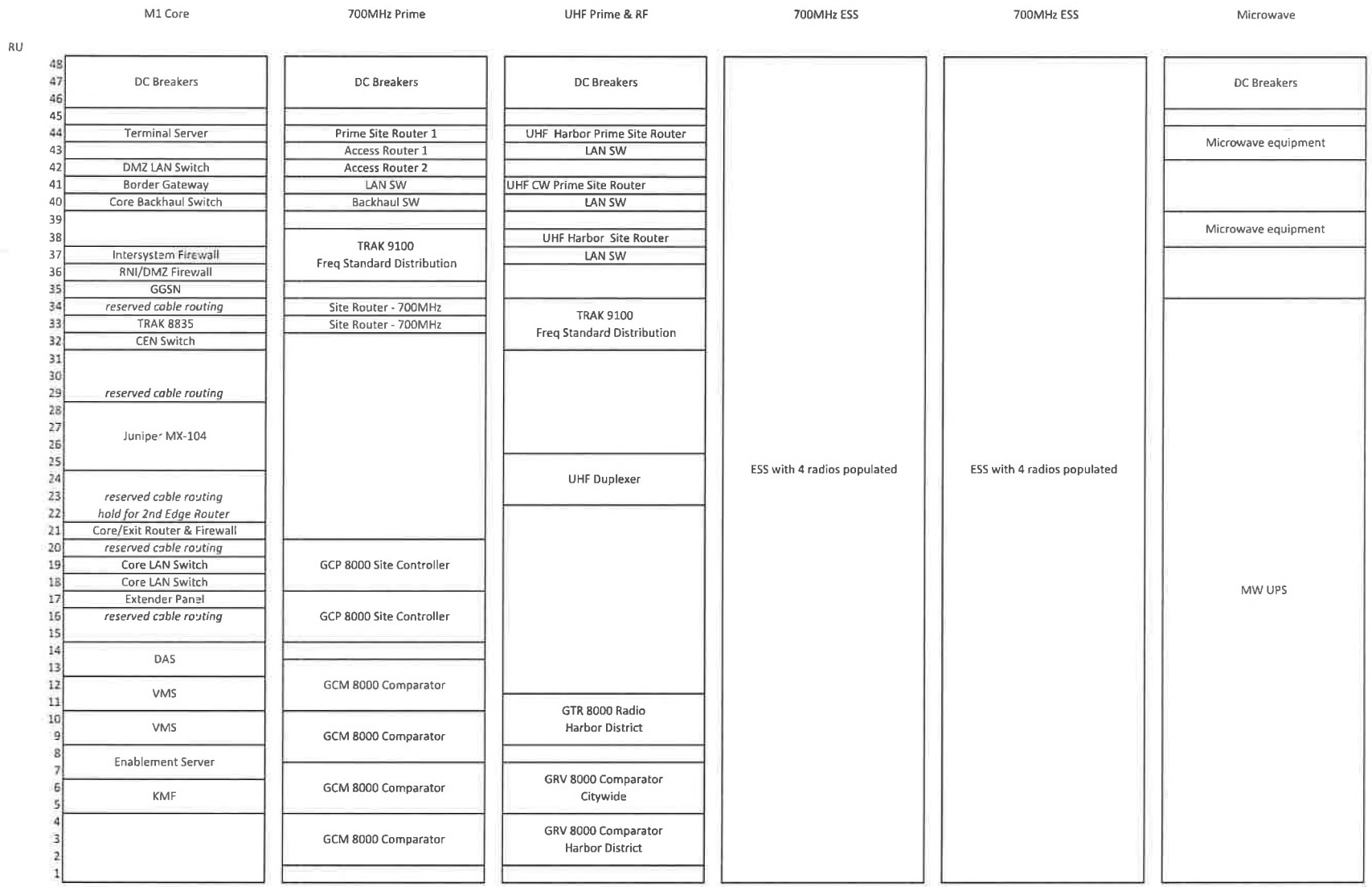
Marine Exchange
(UHF & 700 MHz Site)

2.33 RACK FACE DIAGRAMS

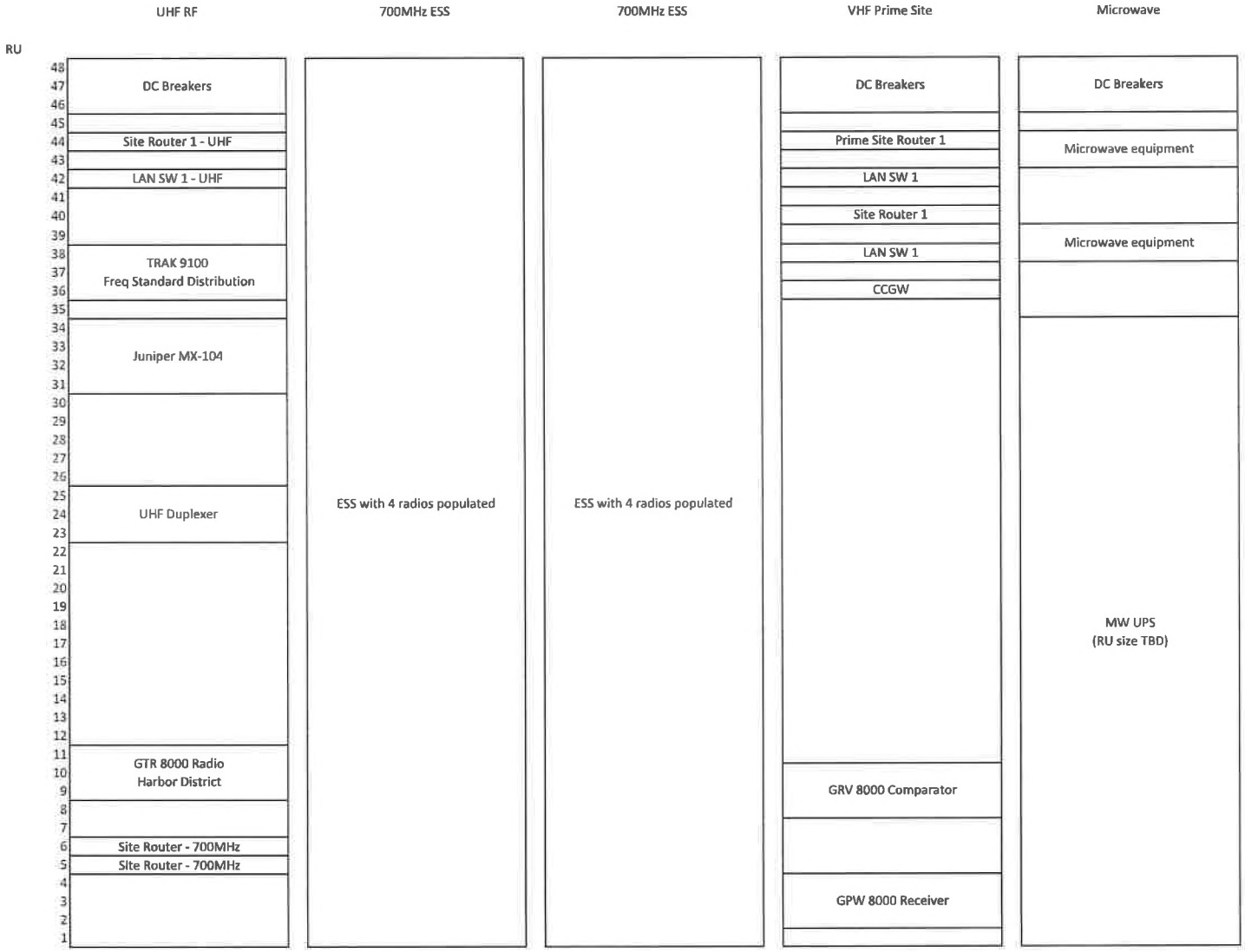
300 Centre St. (PD HQ)



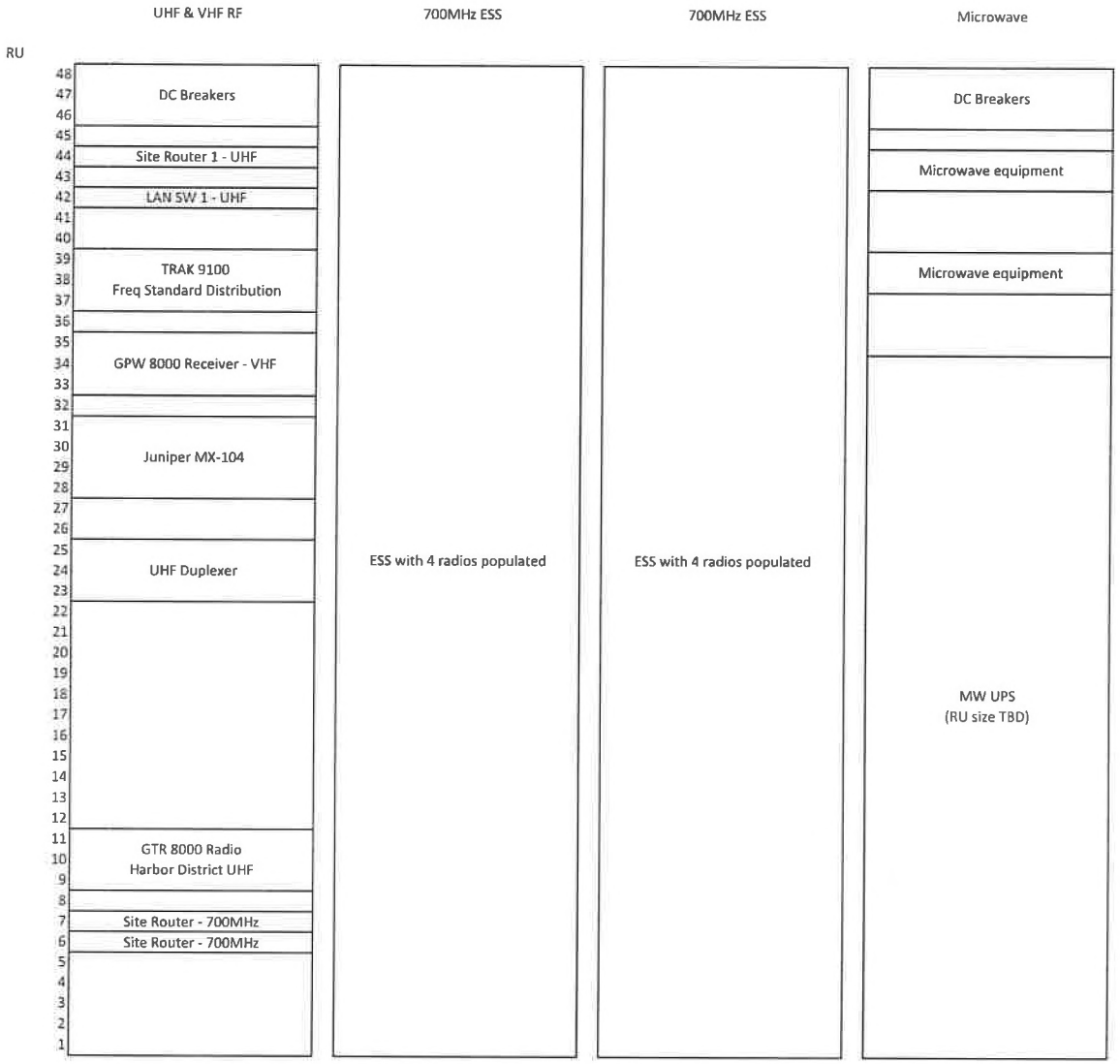
Knoll Hill


M1 Core
700MHz Prime
UHF Prime & RF
700MHz ESS
700MHz ESS
Microwave
RU
DC Breakers
Terminal Server
DMZ LAN Switch
Border Gateway
Core Backhaul Switch
Intersystem Firewall
RNI/DMZ Firewall
GGSN
reserved cable routing
TRAK 8835
CEN Switch
reserved cable routing
Juniper MX-104
reserved cable routing
hold for 2nd Edge Router
Core/Exit Router & Firewall
reserved cable routing
Core LAN Switch
Core LAN Switch
Extender Panel
reserved cable routing
DAS
VMS
VMS
Enablement Server
KMF
DC Breakers
Prime Site Router 1
Access Router 1
Access Router 2
LAN SW
Backhaul SW
TRAK 9100
Freq Standard Distribution
Site Router - 700MHz
Site Router - 700MHz
GCP 8000 Site Controller
GCP 8000 Site Controller
GCM 8000 Comparator
GCM 8000 Comparator
GCM 8000 Comparator
GCM 8000 Comparator
DC Breakers
UHF Harbor Prime Site Router
LAN SW
UHF CW Prime Site Router
LAN SW
UHF Harbor Site Router
LAN SW
TRAK 9100
Freq Standard Distribution
UHF Duplexer
GTR 8000 Radio
Harbor District
GRV 8000 Comparator
Citywide
GRV 8000 Comparator
Harbor District
ESS with 4 radios populated
ESS with 4 radios populated
DC Breakers
Microwave equipment
Microwave equipment
MW UPS

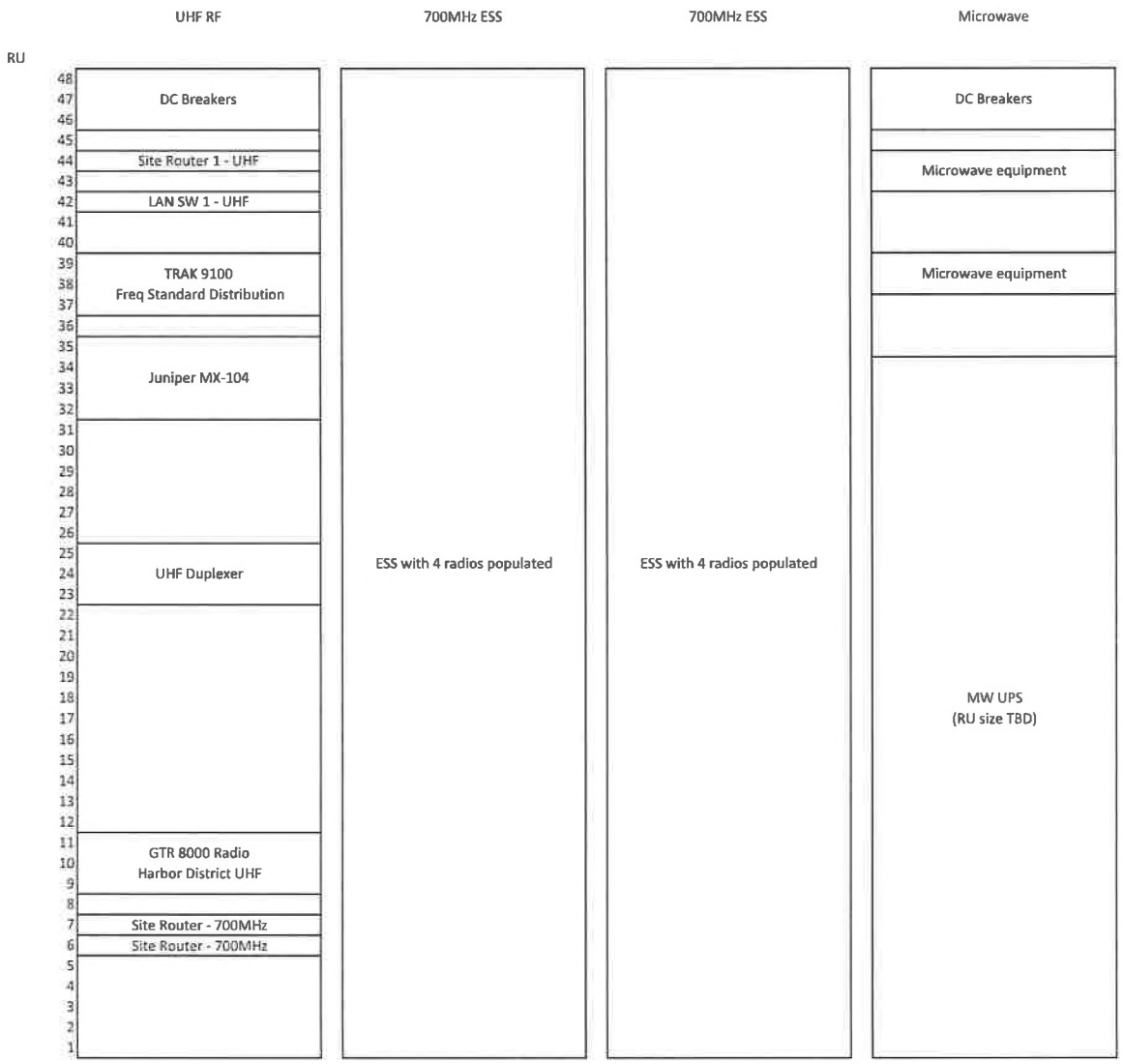
300 Water Street (MLETC)



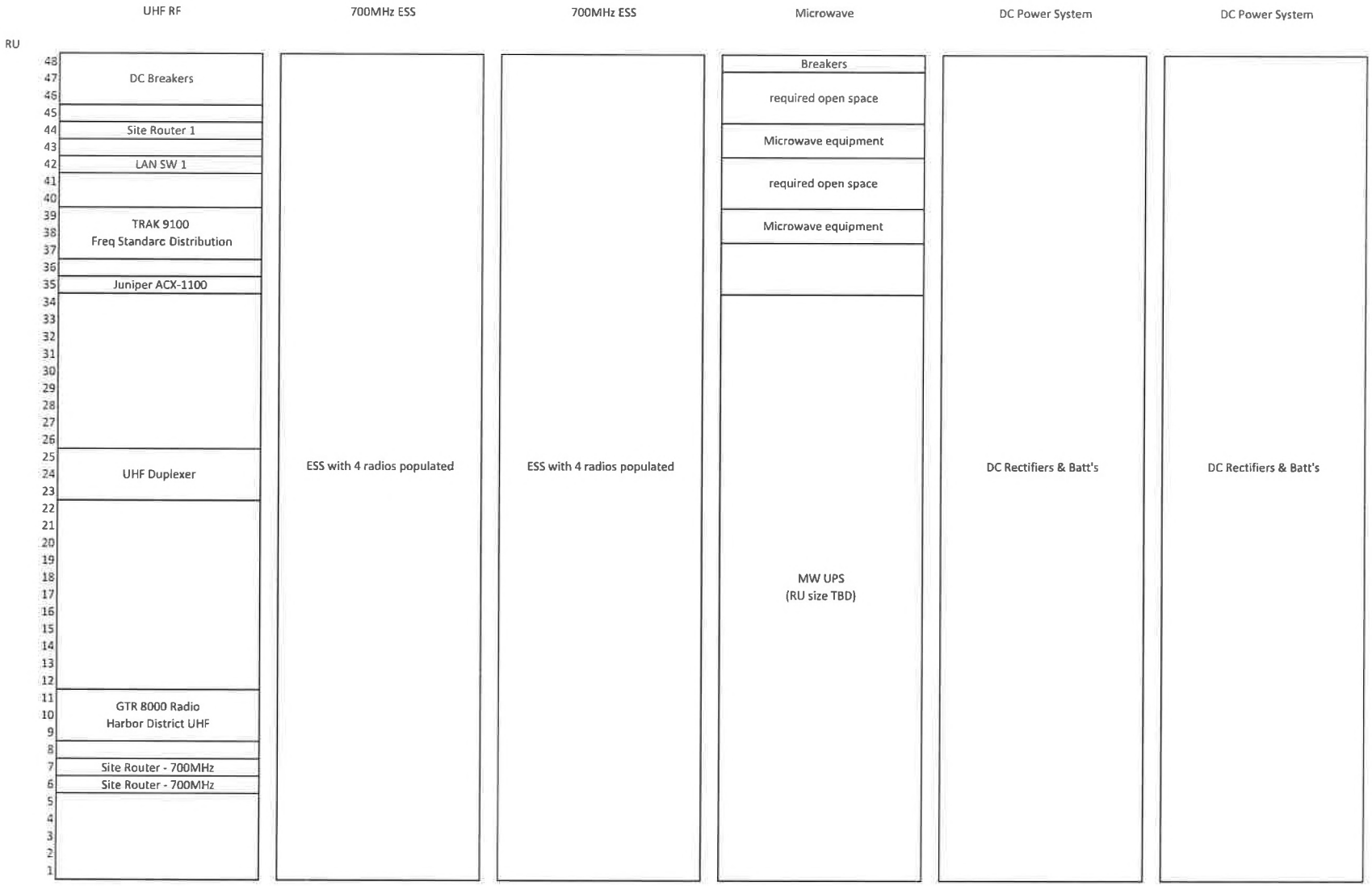
Gaffey Street (Marine Exchange)



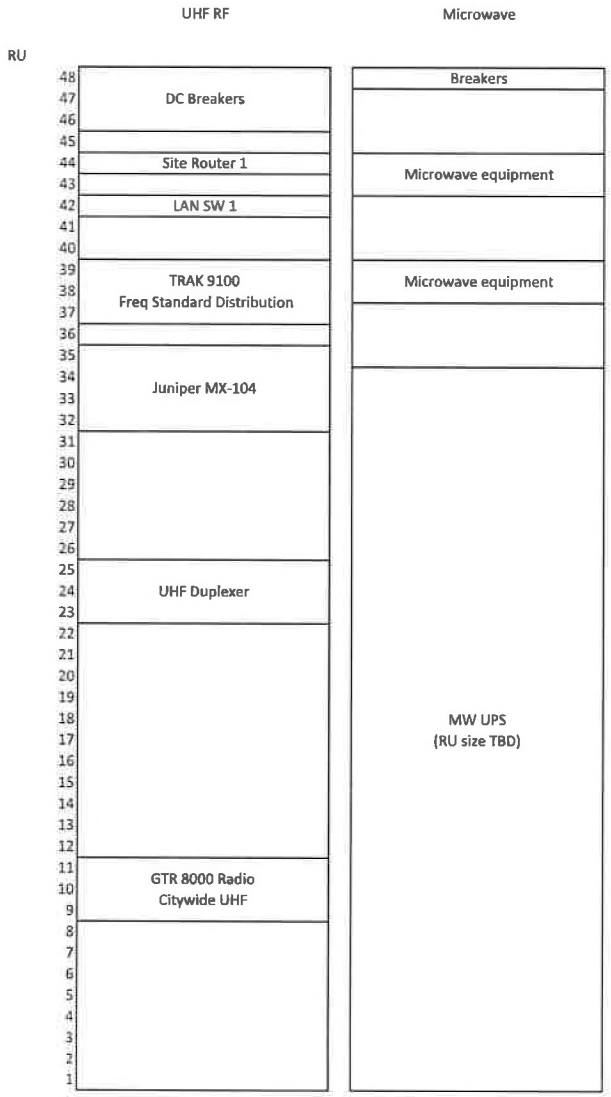
San Pedro Hill



Catalina Island (Black Jack Mountain)



Mt. Lukens


UHF RF
Microwave
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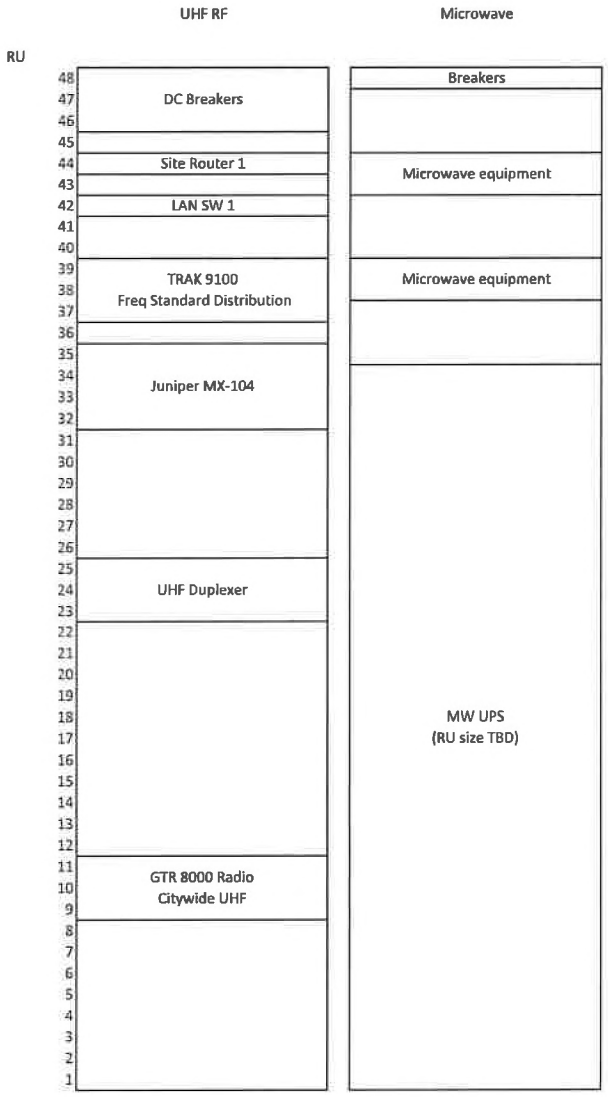
1
DC Breakers
Site Router 1
LAN SW 1
TRAK 9100
Freq Standard Distribution
Juniper MX-104
UHF Duplexer
GTR 8000 Radio
Citywide UHF
Breakers
Microwave equipment
Microwave equipment
MW UPS
(RU size TBD)

Saddle Peak


UHF RF
Microwave
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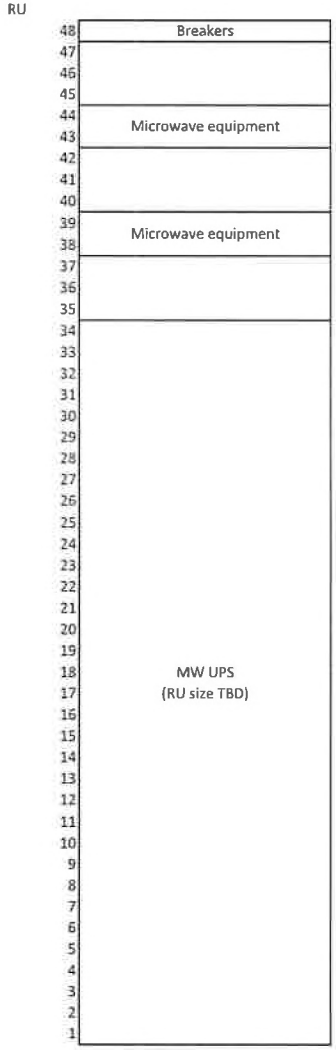
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
DC Breakers
Site Router 1
LAN SW 1
TRAK 9100
Freq Standard Distribution
Juniper MX-104
UHF Duplexer
GTR 8000 Radio
Citywide UHF
Breakers
Microwave equipment
Microwave equipment
MW UPS
(RU size TBD)

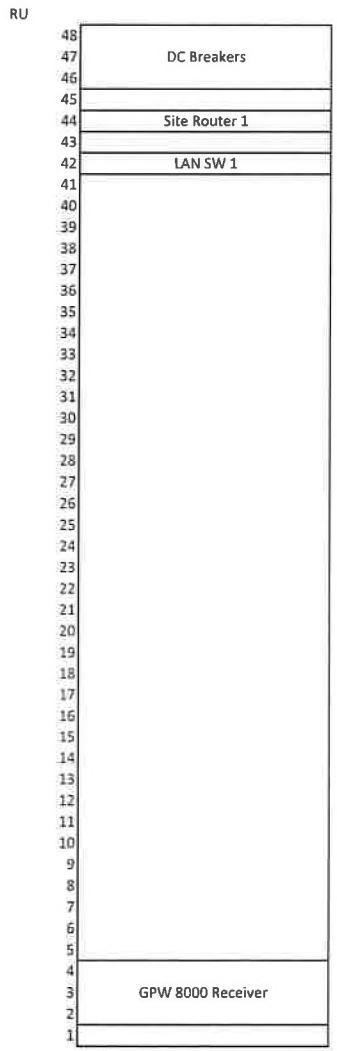
Sierra Peak

Microwave

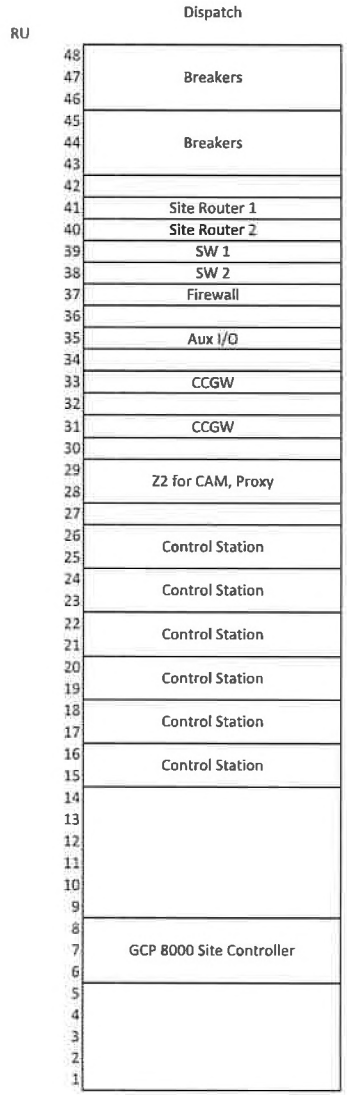


Berth 84

VHF Rx Site



Dispatch Location



2.34 POWER REQUIREMENTS & HVAC LOADING REQUIREMENTS

Site Name / Location	Total Watts	Total BTU
300 Water Street, MLETC	**Total Watts**	**Total BTU**
700MHz Prime rack	1252.5	10337.7
UHF Prime+BS rack	1054.8	6378.2
700MHz ESS1 rack	2417.0	8315.0
700MHz ESS2 rack	2417.0	8315.0
VHF rack	220.0	1154.5
MW rack	1080.0	1806.0
Total	8441.3	36306.4
Total w/25% Buffer	10551.625	45383
Gaffey Street, Marine Exchange	**Total Watts**	**Total BTU**
UHF rack	755.0	3637.4
700MHz ESS1 rack	2417.0	8315.0
700MHz ESS2 rack	2417.0	8315.0
VHF rack	220.0	1154.5
MW rack	1080.0	2007.0
Total	6889	23428.9
Total w/25% Buffer	8611.25	29286.125
3690 E. Crest Road, San Pedro Hill	**Total Watts**	**Total BTU**
UHF rack	755.0	3637.4
700MHz ESS1 rack	2417.0	8315.0
700MHz ESS2 rack	2417.0	8315.0
MW rack	1080.0	1069.0
Total	6669	21336.4
Total w/25% Buffer	8336.25	26670.5
Knoll Hill	**Total Watts**	**Total BTU**
M1 Core rack	7385.7	25207.3
UHF rack	755.0	3637.4
700MHz ESS1 rack	2417.0	8315.0
700MHz ESS2 rack	2417.0	8315.0
MW rack	1080.0	1069.0
Total	14054.7	46543.7
Total w/25% Buffer	17568.375	58179.625

Site Name / Location	Total Watts	Total BTU
Mt. Lukens	**Total Watts**	**Total BTU**
UHF rack	755.0	3637.4
MW rack	1080.0	1861.0
Total	1835	5498.4
Total w/25% Buffer	2293.75	6873
Saddle Peak	**Total Watts**	**Total BTU**
UHF rack	755.0	3637.4
MW rack	1080.0	1431.1
Total	1835	5068.5
Total w/25% Buffer	2293.75	6335.625
Black Jack Mountain, Catalina Island	**Total Watts**	**Total BTU**
UHF rack	755.0	3637.4
700MHz ESS1 rack	2417.0	8315.0
700MHz ESS2 rack	2417.0	8315.0
MW rack	1080.0	1069.0
Total	6669	21336.4
Total w/25% Buffer	8336.25	26670.5
330 Centre Street, HQ	**Total Watts**	**Total BTU**
M1 DSR Core rack	7237.8	24702.8
700MHz Prime rack	1252.5	10337.7
UHF Prime rack	299.8	2740.8
VHF Rx+vote rack	299.8	2083.8
MW rack	1080.0	1069.0
Total	10169.9	40934.1
Total w/25% Buffer	12712.375	51167.625
Dispatch Center	**Total Watts**	**Total BTU**
M1 DSR Core rack	8310.6	31749.1
MW rack	1080.0	1069.0
Total	9390.6	32818.1
Total w/25% Buffer	11738.25	41022.625

SECTION 3

ADDITIONAL RADIO SITE CONSTRUCTION

3.1 SITE DEVELOPMENT SCOPE OVERVIEW

To meet the long-term desire of the Port to eliminate an existing microwave site and expand radio system coverage Motorola has included this new radio site construction section. Unlike the other sections of the proposal this scope is not included in the project pricing and is for budgetary guidance purposes only. Scope and pricing are subject to change after a detailed site walk is completed by Motorola's A&E division. Based upon data gathered on previous site walks, meetings, and discussions with the Port of LA it is believed that the design and cost estimates will allow the Port to determine if constructing a new radio site is desired.

3.2 NEW SITE LOCATION DEVELOPMENT

3.2.1 Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Included
- New fenced compound/expansion size – 35-foot x 85-foot.
- Clearing type – Light.
- New power run – 150 feet
- Electrical service type – Underground, 300-amp - 120/240-volt, single-phase.
- New fuel tank size – 500 gallons, Type – Diesel sub-base.
- New generator size – 80 kW, Type – Outdoor.
- New tower to be used for antennas – 120-foot self-supported tower.
- New tower foundation size – 60 cubic yards, Type – Pier and pad.

3.2.2 Motorola Responsibilities:

3.2.2.1 Site Engineering

- Prepare site construction drawings showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Perform a site and topographic survey for the property on which the communication site is located or will be located.
- Prepare a 2C/1A letter certifying the accuracy of the surveyed data for the tower.
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.

- Prepare zoning drawings that can be used to describe the proposed site installation in sufficient detail.
- Prepare record drawings of the site showing the as-built information.
- Conduct utility investigation and coordinate with local utility company for power hook up.
- Perform construction staking around the site to establish reference points for proposed construction.
- Prepare photo renderings of how a specific site or sites would look after completion.
- Conduct a balloon test to prepare site line graphs showing potential visibility of the proposed communication site.
- Provide an expert witness for up to 3 day(s) to attend or testify at public meetings and/or hearings to provide expert testimony to assist in obtaining zoning approvals.
- Perform NEPA Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 CFR Chapter 1, subsection 1.1307 that may potentially be impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work. Regional Environmental Review (RER) report submittals if required by FEMA have not been included. Perform Cultural Resource study as needed to identify sensitive historical and archaeological monuments that might be impacted by proposed construction
- Perform an ASTM E 1527-05 certified Phase I Environmental Site Assessment (ESA), to identify obvious and reasonably likely on-site and/or off-site potential sources of contamination that might pose a potential risk of leasing and building on a piece of property, and whether further environmental investigations are warranted. This study does not include Phase II assessments, risk/cost evaluations, and permitting assistance that may be required if risk factors are indicated.
- Conduct up to 40-foot deep soil boring test at tower location and prepare geotechnical report of soil conditions at locations of the tower foundation. Grouting of boring holes or access by Automatic Traction Vehicle (ATV) - mounted rig is not included.
- Conduct construction inspection of foundation steel prior to pour, materials testing of concrete and field density tests of backfill to ensure quality construction.
- Check tower erection for plumbness, linearity and alignment after installation.
- Perform inspection of the site and the work performed by the Contractor to document that the site is built in accordance with the "Site Plans" and document any deviations or violations.
- Prepare, submit and track application for local permit fees (zoning, electrical, building etc.), prepare FAA filings and procure information necessary for filing.
- FAA Filing (Air Space Analysis, FAA 7460-1; FCC ASR Notifications, FAA 7460-2 Part 1; FCC Notification, FAA 7460-2 Part 2; FRN Application; Local Publication
- Third Party Tower Inspection.

3.2.2.2 Site Preparation

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.
- Provide one-time mobilization costs for the construction crews. Any remobilization due to interruptions/delays that are out of Motorola's control will result in additional costs.
- Perform light clearing of brush, grubbing and disposal of vegetation and shrub growth in the site compound area and a 20-foot path around it (9,375 square feet).
- Grade the site compound and 10-foot path around it to provide a level, solid, undisturbed surface for installation of site components (Not to exceed 5,775 square feet).

- Supply and install gravel surfacing to a depth of 6 inches, including herbicide treatment and geotextile fabric installation within the fenced in site compound area, and a 3-foot path around it (Not to exceed 5,775 square feet).
- Supply and install (6) bollard guard posts.
- Provide silt fence around the compound to control soil erosion (not to exceed 240 linear feet).
- Supply and install 8-foot high chain-link fencing with a ten-foot wide gate around the shelter compound (not to exceed 559 linear feet).
- Perform site touch up (fertilize, seed and straw) disturbed areas not covered with gravel after completion of construction work. Landscaping, decorative fencing or any other aesthetic improvement that may be required by local jurisdictions has not been included and will be handled through a negotiated contract change notice.

3.2.2.3 Site Components Installation

- Construct 1 reinforced concrete foundation necessary for a 12-foot x 24-foot shelter.
- Construct 1 concrete slab for generator with up to 500 gallon above-ground diesel fuel tank below its base.
- Supply and install 1 prefabricated concrete shelter 12-foot x 24-foot.
- Supply and install 1 500-gallon sub-base diesel fuel tank(s), fill it with fuel and connect it to the generator.
- Supply and install fuel tank monitors on the tanks to monitor low fuel in tanks and run alarm wiring to the building located within 50 feet of the tank.
- Supply and install 1 standby power generator (80 kW) located within 20 feet of the ATS, including interconnection wiring between the generator, transfer switch, and site electrical service mains.
- Supply and install 1.97 120/240-volt, 300-amp, single-phase meter pedestal and hook-up for electrical service by the local utility.
- Provide all trenching, conduit, and cabling necessary for underground hook-up of power to the shelter from nearby utility termination located within 256 cable feet of the shelter.
- Supply and install a perimeter grounding system around the compound and shelter. The ground system is to tie to the fence and all new metal structures within the compound to meet current Motorola's R56 standards.
- Conduct 1 three-point ground resistance test of the site. Should any improvements to grounding system be necessary after ground testing, the cost of such improvements shall be the responsibility of Port of Los Angeles.
- Supply and install 1 freestanding 24-inch-wide cable/ice bridge from the tower to the shelter (up to 20 linear feet).

3.2.2.4 Tower Work

- Construct pier and pad type tower foundations including excavation, rebar and concrete (not to exceed 60 cubic yards).
- Erect new 120-foot self-supported tower.
- Supply and install grounding for the tower base for self-supported towers

3.2.2.5 Antenna and Transmission Line Installation

- Install (4) antenna(s) for the RF system.
- Install (2) 8-foot microwave dishes.
- Install up to 60 linear feet of 1/2-inch transmission line.

- Install up to 640 linear feet of 7/8-inch transmission line.
- Install up to 300 linear feet of EW90 waveguide for microwave dishes.
- Perform sweep tests on transmission lines.
- Perform alignment of each of 2 microwave paths to ensure that the microwave dishes are optimally positioned.
- Provide and install six-hole hanger blocks and attachment hardware for supporting transmission lines on the antenna support structure every three feet.
- Supply and install a ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

3.2.2.6 Miscellaneous Work

- Project Management Administration
- Third party locates prior to construction
- Temporary fencing
- Water, toilet, temp power for construction
- Spoils off-haul and disposal
- Prevailing Wage Adjustment Included
- Structural Fill for Backfill of Tower Foundation

3.2.3 Customer Responsibilities:

3.2.3.1 Site Acquisition

- Purchase or execute an option/lease/license agreement (lease) and acquire clear land title/site lease/shared use agreement for the candidate site.

3.2.3.2 Site Responsibilities

- If required, prepare and submit Electromagnetic Energy (EME) plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines.
- As applicable, coordinate, prepare, submit, and pay for all required permits and inspections for the work that is the Customer's responsibility.
- Pay for all utility connection, pole or line extensions, and any easement or usage fees.
- Review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Customer shall review and approve the re-submitted plans within 7 calendar days from the date of submittal.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.
- Maintain existing access road in order to provide clear and stable entry to the site for heavy-duty construction vehicles, cement trucks and cranes. Sufficient space must be available at

the site for these vehicles to maneuver under their own power, without assistance from other equipment.

- Secure power connection to the site, associated permitting and installation of a meter and disconnect within 50 feet of the proposed shelter location.
- Provide additional temporary space for staging of the construction equipment during the construction of new site facilities (tower, shelter, generator, fuel tank etc.).
- Customer responsible for costs of any permits as well as FAA/FCC filings.

3.2.4 Assumptions:

- Prevailing wage, certified payroll, mandatory union workers or mandatory minority workers are required for this work.
- All clarifications and exceptions contained in this Section (General Site Development Assumptions) take precedence over any other section of this Contract.
- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- All recurring and non-recurring utility costs [including, but not limited to, generator fuel (except first fill), electrical, Telco] will be borne by the Customer or site owner.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Site will have adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.
- Pricing has been based on National codes such IBC or BOCA. Local codes or jurisdictional requirements have not been considered in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety.
- In absence of geotechnical reports, foundations and subsurface conditions for tower design are based on Presumptive Sand soil parameters, as defined by EIA-222-G. Also, rock coring, piling, extensive dewatering of foundations, permanent casings or hazardous material removal has not been included.
- For zoning approvals, a maximum of 60 days will be required from time of submittal with attendance at maximum of two (2) required planning meetings.
- The new tower location will pass the FAA hazard study, zoning, FCC and environmental permitting.
- The restoration of the site surroundings by fertilizing, seeding and strawing the disturbed areas will be adequate.
- Tower and foundation sizing is based on the tower loading requirements as a result of the RF Antenna System design and the Microwave Antenna System design (i.e. - dish sizes and locations obtained from paper path studies). If after physical path studies, the dish sizes and locations change, then Motorola will then review the impact to tower structure and foundations and revise applicable costs.

- If as a result of NEPA studies, any jurisdictional authority should determine that a proposed communications facility "may have a significant environmental impact", the environmental impact studies or field testing and evaluation related to such determination have not been included.
- The site location can be finalized and lease agreement can be reached with the property owner within 60 calendar days after the start of the site acquisition effort.
- A waiver to zoning requirements like setbacks, tower height limitations, etc. can be obtained.
- The soil resistivity at the site is sufficient to achieve resistance of ten (10) ohms or less. Communications site grounding will be designed and installed per Motorola's Standards and Guidelines for Communications Sites (R56).
- Underground utilities are not present in the construction area, and as such no relocation will be required.
- Foundations for the shelter, generator and fuel tank are based "normal soil" conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.

3.2.5 Completion Criteria

- Site development completed per issued for construction (IFC) construction drawings, project requirements, contractual obligations (including any customer/Motorola approved changes) and approved by the Port.
  - This shall be confirmed by contractor and reviewed with Motorola construction manager and project manager before inspections occur.
- All jurisdictional and contractual required testing and inspections to be performed by the contractor. (Contractual testing and inspections defined and agreed to with project team and customer prior to project kick off; vendor solely responsible for conducting, coordinating and paying for all jurisdictional testing and inspections).
- Motorola site development checklist shall be completed and signed off by contractor prior to customer inspection. (Review with project team and customer and amend checklist as required at project kick off or before work begins).
- Site turn-over package completed and turned over to Motorola (As defined and agreed to with project team and customer).
- All punch list and deficiencies shall be completed prior to customer and Motorola inspections.

3.3 MOTOROLA STANDARD BUILDING SPECIFICATIONS

12x24 MSB Specifications	
Site Equipment Capacity	(12) 2'x2' rack locations
Building Size	Outside: 24' L x 11'8" W x 10'6" H Inside: 23' L x 10'8" W x 9'1" Interior clear
Load	Floor: 300 psf Roof: 150 psf Walls: 150 mph
Walls Roof	Concrete 2 hr. fire rated, Ballistics tested for UL-752 with 1/2" white embossed fiberglass paneling

12x24 MSB Specifications	
Insulation	Walls: R-11 Ceiling: R-19
Door	(1) 36" X 7'0" with dead bolt, anti-pick plate, door bumper & "T" tie back
Cable Ladder	24" wide cable ladder, gold chromate over equipment racks to cable entrance
Cable Entry	(1) 12 port cable entry with caps and (2) 3" PVC sleeve cast in concrete for Telco entry
Fire Protection	(1) Each Wall mounted 20lb. ABC and 10lb. CO2 extinguishers
Alarms	Smoke, Power Fail, High/Low temp, intrusion, Gen, ATS and UPS alarms on dry terminal 66 block with amphenol connector (see table 1)
Warranty	10-year manufacturer warranty from the date of shipment
Lighting Specifications:	
Interior	Ceiling: (10) 4 ft. fluorescent
Exterior	Security: (1) LED photocell
Emergency	(1) Twin bulb with battery EXIT sign located over doorway
Electrical Specifications:	
Electrical Service	120/240/200A 1 phase
Service Disconnect Secondary Surge Arrestor	(1) R56 Approved Type 1 Surge Protection Device (SPD)
Main Panel Surge Arrestor	(1) R56 Approved Type 2 Surge Protection Device (SPD)
Main Load Center	(1) 300A Main breaker
Exterior Outlets	(2) GFI duplex outlets
Service Outlets	(7) Duplex outlets
UPS Load Centers	(3) Load centers with circuits to feed racks
FNE Outlets	(3) Raceway containing dedicated simplex outlets mounted under cable ladder
Grounding Specifications:	
Grounding Standard	Meets or Exceeds Motorola's R56 Specifications
Air Conditioning Specifications:	
Air-Conditioning	(2) 4-ton air conditioning units with integrated heater strips, lead-lag controller
Warranty	2-year manufacturer warranty from the date of shipment
Generator Specifications:	
Generator	80kW, diesel fueled, 120/240V 1 phase 60HZ
Automatic Transfer Switch	300-amp, 240 volt
Warranty	2-year manufacturer warranty from the date of shipment
U.P.S Specifications:	
U.P.S	(2) 20kVA/18kW, maintenance bypass switch, 7 minute battery backup
Warranty	2-year manufacturer warranty from the date of shipment

SECTION 4

EQUIPMENT LISTS

4.1 EQUIPMENT LISTS

4.1.1 UASI-18 Equipment List

Qty.	Nomenclature	Description
		Master Site Equipment
1	SQM01SUM0323	ASTRO MASTER SITE
1	CA03515AA	ADD: NEW ZONE CORE
1	CA03507AA	ADD: RACK
5	UA00153AB	ADD: P25 FDMA TRUNKING OPERATION SI
5	UA00159AB	ADD: P25 PHASE 2 TDMA TRKNG OP SITE
5	UA00160AA	ADD: PHASE 2 DYNAMIC TG ASGNMT SITE
5	UA00408AA	ADD: ENHANCED DATA-P25 TRNK SITE
3	UA00156AA	ADD: MCC7500 CONSOLE LICENSES (QTY
1	CA01499AB	ADD:DSR NOTIFICATION
1	CA03509AA	ADD: EDGE ROUTER PAIR
2	UA00152AA	ADD:500 RADIO USER LICENSES
1	UA00664AA	ADD: 500 VISITING RADIO USER LICENS
2	UA00482AA	ADD: LOCATION ON PTT 500 USER LICEN
2	UA00700AA	ADD: GROUP SERVICES
2	UA00699AA	ADD: TRANSCODED SIMULTANEOUS CALLS
1	UA00146AA	ADD: UNIFIED EVENT MANAGER (UEM)
1	UA00149AA	ADD: RADIO CONTROL MANAGER
1	UA00139AA	ADD: NORTHBOUND INTERFACE
1	ZA00104AA	ENH: TECHNICAL ASSISTANCE, FOURTY H
35	UA00161AA	P25 TDMA PER BASE RADIO LICENSE
10	UA00162AA	DYNAMIC CHANNEL ASSIGNMENT PER BASE
1	UA00227AA	UEM SNMP ELEMENT MGMT TOOLKIT (QTY
1	DSTS453BE4GUS	NAS Server: QNAP J3455 QUAD CORE BA
1	T8597	ASTRO 2019.1 CLIENT
1	TT3492	Z2 G4 MINI WORKSTATION NON RETURNAB
1	DSF1DC108V	18.5INCH WIDESCREEN RACK CONSOLE WI
4	DSF1D940106	BELKIN OMNIVIEW ENTERPRISE SERIES -
1	DSF2B56AA	ESB EXTERNAL DVD DRIVE
12	T7885	MCAFEE WINDOWS AV CLIENT

Qty.	Nomenclature	Description
1	CLN1868	2930F 24-PORT SWITCH
1	SQM01SUM0257	INTELLIGENT MIDDLEWARE
1	CA02384AE	ADD: UNIFIED NETWORK SERVICES SOFTW
1	CA02354AA	ADD: ASTRO NETWORK APPLICATION INTE
1	CA02362AE	ADD: MCAFEE STANDALONE ANTI VIRUS S
1	CA03062AA	ADD: IMW HIGH TIER/NON-REDUNDANT
1	UA00015AA	ADD: 501-1000 RESOURCES FOR LOCATIO
1	UA00056AA	ADD: 501-1000 RESOURCES FOR PRESENC
1	UA00296AA	ADD: 0-100 RESOURCES FOR GROUP MANA
1	UA00290AA	ADD: 501-1000 RESOURCES FOR MESSAGI
1	CA02053AE	ADD: SUPPLEMENTAL CD IA (IMW)
1	CA02668AE	ADD: SQL SVR STD2014 EMB
1	DSTRAK91061	FOUR PORT DDM
1	T7776	ISSI 8000 / CSSI 8000 UPGRAGE Softw
1	UA00005AA	ADD: ISSI Automatic Roaming License
2	UA00184AA	ADD:ISSI AUTOMATIC ROAMING LICENSE
1	T7688	KEY MANAGEMENT FACILITY
1	ZA01180AA	ADD: KMF SERVER AND WEB CLIENT SW
1	CA01229AA	ADD: KMF REDUNDANCY SOFTWARE
1	TT2872	DL380 G9 SERVER WITH WINDOWS SERVER
1	SQM01SUM0222	KMF CRYPTR
1	CA00147AG	ADD: BASIC SOFTWARE OPTION
1	CA00182AV	ADD: AES 256 ENCRYPTION KIT
1	CA02066AA	AC Line Cord, North America
1	TKN9285	RACK MOUNT KIT FOR CRYPTR II
1	TT3492	Z2 G4 MINI WORKSTATION NON RETURNAB
1	T8476B	KVL 5000
1	CA03358AA	ADD: ASTRO 25 MODE
1	CA00182AW	ADD: AES ENCRYPTION SOFTWARE
1	CA03467AA	ADD: NORTH AMERICA MICRO USB CHARGE
1	PMKN4012B	PORTABLE PROGRAMMING CABLE
1	PMKN4012B	PORTABLE PROGRAMMING CABLE
1	CB000262A01	CABLE,MICRO USB PROGRAMMING CABLE
1	PMPN4119A	CHARGER,CHGR VEHICULAR ADAPTER EXT
1	DVN4046B	MASTER SYSTEM KEY STARTER KIT
1	TRN7343	SEVEN AND A HALF FOOT RACK
1	T8586	FORTINET FIREWALL APPLIANCE
1	DSK3R64AA	HP 9.5MM SLIM SUPERMULTI DVD WRITER

Qty.	Nomenclature	Description
1	DLN8006	FRU: DL380 G10 POWER SUPPLY
1	DLN8007	FRU: DL380 G10 FAN
1	DLN6942	1.2 TB HARD DRIVE
1	DLN8013	FRU: DAS 4525 CHASSIS ONLY
1	DLN8014	FRU: DAS 4525 POWER SUPPLY
1	DLN8015	FRU: DAS 4525 CONTROLLER MODUL
1	DLN8016	FRU: DAS 4125 JBOD MODULE
1	DLN8017	FRU: 600GB HARD DRIVE, DAS 452
1	CLN1868	2930F 24-PORT SWITCH
1	CLN1869	2930F 48-PORT SWITCH
Backup Master Site Equipment		
1	SQM01SUM0324	DYNAMIC SYSTEM RESILIENCE
1	CA03520AA	ADD: DSR ZONE CORE
1	CA03507AA	ADD: RACK
2	UA00699AA	ADD: TRANSCODED SIMULTANEOUS CALLS
1	T8586	FORTINET FIREWALL APPLIANCE
1	T8597	ASTRO 2019.1 CLIENT
1	TT3492	Z2 G4 MINI WORKSTATION NON RETURNAB
1	DSF1DC108V	18.5INCH WIDESCREEN RACK CONSOLE WI
4	DSF1D940106	BELKIN OMNIVIEW ENTERPRISE SERIES -
1	DSF2B56AA	ESB EXTERNAL DVD DRIVE
1	CLN1868	2930F 24-PORT SWITCH
1	DSTRAK91061	FOUR PORT DDM
1	T7688	KEY MANAGEMENT FACILITY
1	ZA01180AA	ADD: KMF SERVER AND WEB CLIENT SW
1	CA01229AA	ADD: KMF REDUNDANCY SOFTWARE
1	TT2872	DL380 G9 SERVER WITH WINDOWS SERVER
1	SQM01SUM0222	KMF CRYPTR
1	CA00147AG	ADD: BASIC SOFTWARE OPTION
1	CA00182AV	ADD: AES 256 ENCRYPTION KIT
1	CA02066AA	AC Line Cord, North America
1	TKN9285	RACK MOUNT KIT FOR CRYPTR II
1	DSTG191B	TECH GLOBAL EVOLUTION SERIES 19INCH
1	TT3492	Z2 G4 MINI WORKSTATION NON RETURNAB
1	TRN7343	SEVEN AND A HALF FOOT RACK
1	T8586	FORTINET FIREWALL APPLIANCE
1	DLN8006	FRU: DL380 G10 POWER SUPPLY
1	DLN8007	FRU: DL380 G10 FAN

Qty.	Nomenclature	Description
1	DLN6942	1.2 TB HARD DRIVE
1	DLN8013	FRU: DAS 4525 CHASSIS ONLY
1	DLN8014	FRU: DAS 4525 POWER SUPPLY
1	DLN8015	FRU: DAS 4525 CONTROLLER MODUL
1	DLN8016	FRU: DAS 4125 JBOD MODULE
1	DLN8017	FRU: 600GB HARD DRIVE, DAS 452
1	CLN1868	2930F 24-PORT SWITCH
1	CLN1869	2930F 48-PORT SWITCH
	Dispatch Center	
1	B1949	MCC 7500E SOFTWARE DVD
1	B1948	MCC 7500E DISPATCH POSITION LICENSE
9	UA00250AA	ADD: 30 RADIO RESOURCES LICENSE
9	UA00653AA	ADD: BASIC CONSOLE OPERATION
9	UA00654AA	ADD: ASTRO 25 TRUNKING OPERATION
9	UA00655AA	ADD: ADVANCED CONVENTIONAL OPERATIO
9	UA00658AA	ADD: SECURE OPERATION
9	UA00659AA	ADD: ADP/AES/DES-OFB ENCRYPTION
9	UA00660AA	ADD: OTEK OPERATION
9	UA00661AA	ADD: ENHANCED IRR
9	B1941	USB AUDIO INTERFACE MODULE
9	B1914	MCC SERIES DESKTOP GOOSENECK MICROP
9	B1913	MCC SERIES HEADSET JACK
9	RLN6098	HDST MODULE BASE W/PTT, 15 FT CBL
9	BDN6647G	MEDIUM WEIGHT SINGLE MUFF HEADSET W
9	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH
9	T7885	MCAFEE WINDOWS AV CLIENT
9	DSUSB31000S	STARTECH USB 3.0 TO GIGABIT ETHERNE
9	DSST7300U3M	STARTECH 7 PORT USB 3.0 HUB
9	DSRMP615A	SPD, TYPE 3, 120V RACK MOUNT, 15A P
1	DSF2B56AA	USB EXTERNAL DVD DRIVE
9	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG
9	DSEV221B	TECH GLOBAL EVOLUTION SERIES 22INCH
9	TT3492	Z2 G4 MINI WORKSTATION NON RETURNAB
9	DSY7B61AA	HP Z2 MINI ARM WALL VESA MOUNT
18	B1952	SPEAKER, DESKTOP, USB
18	CA03406AA	ADD: AC LINE CORD, NORTH AMERICA
18	CA03413AA	ADD: USB CABLE, TYPE A TO TYPE C, 4
18	CA03405AA	ADD: POWER SUPPLY WITH DC CORD

Qty.	Nomenclature	Description
2	CLN1868	2930F 24-PORT SWITCH
2	CLN1866	FRU: 1M DAC CABLE
2	T8492	SITE AND HUB ROUTER AND FIREWALL- A
2	CA03445AA	ADD: MISSION CRITICAL HARDENING
2	CA03448AA	ADD: STATEFUL FIREWALL
1	SQM01SUM0205	GGM 8000 GATEWAY
1	CA01616AA	ADD: AC POWER
1	CA02086AA	ADD: HIGH DENSITY ENH CONV GATEWAY
1	SQM01SUM0205	GGM 8000 GATEWAY
1	CA01616AA	ADD: AC POWER
1	CA02086AA	ADD: HIGH DENSITY ENH CONV GATEWAY
1	BVN1013	MKM 7000 Console Alias Manager Soft
1	DSF2B56AA	USB EXTERNAL DVD DRIVE
1	BVN6079	PRX 7000 Proxy Application SW DVD
1	TT3492	Z2 G4 MINI WORKSTATION NON RETURNAB
1	DSEV221B	TECH GLOBAL EVOLUTION SERIES 22INCH
1	T8492	SITE AND HUB ROUTER AND FIREWALL- A
1	CA03445AA	ADD: MISSION CRITICAL HARDENING
1	CA03448AA	ADD: STATEFUL FIREWALL
1	T7038	GCP 8000 SITE CONTROLLER
1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA03111AA	ADD: CEC COMPLIANCE
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
1	CA00303AA	ADD: QTY (1) SITE CONTROLLER
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA01136AA	MCC 7500 CONVEN SITE OPER
1	T8343	GSERIES SOFTWARE LICENSING
1	UA00415AA	ADD: GSERIES SC-CONV
2	BLN1317	MCC 7500 AIS SOFTWARE FIELD-ADD LIC
2	BLN1302	OVER THE ETHERNET KEYING (OTEK) OPE
2	BLN1304	SECURE OPERATION FIELD-ADD LICENSE
2	TT3492	Z2 G4 MINI WORKSTATION NON RETURNAB
9	DQG20GB612	POWER STRIP 6 OUTLET 15A 125VA
2	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TS
2	DSRMP615A	SPD, TYPE 3, 120V RACK MOUNT, 15A P
1	B1948	MCC 7500E DISPATCH POSITION LICENSE
2	UA00653AA	ADD: BASIC CONSOLE OPERATION
2	UA00654AA	ADD: ASTRO 25 TRUNKING OPERATION

Qty.	Nomenclature	Description
2	UA00655AA	ADD: ADVANCED CONVENTIONAL OPERATIO
2	UA00659AA	ADD: ADP/AES/DES-OFB ENCRYPTION
2	UA00658AA	ADD: SECURE OPERATION
2	UA00249AA	ADD: 15 RADIO RESOURCES LICENSE
2	UA00661AA	ADD: ENHANCED IRR
2	UA00660AA	ADD: OTEK OPERATION
1	UA00254AA	ADD: PRX 7000 PROXY SW LICENSE (1-1
2	TT3493	ZBOOK 15 G5 NON RETURNABLE
2	RLN6098	HDST MODULE BASE W/PTT, 15 FT CBL
2	RMN5150A	OVER-THE-HEAD, MONAURAL, NOISE-CANC
2	DDN1428	XLR TO USB ADAPTER SHURE
1	B1952	SPEAKER, DESKTOP, USB
1	CA03406AA	ADD: AC LINE CORD, NORTH AMERICA
1	CA03405AA	ADD: POWER SUPPLY WITH DC CORD
1	B1914	MCC SERIES DESKTOP GOOSENECK MICROP
1	B1913	MCC SERIES HEADSET JACK
1	TT3492	Z2 G4 MINI WORKSTATION NON RETURNAB
1	CLN1868	2930F 24-PORT SWITCH
1	CLN1866	FRU: 1M DAC CABLE
1	T8492	SITE AND HUB ROUTER AND FIREWALL- A
1	CA03445AA	ADD: MISSION CRITICAL HARDENING
1	CA03448AA	ADD: STATEFUL FIREWALL
1	DLN6966	FRU: GCP 8000/GCM 8000/GPB 8000
1	DLN6781	FRU: POWER SUPPLY
1	B1948	MCC 7500E DISPATCH POSITION LICENSES
1	B1949	MCC 7500E SOFTWARE DVD
1	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG
2	B1905	MCC 7500 ASTRO 25 SOFTWARE
2	B1933	MOTOROLA VOICE PROCESSOR MODULE
2	CA00288AB	ADD: MCC 7500 ARCHIVING INTERFACE SERVER SOFTWARE LICENSE
2	CA00143AC	ADD: DES-OFB ALGORITHM
2	CA00182AB	ADD: AES ALGORITHM
2	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN
2	T7885	MCAFEE WINDOWS AV CLIENT
2	TT3492	Z2 G4 MINI WORKSTATION NON RETURNAB
1	TT2669	120 SIMUL CALL MCC 7500 IP RECORDER
1	TT06274AA	ADD: IP LOGGING RECORDER FOR USE ON A2019 SYSTEMS

Qty.	Nomenclature	Description
1	TT06274AA	ADD: IP LOGGING RECORDER FOR USE ON A2019 SYSTEMS
2	T7885	MCAFEE WINDOWS AV CLIENT
2	TT3492	Z2 G4 MINI WORKSTATION NON RETURNAB
2	DSTG191B	TECH GLOBAL EVOLUTION SERIES 19INCH NON TOUCH
2	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG
2	T7885	MCAFEE WINDOWS AV CLIENT
2	B1952	SPEAKER, DESKTOP, USB
2	CA03413AA	ADD: USB CABLE, TYPE A TO TYPE C, 4.5M
1	DDN9748	19 INCH BLACK SHELF
1	TT2671	32 CHANNEL NRX BASE BUNDLE
8	TT05764AA	ADD: ADDITIONAL 8 RECORDING LICENSES - MAX OF 20
32	TT05771AA	ADD: ANALOG CHANNEL FLAG
32	TT05772AA	ADD: DIGITAL CHANNEL FLAG
32	TT05774AA	ADD: TELEPHONY VOIP CHANNEL FLAG
1	DS1101990	SPD, SHIELDED RJ-45 JACK, SINGLE LINE GBE (1000MBPS) R56 COMPLIANT
WAVE Push To Talk		
2	SQM01SUM0284B	WAVE 5000 SERVER
2	SQM01SUM0292	CRYPTR
2	CA02066AA	AC Line Cord, North America
2	CA02954AA	ADD: SECURE OPERATION
2	CA02933AA	ADD: ASTRO AES 256, DES-OFB, ADP ENCRYPTION KIT
1	SSV00S01291A	CRITICAL CONNECT BASIC SUBSCRIPTION (5 YEAR)
1	LSV00S01306B	CRITICAL CONNECT ONSITE SERVICE
10	SSV00S01500A	WAVE DISPATCH
50	SSV00S01499A	WAVE SUBSCRIPTION

4.1.2 UASI-19 Equipment List

Qty.	Nomenclature	Description
700MHz Radio System Prime Site		
1	T7321	GCM 8000 COMPARATOR
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
2	CA01183AA	GCM 8000 COMPARATOR
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE
2	CA01974AA	ADD: TRUNKING REDUNDANT COMPRTR SW
1	CA03111AA	ADD: CEC COMPLIANCE

Qty.	Nomenclature	Description
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA01400AA	ADD: POWER CABLE, DC
1	T8343	GSERIES SOFTWARE LICENSING
2	UA00402AA	ADD: GSERIES CM-P25 TRNK IP
2	UA00418AA	ADD: P25 TDMA TRNK COMPARATOR SW
2	UA00419AA	ADD: REDUNDANT CMPRTR P25 TRNK
1	T7321	GCM 8000 COMPARATOR
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
2	CA01183AA	GCM 8000 COMPARATOR
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE
2	CA01974AA	ADD: TRUNKING REDUNDANT COMPRTR SW
1	CA03111AA	ADD: CEC COMPLIANCE
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA01400AA	ADD: POWER CABLE, DC
1	T8343	GSERIES SOFTWARE LICENSING
2	UA00402AA	ADD: GSERIES CM-P25 TRNK IP
2	UA00418AA	ADD: P25 TDMA TRNK COMPARATOR SW
2	UA00419AA	ADD: REDUNDANT CMPRTR P25 TRNK
1	T7321	GCM 8000 COMPARATOR
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
2	CA01183AA	GCM 8000 COMPARATOR
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE
2	CA01974AA	ADD: TRUNKING REDUNDANT COMPRTR SW
1	CA03111AA	ADD: CEC COMPLIANCE
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA01400AA	ADD: POWER CABLE, DC
1	T8343	GSERIES SOFTWARE LICENSING
2	UA00402AA	ADD: GSERIES CM-P25 TRNK IP
2	UA00418AA	ADD: P25 TDMA TRNK COMPARATOR SW
2	UA00419AA	ADD: REDUNDANT CMPRTR P25 TRNK
1	T7321	GCM 8000 COMPARATOR
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
2	CA01183AA	GCM 8000 COMPARATOR

Qty.	Nomenclature	Description
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION
1	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE
2	CA01974AA	ADD: TRUNKING REDUNDANT COMPRTR SW
1	CA03111AA	ADD: CEC COMPLIANCE
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA01400AA	ADD: POWER CABLE, DC
1	T8343	GSERIES SOFTWARE LICENSING
2	UA00402AA	ADD: GSERIES CM-P25 TRNK IP
1	UA00418AA	ADD: P25 TDMA TRNK COMPARATOR SW
2	UA00419AA	ADD: REDUNDANT CMPRTR P25 TRNK
1	T7038	GCP 8000 SITE CONTROLLER
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
1	CA00303AA	ADD: QTY (1) SITE CONTROLLER
1	CA01194AA	ADD: IP BASED MULTISITE SITE CONTRO
1	CA03111AA	ADD: CEC COMPLIANCE
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA01400AA	ADD: POWER CABLE, DC
1	T8343	GSERIES SOFTWARE LICENSING
1	UA00405AA	ADD: GSERIES SC-P25 TRNK MS IP
1	T7038	GCP 8000 SITE CONTROLLER
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
1	CA00303AA	ADD: QTY (1) SITE CONTROLLER
1	CA01194AA	ADD: IP BASED MULTISITE SITE CONTRO
1	CA03111AA	ADD: CEC COMPLIANCE
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA01400AA	ADD: POWER CABLE, DC
1	T8343	GSERIES SOFTWARE LICENSING
1	UA00405AA	ADD: GSERIES SC-P25 TRNK MS IP
1	DSTRAK91008EDC	PRIME/MASTER SITE REDUNDANT MODULAR
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR
1	CLN1869	2930F 48-PORT SWITCH
1	CLN1868	2930F 24-PORT SWITCH
1	T8555	EDGE ROUTER & FIREWALL DC
1	CA03445AA	ADD: MISSION CRITICAL HARDENING

Qty.	Nomenclature	Description
1	CA03448AA	ADD: STATEFUL FIREWALL
1	T8555	EDGE ROUTER & FIREWALL DC
1	CA03445AA	ADD: MISSION CRITICAL HARDENING
1	CA03448AA	ADD: STATEFUL FIREWALL
1	TRN7343	SEVEN AND A HALF FOOT RACK
700MHz Radio System Redundant Prime Site		
1	T7321	GCM 8000 COMPARATOR
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
2	CA01183AA	GCM 8000 COMPARATOR
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE
2	CA01974AA	ADD: TRUNKING REDUNDANT COMPRTR SW
1	CA03111AA	ADD: CEC COMPLIANCE
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA01400AA	ADD: POWER CABLE, DC
1	T8343	GSERIES SOFTWARE LICENSING
2	UA00402AA	ADD: GSERIES CM-P25 TRNK IP
2	UA00418AA	ADD: P25 TDMA TRNK COMPARATOR SW
2	UA00419AA	ADD: REDUNDANT CMPRTR P25 TRNK
1	T7321	GCM 8000 COMPARATOR
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
2	CA01183AA	GCM 8000 COMPARATOR
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE
2	CA01974AA	ADD: TRUNKING REDUNDANT COMPRTR SW
1	CA03111AA	ADD: CEC COMPLIANCE
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA01400AA	ADD: POWER CABLE, DC
1	T8343	GSERIES SOFTWARE LICENSING
2	UA00402AA	ADD: GSERIES CM-P25 TRNK IP
2	UA00418AA	ADD: P25 TDMA TRNK COMPARATOR SW
2	UA00419AA	ADD: REDUNDANT CMPRTR P25 TRNK
1	T7321	GCM 8000 COMPARATOR
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
2	CA01183AA	GCM 8000 COMPARATOR
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION

Qty.	Nomenclature	Description
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE
2	CA01974AA	ADD: TRUNKING REDUNDANT COMPRTR SW
1	CA03111AA	ADD: CEC COMPLIANCE
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA01400AA	ADD: POWER CABLE, DC
1	T8343	GSERIES SOFTWARE LICENSING
2	UA00402AA	ADD: GSERIES CM-P25 TRNK IP
2	UA00418AA	ADD: P25 TDMA TRNK COMPARATOR SW
2	UA00419AA	ADD: REDUNDANT CMPRTR P25 TRNK
1	T7321	GCM 8000 COMPARATOR
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
2	CA01183AA	GCM 8000 COMPARATOR
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION
1	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE
2	CA01974AA	ADD: TRUNKING REDUNDANT COMPRTR SW
1	CA03111AA	ADD: CEC COMPLIANCE
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA01400AA	ADD: POWER CABLE, DC
1	T8343	GSERIES SOFTWARE LICENSING
2	UA00402AA	ADD: GSERIES CM-P25 TRNK IP
1	UA00418AA	ADD: P25 TDMA TRNK COMPARATOR SW
2	UA00419AA	ADD: REDUNDANT CMPRTR P25 TRNK
1	T7038	GCP 8000 SITE CONTROLLER
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
1	CA00303AA	ADD: QTY (1) SITE CONTROLLER
1	CA02474AA	ADD:GEO-REDUN BACK-UP SC LIC
1	CA01194AA	ADD: IP BASED MULTISITE SITE CONTRO
1	CA03111AA	ADD: CEC COMPLIANCE
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA01400AA	ADD: POWER CABLE, DC
1	T8343	GSERIES SOFTWARE LICENSING
1	UA00405AA	ADD: GSERIES SC-P25 TRNK MS IP
1	DSTRAK91008EDC	PRIME/MASTER SITE REDUNDANT MODULAR
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR

Qty.	Nomenclature	Description
1	CLN1869	2930F 48-PORT SWITCH
1	CLN1868	2930F 24-PORT SWITCH
1	T8555	EDGE ROUTER & FIREWALL DC
1	CA03445AA	ADD: MISSION CRITICAL HARDENING
1	CA03448AA	ADD: STATEFUL FIREWALL
1	T8555	EDGE ROUTER & FIREWALL DC
1	CA03445AA	ADD: MISSION CRITICAL HARDENING
1	CA03448AA	ADD: STATEFUL FIREWALL
1	TRN7343	SEVEN AND A HALF FOOT RACK
1	DSTRAK91061	FOUR PORT DDM
1	CLN1868	2930F 24-PORT SWITCH
1	CLN1866	FRU: 1M DAC CABLE
1	CLN1869	2930F 48-PORT SWITCH
1	CLN1866	FRU: 1M DAC CABLE
1	DLN6966	FRU: GCP 8000/GCM 8000/GPB 8000
1	DLN6455	CONFIGURATION/SERVICE SOFTWARE
700MHz Radio System Remote Site (x5)		
1	T8547	SITE AND HUB ROUTER AND FIREWALL -
1	CA03445AA	ADD: MISSION CRITICAL HARDENING
1	CA03448AA	ADD: STATEFUL FIREWALL
1	T8547	SITE AND HUB ROUTER AND FIREWALL -
1	CA03445AA	ADD: MISSION CRITICAL HARDENING
1	CA03448AA	ADD: STATEFUL FIREWALL
1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
1	CA00855AA	ADD: 700/800 MHZ
1	X304AE	ADD: QTY (4) GTR 8000 BASE RADIOS
4	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO
1	CA03111AA	ADD: CEC COMPLIANCE
4	CA01842AA	ADD: P25 TDMA SOFTWARE
2	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE
1	CA02686AA	ADD: AC DC POWER DISTRIBUTION
4	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILIT
1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER
1	CA00882AA	ADD: 700 MHZ TX FILTER W/PMU
2	CA01536AA	ADD: GPB 8000 REFERENCE DISTRIBUTIO
2	CA01537AA	ADD: REFERENCE DISTRIBUTION SOFTWAR

Qty.	Nomenclature	Description
1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU
1	T8343	GSERIES SOFTWARE LICENSING
4	UA00400AA	ADD: GSERIES BR-P25 TRNK MS IP
2	UA00409AA	ADD: GSERIES RDM
1	PMUG1017A	GNSS REMOTE RECEIVER ASSY
1	DSWM4	HEAVY DUTY W STYLE WALL MOUNT WITH
1	DSP04268	ALUMINUM 6061-T6. PIPE 1 INCH SCHED
1	DS30C87465CO1	125FT OUTDOOR UV PROTECTED CABLE 6
1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
1	CA00855AA	ADD: 700/800 MHZ
1	X304AE	ADD: QTY (4) GTR 8000 BASE RADIOS
4	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO
1	CA03111AA	ADD: CEC COMPLIANCE
3	CA01842AA	ADD: P25 TDMA SOFTWARE
1	CA02686AA	ADD: AC DC POWER DISTRIBUTION
4	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK
1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBIN
1	CA01058AA	ADD: 700/800 PHASING HARNESS
2	CA00885AA	ADD: HIGH AVAILABILITY XHUB
1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU
1	T8343	GSERIES SOFTWARE LICENSING
4	UA00400AA	ADD: GSERIES BR-P25 TRNK MS IP
1	DSTRAK91061	FOUR PORT DDM
1	DLN6895	FRU: PA 7/800 MHz
1	DLN6885	FRU: XCVR 7/800 MHZ V2
1	DLN6634	FRU: 700/800 MHZ SITE LNA
1	DLN1306	FRU: 700/800 MHZ CABINET RMC MODULE
1	DLN6805	FRU: ENERGY EFFICIENT POWER SUPPLY
1	DLN6898	FRU: FAN MODULE
1	DLN6677	FRU: G-SERIES XHUB
1	DLN6455	CONFIGURATION/SERVICE SOFTWARE
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POL
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING
150	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED
2	DSA5DFD	D-CLASS 7-16 DIN FEMALE FOR AVA5-50

Qty.	Nomenclature	Description
4	DSSG7812B2U	SG78-12B2U SUREGROUND GROUNDING KIT
1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP
5	MDN6817	42396A-5 7/8" CABLE HANGER STAINLE
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH P
1	DSGSAKITD	GROUND STRAP KIT - DIN
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POL
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POL
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING
150	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED
2	DSA5DFD	D-CLASS 7-16 DIN FEMALE FOR AVA5-50
4	DSSG7812B2U	SG78-12B2U SUREGROUND GROUNDING KIT
1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP
5	MDN6817	42396A-5 7/8" CABLE HANGER STAINLE
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH P
1	DSGSAKITD	GROUND STRAP KIT - DIN
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POL
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2
700MHz Radio System Antennas		
1	DSCC80706T3	OMNI, CORP COLLINEAR, 6DDBD, 746-87
1	DSCC80706T3	OMNI, CORP COLLINEAR, 6DDBD, 746-87
1	DSCC80706T3	OMNI, CORP COLLINEAR, 6DDBD, 746-87
1	DSCC80706T3	OMNI, CORP COLLINEAR, 6DDBD, 746-87
1	DSBPA74966013	PANEL ANTENNA, 11DBD, 746-960MHZ, 6
1	DSCC80706T3	OMNI, CORP COLLINEAR, 6DDBD, 746-87
1	DSCC80708T3	OMNI CORPORATE COLLINEAR 8DBD 746-8
1	DSCC80708T3	OMNI CORPORATE COLLINEAR 8DBD 746-8
1	DSBPA74966013	PANEL ANTENNA, 11DBD, 746-960MHZ, 6
1	DSCC80706T3	OMNI, CORP COLLINEAR, 6DDBD, 746-87
MCD5000 Backup Desksets		
6	L37TSS9PW1 N	ALL BAND CONSOLETTE
6	G806	ENH: ASTRO DIGITAL CAI OP APX
6	G51	ENH: SMARTZONE OPERATION APX
6	G361	ENH: P25 TRUNKING SOFTWARE APX
6	GA00580	ADD: TDMA OPERATION APX

Qty.	Nomenclature	Description
6	L999	ADD: FULL FP W/05/KEYPAD/CLOCK/VU
6	W382	ADD: CONTROL STATION DESK GCAI MIC
6	CA01598	ADD: AC LINE CORD US
6	HKN6233C	APX CONSOLETTE RACK MOUNT KIT
6	G78	ADD: 3Y ESSENTIAL SERVICE
6	G996	ENH: OVER THE AIR PROVISIONING
6	QA03399	ADD: ENHANCED DATA
6	G298	ENH: ASTRO 25 OTAR W/ MULTIKEY
6	G843	ADD: AES ENCRYPTION APX
2	F2380	MCD 5000 DESKSET
2	FHN7469	MCD 5000 DESKSET / RGU POWER SUPPLY WITH USA POWER CORD
2	FKN8695	ETHERNET CABLE 10' WITH RED & BLACK LABELS
2	F7879	SM, RADIO GATEWAY UNIT (RGU)
2	FHN7469	MCD 5000 DESKSET / RGU POWER SUPPLY WITH USA POWER CORD
2	FKN8695	ETHERNET CABLE 10' WITH RED & BLACK LABELS
1	FTN7490	MCD 5000 DESKSET RGU RACK MOUNT PANEL PLUS SCREWS
1	FVN5847	MCD 5000 DESKSET SYSTEM CONFIG TOOL - SYSTEM W/OUT OMC
1	FHN7469AS	POWER SUPPLY KIT FOR SERVICE
1	CLN1868	2930F 24-PORT SWITCH

4.1.3 Non-UASI Funded Equipment List

Qty.	Nomenclature	Description
		UHF Channel Prime Site
1	DSTRAK91008E	PRIME/MASTER SITE REDUNDANT MODULAR
2	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR
1	T8493	EDGE ROUTER & FIREWALL AC
1	CA03445AA	ADD: MISSION CRITICAL HARDENING
1	CA03448AA	ADD: STATEFUL FIREWALL
1	CLN1868	2930F 24-PORT SWITCH
1	T8341	GRV 8000 COMPARATOR
1	CA03084AA	ADD: COMPARATOR
1	CA03320AA	ADD: ASTRO 25 CONVENTIONAL SOFTWARE
1	CA03317AA	ADD: DIGITAL CONV SIMULCAST SOFTWAR
1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE

Qty.	Nomenclature	Description
1	CA03111AA	ADD: CEC COMPLIANCE
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
1	DSTRAK91061	FOUR PORT DDM
1	DLN6898	FRU: FAN MODULE
UHF Channel Remote Site (x7)		
1	T7039	GTR 8000 Base Radio
1	X640AL	ADD: UHF R2 (435-524 MHZ)
1	CA01948AA	ADD: CONVENTIONAL SOFTWARE
1	CA01502AA	ADD: ASTRO 25 CONVENTIONAL SIMULCAS
1	CA01503AA	ADD: FALL BACK IN SIMULCAST CABINET
1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA03111AA	ADD: CEC COMPLIANCE
1	X265AP	ADD: BR PRESELECTOR 380-512 MHZ
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
1	CA01400AA	ADD: POWER CABLE, DC
1	DSBCDUP02BD	450-470MHZ SINGLE CH DUPLEXER/RX AM
1	CLN1868	2930F 24-PORT SWITCH
1	T8547	SITE AND HUB ROUTER AND FIREWALL -
1	CA03445AA	ADD: MISSION CRITICAL HARDENING
1	CA03448AA	ADD: STATEFUL FIREWALL
1	TRN7343	SEVEN AND A HALF FOOT RACK
1	TRN7343	SEVEN AND A HALF FOOT RACK
1	DLN6896	FRU: PA UHF R2
1	DLN6887	FRU: XCVR UHF R2 V2 PWR EFF OPT CRD
1	DLN6805	FRU: ENERGY EFFICIENT POWER SUPPLY
1	DLN6898	FRU: FAN MODULE
1	DLN6455	CONFIGURATION/SERVICE SOFTWARE
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POL
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING
150	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED
2	DSA5DFD	D-CLASS 7-16 DIN FEMALE FOR AVA5-50
4	DSSG7812B2U	SG78-12B2U SUREGROUND GROUNDING KIT
1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP
5	MDN6817	42396A-5 7/8" CABLE HANGER STAINLE
1	DSVHF50DMAPGR	RF SPD, 100-512MHZ, DC BLOCK HIGH P

Qty.	Nomenclature	Description
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POL
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2
		UHF Channel Antennas
1	DSFSA4067DIN	DIRECTIONAL DIPOLE ARRAY, 9 DBD, 13
1	DSFSA4067DIN	DIRECTIONAL DIPOLE ARRAY, 9 DBD, 13
1	DSCOL41070	OMNI. MEANDER COLLINEAR, 9 DBD, 450
1	DSCOL41070	OMNI. MEANDER COLLINEAR, 9 DBD, 450
1	DSCOL41070	OMNI. MEANDER COLLINEAR, 9 DBD, 450
1	DSBA8067DIN	OMNI. EXPOSED DIPOLE ARRAY, 6 DBD,
1	DSBA8067DIN	OMNI. EXPOSED DIPOLE ARRAY, 6 DBD,
		VHF RX Prime Site
1	T8341	GRV 8000 COMPARATOR
1	CA03084AA	ADD: COMPARATOR
1	CA01949AC	ADD: ANALOG CONV ONLY SW
1	CA01951AC	ADD: ANALOG CONV VOTING SW
1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
1	CA03111AA	ADD: CEC COMPLIANCE
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA00719AA	ADD: ASTRO SYSTEM RELEASE 7.19
1	DLN6898	FRU: FAN MODULE
		VHF RX Remote Site (x3)
1	T7540	GPW 8000 RECEIVER
1	X301AR	ADD: QTY 1 GPW 8000 RECEIVER
1	X530BH	ADD: VHF (136-174 MHZ)
1	CA01953AB	ADD: POWER EFFICIENCY PACKAGE
1	CA03111AA	ADD: CEC COMPLIANCE
1	X153AW	ADD: RACK MOUNT HARDWARE
1	CA01400AA	ADD: POWER CABLE, DC
1	CA01954AB	WILDCARD w/GPIO
1	X265AM	BR PRESELCTOR, 150-174 MHZ
1	CA03090AB	ADD: RX ANALOG CONV IP VOTING/SIMUL
1	CA00718AA	ADD: ASTRO SYSTEM RELEASE 7.18
1	DLN6893	FRU: XCVR VHF V2 W/OPTION CARD
1	DLN6781	FRU: POWER SUPPLY
1	DLN6898	FRU: FAN MODULE
1	DLN6455	CONFIGURATION/SERVICE SOFTWARE
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POL

Qty.	Nomenclature	Description
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING
150	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED
2	DSA5NFS	N FEMALE FOR AVA5-50 CABLE
4	DSSG7812B2U	SG78-12B2U SUREGROUND GROUNDING KIT
1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP
5	MDN6817	42396A-5 7/8" CABLE HANGER STAINLE
1	DSIS50NXC2MA	RF SPD, 125-1000MHZ DC BLOCK FLANGE
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED
VHF RX Remote Site Antennas		
1	DSBA8041DIN	OMNI, EXPOSED DIPOLE ARRAY, 6 DBD,
1	DSBA8041DIN	OMNI, EXPOSED DIPOLE ARRAY, 6 DBD,
1	DSBA8041DIN	OMNI, EXPOSED DIPOLE ARRAY, 6 DBD,
7	DSUC1142	PIPE TO PIPE CLAMP, 1.5" TO 5" PIPE
10	DSUC1143	PIPE TO PIPE CLAMP, 1.5" TO 5" PIPE
3	DSUC1142	PIPE TO PIPE CLAMP, 1.5" TO 5" PIPE
Microwave & MPLS		
9	DSIGMX104PREMAC	MX104 PREM BNDL 4MIC SLOTS 2PS 2RES JUNOS CIF DVR W/ 8X480TV
18	DSIGMIC3D20GESFPE	MIC-3D-20GE-SFP ENHANCED MAC SEC & TIMING PHY MAX 256 APS
18	DSIGCBLPWRC15MHTMP	2.5M 13A/125V PWR CORD AC C15M STRAIGHT NEMA N5-15 TO HIGH TEMP
54	DSIGSFP1GEFE	SFP 10/100/1000 COPPER
9	DSIGSVCNDMX104	ND SUPPORT FOR MX104
1	DSFG60D	FG-60D - 10 X GE RJ45 PORTS
1	DSIGMX104PREMAC	MX104 PREM BNDL 4MIC SLOTS 2PS 2RES JUNOS CIF DVR W/ 8X480TV
2	DSIGMIC3D20GESFPE	MIC-3D-20GE-SFP ENHANCED MAC SEC & TIMING PHY MAX 256 APS
4	DSIGSFP1GEFE	SFP 10/100/1000 COPPER
1	DSIGSVCNDMX104	ND SUPPORT FOR MX104
1	DS_POLA_NOKIA_MW_V1	CUSTOM NOKIA MICROWAVE QUOTE
Knoll Hill Greenfield Site		
1	TT1001	MSB 12X24 1-RM BLDG. INCLS GENERAC 70KW LP GEN & (2) 16KW UPS
1	TT01020AA	ADD: SIESMIC RATING OD GEN ONLY, 51%-220%G ONLY
1	TT01004AA	ALT: DIESEL GENERATOR (GENERAC)
1	TT01023AA	DEL: DELETE 20KVA/16KW UPS (QTY 2)

Qty.	Nomenclature	Description
1	DQ-462564-01	Valmont 2020 120-foot self-supported tower
1	DS500GTANKUPGB	500 GAL FUEL TANK OPTION (FOR 60-80KW) ADDER TO STANDLAONE GENSET
Aeroflex Serivce Monitor Upgrades		
1	DQTT05348AA	P25 CONTROL CHANNEL LOGGER / 390XOPT206 (REQUIRES 390XOPT200)
1	DQTT05359AA	P25 AES ENCRYPTION / 390XOPT240 / R2077A
1	DQTT05362AA	P25 PERFORMANCE TEST TRIGGERS / 390XOPT260
1	DS390XOPT644	MOTOROLA APX 8000 SERIES AUTOTEST/ALIGNMENT
1	DS390XOPT645	MOTOROLA APX "B" SERIES AUTOTEST/ALIGNMENT
1	DSTT05345AA	P25 CONVENTIONAL WITH DES OFB TYPE III / 390XOPT200 / R2075A
1	DSTT05356AA	AUTOTEST II FOR P25 RADIO SYSTEMS / 390XOPT218 / R2083A
1	DSTT05343AA	TRACKING GENERATOR / 390XOPT061 / R2020A
1	DQ390XOPT604	APX-7000 AUTOTEST & ALIGNMENT/ 390XOPT604
1	DDN9837	10 AMP CURRENT SHUNT 0.01 OHM / AC24011 / R1794A
1	DSTT05346AA	P25 TRUNKING VHF/UHF/700/800MHZ / 390XOPT201 (REQUIRES 390XOPT200)
1	DS390XOPT220	P25 PHASE 2 TWO-SLOT TDMA PHYSICAL LAYER/390XOPT220
1	DSTT05359AA	P25 AES ENCRYPTION / 390XOPT240 / R2077A
DC Power Systems		
1	DSLMHFX800ST	DC POWER SYS, 48V 800ADC 84X23X18 RELAY RACK, 1200 ADC DIST UNIT
8	DSLMHF7548VZE1T	48V, 75A LMHF RECTIFIER (T)
1	DSWLBG2088ST	BATTERY, 2088AH 48VDC STRING CONSISTING OF (24) 2V CELLS ST RATE VLRA
30	DSSP4KLMDC10B1A	LMDC BREAKER,10A
1	DSLMHFX450ST	DC POWER SYS, 48V 450ADC, DIST MOD, LVLD, CONTROLLER, BATT DISC
4	DSLMHF7548VZE1T	48V, 75A LMHF RECTIFIER (T)
1	DSWLBG800ST	BATTERY, 800AH 48VDC STRING CONSISTING OF (24) 2V CELLS ST RATE VLRA
10	DSSP4KCDPD10B1	10 AMP BREAKER FOR TYPE CDPD
1	DSLMHFX450ST	DC POWER SYS, 48V 450ADC, DIST MOD, LVLD, CONTROLLER, BATT DISC
4	DSLMHF7548VZE1T	48V, 75A LMHF RECTIFIER (T)
1	DSWLBG800ST	BATTERY, 800AH 48VDC STRING CONSISTING OF (24) 2V CELLS ST RATE VLRA
10	DSSP4KCDPD10B1	10 AMP BREAKER FOR TYPE CDPD
1	DSLMHFX450ST	DC POWER SYS, 48V 450ADC, DIST MOD, LVLD, CONTROLLER, BATT DISC
4	DSLMHF7548VZE1T	48V, 75A LMHF RECTIFIER (T)
1	DSWLBG800ST	BATTERY, 800AH 48VDC STRING CONSISTING OF (24) 2V CELLS ST RATE VLRA

Qty.	Nomenclature	Description
10	DSSP4KCDPD10B1	10 AMP BREAKER FOR TYPE CDPD
1	DSLMHFX450ST	DC POWER SYS, 48V 450ADC, DIST MOD, LVLD, CONTROLLER, BATT DISC
4	DSLMHF7548VZE1T	48V, 75A I MHF RECTIFIER (T)
1	DSWLBG800ST	BATTERY, 800AH 48VDC STRING CONSISTING OF (24) 2V CELLS ST RATE VLRA
10	DSSP4KCDPD10B1	10 AMP BREAKER FOR TYPE CDPD
1	DSLMHFX450ST	DC POWER SYS, 48V 450ADC, DIST MOD, LVLD, CONTROLLER, BATT DISC
5	DSLMHF7548VZE1T	48V, 75A LMHF RECTIFIER (T)
1	DSWLBG1200ST	BATTERY, 1200AH 48VDC STRING CONSISTING OF (24) 2V CELLS ST RATE VLRA
10	DSSP4KCDPD10B1	10 AMP BREAKER FOR TYPE CDPD
1	DSLMHFX450ST	DC POWER SYS, 48V 450ADC, DIST MOD, LVLD, CONTROLLER, BATT DISC
5	DSLMHF7548VZE1T	48V, 75A LMHF RECTIFIER (T)
1	DSWLBG1200ST	BATTERY, 1200AH 48VDC STRING CONSISTING OF (24) 2V CELLS ST RATE VLRA
10	DSSP4KCDPD10B1	10 AMP BREAKER FOR TYPE CDPD
1	DSLMHFX450ST	DC POWER SYS, 48V 450ADC, DIST MOD, LVLD, CONTROLLER, BATT DISC
5	DSLMHF7548VZE1T	48V, 75A LMHF RECTIFIER (T)
1	DSWLBG1200ST	BATTERY, 1200AH 48VDC STRING CONSISTING OF (24) 2V CELLS ST RATE VLRA
30	DSSP4KCDPD10B1	10 AMP BREAKER FOR TYPE CDPD
In-Building DAS		
1	DS_POLA_NOKIA_MW_V1	CUSTOM NOKIA MICROWAVE QUOTE
1	DS_BDA_POLA_SPV	POLA BDA EQUIPMENT S PALOS VERDES ST.
1	DS_BDA_POLA_PD	POLA BDA EQUIPMENT PD BUILDING
APX Subscriber Feature Upgrades		
1	T8627	TDMA
320	QA03399AB	ADD: ENHANCED DATA
320	QA09008	ADD: GROUP SERVICES FLP

SECTION 5

ACCEPTANCE TEST PLAN

Port of Los Angeles - P25 Trunking Upgrade

ASTRO25 7.17 M-Core & Simulcast Trunking

Draft ATP – (Finalized in Design Review)

5.1 WIDE AREA TRUNKING - TDMA ONLY SITES

5.1.1 Auto Site Affiliation

1. DESCRIPTION

A Radio affiliation is a function that links a unique radio ID and unique talkgroup to a specific site. This information is stored in a affiliation table in the zone database.
Before resources are assigned, the affiliation table is accessed to know which sites need to be assigned to support the call. Only the sites that need to be assigned that have associated talkgroups will be assigned. If the site does not have that talkgroup affiliated to it will not be assigned. This allows for more calls to be processed with fewer resources.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 2
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE - SITE 2
This test requires the ZoneWatch feature.

Note: There are system settings which could affect the assignment of resources, such as required site.

VERSION #1.030

2. TEST

Step 1. Turn RADIO-1 off and on.

Step 2. Verify via ZoneWatch that RADIO-1 sends in its affiliation.

Step 3. Initiate a call using RADIO-1 on TALKGROUP 1.

Step 4. Verify RADIO-2 can receive and respond to the call. Using ZoneWatch verify that no resources are assigned at SITE 2 as there are no subscribers affiliated to TALKGROUP 1 at SITE 2.

Step 5. Initiate a call on TALKGROUP 2 using RADIO-3.

Step 6. Verify that RADIO-4 can receive and respond to the call. Using ZoneWatch verify that no resources are assigned at SITE 1 as there are no subscribers affiliated to TALKGROUP 2 at SITE 1.

Pass____ Fail____

5.1.2 Talkgroup Call

1. DESCRIPTION

The Talkgroup is the primary level of organization for communications on a trunked radio system. Radios with Talkgroup call capability will be able to communicate with other members of the same Talkgroup. This provides the effect of a private channel down to the Talkgroup level.
This test will demonstrate that a Talkgroup transmission initiated by a radio user will only be heard by system users, which have, the same Talkgroup selected. As with other types of calls, Talkgroup calls can take place from anywhere in the system.

SETUP

RADIO-1 - SITE 1 - TALKGROUP 1
RADIO-2 - SITE 2 - TALKGROUP 1
RADIO-3 - SITE 1 - TALKGROUP 2
RADIO-4 - SITE 2 - TALKGROUP 2

VERSION #1.040

2. TEST

Step 1. Initiate a Wide Area Call with RADIO-1 in TALKGROUP 1.

Step 2. Observe that only RADIO-2 will be able to monitor and respond to the call.

Step 3. Initiate a Wide Area Call with RADIO-3 in TALKGROUP 2.

Step 4. Observe that only RADIO-4 will be able to monitor and respond the call.

Pass____ Fail____

5.1.3 Recent User Priority (TDMA)

1. DESCRIPTION

A recent user of the channel has priority over other users of equal priority of being assigned a channel when a busy queue exists. The maximum number of consecutive times that a user may be elevated to recent user priority is two.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 2
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 3
RADIO-3 - SITE - SITE 1
RADIO-5 - TALKGROUP 4
RADIO-5 - SITE - SITE 1

VERSION #1.030

2. TEST

Step 1. Ensure that the priority level for all talkgroups is the same. Simulate a busy system by disabling all the physical channels at SITE 1 with the exception of the control channel and one voice channel. Press the PTT of RADIO-5 and keep this call in progress for the duration of the test

Step 2. Press and hold the PTT switch of RADIO-1.

Step 3. Press and hold the PTT switch on RADIO-2 and then press and hold the PTT switch on RADIO-3. Verify that both radios receive a busy tone.

Step 4. Release the PTT switches on RADIO-2 and RADIO-3.

Step 5. Release the PTT switch on RADIO-1.

Step 6. As soon as RADIO-2 receives its callback tone, press and hold its PTT switch.

Step 7. Within 2 seconds of callback, re-key RADIO-1. Verify that RADIO-1 receives a busy tone. Release the PTT switch on RADIO-1.

Step 8. Release the PTT switch on RADIO-2. Verify that RADIO-1 receives a callback tone before RADIO-3.

Step 9. Repeat Steps 2-8 for RADIO-1 and RADIO-2. Verify that the priority of RADIO-1 is once more elevated in the busy queue.

Step 10. Repeat Steps 2-8 for RADIO-1 and RADIO-2 once more. Verify that in Step 9 that RADIO-3 receives the callback tone since RADIO-1 cannot be elevated in the busy queue more than two consecutive times. Release the PTT of RADIO-5.

Pass____ Fail____

5.1.4 Continuous Assignment Updating

1. DESCRIPTION

When a talkgroup is assigned a voice channel, the site controller continues to transmit the channel assignment on the control channel for the duration of the talkgroup call. Radios coming into use on the system are automatically sent to voice channels with conversations in progress involving their selected talkgroups.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
RADIO-3 - TALKGROUP 1

VERSION #1.010

2. TEST

Step 1. Turn OFF RADIO-1.

Step 2. Initiate a Talkgroup Call using RADIO-2 and verify RADIO-3 hears the audio.

Step 3. While the Talkgroup Call is in progress, turn ON RADIO-1.

Step 4. Observe RADIO-1, which was just brought back into service, joins the Talkgroup Call already in progress.

Step 5. End the talkgroup call.

Step 6. Switch RADIO-1 to another talkgroup.

Step 7. Initiate a Talkgroup Call from RADIO-2 to RADIO-3.

Step 8. While the Talkgroup Call is in progress, set RADIO-1 back to TALKGROUP 1.

Step 9. Observe that RADIO-1 joins the Talkgroup Call already in progress.

Pass____ Fail____

5.1.5 Call Alert

1. DESCRIPTION

Call Alert is a tone page that allows a user to selectively alert another radio unit. The initiating radio will receive notification from the trunked system as to whether or not the page was received by the target radio. Units receiving a Call Alert will sound an alert tone. As with other types of calls, Call Alerts can take place from anywhere in the system.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
RADIO-3 - TALKGROUP 3

VERSION #1.010

2. TEST

Step 1. Using RADIO-1, press the page button.

Step 2. Enter the unit ID of RADIO-2 with the keypad, or scroll to the location where this ID is stored

Step 3. Press the PTT to initiate the call alert. Verify that the RADIO-1 user receives audible indication that the Call Alert was sent.

Step 4. Verify that RADIO-2 user receives an audible indication of an incoming Call Alert was sent but RADIO-3 does not.

Step 5. Verify RADIO-1 gets an audible indication that the Call Alert was successfully received at the target radio.

Step 6. Turn off RADIO-2. Send a Call Alert from RADIO-1 to RADIO-2.

Step 7. Verify that the RADIO-1 user receives audible indication that the Call Alert was sent.

Step 8. Verify RADIO-1 receives a "No Acknowledgement" indication that the Call Alert was not received at the target radio.

Pass____ Fail____

5.1.6 Private Call

1. DESCRIPTION

Private Call is a selective calling feature that allows a radio user to carry on one-to-one conversation that is only heard by the 2 parties involved. Subscriber units receiving a private call will sound an alert tone. As with other types of calls, Private Calls can take place from anywhere in the system.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
RADIO-3 - TALKGROUP 1

VERSION #1.020

2. TEST

Step 1. Using RADIO-1, press the Private Call (Call) button.

Step 2. Enter the unit ID of RADIO-2 with the keypad, or scroll to the location where this ID is stored.

Step 3. Press the PTT to initiate the Private Call.

Step 4. Verify that RADIO-2 hears tones and the display indicates that a Private Call has been received, but RADIO-3 receives no indications.

Step 5. Answer the call at RADIO-2 by pressing the Private Call (Call)/Respond button. If RADIO-2 has a display, verify it shows the ID number or Alias of the calling unit.

Step 6. Press the PTT switch on RADIO-2 and respond to the Private Call. Note that if you do not press the Private Call button before pressing PTT, your audio will be heard by all members of the talkgroup, and not just by the radio initiating the Private Call.

Step 7. Verify that RADIO-2 can communicate with RADIO-1.

Step 8. Verify that RADIO-3 does not monitor the Private Call.

Step 9. End the Private Call by pressing the "home" key and return to normal talkgroup operation.

Pass____ Fail____

5.1.7 Emergency Alarm and Call with Top of Queue (TDMA)

1. DESCRIPTION

Users in life threatening situations can use the Emergency button on the radio to immediately send a signal to the dispatcher and be assigned the next available voice channel. An Emergency Call can be set to either Top of Queue or Ruthless Preemption operation. To accomplish this test, an Emergency Alarm and Call will be initiated from a subscriber which will be received by a subscriber affiliated at any site of any zone in the system.

NOTE: If the subscriber does not have the Display option, the Emergency ID will not be displayed.

NOTE: All radios and talkgroups should start with default priorities. Default is 10.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - Any Site
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 3
RADIO-4 - SITE - SITE 1
RADIO-5 - TALKGROUP 4
RADIO-5 - SITE - Any Site

VERSION #1.020

2. TEST

Step 1. Verify the emergency type for TALKGROUP 1's template to be set up as Top of Queue.

Step 2. Simulate a busy system by disabling all channels at SITE 1 with the exception of the control channel and one physical voice channel. Press the PTT on RADIO-5 and hold until the completion of the test.

Step 3. Press the PTT to initiate a call with RADIO-3 and hold the PTT switch until instructed to release.

Step 4. Key RADIO-4 and verify the radio receives a busy tone. Release the PTT switch on RADIO-4.

Step 5. Using RADIO-1, send an Emergency Call by depressing the emergency switch and then the PTT switch.

Step 6. Observe that RADIO-1 cannot transmit due to the voice channel being busy.

Step 7. Release the PTT switch on RADIO-3. Observe that RADIO-1 receives the call back before RADIO-4 and is able to proceed with the call.

Step 8. Observe that the display on RADIO-2 denotes an emergency and the unit ID or alias of RADIO-1.

Step 9. Dekey RADIO-1 and end the Emergency Call by holding down the Emergency button on RADIO-1 until an alert tone sounds. Verify RADIO-1 returns to normal operation.

Step 10. Verify RADIO-4 receives a callback. Release the PTT on RADIO-5. Return the system to normal operation.

Pass____ Fail____

5.1.8 Emergency Alarm and Call with Ruthless Preemption (TDMA)

1. DESCRIPTION

Users in life threatening situations can use the Emergency button on the radio to immediately send a signal to the dispatcher and be assigned the next available voice channel. An Emergency Call can be set to either Top of Queue or Ruthless Preemption operation. To accomplish this test, an Emergency Alarm and Call will be initiated from a subscriber which will be received by a subscriber, on the same talkgroup, affiliated at any site of any zone in the system.
NOTE: If the subscriber does not have the Display option, the Emergency ID will not be displayed. This test is not recommended for single site systems as RF contention will occur.

SETUP

RADIO-1 - TALKGROUP 5
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 5
RADIO-2 - SITE - SITE 2
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE - SITE 1
RADIO-5 - TALKGROUP 1
RADIO-5 - SITE - SITE 1
CONSOLE-1 - TALKGROUP 5

VERSION #1.020

2. TEST

Step 1. Verify the emergency type for TALKGROUP 5's template is configured as Ruthless Preemption.

Step 2. Simulate a busy system by disabling all physical channels at SITE 1 with the exception of the control channel and one voice channel. Press the PTT on RADIO-4 and keep the call in progress for the duration of the test. Verify RADIO-3 receives the call.

Step 3. Press the PTT to initiate a call with RADIO-5 and hold the PTT switch until instructed to release.

Step 4. Key RADIO-1 and verify the radio receives a busy tone. Release the PTT switch on RADIO-1.

Step 5. Using RADIO-1 send an Emergency Call by pressing the emergency switch and then the PTT switch.

Step 6. Observe that RADIO-1 is granted the channel immediately and the Talkgroup Call is dropped for RADIO-4. Verify an Emergency Alarm is displayed at a console position monitoring TALKGROUP 5. Verify that CONSOLE-1 and RADIO-2 receive audio from RADIO-1. Dekey RADIO-4.

Step 7. Key RADIO-3 and verify the radio receives a busy tone. Release the PTT switch on RADIO-3.

Step 8. End the Emergency Call by holding down the Emergency button on RADIO-1 until an alert tone sounds. Verify RADIO-1 returns to normal operation and that RADIO-3 receives a callback after the emergency hang time expires.

Step 9. Release the PTT on RADIO-5.

Step 10. Enable the disabled channels at SITE 1 to return the system to normal operation.

Pass____ Fail____

5.1.9 All Start Talkgroups (TDMA)

1. DESCRIPTION

Talkgroups can be set up as either All Start or Fast Start.

"AllStart" is the default Talkgroup Call setup approach that requires that all sites with affiliated talkgroup members and other required resources be available before the call begins. Otherwise, the system returns a busy response to the subscriber who initiated the Talkgroup Call. Once the required resources become available, the call is granted. NOTE: This feature only works on a multi-site system.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 2
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-5 - TALKGROUP 4
RADIO-5 - SITE - SITE 1

VERSION #1.020

2. TEST

Step 1. Verify TALKGROUP 1's template is setup as an All Start Talkgroup.

Step 2. Simulate a busy system by disabling all channels at SITE 1 with the exception of the control channel and one physical voice channel.

Step 3. Press the PTT on RADIO-5 and keep the call up for the duration of the test.

Step 4. Key RADIO-3 and busy out the only remaining voice channel at SITE 1 where RADIO-2 and RADIO-3 are affiliated..

Step 5. Initiate a Talkgroup call from RADIO-1 and observe a busy indication is received due to no available voice channel at SITE 1 where RADIO-2 is affiliated.

Step 6. End the call from RADIO-3. Verify that the call from RADIO-1 is now granted and RADIO-2 can hear the audio.

Step 7. Release the PTT on RADIO-5.

Pass____ Fail____

5.1.10 Fast Start Talkgroup without Critical Site (TDMA)

1. DESCRIPTION

Talkgroups can be set up as either All Start or Fast Start.
A "FastStart" configuration for the Talkgroup Call allows a group call setup whether or not all affiliated Talkgroup members are available. This "Automatic Busy Override by Talkgroup" call setup method still requires the participation of all affiliated consoles, LOMIs (i.e. logging recorders) and critical sites before the call can begin. As channels at the affiliated talkgroup members' sites become available, they are added to the call in progress.

NOTE: This feature only works on a multi-site system.

SETUP

RADIO-1 - TALKGROUP 4
RADIO-1 - SITE - SITE 2
RADIO-2 - TALKGROUP 4
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-5 - TALKGROUP 1
RADIO-5 - SITE - SITE 1

VERSION #1.010

2. TEST

Step 1. Verify that TALKGROUP 4's template is set up as Fast Start with no critical sites specified.

Step 2. Simulate a busy system by disabling all physical channels at SITE 1 with the exception of the control channel and one voice channel. Press the PTT on RADIO-5 and keep this call in progress for the duration of the test.

Step 3. Key RADIO-3 and busy out the only remaining voice channel available at SITE 1.

Step 4. Initiate a Talkgroup Call from RADIO-1 and observe the call is granted even with no voice channel available at SITE 1 for RADIO-2.

Step 5. Dekey RADIO-3. Verify that RADIO-2 can now hear RADIO-1. Release the PTT on RADIO-5.

Pass____ Fail____

5.1.11 Priority Monitor/Non-Priority Scan

1. DESCRIPTION

This test will demonstrate that a subscriber unit can scan a pre-programmed list to find any Priority and Non-priority Talkgroups with assigned voice channels at that site. To demonstrate this, a call will be initiated from a subscriber at a remote site on a talkgroup monitored by a subscriber at the same site as the scanning radio. The scanning radio will scan from its selected talkgroup to the active talkgroup.

Note: Subscribers must be capable of supporting the Talkgroup scan.

SETUP

RADIO-1 - TALKGROUP 1 (SCANNING)
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 2
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 3
RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 3
RADIO-4 - SITE - SITE 2

* RADIO-1 needs to be set to a dial position configured to scan.

VERSION #1.010

2. TEST

Step 1. Verify that RADIO-1 is set to TALKGROUP 1 and in the scan mode of operation and programmed to scan TALKGROUP 1, TALKGROUP 2, and TALKGROUP 3.

Step 2. Initiate a Talkgroup Call with RADIO-4 and observe that RADIO-1 scans to the talkgroup and receives the call. Keep the call in progress until completion of the following step.

Step 3. Initiate a Talkgroup Call with RADIO-2 and observe that RADIO-1 does not receive the call since RADIO-1 is listening to TALKGROUP 3.

Pass____ Fail____

5.1.12 Alias Download to a Talkgroup

1. DESCRIPTION

When alias download is enabled in the radio, the infrastructure will deliver the Radio Alias of the transmitting radio as defined in the provisioning manager to all members of a talkgroup at the end of a group call during hang time. Updated radio aliases are displayed on the next PTT.

SETUP

RADIO-1 - TALKGROUP 1 (Must be equipped with a display and affiliated to the TALKGROUP)

RADIO-2 - TALKGROUP 1 (Must be equipped with a display and affiliated to the TALKGROUP)

VERSION #1.000

2. TEST

Step 1. From RADIO-1, initiate a voice call to TALKGROUP 1.

Step 2. Verify that audio is received at RADIO-2 and that RADIO-1's alias is displayed on RADIO-2's display.

Step 3. In the Provisioning Manager, open the radio record for RADIO-1 and change the alias. Distribute the changes to the infrastructure.

Step 4. From RADIO-1, initiate two to three voice calls to TALKGROUP 1 spaced 10 seconds apart.

Step 5. Verify that audio is received at RADIO-2 and that RADIO-1's updated alias is eventually displayed on RADIO-2's display.

Pass____ Fail____

5.2 MCC 7100/7500 TRUNKED RESOURCES

5.2.1 Instant Transmit

1. DESCRIPTION

The instant transmit switch provides immediate operator access to a channel, independent of its select status (selected or unselected). It provides priority over other dispatcher transmit bars or optional footswitches.

SETUP

RADIO-1 - TALKGROUP 1
CONSOLE-1 – TALKGROUP 1 (Selected), TALKGROUP 2 (Unselect mode)

VERSION #1.010

2. TEST

Step 1. Using CONSOLE-1, press the Instant Transmit button on TALKGROUP 1.

Step 2. Verify that the Transmit indicator is lit.

Step 3. Verify RADIO-1 can monitor and respond to the call on TALKGROUP 1.

Step 4. On RADIO-1 change to TALKGROUP 2.

Step 5. Using CONSOLE-1, press the Instant Transmit button on the TALKGROUP 2 radio resource.

Step 6. Verify RADIO-1 can monitor and respond to the call on TALKGROUP 2.

Pass____ Fail____

5.2.2 Talkgroup Selection and Call

1. DESCRIPTION

The Talkgroup Call is the primary level of organization for communications on a trunked radio system. Dispatchers with Talkgroup Call capability will be able to communicate with other members of the same talkgroup. This provides the effect of an assigned channel down to the talkgroup level. When a Talkgroup Call is initiated from a subscriber unit, the call is indicated on each dispatch operator position that has a channel control resource associated with the unit's channel/talkgroup.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
RADIO-3 - TALKGROUP 1
RADIO-4 - TALKGROUP 2
CONSOLE-1 - TALKGROUP 1
CONSOLE-2 - TALKGROUP 2

VERSION #1.010

2. TEST

Step 1. Initiate a wide area call from CONSOLE-1 on TALKGROUP 1.

Step 2. Observe that RADIO-1 and RADIO-3 will be able to monitor the call. Dekey the console and have either radio respond to the call.

Step 3. Observe that all consoles with TALKGROUP 1 can monitor both sides of the conversation.

Step 4. Initiate a wide area call from CONSOLE-2 on TALKGROUP 2.

Step 5. Observe that RADIO-2 and RADIO-4 will be able to monitor the call. Dekey the console and have either radio respond to the call.

Step 6. Observe that all consoles with TALKGROUP 2 can monitor both sides of the conversation.

Pass____ Fail____

5.2.3 PTT Unit ID/Alias Display

1. DESCRIPTION

Console operator positions contain various resources such as talkgroup, multigroup, Private Call which enables the dispatcher to communicate with the subscriber units. If activity occurs on one of these operator position resources, the unit ID or associated alias of the initiating radio appears at the console resource.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1
CONSOLE-2 - TALKGROUP 1

VERSION #1.010

2. TEST

Step 1. Select the resource for TALKGROUP 1 on CONSOLE-1.

Step 2. Initiate a call on TALKGROUP 1 from RADIO-2 and observe that the alias is seen at CONSOLE-1 in the resource window as well as in the Activity Log window.

Step 3. Initiate a call from RADIO-1 and observe that the alias of RADIO-1 is seen at CONSOLE-1 in the resource window as well as in the Activity Log window.

Step 4. Modify RADIO-2's alias. Make sure to give enough time for the alias change to propagate to the Zone Controller.

Step 5. Initiate a call from RADIO-2 and observe the new alias of RADIO-2 is seen at CONSOLE-1 in the list in the resource window as well as in the Activity Log window.

Step 6. Return RADIO-2's alias to its original state.

Pass____ Fail____

5.2.4 Emergency Alarm and Call Display Description

1. DESCRIPTION

Users in life threatening situations can use the emergency button on the radio to send an audible alarm and a visual alarm signal to a console operator in order to request immediate system access to a voice channel for an emergency call. An emergency alarm begins after the radio user presses the radio's emergency button. Pressing the emergency button places the radio in "emergency mode". To begin an emergency call, the radio user must press the radio's PTT button while in "emergency mode." The assigned voice channel will be dedicated to the emergency caller's talkgroup for an extended period of time, equal to the Message Hang Time plus the Emergency Hang Time. As with other call types, emergency calls can operate across sites as well as within the same site.

SETUP

RADIO-1 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1
CONSOLE-2 - TALKGROUP 1

VERSION #1.010

2. TEST

Step 1. Initiate an Emergency Alarm from RADIO-1.

Step 2. Observe the Emergency from RADIO-1 is received at CONSOLE-1 for TALKGROUP 1.

Step 3. Acknowledge the Emergency at the operator position. Verify CONSOLE-2 receives notification that the call has been acknowledged.

Step 4. Initiate a call with RADIO-1 to initiate an Emergency call.

Step 5. Observe CONSOLE-1 and CONSOLE-2 can monitor RADIO-1

Step 6. Clear the Emergency from CONSOLE-1 on TALKGROUP 1.

Step 7. End the Emergency Alarm from RADIO-1.

Pass____ Fail____

5.2.5 Multi-Select Operation

1. DESCRIPTION

Multi-Select (Msel) allows the console operator to group a number of channels/talkgroups together such that when the general transmit bar is depressed, all of the multi-selected channels/talkgroups will transmit at the same time with the same information. Multi-Select is one way communication call. If a radio user responds to a Multi-Select call the talkgroup the user is affiliated to will be the only one to hear the call. There is no super-group formed, so radio communication is still at the single talkgroup level. Multi-Select is utilized to send an APB to several channels/talkgroups. A Multi-Select has a limit of twenty (20) trunking/conventional resources

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
CONSOLE-1 - TALKGROUP 1, TALKGROUP 2

VERSION #1.010

2. TEST

Step 1. From CONSOLE-1, create an Msel group with TALKGROUP 1 and TALKGROUP 2.

Step 2. Transmit on the Msel using the Msel instant transmit button.

Step 3. Verify that RADIO-1 and RADIO-2 hear the call.

Step 4. Initiate a call with RADIO-1.

Step 5. Verify the call is heard on CONSOLE-1 but not on RADIO-2.

Step 6. Initiate a call with RADIO-2.

Step 7. Verify the call is heard on CONSOLE-1 but not on RADIO-1.

Step 8. On CONSOLE-1 dissolve the Msel.

Pass____ Fail____

5.2.6 Talkgroup Patch

1. DESCRIPTION

Talkgroup Patch allows a dispatcher to merge several talkgroups together on one voice channel to participate in a single conversation. This can be used for situations involving two or more talkgroups that need to communicate with each other.
Using the Patch feature, the console operator can talk and listen to all of the selected talkgroups grouped; in addition, the members of the individual talkgroups can also talk or listen to members of other talkgroups. Patched talkgroups can communicate with the console dispatcher and other members of different talkgroups because of the "supergroup" nature of the Patch feature.

NOTE : If "secure" and "clear" resources are patched together, one repeater for each mode may be assigned per site.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
RADIO-3 - TALKGROUP 1
RADIO-4 - TALKGROUP 2
CONSOLE-1 - TALKGROUP 1 and TALKGROUP 2

Note: All 4 Radios must have the same home zone.

VERSION #1.010

2. TEST

Step 1. Using CONSOLE-1 create a patch between TALKGROUP 1 and TALKGROUP 2.

Step 2. Initiate a patch call from CONSOLE-1.

Step 3. Verify RADIO-1, RADIO-2, RADIO-3, and RADIO-4 can monitor the call.

Step 4. Initiate several calls between the radios and verify successful communication.

Step 5. Dissolve the patch created in step 1.

Pass____ Fail____

5.2.7 Talkgroup Patch - Secure

1. DESCRIPTION

Talkgroup Patch allows a dispatcher to merge several talkgroups together on one voice channel to participate in a single conversation. This can be used for situations involving two or more talkgroups that need to communicate with each other. Using the Patch feature, the console operator can talk and listen to all of the selected talkgroups grouped; in addition, the members of the individual talkgroups can also talk or listen to members of other talkgroups. Patched talkgroups can communicate with the console dispatcher and other members of different talkgroups because of the "supergroup" nature of the Patch feature.

SETUP

RADIO-1 - TALKGROUP 1 (Secure TX Mode)
RADIO-2 - TALKGROUP 2 (Secure TX Mode)
RADIO-3 - TALKGROUP 1 (No secure keys loaded)
RADIO-4 - TALKGROUP 2 (Clear TX Mode with keys loaded)
CONSOLE-1 - TALKGROUP 1 and TALKGROUP 2 (Secure TX Mode)

Note: All 4 Radios must have the same home zone.

VERSION #1.010

2. TEST

Step 1. Using CONSOLE-1 create a secure patch between TALKGROUP 1 and TALKGROUP 2.

Step 2. Initiate a patch call from CONSOLE-1.

Step 3. Verify RADIO-1, RADIO-2 and RADIO-4 can monitor the call.

Step 4. Initiate a talkgroup call on TALKGROUP 1 from RADIO-1.

Step 5. Observe that all radios are able to hear RADIO-1 except RADIO-3.

Step 6. Dissolve the patch.

Pass____ Fail____

5.2.8 Talkgroup Patch with Conventional

1. DESCRIPTION

Talkgroup Patch allows a dispatcher to merge several talkgroups together on one voice channel to participate in a single conversation. This can be used for situations involving two or more channels or talkgroups that need to communicate with each other.
Using the Patch feature, the console operator can talk and listen to all of the selected talkgroups grouped; in addition, the members of the individual channels/talkgroups can also talk or listen to members of other channels/talkgroups. Patched resources can communicate with the console dispatcher and other members of different channels/talkgroups because of the "supergroup" nature of the Patch feature.
NOTE : If "secure" and "clear" resources are patched together, one repeater for each mode may be assigned per site.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - CONVENTIONAL CHANNEL 1
RADIO-3 - TALKGROUP 1
RADIO-4 - CONVENTIONAL CHANNEL 1
CONSOLE-1 - TALKGROUP 1 and CONVENTIONAL CHANNEL 1

VERSION #1.010

2. TEST

Step 1. Using CONSOLE-1 create a patch between TALKGROUP 1 and CONVENTIONAL CHANNEL 1.

Step 2. Initiate a patch call from CONSOLE-1.

Step 3. Verify RADIO-1, RADIO-2, RADIO-3, and RADIO-4 can monitor the call

Step 4. Initiate several calls between the radios and verify successful communication

Step 5. Dissolve the patch created in step 1.

Pass____ Fail____

5.2.9 Call Alert

1. DESCRIPTION

Call Alert Page allows a subscriber/dispatcher to selectively alert another radio unit. The initiating subscriber/console will receive notification as to whether or not the call alert was received. Units receiving a Call Alert will sound an alert tone and show a visual alert indication. The display will also show the individual ID of the initiating subscriber/console unit.

SETUP

RADIO-1 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1

VERSION #1.030

2. TEST

Step 1. Using CONSOLE-1, select the call alert button in the "Private Call" resource window.

Step 2. Enter the ID of RADIO-1 and send the call alert to RADIO-1.

Step 3. Verify that RADIO-1 receives the alert and that the ID or alias of the console is shown.

Step 4. Turn off RADIO-1.

Step 5. Using CONSOLE-1, send the call alert to RADIO-1 again.

Step 6. Verify that after trying to page RADIO-1, the console displays "Can not send call alert - target not found" in the summary/status list.

Pass____ Fail____

5.2.10 Console Initiated Private Call to Subscriber

1. DESCRIPTION

Private Conversation is a selective calling feature which allows a dispatcher or radio user to carry on one-to-one conversation that is heard only by the two parties involved. Subscriber units receiving a private call will sound an alert tone. As with other call types, Private Calls operate across sites as well as within the same site.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1

VERSION #1.020

2. TEST

Step 1. Using CONSOLE-1, select the "PRIVATE-CALL" tile and click the Private Call function.

Step 2. Select the unit to be Private Called, in this case RADIO-1. (or select the numeric keypad and enter the Unit ID to be Private Called.)

Step 3. Click the Send button.

Step 4. Answer the Private Call with RADIO-1 and respond to the console.

Step 5. Verify RADIO-2 does not hear the private conversation.

Step 6. After completing the Private Call, return to the normal talkgroup mode.

Pass____ Fail____

5.2.11 Console Priority

1. DESCRIPTION

Console Operator Positions have ultimate control of transmitted audio on an assigned voice channel resource. The Console Position has the capability to take control of an assigned voice channel for a talkgroup call so that the operator's audio overrides any subscriber audio. Console priority is a feature that enables dispatchers to gain immediate access to an assigned voice channel so that a central point of audio control exists.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1

VERSION #1.020

2. TEST

Step 1. Initiate a Talkgroup call from RADIO-1 on TALKGROUP 1. Keep this call in progress until the test has completed.

Step 2. Observe that RADIO-2 receives the call.

Step 3. While the call is in progress, key up CONSOLE-1 on TALKGROUP 1.

Step 4. Observe that RADIO-2 is now receiving audio from CONSOLE-1 on TALKGROUP 1.

Step 5. De-key CONSOLE-1.

Step 6. Verify RADIO-2 now receives RADIO-1 audio.

Step 7. End the TALKGROUP 1 call from RADIO-1.

Pass____ Fail____

5.2.12 Remote Monitor

1. DESCRIPTION

Remote Monitor from Console is a call type in which the console operator can select and remotely key a subscriber unit. This allows the dispatcher to monitor the transmit audio remotely and without detection. This feature is useful in situations where the subscriber unit has been stolen, or there is a need to determine if the radio user is incapacitated and cannot activate a PTT (i.e. an officer has been injured or is under duress). The radio being monitored will not show any sign of being keyed up. This test can be run in secure or clear mode on a trunked 9600 or 3600 site.

SETUP

RADIO-1 - TALKGROUP 1

CONSOLE-1 - TALKGROUP 1

VERSION #1.020

2. TEST

Step 1. Put RADIO-1 into Remote Monitor via the Remote Monitor tile on the CONSOLE-1.

Step 2. Verify that RADIO-1 keys up without any transmit indication.

Step 3. Verify any audio is heard by RADIO-2 and CONSOLE-1.

Step 4. Wait 30 seconds and verify that RADIO-1 dekeys.

Pass____ Fail____

5.2.13 Instant Recall Recorder (IRR) Operation

1. DESCRIPTION

The Instant Recall Recorder (IRR) allows for audio from a phone call or a radio call to be played back at the MCC 7500 or MCC 7100 Console position. Thirty minutes of audio is saved for radio and an additional thirty minutes for telephone. The audio is saved on the positions hard disk in the form of a .wav file.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1

CONSOLE-1 - TALKGROUP 1 running IRR application.

VERSION #1.020

2. TEST

Step 1. Select a radio channel on the CONSOLE-1 application window.

Step 2. Select IRR from the CONSOLE-1 toolbar.

Step 3. Initiate radio communication between RADIO-1 and RADIO-2.

Step 4. Verify a new entry appears in the IRR log window.

Step 5. Select the new entry from the list.

Step 6. Press play and verify conversation replay.

Pass____ Fail____

5.2.14 Text Message to a Talkgroup

1. DESCRIPTION

The dispatch console operator can send a text message to a talkgroup from the Dispatch Console. The text message can be up to 160 characters in length and is sent on the voice channel during hangtime.

SETUP

RADIO-1 - TALKGROUP 1 (Must be equipped with a display and affiliated to the TALKGROUP)

VERSION #1.040

2. TEST

Step 1. Open the group text messaging window from the dispatch console.

Step 2. Select TALKGROUP 1 under the resource drop down list.

Step 3. In the text message entry box, type a text message up to 160 characters.

Step 4. Send the text message.

Step 5. On RADIO-1 verify that the text message was received from the Dispatch Console.

Pass____ Fail____

5.3 RADIO CONTROL MANAGER (RCM) FEATURES

5.3.1 Radio Check

1. DESCRIPTION

Radio Check is a RCM command used to verify that a radio is active in the trunking system. The Radio Check command causes the Zone Controller to poll for the radio requesting that the radio re-affiliate. When the radio re-affiliates, the RCM then has the knowledge that the radio is powered on and within system range. If the radio is involved in a conversation, whether group or interconnect, the RCM application displays a message to that effect.

The information displayed by the RCM in response to the Radio Check command is: current talkgroup affiliation, the multigroup that the talkgroup is attached to (assuming the talkgroup belongs to a multigroup), and the site where the radio is affiliated. If the radio does not respond to the Radio Check command, a message to that effect displays.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 2

VERSION #1.030

2. TEST

Step 1. Select the Status menu and then select the Radio Check item to open the Radio Check window.

Step 2. Enter the ID or alias of RADIO-2 into the entry box and click the Apply button.

Step 3. Observe the radio is polled and the current radio information is displayed on the RCM.

Step 4. Turn off RADIO-1.

Step 5. Enter the ID or alias of the RADIO-1 into the entry box and click the Apply button.

Step 6. Observe that the RCM displays "Radio Not Found."

Step 7. Depress and hold the PTT button of RADIO-2 until instructed to release.

Step 8. Enter the ID or alias of RADIO-2 into the entry box and click the Apply button. Observe that a busy for the radio is displayed on the RCM.

Step 9. Release the PTT button on RADIO-2.

Step 10. Observe the radio is polled and the current radio information is displayed on the RCM.

Pass____ Fail____

5.3.2 Selective Radio Inhibit

1. DESCRIPTION

The INHIBIT command issued by the Radio Control Manager (RCM) disables a radio, preventing it from transmitting or receiving any audio. All of the radio's functionality ceases while a radio is inhibited by the RCM. Once inhibited, the radio cannot be used to monitor voice channels or for any other radio user initiated activity. Note that an inhibited radio still monitors the control channel so that it can be re-enabled with the Cancel Inhibit command. Upon receiving the Cancel Inhibit command from the RCM, the radio returns to its normal operation.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1

VERSION #1.030

2. TEST

Step 1. With the RCM open from the main Command tab click on the "+" button.

Step 2. Enter the IDs or aliases of RADIO-1.

Step 3. Select "Selective Inhibit" button.

Step 4. Once all desired radio information is entered and appears in the command window click the submit to initiate the command.

Step 5. Observe RADIO-1 is inhibited and appears to be dead.

Step 6. Observe that the Inhibit task appears in the Command tab.

Step 7. Cancel the Inhibit by selecting the task in the Command tab and clicking the Revert button to submit the task.

Step 8. Observe that the Cancel Inhibit task appears in the Command tab and that RADIO-1 is returned to normal operation.

Pass____ Fail____

5.3.3 Emergency Alarm Display

1. DESCRIPTION

The emergency call information that is displayed on the Radio Control Manager (RCM) includes the radio alias of the radio that initiated the Emergency Alarm, the talkgroup that the radio was affiliated to at the time the alarm was sent, and the time the alarm was received.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 2

One RCM which has TALKGROUP 1 attached is required.

VERSION #1.030

2. TEST

Step 1. With the Radio Control Manager (RCM) open select the Event tab and verify that the Emergency Alarm window is visible. If it is not, select the the Emergency Alarm check box to bring it to the RCM viewable area.

Step 2. Initiate an Emergency Alarm from RADIO-1.

Step 3. Observe that the RCM receives the Emergency Alarm.

Step 4. Acknowledge the Emergency by selecting the Emergency in the window and clicking on the Respond button.

Step 5. Verify the window displays the radio alias, the talkgroup, and the time the alarm was received.

Step 6. Again, select the displayed Emergency and click the Delete button to clear the emergency.

Step 7. Reset the radio by holding the Emergency button until the radio clears.

Step 8. Repeat Steps 1-7 using RADIO-2.

Pass____ Fail____

5.4 FAULT MANAGEMENT

5.4.1 Unified Event Manager - Base Views

1. DESCRIPTION

The Unified Event Manager (UEM) in its base configuration provides a number of views. The purpose of this test is to demonstrate the key views available from the UEM.

The Physical Summary and Detail View (Physical Map) and Service Summary and Detail View (Service Map) in previous releases are deprecated and are replaced by the Zone Map. Custom views can be saved and retrieved by other NM Client users.

SETUP

NMclient01 - UEM session up and running.

VERSION #1.010

2. TEST

Step 1. Alarms View: In the navigation pane expand Fault Management and select Alarms. The view displays active alarms for managed resources, displaying impacted managed resources and specific objects on the managed resource along with selected alarm properties.

Step 2. Alarm View Search: Customize the Active Alarms display by selecting the View option from the menu bar, then select Search. Perform a Managed Resource search for channels, site controllers and routers by entering "Contains" and ch, sc, and z00 respectively in the search fields to perform the three separate searches. For each of the three searches a filtered alarm view is displayed that contains alarms for the appropriate device in the search.

Step 3. Network Events View: In the navigation pane expand Fault Management and select Network Events. The view displays recent events reported for managed resources, displaying impacted managed resources and specific object on the managed resource along with selected event properties. Alarming events are base for creating alarm objects.

Step 4. Physical Summary View: In the navigation pane expand Zone Views and Physical, then select Physical Summary View. The Physical Summary View provides an aggregated alarm severity status of the devices located at all subnets in the Zone.

Step 5. Service Summary View: In the navigation pane expand Zone Views and Service, then select Service Summary View. The Service Summary View provides a quick summary of the service status of sites in a Zone, including access to Channel status.

Step 6. Zone Map: In the navigation pane, expand Zone Views and select Zone Map. The Zone Map view provides an aggregated alarm severity status of the devices located at discovered sites in the Zone.

Step 7. Network Database: In the navigation pane select Network Database. The Network Database displays a list of all discovered Managed Resources and Sites. The display includes properties of each resource as well as overall severity of all objects and/or sub resources

Pass____ Fail____

5.4.2 Site Path Failure (Ethernet) Reports to the Unified Event Manager

1. DESCRIPTION

This test will demonstrate that the Unified Event Manager (UEM) alarms view is able to capture information about various failures at the system and zone level.

This test simulates a microwave/transport failure by removing a customer selected site data link and monitoring the alerts.

Note: If using a Simulcast site, this test refers to the Prime Site links. While failures would be seen at the subsite level if a Subsite link were failed, the site would not drop into Site Trunking.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
NMclient01 - UEM session up and running.

* RADIO-1 should be "Site Locked"

VERSION #1.030

2. TEST

Step 1. Remove the Ethernet cable(s) to the SITE 1 router(s) (If Simulcast, this refers to the Prime Site router(s)) at the site where RADIO-1 is affiliated. Be certain to remove the Ethernet cable from both routers if redundant site links are being utilized.

Step 2. Observe the UEM reports CommFailure alarms for the devices at the affected site.

Step 3. In addition, observe that the site is now in the Site Trunking mode.

Step 4. Reconnect the Ethernet cable(s) disconnected in Step 1.

Step 5. Observe the site returns to the Wide Area Trunking mode.

Step 6. Observe the topology and alarms/events that appear in the UEM, indicating the site is in recovery and after a period of time has recovered.

Pass____ Fail____

5.4.3 Console PC - Voice Processing Module Link Failure Reports to the Unified Event Manager

1. DESCRIPTION

This test will demonstrate that the Unified Event Manager (UEM) alarms view is able to capture information about various failures at the system and zone level.

This test simulates a Console PC to Voice Processing Module (VPM) link failure.

SETUP

RADIO-1 - TALKGROUP 1

CONSOLE-1 - TALKGROUP 1 (VPM Based console)

VERSION #1.020

2. TEST

Step 1. Initiate a call from RADIO-1 to CONSOLE-1 to verify communication.

Step 2. Remove the Ethernet cable from the VPM to the Console Site Ethernet Switch.

Step 3. Observe the UEM reports CommFailure alarms for the VPM.

Step 4. In addition, observe that CONSOLE-1 reports the link to the VPM as Down.

Step 5. Reconnect the VPM to the Console Site Ethernet Switch.

Step 6. Observe that UEM regains communication with the VPM and the Console PC to VPM link recovers.

Step 7. Initiate a call from RADIO-1 to CONSOLE-1 to verify communication.

Pass____ Fail____

5.5 SYSTEM RELIABILITY FEATURES

5.5.1 Base Station Identification

1. DESCRIPTION

This test will demonstrate that the repeater(s) programmed for Base Station Identification (BSI) operation at every site broadcasts the FCC BSI at predefined intervals (usually 30 minutes). To accomplish this, a service monitor will be set up to monitor the BSI channel of a random site and note that the Base Station Identification is heard.

SETUP

A service monitor will be required to perform this test.

Note: A properly configured subscriber can be used to monitor the frequency for the BSI tones in place of a service monitor.

2. TEST

Step 1. Choose one site to test for Base Station Identification (BSI).

Step 2. Setup the service monitor or subscriber to receive the frequency of the BSI channel for the particular site.

Step 3. Monitor the service monitor until the Base Station Identification is broadcast. Verify that the BSI tones are heard on the monitored frequency.

VERSION #1.030

Pass____ Fail____

5.5.2 Multiple Control Channels

1. DESCRIPTION

A maximum of four channels are eligible for assignment as control channel at each site. In the event that the assigned control channel fails at any remote site, the Zone Controller automatically selects one of the other control capable channels as the active control channel for that site. A Control Channel Preference Level can be used to rank the control capable channels where 1 is the highest ranking and 4 the lowest.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE - SITE 1

VERSION #1.020

2. TEST

Step 1. Initiate a Talkgroup Call with RADIO-1 on TALKGROUP 1.

Step 2. Observe that only RADIO-2 will be able to monitor and respond to the call.

Step 3. Initiate a Talkgroup Call with RADIO-3 on TALKGROUP 2.

Step 4. Observe that only RADIO-4 will be able to monitor and respond to the call.

Step 5. Power off the control channel at SITE 1.

Step 6. Observe that the control channel rotates to the next available channel capable of acting as a control channel.

Step 7. Initiate a Talkgroup Call with RADIO-1 on TALKGROUP 1.

Step 8. Observe that only RADIO-2 will be able to monitor and respond to the call.

Step 9. Initiate a Talkgroup Call with RADIO-3 on TALKGROUP 2.

Step 10. Observe that only RADIO-4 will be able to monitor and respond to the call. Power up the channel previously powered off to return the system to normal operation.

Pass____ Fail____

5.5.3 Redundant Site Controller Switching - Automatic Switchover

1. DESCRIPTION

The Site Controller subsystem uses two Site Controllers in a redundant configuration. The backup Site Controller is made active either upon the loss of communication to the active Site Controller or upon a user initiated command from the Site Control Manager.
This test will demonstrate that on the loss of the active site controller the standby controller will become active and carry on the site operations.

SETUP

RADIO-1 – TALKGROUP 1
RADIO-1 – SITE – SITE 1
RADIO-2 – TALKGROUP 1
RADIO-2 – SITE – SITE 1
RADIO-3 – TALKGROUP 1
RADIO-3 – SITE – SITE 1

All Radios should be "Site Locked".

VERSION #1.020

2. TEST

Step 1. Verify both Site Controllers are available and in the "Normal" state.

Step 2. Power off the active Site Controller (or in the ESS configuration connect to the Active Site controller using CSS and perform a "reset") and verify the backup becomes the new active Site Controller (note events in the event viewer).

Step 3. Key RADIO-1 and verify that RADIO-2 and RADIO-3 hear the audio.

Step 4. End the call from RADIO-1.

Step 5. Power up the Site Controller (if it was powered off). Verify the Site Controller returns to the normal state.

Pass____ Fail____

5.5.4 Redundant Zone Controller Switching/Automatic Switchover

1. DESCRIPTION

In a non-DSR configuration the Zone Controller subsystem uses two Zone Controllers in a redundant configuration. The backup Zone Controller is made active either upon the loss of the active ZC or upon a user command from the Unified Network Configurator (UNC). In a DSR configuration there are 4 Zone Controllers in a redundant configuration. Any one of the 4 could be active to keep the Zone Sites in Wide Area Trunking. If using the Dynamic Resilience Zone configuration the Unified Event Manager will report the Zone Controller switchover in both Unified Event Managers (UEM).

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 2
RADIO-3 - TALKGROUP 1
RADIO-3 - SITE - Site3 (Site3 should be in another Zone if applicable.)

* The Zone Controllers should be successfully synchronized before performing this procedure.

VERSION #1.030

2. TEST

Step 1. Verify the state of the current Zone Controllers is Active or Standby in the Unified Network Configurator (UNC). (There will be 2 Zone Controllers in single Zone or 4 in the case of DSR zones.)

Step 2. Reset the active Zone Controller application via the Unified Event Manager (UEM) diagnostic.

Step 3. Verify using UNC, UEM and ZoneWatch (if applicable) that the standby Zone Controller becomes active and brings all sites back wide. Wait for the Radios to settle out the site affiliations.

Step 4. Key RADIO-1 and verify that RADIO-2 and RADIO-3 hear the audio.

Step 5. End the call from RADIO-1.

Step 6. Verify that Zone Controller that was reset comes back up to a "Standby" state.

Pass____ Fail____

5.5.5 Continued Operation Upon Loss of Prime Site Switch

1. DESCRIPTION

The Simulcast Prime Site High Availability feature enhances current operation by increasing the number of channels available following a LAN switch failure. These sites are configured with four LAN switches rather than the standard two LAN switch configuration. When the same site resources are spread across four LAN switches, the failure of a single switch removes fewer resources hence improving the general availability of resources as well as improving the likelihood of preserving redundancy.

Per current operation, these sites are expected to preserve wide area operation upon failure of any of the switches (assumes redundant WAN links are utilized between the master site and prime site). This test case will demonstrate continued wide area operation upon a single switch failure. It also demonstrates increased channel availability over the standard 2 LAN switch configuration.

SETUP

RADIO-1 TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 TALKGROUP 1
RADIO-2 - SITE - SITE 2
RADIO-3 TALKGROUP 1
RADIO-3 - SITE - SITE 1

Channel 2 (on switch 2) is set as the preferred control channel. Channel 4 is the next preferred.

Redundant WAN links are configured between the master site and prime site.

Ensure Zone Watch is setup to monitor the sites and the Unified Event Manager (UEM) is available for viewing faults.

Note: Switch failures may be simulated by pulling power on the switch.

VERSION #1.010

2. TEST

Step 1. Verify that the SITE 1 is in wide area trunking. (Normal Operation)

Step 2. Fail switch 2 and verify that the Site remains in wide area trunking.

Step 3. Verify that the UEM reports the failure of switch 2.

Step 4. Verify in ZoneWatch that channels on switches 1, 3 and 4 are available.

Step 5. Key-up RADIO-1 on a channel connected to switch 1 and verify that RADIO-2 and RADIO-3 receive RADIO-1 audio. Repeat this step for channels connected to switch 3 and 4 also.

Pass____ Fail____

5.5.6 Continued Operation Upon Loss of Reference Distribution Module

1. DESCRIPTION

Dual LAN subsites are equipped with new hardware that enable all of the Multisite Base Radios (MsBRs) to communicate over an active or redundant LAN, thus lessening the impacts of a single point of failure. Two modules ("GPB 8000 Reference Distribution Modules (RDM)") are added to the primary GTR8000 Expandable Site Subsystem (ESS) to facilitate the switching and time reference distribution functions at the remote sites. In addition, the expansion cabinets are equipped with two Expansion HUBs (XHUBs). A failure of an RDM or XHUB will result in the MsBRs automatically reverting to the LAN served by the other active RDM/XHUB thus allowing continued wide area operation by all MsBRs.

This test case will demonstrate continued wide area operation upon a single point of failure associated with an RDM failure.

SETUP

RADIO-1 TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 TALKGROUP 1
RADIO-2 - SITE - SITE 2
RADIO-3 TALKGROUP 1
RADIO-3 - SITE - SITE 1

Ensure ZoneWatch is setup to monitor the sites and the Unified Event Manager (UEM) is available for viewing faults.

Note: An RDM/XHUB failure can be simulated by pulling the RDM/XHUB out of the ESS.

VERSION #1.020

2. TEST

Step 1. Using RADIO-1, key-up on a channel residing on SITE 1's primary Expandable Site Subsystem (ESS). While RADIO-1 is keyed, fail RDM 1.

Step 2. Verify RADIO-1 operation on ZoneWatch. RADIO-1 stays on the same channel and the Site remains in wide area trunking.

Step 3. Verify that RADIO-2 and RADIO-3 receive RADIO-1 audio.

Step 4. Verify that the UEM reports the failure of RDM 1.

Step 5. Dekey RADIO-1, key-up RADIO-3 on a channel residing on the primary ESS. While RADIO-3 is keyed, restore RDM 1.

Step 6. Verify RADIO-3 operation on ZoneWatch. RADIO-3 stays on the same channel and the Site remains in wide area trunking.

Step 7. Verify that RADIO-1 and RADIO-2 receive RADIO-3 audio.

Step 8. Verify that the UEM reports the recovery of RDM 1.

Pass____ Fail____

5.5.7 Redundant Comparator Switching – Comparator Failure

1. DESCRIPTION

IP Simulcast Trunking subsystem can use two comparators for each channel in a redundant configuration at the Prime Site. The standby comparator is made active upon the loss of the active comparator.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1

Channel-1 – Control Channel
CSS Status Panel or UNC command can be used to verify the current redundancy state of the comparator (Active or Standby).

VERSION #1.030

2. TEST

Step 1. Verify the system is in Wide Trunking Mode with Channel-1 as the control channel and Channel-2 in service.

Step 2. Key RADIO-1 and verify that RADIO-2 hears the audio. Verify Channel-2 is used.

Step 3. Power off or Disable the Active comparator (i.e. Comparator 2) for Channel-2. Verify Channel-2 is out of service and RADIO-1's call ended.

Step 4. DeKey RADIO-1

Step 5. Verify the Standby comparator (i.e. CM2b) for Channel-2 becomes Active and Channel-2 is back in service (note the event in UEM event viewer).

Step 6. Re-key RADIO-1 and verify that RADIO-2 hears the audio. Verify Channel-2 is used.

Step 7. Power on or restore Comparator-2. Verify Comparator-2 is in the Enabled state.

Pass____ Fail____

5.6 AUDIO IP LOGGING

5.6.1 Logging Trunking Talkgroup Call

1. DESCRIPTION

This test will demonstrate how the Archiving Interface Server (AIS) can be used to log trunking talkgroup call audio/events on a given talkgroup. The audio is archived in a vocoded format (IMBE for Trunking Talkgroup Calls).

SETUP

The AIS at MCC 7500 Console site affiliated to TALKGROUP 1.
RADIO-1 - TALKGROUP 1
RADIO-1 - SITE 1
CONSOLE-1 - TALKGROUP 1
CONSOLE-1 - CONSOLE SITE 1

VERSION #1.020

2. TEST

Step 1. Initiate a talkgroup call from RADIO-1 on TALKGROUP 1.

Step 2. Observe that the call events/audio are being sent to the logging system by the AIS.

Step 3. Using the playback application, verify the logged audio/events correspond to steps 1 and 2.

Step 4. Initiate a talkgroup call from CONSOLE-1 on TALKGROUP 1.

Step 5. Observe that the call events/audio are being sent to the logging system by the AIS.

Step 6. Using the playback application, verify the audio/events logged correspond to steps 4 and 5.

Pass____ Fail____

5.6.2 Logging Secure Trunking Talkgroup Call

1. DESCRIPTION

This test will demonstrate the Archiving Interface Server (AIS) can be used to log trunking talkgroup call audio for call in a secure transmit mode on a given talkgroup. The audio is archived in a vocoded decrypted format (IMBE for Trunking Talkgroup Call) only when the logging system user requested coded audio to be logged.

SETUP

The AIS at MCC7500 Console site is affiliated to TALKGROUP 1 and has the appropriate secure keys loaded.
RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
CONSOLE-1 - TALKGROUP 1

VERSION #1.020

2. TEST

Step 1. Initiate PTT from RADIO-1 on TALKGROUP 1 in a secure transmit mode.

Step 2. Observe that the call audio is being sent to the logging system by the playback application.

Step 3. If TALKGROUP 1 is marked to receive coded audio verify the coded audio can be played back via the application.

Step 4. Observe that the events for the TALKGROUP 1 call is logged even if the TALKGROUP 1 is not marked to receive coded audio.

Pass____ Fail____

5.7 INTEGRATED VOICE AND DATA (IV & D)

5.7.1 Context Activation

1. DESCRIPTION

Context Activation covers the process a Radio uses to register for packet data service on the trunked system. For this test, the Radio is configured to initiate a context request with the system upon power-on.

SETUP

RADIO-1 - TALKGROUP 1 (Powered-off)

Note: RADIO-1 must have data capabilities enabled in the network manager.

VERSION #1.020

2. TEST

Step 1. Power-on RADIO-1.

Step 2. Observer radio context activation and can be identified by the icon in the upper right-hand corner of the radio if equipped with a display.

Pass____ Fail____

5.7.2 Over the Air Programming (PoP25)

1. DESCRIPTION

The feature Programming Over P25 (POP25) allows a user to configure a radio remotely from the enterprise network by sending a sequence of commands over-the-air via the ASTRO 25® IV&D system. It is expected that the POP25 will significantly reduce the operational costs of IV&D radios by configuring personalities, talkgroups, channels, sites, etc in a radio without physically touching the radio.
This test will demonstrate the ability to perform a subscriber update using Customer Programming Software (CPS) over the air.

NOTE: There are subscriber programming options that will affect the test. The subscriber can be programmed to Approve the update, implement the update on next power cycle or disregard the update.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1

PC loaded with Customer Programming Software (CPS) and the System Key Dongle. The PC must be connected to the ASTRO 25® network via the CEN. RADIO-1 must be data capable and context activated for data service.

VERSION #1.010

2. TEST

Step 1. Locate IP address for RADIO-1

Step 2. From the CPS computer on the Customer Enterprise Network (CEN), connect to RADIO-1 over the network and read the subscriber.

Step 3. Make a change to the archived program file and write to RADIO-1.

Step 4. Once the new archive is received at RADIO-1 the radio user will have to approve the new configuration.

Step 5. Once the new configuration has been received and the load is complete, verify the configuration change has been implemented.

Step 6. On the CPS PC return the archive feature to the original state.

Step 7. Send the program update to RADIO-1. Verify the progress bar is shown in the CPS status bar.

Step 8. Begin a talkgroup call by keying RADIO-2. Verify RADIO-1 hears the audio.

Step 9. While the call is in progress dekey and key RADIO-2 several times with various pauses to interrupt the data transfer to RADIO-1.

Step 10. Dekey RADIO-2 and verify the data transfer completes. Once the programming update has completed accept the configuration change on RADIO-1. Verify RADIO-1 configuration has returned to its original state.

Pass____ Fail____

5.8 ENHANCED DATA

5.8.1 Enhanced Data Context Activation

1. DESCRIPTION

Context Activation refers to the process a Radio uses to register for packet data service on the trunked system. For this test, the Radio is configured to initiate a context request with the system upon power-on.

SETUP

RADIO-1 - TALKGROUP 1 (Must be equipped with a display and initially Powered-off)

Note: RADIO-1 must have data capabilities enabled in the network manager.

VERSION #1.050

2. TEST

Step 1. Power-on RADIO-1.

Step 2. After a period of 10 seconds, observe that the radio is enabled for data services by the presence of a data icon on the radio display.

Step 3. Using the menu buttons below the radio display, observe that the radio has a valid IP address

Pass____ Fail____

5.9 OVER THE AIR REKEYING (OTAR)

5.9.1 Clear Hello

1. DESCRIPTION

The KMF operator can send a message to any radio to confirm that the radio is on the system.

Note: The devices under test must have a valid air address registered with the KMF and must be accessible on the data system.

SETUP

RADIO-1 TALKGROUP 1

RADIO-1 must not be configured for enhanced security mode in either radio programming or the KMF.

VERSION #1.020

2. TEST

Step 1. Go to the Radio Management page of the KMF

Step 2. Initiate a Clear Hello operation

Step 3. Click the 'Clear Hello' button, or right-click and choose 'Clear Hello.'

Step 4. Go to the Operation Status page of KMF verify that the RADIO-1's Clear Hello operation is shown. The operation is complete when the Operation Status is 100% completed.

Pass____ Fail____

5.9.2 Encrypted Hello

1. DESCRIPTION

The KMF operator can send an encrypted message to any radio to confirm that radio is on the system and that its encryption services are functioning.

Note: The devices under test must have a valid air address registered with the KMF and must be accessible on the data system.

SETUP

RADIO-1 - TALKGROUP 1
Note: The radio must be current in the KMF

VERSION #1.020

2. TEST

Step 1. Go to the Radio Management page of the KMF

Step 2. Select RADIO-1 from the list.

Step 3. Initiate an Encrypted Hello operation

Step 4. Go to the Operation Status page of KMF, verify that RADIO-1's Encrypted Hello operation is shown. The operation is complete when the Operation Status is completed.

Pass____ Fail____

5.9.3 Full Update to Subscriber

1. DESCRIPTION

The entire set of encryption keys (in addition to other state parameters) are sent to a radio using the Full Unit Update command.

Note: The devices under test must have a valid air address registered with the KMF and must be accessible on the data system.

SETUP

RADIO-1 - TALKGROUP 1 (Secure Mode)
RADIO-2 - TALKGROUP 1 (Secure Mode)
RADIO-2 will be a reference radio.

Note: It is assumed that both radios under test are current with the KMF.

VERSION #1.030

2. TEST

Step 1. Delete both TEKs from the CKR assigned to the talkgroup under test, from RADIO-1.

Step 2. Using RADIO-1, verify when the subscriber is set to secure mode, the radio indicates a key fail.

Step 3. Go to the Radio Management page of the KMF.

Step 4. Select RADIO-1 from the list.

Step 5. Initiate an Full Update operation.

Step 6. Go to the Operation Status page of KMF, verify that RADIO-1's Full Update operation is shown. The operation is complete when the Operation Status is "Completed." Note that a warmstart operation will occur if the TEK selected for the OTAR session is one of the TEKs assigned to CKR.

Step 7. Now that RADIO-1 contains the keys in the CKR, verify secure communications between RADIO-1 and RADIO-2.

Pass____ Fail____

5.10 OVER THE ETHERNET KEYING (OTEK)

5.10.1 Clear Hello using over the Ethernet Keying (OTEK)

1. DESCRIPTION

The KMF operator can send a message to any console to confirm that console is on the system.

Note: If the console has just been powered up, make sure to let it stabilize and to login via the console user interface to make sure the console registers with the KMF. Verify KMF registration by observing the KMF's Operations Status page to see that the test console has registered.

SETUP

This test will require one console (CONSOLE-1).

2. TEST

Step 1. Go to the Console Management page of the KMF.

Step 2. Select CONSOLE-1 from the list

Step 3. Initiate a Clear Hello operation.

Step 4. Go to the Operation Status page of KMF, verify that CONSOLE-1's Clear Hello operation is shown. The operation is complete when the Operation Status is "Completed."

VERSION #1.020

Pass____ Fail____

5.10.2 Encrypted Hello using over the Ethernet Keying (OTEK)

1. DESCRIPTION

The KMF operator can send an encrypted message to any console to confirm that console is on the system and that its encryption services are functioning.

Note: If the console has just been powered up, make sure to let it stabilize and to login via the console user interface to make sure the console registers with the KMF. Verify KMF registration by observing the KMF's Operations Status page to see that the test console has registered.

SETUP

CONSOLE-1 - TALKGROUP 1

Note: The console must be current in the KMF.

VERSION #1.020

2. TEST

Step 1. Go to the Console Management page of the KMF.

Step 2. Select CONSOLE-1 from the list.

Step 3. Initiate a Encrypted Hello operation

Step 4. Go to the Operation Status page of KMF, verify that RADIO-1's Clear Hello operation is shown. The operation is complete when the Operation Status is "Completed."

Pass____ Fail____

5.10.3 Full Update to Console using Over The Ethernet Keying (OTEK)

1. DESCRIPTION

The entire set of encryption keys (in addition to other state parameters) are sent to a console using the Full Unit Update command.

Note: If the console has just been powered up, make sure to let it stabilize and to login via the console user interface to make sure the console registers with the KMF. Verify KMF registration by observing the KMF event viewer to see that the test console has registered.

SETUP

CONSOLE-1 - TALKGROUP 3 (Reference console)
CONSOLE-3 - TALKGROUP 3 (test console that will be used for OTEK operation)
It is assumed that CONSOLE-3 initially does not have any traffic keys but does have a UKEK.

Note: It is assumed that this test will occur after all OTEK configurations are completed.
Note: This can be done with a VPM based console or a secure card based console.

VERSION #1.020

2. TEST

Step 1. Initiate a secure call on TALKGROUP 3 from CONSOLE-1 to CONSOLE-3

Step 2. Verify that no audio is received on CONSOLE-3 because the console does not have a key or has the incorrect key.

Step 3. Go to the Console Management page of the KMF

Step 4. Select CONSOLE-3 from the list

Step 5. Initiate a Full Update operation.

Step 6. Go to the Operation Status page of KMF, verify that CONSOLE-3's Clear Hello operation is shown. The operation is complete when the Operation Status is "Completed."

Step 7. The console will now have the current keys. Go to the Console Management page of the KMF and verify that CONSOLE-3's currency state is marked as "Current."

Step 8. Now that CONSOLE-3 is current, verify secure communications between CONSOLE-1 and CONSOLE-3.

Pass____ Fail____

5.11 SYSTEM MANAGEMENT TESTS

5.11.1 ZoneWatch

1. DESCRIPTION

ZoneWatch is an administration tool for monitoring radio traffic on a system. A system manager can use ZoneWatch to analyze traffic patterns for load distribution and troubleshoot radio and site problems. ZoneWatch is used to view current radio traffic activity for the system. This activity is displayed in graphical format, color-coded for easy identification of the type of activity occurring on the system.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 2
RADIO-3 - TALKGROUP 1
RADIO-3 - SITE - SITE 3
RADIO-4 - TALKGROUP 1
RADIO-4 - SITE - SITE 4

VERSION #1.010

2. TEST

Step 1. Verify that ZoneWatch has been configured for the Grid and Multi Site Scroll windows to display system activity.

Step 2. From the PC Application Launcher, select a zone folder.

Step 3. From within that zone, select ZoneWatch.

Step 4. Select the appropriate profile to be able to view the channel usage on the system.

Step 5. Initiate several calls with the radios and observe that the appropriate channel usage information is displayed.

Pass____ Fail____

5.11.2 Affiliation Display

1. DESCRIPTION

Affiliation Display is a Private Radio Network Management (PRNM)application that monitors the mobility of radios for a particular zone. Mobility describes how radio users travel between different sites in a zone and how they communicate with other members of their assigned talkgroup or even with members outside of their talkgroup. A radio can be viewed in more than one zone. As a radio roams from one site to another or changes talkgroups, Affiliation Display updates and displays the affiliation and de-affiliation information for a monitored radio. This information can be useful for the troubleshooting and tracking of radios in the system and for monitoring the movement of traffic within a zone.
The Affiliation Display is divided into three sections: Site Viewer, Talkgroup Viewer, and Radio Viewer.
- The Site Viewer displays the number of talkgroups and number of radios affiliated to that site.
- The Talkgroup Viewer displays how many radios are affiliated to that talkgroup and the number of sites at which the talkgroup has radios affiliated.
- The Radio Viewer window displays affiliation information for a custom list of radios.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 2
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE - SITE 2

VERSION #1.010

2. TEST

Step 1. Add RADIO-1,RADIO-2,RADIO-3, and RADIO-4 to the Affiliation Display.

Step 2. Verify that RADIO-1 and RADIO-2 show they are affiliated to SITE 1 and TALKGROUP 1.

Step 3. Verify that RADIO-3 and RADIO-4 show they are affiliated to SITE 2 and TALKGROUP 2.

Step 4. Change the talkgroup of RADIO-1 and RADIO-2 to TALKGROUP 2.

Step 5. Verify that RADIO-1 and RADIO-2's affiliated talkgroup changes to TALKGROUP 2 on the Affiliation Display.

Step 6. Change the site of RADIO-3 and RADIO-4 to SITE 1.

Step 7. Verify that RADIO-3 and RADIO-4's affiliated site changes to SITE 1 on the Affiliation Display.

Pass____ Fail____

5.11.3 Unified Event Manager - Force Synchronization - Core Router

1. DESCRIPTION

Synchronization is the process where the status of a device is periodically checked. There could be situations where a user may not want to wait for the minimum period to view the synchronization results. Therefore, the user can initiate a synchronization request for the device with the manager called Force Synchronization. Force Synchronization interrupts the normal synchronization process and checks the status of a particular device.

The purpose of this test is to demonstrate the ability to manually synchronize the state with agents within the system using the Unified Event Manager (UEM).

Manual synchronization provides a fallback to obtain object status after a network interruption.

NOTE: This test can be run on a standalone Core Router/Gateway or a combined Core/Exit Router/Gateway.

SETUP

NMclient01 - UEM session up and running.

VERSION #1.030

2. TEST

Step 1. On a UEM client session, click on the Network Database node tree in the navigation window.

Step 2. Right click on a Core Router, then select Synchronize.

Step 3. The Synchronization Job Status window appears with the Job Status ID.

Step 4. Click on the View Job Status button.

Step 5. The Job Status View window opens providing the Job ID, Status, Owner, Type, Target, Submit Time, End Time, and Additional Info for all the jobs.

Step 6. Locate the Synchronization job initiated in step 2 and click on the job. Verify the Synchronization job is listed with a status of Success.

Step 7. Click on the View Log button. A summary of the Synchronization job details is provided in the job log.

Step 8. Locate the Core Router in the Network Database View. The correct Severity property of the device is displayed.

Pass____ Fail____

5.11.4 Unified Event Manager - Force Synchronization - Site Controller

1. DESCRIPTION

Synchronization is the process where the status of a device is periodically checked. There could be situations where the user may not want to wait for the minimum period to view the synchronization results. Therefore, the user can initiate a synchronization request for the device with the manager called Force Synchronization. Force Synchronization interrupts the normal synchronization process and checks the status of a particular device.

The purpose of this test is to demonstrate the force synchronize state with agents within the system using the Unified Event Manager (UEM).

Force synchronization provides a fallback to obtain object status after a network interruption.

SETUP

NMclient01 - UEM session up and running.

VERSION #1.030

2. TEST

Step 1. On the UEM client session, click on the Network Database node tree in the navigation window.

Step 2. Right click on a Site Controller, then select Synchronize.

Step 3. The Synchronization Job Status window appears with the Job Status ID.

Step 4. Click on the View Job Status button.

Step 5. The Job Status View window opens providing the Job ID, Status, Owner, Type, Target, Submit Time, End Time, and Additional Information for all the jobs.

Step 6. Locate the Synchronization job initiated in step 2 and click on the job. Verify the Synchronization job is listed with a status of Success.

Step 7. Click on the View Log button. A summary of the Synchronization job details is provided in the job log.

Step 8. Locate the Site Controller in the Network Database View. The correct Severity property of the device is displayed.

Pass____ Fail____

5.12 DYNAMIC SYSTEM RESILIENCE

5.12.1 Primary Core Failure - Switchover to Back-up Core (Voice and Data Services)

1. DESCRIPTION

Dynamic System Resilience (DSR) allows a system to continue to function with minimal loss of voice and/or Data communications due to the failure of any controlling master site.
This test will demonstrate in the event of a complete Primary Core failure, the Backup Core takes over in order to return the system back to wide area trunking. Some of the Backup Core equipment automatically takes over while the Network Management servers like the Provisioning Manager Server and Unified Network Configurator require manual switchover.
Note: This test case applies to the following data services - Trunking IV&D, HPD and Conventional IV&D data. The test case can be executed with any or all of the supported data services and should include the appropriate packet data gateways, sites and the radio personalities in the setup of the test case.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-5 - TALKGROUP 1
Mobile Data Terminal (MDT) connected to RADIO-5
UDP Tool installed on both the MDT and Host computers
Zone Controller 1: Active
Zone Controller 2: Standby
Zone Controller 3: Standby
Zone Controller 4: Standby
Packet Data Gateway 1: Active
Packet Data Gateway 2: Standby
Unified Network Configurator 1: Active
Unified Network Configurator 2: Standby
User Configuration Manager: Active
User Configuration Manager 2: Standby
System Statistics Server 1: Active
System Statistics Server 2: Active

VERSION #1.040

2. TEST

Step 1. Initiate a TALKGROUP 1 call from RADIO-1. Verify that RADIO-2 receives the audio.

Step 2. Using RADIO-5 MDT, configure the data application for periodic inbound data messages. (1 message every 30 seconds) Observe at the Host PC that data messages are received.

Step 3. Pull the power cords to the Primary Core LAN Switches 1 & 2. (Also the redundant power supply (RPS) if equipped.)

Step 4. In the Unified Network Configurator (UNC), select Zone Controllers 1 through 4 and check the redundancy state using the Quick Command feature. (Note: In a single Zone system or when the test is run on the Zone with the primary core system servers the backup UNC will need to be manually enabled to run the quick command.)

Step 5. Verify that Zone Controller (ZC) 3 is Active. (Note that the transition of ZC 3 to the "Active" state causes the currently active ZC to reset and the sites will temporarily lose Wide Area Trunking while the connection to ZC 3 is established.)

Step 6. In the Unified Network Configurator, select any of the Packet Data Gateways 1 and 2 and check the redundancy state using the Quick Command feature.

Step 7. Verify that Packet Data Gateway 2 is Active.

Step 8. Initiate a TALKGROUP 1 call from RADIO-1. Verify that RADIO-2 receives the audio.

Step 9. Observe at the Host PC that received data messages have continued.

Step 10. If the backup servers were enabled for the test, they should now be disabled. Return the system to normal by powering up the core switches. Verify once the Zone Controllers start to communicate only 1 Zone Controller will be active.

Pass____ Fail____

5.13 ISSI 8000

5.13.1 Automatic Roaming - Talkgroup Call for Home Talkgroup

1. DESCRIPTION

This test will demonstrate that a group call initiated from a home radio/console in the local system that is affiliated to a home talkgroup can be heard by a home radio that has roamed to a foreign system and is affiliated to the home talkgroup.
This test will also demonstrate that a group call initiated from a home radio that has roamed to a foreign system and is affiliated to a talkgroup home to the local system can be heard by home radio and console affiliated to the home talkgroup in the local system.

SETUP

SYSTEM 1 (home of TALKGROUP 1)

RADIO-1 (home radio on SYSTEM 1, has roamed to SYSTEM 2) - TALKGROUP 1
RADIO-2 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1

RADIO-2 and CONSOLE-1 (home to SYSTEM 1, located in SYSTEM 1) - TALKGROUP 1

SYSTEM 2
RADIO-1 - TALKGROUP 1

VERSION #1.020

2. TEST

Step 1. Initiate a group call from RADIO-2 on TALKGROUP 1.

Step 2. Observe that RADIO-1 and CONSOLE-1 are able to monitor and respond to the call on TALKGROUP 1.

Step 3. Initiate a group call from CONSOLE-1 on TALKGROUP 1.

Step 4. Observe that RADIO-1 and RADIO-2 are able to monitor and respond to the call on TALKGROUP 1

Step 5. Initiate a group call from RADIO-1 on TALKGROUP 1.

Step 6. Observe that RADIO-2 and CONSOLE-1 are able to monitor and respond to the call on TALKGROUP 1.

Pass____ Fail____

5.13.2 Automatic Roaming - Emergency Alarm and Call for Home Talkgroup

1. DESCRIPTION

This test will demonstrate that emergency alarm and call initiated from a home radio that has roamed to a foreign system and is affiliated to a talkgroup home to the local system can be heard by a console that is affiliated to the home talkgroup in the local system. This test also verifies that the emergency can be acknowledged and knocked down by the console in the local system.

SETUP

SYSTEM 1 (home of TALKGROUP 1)
CONSOLE-1 - TALKGROUP 1

SYSTEM 2
RADIO-1 - TALKGROUP 1

RADIO-1 is a home radio on SYSTEM 1, has roamed to SYSTEM 2 and is affiliated to TALKGROUP 1.
CONSOLE-1 is home to SYSTEM 1, located in System 1 and affiliated to TALKGROUP 1.

VERSION #1.020

2. TEST

Step 1. Initiate an emergency alarm from RADIO-1 on TALKGROUP 1 by holding the emergency button.

Step 2. Observe that CONSOLE-1 is able to hear and see the emergency alarm on TALKGROUP 1.

Step 3. Acknowledge the emergency alarm on TALKGROUP 1 from CONSOLE-1.

Step 4. Key RADIO-1 to initiate an emergency call on TALKGROUP 1.

Step 5. Observe that CONSOLE-1 is able to monitor and respond to the emergency call on TALKGROUP 1.

Step 6. Knock down the emergency from CONSOLE-1 on TALKGROUP 1.

Step 7. Exit emergency mode on RADIO-1 by holding the emergency button on the radio.

Pass____ Fail____

5.14 LOCATION SERVICE

5.14.1 Location Updates

1. DESCRIPTION

The Location Service send updates at configured time intervals. These intervals can be updated which will send a message to the subscriber updating the reporting parameters.

Note: Location requires reception of a clear GPS signal which may not always be possible in the CCSi environment. Location tests are not recommended for staging but rather for the final destination when it is possible to perform outdoor tests more easily.

SETUP

MotoMapping Client installed

RADIO-1 - GPS enabled and provisioned on the Location Service

Note: It is possible that an external GPS antenna may be required if testing inside CCSi.

VERSION #1.020

2. TEST

Step 1. From the device list on the mapping client, expand the device details for RADIO-1. This will display the Latitude, Longitude and the update time.

Step 2. Select RADIO-1 on the map and right clickto bring up a pop up box.

Step 3. Select the option "Set Location Update Frequency" and update the parameter "Delta Time to Min=30 seconds. Verify that RADIO-1 is updating every 30 seconds by looking at the device list.

Pass____ Fail____

5.15 LOCATION ON PTT

5.15.1 Location on PTT - Enabled for All Calls

1. DESCRIPTION

The test will demonstrate Location on PTT capability when enabled for all calls. The dispatcher will see updated locations a subscriber transmitting in a group call and transmitting in an emergency call.

SETUP

RADIO-1 - TALKGROUP 1
CONSOLE-1 – TALKGROUP 1
MAPPING-1 – RADIO-1

RADIO-1 is configured in the UNS for Location on PTT - Enabled for All Calls.
Subscribers must have GPS coverage.

VERSION #1.040

2. TEST

Step 1. Using RADIO-1 transmit on TALKGROUP 1.

Step 2. Will demonstrate that CONSOLE-1 hears RADIO-1 and a little more than 2 seconds after audio starts MAPPING-1 shows an updated location for RADIO-1 not indicating emergency.

Step 3. Dekey RADIO-1.

Step 4. Using RADIO-1 press and release emergency button and then transmit on TALKGROUP 1.

Step 5. Will demonstrate that CONSOLE-1 hears RADIO-1 and a little more than 2 seconds after audio starts MAPPING-1 shows an updated location for RADIO-1 indicating emergency.

Step 6. Dekey RADIO-1 and press and release emergency button to exit emergency.

Step 7. Using CONSOLE-1, knockdown the emergency call.

Step 8. Will demonstrate no more locations are updated for RADIO-1 at MAPPING-1.

Pass____ Fail____

5.15.2 Location on PTT - Enabled for Emergency Calls

1. DESCRIPTION

The test will demonstrate Location on PTT capability when enabled for emergency calls. The dispatcher will see updated locations for subscribers transmitting in emergency mode and subscribers transmitting not in emergency mode that are in the emergency call.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 – TALKGROUP 1
CONSOLE-1 – TALKGROUP 1
MAPPING-1 – RADIO-1 and RADIO-2

RADIO-1 and RADIO-2 are configured in the UNS for Location on PTT - Enabled for Emergency Calls. Subscribers must have GPS coverage.

VERSION #1.030

2. TEST

Step 1. Using RADIO-1 transmit on TALKGROUP 1.

Step 2. Will demonstrate that CONSOLE-1 hears RADIO-1 and MAPPING-1 does not show an updated location for RADIO-1.

Step 3. Dekey RADIO-1 and press and release emergency button and then transmit on TALKGROUP 1.

Step 4. Will demonstrate that CONSOLE-1 hears RADIO-1 and a little more than 2 seconds after audio starts MAPPING-1 shows an updated location for RADIO-1 indicating emergency.

Step 5. Dekey RADIO-1.

Step 6. Using RADIO-2 transmit on TALKGROUP 1.

Step 7. Will demonstrate that CONSOLE-1 hears RADIO-2 and a little more than 2 seconds after audio starts MAPPING-1 shows an updated location for RADIO-2 not indicating emergency.

Step 8. Dekey RADIO-2.

Step 9. Using RADIO-1, press and release emergency button to exit emergency.

Step 10. Using CONSOLE-1, knockdown the emergency call.

Pass____ Fail____