LEASE PURCHASE AND HARDWARE A G R E E M E N T

THIS LEASE PURCHASE AND HARDWARE AGREEMENT ("Agreement") is made between the **CITY AND COUNTY OF DENVER**, a municipal corporation of the State of Colorado (the "City") and **MOTOROLA SOLUTIONS**, Inc., a Delaware corporation registered to do business in Colorado, whose address is 7237 Church Ranch Blvd., Suite 406, Westminster, CO 80021 ("Contractor" or "Motorola"), jointly "the parties."

RECITALS:

1. The City desires to obtain a turnkey P25 radio system ("System") as described in the Technical and Implementation Documents (defined below) and provide for future equipment and/or service purchases and Contractor desires to provide those to the City.

2. Payment for the System (defined below) shall be financed through a separate lease-purchase agreement (the "LPA") between the City and **Banc of America, Public Capital Corp**("Financer") and disbursed from a separate escrow agreement in which the funds from the LPA will be deposited ("Escrow Agreement").

IT IS HEREBY AGREED BETWEEN THE PARTIES AS FOLLOWS:

1. EXHIBITS, SOFTWARE LICENSE, SUPPORT, EQUIPMENT AND WARRANTIES AND MAINTENANCE TO BE PROVIDED AND SERVICES TO BE PERFORMED:

A. Exhibits. The exhibits listed below are incorporated into and made a part of this Agreement. Any language in the Exhibits which may be held over from the RFP response indicating that the Contractor is proposing to complete deliverables shall be interpreted to indicate that the Contractor shall complete the deliverables. In interpreting this Agreement and resolving any ambiguities, the main body of this Agreement takes precedence over the exhibits and any inconsistency between Exhibits A through F will be resolved in their listed order.

Exhibit A "Software License Agreement"
Exhibit B "Payment Summary / Payment Milestones"
Exhibit C "Technical and Implementation Documents"
C-1 "System Description" (Sections 2.1 and 2.2 of the Motorola Proposal dated 11/20/17)
C-2 "Subscriber Descriptions" (Section 2.3 of the Motorola Proposal dated 11/20/17)
C-3 "Equipment List" (Section 2.1.3 of the Motorola Proposal dated 11/20/17 S*ee Exhibit C-1*)

C-4 "System Implementation Plan" (Sections 2.5, 2.6, 2.7 (Project Management Plan ("PMP")), 2.8 and 2.9 of the Motorola Proposal dated 11/20/17)
C-5 "Acceptance Test Plans" or "ATPs" (Sections 2.9.3 and 2.9.4 of the Motorola Proposal dated 11/20/17 *See Exhibit C-4 Section 2.9*)
C-6 "Preliminary Project Schedule" dated 11/20/17
C-7 "Warranty and Maintenance SOWs" (Sections 2.4 and 2.10 of the Motorola Proposal dated 11/20/17)
Exhibit D "Service Terms and Conditions"
Exhibit E "System Acceptance Certificate"
Exhibit F "Pricing for Ongoing Purchases"
Exhibit G Sample Bond Form

B. Contractor, under the general direction of, and in coordination with, the City's Chief Information Officer or other designated supervisory personnel (the "Manager") agrees to provide, install, test, and provide warranty services for the System, defined below, in accordance with this Agreement and the Technical and Implementation Documents. It is understood and agreed that the System and Warranties associated with this negotiated Agreement that are being provided to the City hereunder are also routinely provided to nongovernmental customers on same terms and conditions that were offered to the City and are agreed to by the City in this Agreement.

C. As the Manager directs, the Contractor shall diligently undertake, perform, and complete all of the services and produce all the deliverables set forth to the City's satisfaction.

D. The Contractor is ready, willing, and able to provide the services required by this Agreement.

E. The Contractor shall faithfully perform the services in accordance with the standards of care, skill, training, diligence, and judgment provided by highly competent individuals performing services of a similar nature to those described in the Agreement and in accordance with the terms of the Agreement.

F. **Definitions.** Capitalized terms used in this Agreement have the following meanings:

(a) "Acceptance Tests" means those tests described in the Acceptance Test Plan.

(b) "Beneficial Use" is the use of the System by the City for purposes other than testing; including functional coverage, or 30-day burn-in testing; optimization; training; cutover preparation; or other purposes agreed to mutually by City and Contractor.

(c) "Confidential Information" means all information marked by a party as "confidential" and confirmed in writing by the other Party as confidential.

(d) “Effective Date” means that date upon which the last Party executes this Agreement.

(e) “Equipment” means the hardware components of the System that City acquires from Contractor under this Agreement. Equipment that is part of the System is described in the equipment list.

(f) “Contractor Software” means software that Contractor or its affiliated companies owns.

(g) “Non-Contractor Software” means software that a party other than Contractor or its affiliated companies owns.

(h) “Open Source Software” (also called “freeware” or “shareware”) means software with either freely obtainable source code, license for modification, or permission for free distribution.

(i) “Proprietary Materials” means certain software tools and/or other technical materials, including, but not limited to, data, modules, components, designs, utilities, subsets, objects, program listings, models, methodologies, programs, systems, analysis frameworks, leading practices and specifications which Contractor has developed prior to, or independently from, the provision of the Services and/or which Contractor licenses from third parties.

(j) “Proprietary Rights” means the patents, patent applications, inventions, copyrights, trade secrets, trademarks, trade names, mask works, know-how, and other intellectual property rights in and to the Equipment and Software, including those created or produced by Motorola under this Agreement and any corrections, bug fixes, enhancements, updates or modifications to or derivative works from the Software whether made by Motorola or another party.

(k) “Software” (i) means proprietary software in object code format, and adaptations, translations, de-compilations, disassemblies, emulations, or derivative works of such software; (ii) means any modifications, enhancements, new versions and new releases of the software provided by Contractor; and (iii) may contain one or more items of software owned by a third party supplier. The term "Software" does not include any third party software provided under separate license or third party software not licensable under the terms of this Agreement.

(l) “Specifications” means the functionality and performance requirements that are described in the Technical and Implementation Documents.

(m) “Subsystem” means a major part of the System that performs specific functions or operations. Subsystems are described in the Technical and Implementation Documents.

(n) "System" means the Equipment, including incidental hardware and materials, Software, and design, installation and implementation services that are combined together into an integrated system; the System(s) is (are) described in the Technical and Implementation Documents.

(o) "System Acceptance" means the successful completion of the functional system tests, coverage tests, training and the 30-day operational test Acceptance.

(p) "Warranty Period" means one (1) year from the date of System.

(q) "Lease" or "LPA" means the lease entered into between the City and Financer to finance the Financed System.

F. Maintenance Service. During the Warranty Period, in addition to warranty services, Motorola will provide maintenance services for the Equipment and support for the Motorola Software pursuant to Exhibit C-7. Those services and support are included in the System price. If the City wishes to purchase additional maintenance and support services for the Equipment during the Warranty Period, or any maintenance and support services for the Equipment either during the Warranty Period or after the Warranty Period, the description of and pricing for the services will be set forth in a separate document. If the City wishes to purchase extended support for the Motorola Software after the Warranty Period, it may do so by ordering software subscription services. Unless otherwise agreed by the parties in writing, the terms and conditions applicable to those maintenance, support or software subscription services will be Motorola's Maintenance Service Terms and Conditions, attached hereto and incorporated herein as **Exhibit D**, together with the appropriate statements of work.

2. GRANT OF LICENSE; RESTRICTIONS AND NON-FINANCED PURCHASES:

A. Subject to the Motorola Software License Agreement ("Software License Agreement"), attached hereto as **Exhibit A** and incorporated herein, Contractor hereby grants to City a perpetual, irrevocable, non-exclusive right and license to: (a) install, display, perform, and use the Software; and (b) use all intellectual property rights necessary to use the Software as authorized in subparagraph (a).

B. Title to and ownership of the Software will remain with Contractor. City will not reverse engineer or reverse compile any part of the Software without Contractor's prior written consent. City will not remove, obscure or deface any proprietary notice or legend contained in the Software or documentation without Contractor's prior written consent.

C. Additional Equipment or Software.

(i) During the term of this Agreement the City may make purchases under Exhibit F by requesting a quote for goods and/ or services from the Contractor, entering a requisition for a Purchase Order and by placing the Purchase Orders with the Contractor. Funds for any Purchase Order shall be subject to appropriation, as set out in Section 5 (D) and shall be

encumbered as part of the requisition. Any Purchase Order issued by the City shall be subject to the terms and conditions of this Agreement and should reference this Agreement.

(ii) For three (3) years after the expiration date of the Agreement, the City may order additional Equipment or Software, if it is then available. Each purchase order must refer to this Agreement, the expiration date of the Agreement, and must specify the pricing and delivery terms. The Parties agree that, notwithstanding expiration of the Agreement, the applicable provisions of this Agreement (except for pricing, delivery, passage of title and risk of loss to Equipment, warranty commencement, and payment terms) will govern the purchase and sale of the additional Equipment or Software. Additional or contrary terms in the purchase order will be inapplicable, unless signed by both parties. Title and risk of loss to additional Equipment will pass at delivery, warranty will commence upon delivery, and payment is due in accordance with the City Prompt Payment Act (net 35 days). Contractor will send City an invoice as the additional Equipment is shipped or Software is licensed. Alternatively, City may register with and place orders through Motorola Online ("MOL"), and this Agreement will be the "Underlying Agreement" for those MOL transactions rather than the MOL On-Line Terms and Conditions of Sale. MOL registration and other information may be found at https://businessonline.Motorola.com and the MOL telephone number is (800) 814-0601.

(iii) For all orders under Sections 2(C)(i) and (ii), to obtain any such additional services, the City will issue a purchase order referring to this Agreement and the separate proposal document. Omission of reference to this Agreement in the City's purchase order will not affect the applicability of this Agreement. Contractor's proposal may include a cover page entitled "Service Agreement" or "Installation Agreement", as applicable, and other attachments. These cover pages and other attachments are incorporated into this Agreement by this reference.

D. Contractor Software. Any Contractor Software, including subsequent releases, is licensed to City solely in accordance with the Contractor Software License Agreement. The City hereby accepts and agrees to abide by all of the terms and restrictions of the Software License Agreement, as defined in this Agreement.

E. Non-Contractor Software. Any Non-Contractor Software is licensed to City in accordance with the standard license, terms, and restrictions of the copyright owner on the Effective Date unless the copyright owner has granted to Contractor the right to sublicense the Non-Contractor Software pursuant to the Software License Agreement, in which case it applies and the copyright owner will have all of Licensor's rights and protections under the Software License Agreement. Except as otherwise stated in the Agreement, Contractor makes no representations or warranties of any kind regarding Non-Contractor Software. Non-Contractor Software may include Open Source Software.

3. DELIVERY AND ACCEPTANCE:

A. Contractor shall deliver the Software and hardware and perform the services in accordance with the terms of the Agreement and the Technical and Implementation Documents.

B. Upon installation and configuration of the System, Contractor will provide to the City, at least 10 days' notice before the mutually-agreed Acceptance Test Plan occurs. If the Software does not conform to the provisions of the Agreement and the Software License Agreement, the City will so notify Contractor in accordance with Section 11 of this Agreement.

C. During the Warranty Period, if the City is not satisfied with the Contractor's performance of the services described in the Technical and Implementation Documents, the City will so notify Contractor within thirty (30) days after Contractor's performance thereof. Contractor will, at its own expense, re-perform the service within fifteen (15) days after receipt of City's notice of deficiency.

D. **Commencement of Acceptance Testing.** Contractor will provide to the City at least ten (10) days' notice before the Acceptance Tests commence. System testing will occur only in accordance with the Acceptance Test Plan.

E. **System Acceptance**. System Acceptance will occur upon successful completion of the Acceptance Tests. Upon System Acceptance, the Parties will memorialize this event by promptly executing a System Acceptance Certificate, attached hereto and incorporated herein as **Exhibit E**. If the Acceptance Test Plan includes separate tests for individual Subsystems or phases of the System, acceptance of the individual Subsystem or phase will occur upon the successful completion of the Acceptance Tests for the Subsystem or phase, and the Parties will promptly execute an acceptance certificate for the Subsystem or phase. If the City believes the System has failed the completed Acceptance Tests, the City will provide to Contractor a written notice that includes the specific details of the failure. Contractor shall correct the defects at no additional cost to City. Upon correction of the defects the Acceptance Tests for the applicable corrected part of the System shall be repeated. If the City does not provide to Contractor a failure notice within thirty (30) days after completion of the Acceptance Tests, System Acceptance will be deemed to have occurred as of the completion of the Acceptance Tests. Minor omissions or variances in the System that do not materially impair the operation of the System as a whole will not postpone System Acceptance or Subsystem acceptance, but will be corrected according to a mutually agreed schedule. A schedule for correction must be mutually agreed upon before the City will accept a system or subsystem with minor omissions or variances**.**

F. **Beneficial Use**. The City acknowledges that Contractor's ability to perform its implementation and testing responsibilities may be impeded if the City begins using the System before System Acceptance. Therefore, the City will not commence Beneficial Use before System Acceptance without Contractor's prior written authorization, which will not be unreasonably withheld. Contractor is not responsible for System performance deficiencies that occur during unauthorized Beneficial Use. Upon commencement of Beneficial Use, the City assumes responsibility for the use and operation of the System.

G. **Final Project Acceptance**. Final Project Acceptance will occur after System Acceptance when all deliverables and other work have been completed. When Final

Project Acceptance occurs, the parties will promptly memorialize this final event by so indicating on the System Acceptance Certificate.

3.1 SPECIAL PURCHASING TERMS AND CONDITIONS: In addition to all other terms and conditions stated in this Agreement, Contractor shall comply with the following special purchasing terms and conditions for the System:

A. Pricing is F.O.B. Denver, CO, delivered to the City facilities as set out on Exhibit C.

B. Contractor agrees to bear all risk of loss, injury, or destruction of goods and materials ordered as a result of this Agreement which occur prior to delivery to the City; and such loss, injury or destruction shall not release Contractor from any obligation hereunder. Thereafter, title and risk of loss shall pass to the City and Financer as further described in the LPA.

C. Contractor agrees to furnish, upon the written request of the City, any additional information needed to substantiate or clarify the design and/or performance characteristics of the Equipment.

D. Contractor Invoices must include the following:

(l) City contract control number.

(2) Items listed individually.

(3) Invoice number and date.

(4) Requesting department name and "ship to" address.

(5) Payment terms.

4. TERM: The term of the Agreement begins from the Effective Date and continues for ten (10) years thereafter. If the City desires and Contractor agrees to continue services beyond the term of this Agreement, the parties shall execute an amendment to this Agreement for the agreed upon terms and pricing.

5. COMPENSATION AND PAYMENT:

A. It is understood and agreed that the City has elected to lease/purchase/finance the System and Warranties through the LPA. The City and Financer have also entered into an Escrow Agreement that together with the LPA provide for payment to the Contractor of the System purchase amount stated herein subject to the procedure set out in the LPA. The Contractor's performance under this Agreement is expressly conditioned upon funding of the Escrow Agreement and proper payment as set out herein.

B. Reimbursement Expenses: The fees specified below include all expenses, and no other expenses shall be separately reimbursed hereunder.

C. Invoicing: Concerning the System, Contractor will submit invoices in accordance with the Milestone Schedule in Exhibit B. Within ten days of the receipt of a proper invoice for which the City has accepted the work and deliverables, City will issue an acceptance certificate to the Escrow Holder directing the Escrow Holder to release funds to Contractor in the amount of the approved invoice. For non-financed products and services, the Contractor shall submit an invoice which shall include the City contract number, clear identification of the deliverable that has been completed or delivered, and other information reasonably requested by the City. Payment on all uncontested amounts shall be made in accordance with the City's Prompt Payment Ordinance.

D. Maximum Contract Liabilities:

(i) Notwithstanding any other provision of the Agreement, the City's maximum payment obligation will not exceed **TWENTY MILLION DOLLARS** ($20,000,000.00) (the "Maximum Contract Amount") for the future hardware, software or services available to the City for purchase as set out on Exhibit F.

(ii) The City's payment obligation for the Maximum Contract Amount, whether direct or contingent, extends only to funds appropriated annually by the Denver City Council, paid into the Treasury of the City, and encumbered for the purpose of the Agreement. The City does not by the Agreement irrevocably pledge present cash reserves for payment or performance in future fiscal years. The Agreement does not and is not intended to create a multiple-fiscal year direct or indirect debt or financial obligation of the City. Contractor will be entitled to payment for Equipment and Software delivered, and services rendered up to the date of termination under this provision.

(iii) The City may make additional purchases at the pricing discounts set forth in Exhibit F "Pricing for Ongoing Purchases" for a period of ten years after the Effective Date.

(iv) The total compensation payable to Contractor for acquiring, delivering and fully configuring, installing and acceptance of the System together with the Warranties shall not exceed the amount of **THIRTEEN MILLION FIVE HUNDRED FIFTY-ONE THOUSAND FOURTEEN DOLLARS AND ZERO CENTS** ($13,551,014.00) (the "Maximum Purchase Amount"), payable directly to the Contractor by Financer through the Escrow Agreement. Title to the System shall vest with Financer upon payment of the Maximum Purchase Amount to Contractor. Beneficial use of the System and Warranties shall remain with the City.

(v). The total compensation payable by the City to Contractor under this Agreement for the System and Warranties, Maximum Purchase Amount, shall not exceed Zero Dollars ($0.00).

(vi) The City is not obligated to execute an Agreement or any amendments for any further services, including any services performed by Contractor beyond that specifically described in the attached Exhibits which comprise the System. Any services performed beyond those in the Technical and Implementation Documents are performed at Contractor's risk and without authorization under the Agreement.

6. STATUS OF CONTRACTOR: The Contractor is an independent contractor retained to perform professional or technical services for limited periods of time. Neither the Contractor nor any of its employees are employees or officers of the City under Chapter 18 of the Denver Revised Municipal Code, or for any purpose whatsoever.

7. TERMINATION:

A. The City has the right to terminate the Agreement with cause subject to the understanding that Contractor will have a reasonable time to cure any default and the asserted default is determined to have a material effect on the system as a whole, and without cause upon thirty (30) days prior written notice to the Contractor. However, nothing gives the Contractor the right to perform services under the Agreement beyond the time when its services become unsatisfactory to the Manager. If the City (including its other contractors) delays the performance schedule, the Parties will execute a change order to extend the performance schedule and, if requested, compensate Contractor for all reasonable and documented charges incurred directly as a result of the delay.

B. Notwithstanding the preceding paragraph, the City may terminate the Agreement if the Contractor or any of its officers or employees are convicted, plead *nolo contendere*, enter into a formal agreement in which they admit guilt, enter a plea of guilty or otherwise admit culpability to criminal offenses of bribery, kick backs, collusive bidding, bid-rigging, antitrust, fraud, undue influence, theft, racketeering, extortion or any offense of a similar nature in connection with Contractor's business. Termination for the reasons stated in this paragraph is effective upon receipt of notice.

C. Upon termination of the Agreement, with or without cause, the Contractor shall have no claim against the City by reason of, or arising out of, incidental or relating to termination, except for compensation for work duly requested and satisfactorily performed, including Equipment and Software delivered, as described in the Agreement. If the termination is without cause, then Contractor will also be entitled to compensation for the reasonable and documented expenses incurred by Contractor as a result of the early termination of the Agreement, subject to Contractor's duty to mitigate any damages and expenses.

8. EXAMINATION OF RECORDS: Any authorized agent of the City, including the City Auditor or his or her representative, has the right to access and the right to examine any pertinent books, documents, papers and records of the Contractor, involving transactions related to the Agreement until the latter of three (3) years after the final payment under the Agreement or expiration of the applicable statute of limitations. This provision will not be interpreted as requiring Contractor to disclose information to which it considers confidential or proprietary including, for example, its costs to manufacture the products. The City's inspection shall take place at a Contractor facility, and be limited to the scope of this Agreement.

9. WHEN RIGHTS AND REMEDIES NOT WAIVED: In no event shall any action by either Party hereunder constitute or be construed to be a waiver by the other Party of any breach of covenant or default which may then exist on the part of the Party alleged to be in breach, and the non-breaching Party's action or inaction when any such breach or default shall

exist shall not impair or prejudice any right or remedy available to that Party with respect to such breach or default; and no assent, expressed or implied, to any breach of any one or more covenants, provisions or conditions of the Agreement shall be deemed or taken to be a waiver of any other breach.

10. INSURANCE:

A. General Conditions: Contractor agrees to secure, at or before the time of execution of this Agreement, the following insurance covering all operations, goods or services provided pursuant to this Agreement. Contractor shall keep the required insurance coverage in force at all times during the term of the Agreement, or any extension thereof, during any warranty period, and for three (3) years after termination of the Agreement. The required insurance shall be underwritten by an insurer licensed or authorized to do business in Colorado and rated by A.M. Best Company as "A-"VIII or better. Failure of the Contractor to provide the required notice will be a material breach of the Agreement and Contractor will be responsible for any and all damages arising out of a failure to provide the required notice. Contractor shall provide written notice of cancellation, non-renewal of coverage to the parties identified in the Notices section by mail, within five (5) business days of such notice by its insurer(s) and referencing the City's contract number. If any policy is in excess of a deductible or self-insured retention, the City must be notified by the Contractor. Contractor shall be responsible for the payment of any deductible or self-insured retention. The insurance coverages specified in this Agreement are the requirements, and these requirements do not lessen or limit the liability of the Contractor. The Contractor shall maintain, at its own expense, any additional kinds or amounts of insurance that it may deem necessary to cover its obligations and liabilities under this Agreement.

B. Proof of Insurance: Contractor shall provide a copy of this Agreement to its insurance agent or broker. Contractor may not commence services or work relating to the Agreement prior to placement of coverages required under this Agreement. Contractor shall provide an ACORD certificate, complies with all insurance requirements of this Agreement after contract execution. The City requests that the City's contract number be referenced on the Certificate. The City's acceptance of a certificate of insurance or other proof of insurance that does not comply with all insurance requirements set forth in this Agreement shall not act as a waiver of Contractor's breach of this Agreement or of any of the City's rights or remedies under this Agreement. In the event of the filing of a litigated claim, the City's Risk Management Office may require additional proof of insurance, including but not limited to policies and endorsements.

C. Additional Insureds: For Commercial General Liability, Auto Liability and Excess Liability/Umbrella (if required), Contractor and subcontractor's insurer(s) shall include the City and County of Denver, its elected and appointed officials, employees and volunteers as additional insured.

D. Waiver of Subrogation: For workers compensation required under this Agreement, Contractor's insurer shall waive subrogation rights against the City.

E. Subcontractors and Subconsultants: To the extent applicable to their work all subcontractors and subconsultants (including independent contractors, suppliers or other entities providing goods or services required by this Agreement) shall be subject to similar requirements herein and shall procure and maintain similar coverages required of the Contractor. Contractor shall ensure that all such subcontractors and subconsultants maintain the required coverages. Contractor agrees to provide proof of insurance for all such subcontractors and subconsultants upon request by the City.

F. Workers' Compensation/Employer's Liability Insurance: Contractor shall maintain the coverage as required by statute for each work location and shall maintain Employer's Liability insurance with limits of $100,000 per occurrence for each bodily injury claim, $100,000 per occurrence for each bodily injury caused by disease claim, and $500,000 aggregate for all bodily injuries caused by disease claims. Contractor expressly represents to the City, as a material representation upon which the City is relying in entering into this Agreement, that none of the Contractor's officers or employees who may be eligible under any statute or law to reject Workers' Compensation Insurance shall effect such rejection during any part of the term of this Agreement, and that any such rejections previously effected, have been revoked as of the date Contractor executes this Agreement.

G. Commercial General Liability: Contractor shall maintain a Commercial General Liability insurance policy with limits of $1,000,000 for each occurrence, $1,000,000 for each personal and advertising injury claim, $2,000,000 products and completed operations aggregate, and $2,000,000 policy aggregate.

H. Business Automobile Liability: Contractor shall maintain Business Automobile Liability with limits of $1,000,000 combined single limit applicable to all owned, hired and non-owned vehicles used in performing services under this Agreement

I. Technology Errors & Omissions with Cyber-Liability: Contractor shall maintain Technology Errors and Omissions insurance including cyber liability, network security, privacy liability coverage with limits of $1,000,000 per claim and $1,000,000.

J. Additional Provisions:

(a) For Commercial General Liability, the policy must provide the following:

(i) That this Agreement is an Insured Contract under the policy;
(ii) Defense costs are included in the limits of liability;
(iii) A severability of interests or separation of insureds provision (no insured vs. insured exclusion); and
(iv) A provision that coverage is primary with other coverage or self-insurance maintained by the City.

(b) For claims-made coverage:
(i) The retroactive date must be on or before the contract date or the first date when any goods or services were provided to the City, whichever is earlier.

(ii) Contractor shall advise the City in the event any general aggregate or other aggregate limits are reduced below the required per occurrence limits. At their own expense, and where such general aggregate or other aggregate limits have been reduced below the required per occurrence limit, the Contractor will procure such per occurrence limits and furnish a new certificate of insurance showing such coverage is in force.

11. REPRESENTATION AND WARRANTY: Contractor represents and warrants that:

A. the Software is warranted in accordance with the warranty terms set forth in the Software License Agreement and the applicable provisions of this Section 11;

B. all services will be performed by qualified personnel in a professional and workmanlike manner, consistent with industry standards;

C. all services will conform to applicable specifications and the Exhibits attached hereto;

D. it has the requisite ownership, rights and licenses to perform its obligations under this Agreement fully as contemplated hereby and to grant to the City all rights with respect to the software and services free and clear from any and all liens, adverse claims, encumbrances and interests of any third party;

E. to the best of its knowledge, there are no pending or threatened lawsuits, claims, disputes or actions: (i) alleging that any software or service infringes, violates or misappropriates any third party rights; or (ii) adversely affecting any software, service or supplier's ability to perform its obligations hereunder;

F. to the best of its knowledge, the Software will not violate, infringe, or misappropriate any patent, copyright, trademark, trade secret, or other intellectual property or proprietary right of any third party;

G. the Software will contain no malicious or disabling code that is intended to damage, destroy or destructively alter software, hardware, systems or data; and

H. the media on which all Software is furnished are and will be, under normal use, free from defects in materials and workmanship.

I. System Functionality. Contractor represents that the System will be fit for its particular purpose as a public safety radio system by performing in accordance with the Specifications in all material respects. Upon System Acceptance, this System functionality representation is fulfilled. Contractor is not responsible for System performance deficiencies that are caused by ancillary equipment not furnished by Contractor which is attached to or used in connection with the System or for reasons or parties beyond Contractor's control, such as natural causes; the construction of a building that adversely affects the microwave path reliability or radio frequency (RF) coverage; the addition of frequencies at System sites that cause RF

interference or intermodulation; or City changes to load usage or configuration outside the Specifications.

J. Equipment Warranty. During the Warranty Period, Contractor warrants that the Equipment under normal use and service will be free from material defects in materials and workmanship. If System Acceptance is delayed beyond twelve (12) months after shipment of the Equipment by events or causes under the City's direct control, this warranty expires eighteen (18) months after the shipment of the Equipment.

K. Software Warranty. Unless otherwise stated in the Software License Agreement, during the Warranty Period, Contractor warrants the Software in accordance with the warranty terms set forth in the Software License Agreement and the provisions of this Section that are applicable to the Software. If System Acceptance is delayed beyond twelve (12) months after shipment of the Contractor Software by events or causes under the City's direct control, this warranty expires eighteen (18) months after the shipment of the Contractor Software. If the City purchases a System Upgrade Agreement from Contractor, then the Software will continue to be warranted under such agreement. TO THE EXTENT, IF ANY, THAT THERE IS A SEPARATE LICENSE AGREEMENT PACKAGED WITH, OR PROVIDED ELECTRONICALLY WITH, A PARTICULAR PRODUCT THAT BECOMES EFFECTIVE ON AN ACT OF ACCEPTANCE BY THE END USER, THEN THAT AGREEMENT SUPERSEDES THE SOFTWARE LICENSE AGREEMENT AS TO THE END USER OF EACH SUCH PRODUCT.

L. Exclusions to Equipment and Software Warranties. These warranties do not apply to: (i) defects or damage resulting from: use of the Equipment or Software in other than its normal, customary, and authorized manner; accident, liquids (to the extent the Equipment is not normally subject to such liquids), neglect, or acts of God; disassembly, repair, alteration, modification, or adjustment not provided or authorized in writing by Contractor; City's failure to comply with all applicable industry and OSHA standards; (ii) breakage of or damage to antennas unless caused directly by defects in material or workmanship; (iii) Equipment that has had the serial number removed or made illegible; (iv) batteries (because they carry their own separate limited warranty) or consumables; (v) freight costs to ship Equipment to the repair depot; (vi) scratches or other cosmetic damage to Equipment surfaces that does not affect the operation of the Equipment; and (vii) normal or customary wear and tear.

M. Warranty Claims. *See* Exhibit C-7, Section 2.10 *WARRANTY, MAINTENANCE AND SUPPORT* PLAN.

N. Original End User is Covered. These express limited warranties are extended by Contractor to the original user purchasing the System or Services for commercial, industrial, or governmental use only, and are not assignable or transferable, except as may be required by the Lease or Financer.

O. DISCLAIMER OF OTHER WARRANTIES. THESE WARRANTIES ARE THE COMPLETE WARRANTIES FOR THE EQUIPMENT AND CONTRACTOR SOFTWARE PROVIDED UNDER THIS AGREEMENT AND ARE GIVEN IN LIEU OF ALL

OTHER WARRANTIES. CONTRACTOR DISCLAIMS ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE.

12. DEFENSE AND INDEMNIFICATION:

A. Contractor hereby agrees to defend, indemnify, reimburse and hold harmless City, its appointed and elected officials, agents and employees for, from and against all liabilities, claims, judgments, suits or demands for damages to persons or property to the extent arising out of, resulting from, or relating to the work performed under this Agreement ("Claims"), unless such Claims have been specifically determined by the trier of fact to be the sole negligence or willful misconduct of the City. This indemnity shall be interpreted in the broadest possible manner to indemnify City for any acts or omissions of Contractor or its subcontractors either passive or active, irrespective of fault, including City's concurrent negligence whether active or passive, except for the sole negligence or willful misconduct of City.

B. Contractor's duty to defend and indemnify City shall arise at the time written notice of the Claim is first provided to City regardless of whether Claimant has filed suit on the Claim. Contractor's duty to defend and indemnify City shall arise even if City is the only party sued by claimant and/or claimant alleges that City's negligence or willful misconduct was the sole cause of claimant's damages.

C. Contractor will defend any and all Claims which may be brought or threatened against City and will pay on behalf of City any direct and reasonable third party expenses incurred by reason of such Claims including, but not limited to, court costs and attorney fees incurred in defending and investigating such Claims or seeking to enforce this indemnity obligation. Such payments on behalf of City shall be in addition to any other legal remedies available to City and shall not be considered City's exclusive remedy.

D. Insurance coverage requirements specified in this Agreement shall in no way lessen or limit the liability of the Contractor under the terms of this indemnification obligation. The Contractor shall obtain, at its own expense, any additional insurance that it deems necessary for the City's protection.

E. This defense and indemnification obligation shall survive the expiration or termination of this Agreement.

F. **Patent and Copyright Infringement.**

a) Contractor will indemnify, defend and hold harmless the City, its officers, agents and employees from and against any loss, cost, expense or liability (including but not limited to attorney's fees and awarded damages) to the extent the damages arise out of a third-party claim that the Software or the Equipment manufactured by Contractor or the Contractor Software ("Contractor Product") is alleged to be infringing a United States patent, copyright, trademark, or trade secret or their use by the City is alleged to infringe, violate, or misappropriate

a patent, copyright, trademark, or trade secret ("Infringement Claim"). Contractor's duties to defend and indemnify are conditioned upon the following: (i) the City promptly notifying Contractor in writing of any Infringement Claim; (ii) the City cooperating with Contractor and its legal counsel in the defense thereof; and, (iii) if requested by Contractor, reasonable assistance in the defense of the Infringement Claim. In addition to Contractor's obligation to defend, and subject to the same conditions, Contractor will pay all damages finally awarded against City by a court of competent jurisdiction for an Infringement Claim or agreed to, in writing, by Contractor in settlement of an Infringement Claim.

b) Contractor may in its discretion (i) contest, (ii) settle, (iii) procure for the City the right to continue using the Contractor Product, or (iv) modify or replace the infringing Contractor Product so that it no longer infringing (as long as the functionality and performance are not degraded as reasonably determined by the City). The City may participate in the defense of such action at its own expense. If Contractor concludes in its reasonable judgment that none of the foregoing options are commercially reasonable, then Contractor will refund a pro rata portion of the price of the infringing Contractor Product (based on a 10 year straight line depreciation running from City's final acceptance of the infringing Contractor Product) together with an amount equal to any diminution in value of the System caused by the removal of the infringing Contractor Product, and reimburse the City for all reasonable expenses for removal and replacement of the Equipment and Software. The depreciation amount will be calculated based upon generally accepted accounting standards.

c) Contractor will have no duty to defend or indemnify for any Infringement Claim that is based upon: (i) the combination of the Contractor Product with any software, apparatus or device not furnished by Contractor; (ii) the use of ancillary equipment or software not furnished by Contractor and that is attached to or used in connection with the Contractor Product; (iii) Contractor Product designed or manufactured in accordance with City's designs, specifications, guidelines or instructions, if the alleged infringement would not have occurred without such designs, specifications, guidelines or instructions; (iv) a modification of the Contractor Product by a party other than Contractor or authorized by Contractor; (v) use of the Contractor Product in a manner for which the Contractor Product was not designed or that is inconsistent with the terms of this Agreement; or (vi) the failure by City to install an enhancement release to the Contractor Software that is intended to correct the claimed infringement.

d) This Section 12(E) provides the City's sole and exclusive remedies and Contractor's entire liability in the event of an Infringement Claim. The City has no right to recover and Contractor has no obligation to provide any other or further remedies, whether under another provision of this Agreement or any other legal theory or principle, in connection with an Infringement Claim.

13. <u>COLORADO GOVERNMENTAL IMMUNITY ACT</u>: The parties hereto understand and agree that the City is relying upon, and has not waived, the monetary limitations and all other rights, immunities and protection provided by the Colorado Governmental Act, § 24-10-101, et seq., C.R.S. (2003).

14. TAXES, CHARGES AND PENALTIES: The City shall not be liable for the payment of taxes, late charges or penalties of any nature other than the compensation stated herein, except for any additional amounts which the City may be required to pay under D.R.M.C. § 20-107 to § 20-115.

15. ASSIGNMENT; SUBCONTRACTING: The Contractor shall not voluntarily or involuntarily assign any of its rights or obligations, or subcontract performance obligations, under this Agreement without obtaining the Manager's prior written consent. Any assignment or subcontracting without such consent will be ineffective and void, and shall be cause for termination of this Agreement by the City. Notwithstanding the foregoing, Contractor may assign this Agreement to any of its wholly owned affiliates or its right to receive payment without the prior consent of City, provided that such action will not relieve Contractor of any of its duties under the Agreement. The Manager has sole and absolute discretion whether to consent to any assignment or subcontracting, or to terminate the Agreement because of unauthorized assignment or subcontracting. Contractor shall have the right to challenge any determination made by the Manager. In the event of any subcontracting or unauthorized assignment: (i) the Contractor shall remain responsible to the City; and (ii) no contractual relationship shall be created between the City and any sub-consultant, subcontractor or assign.

16. NO THIRD PARTY BENEFICIARY: Enforcement of the terms of the Agreement and all rights of action relating to enforcement are strictly reserved to the parties. Nothing contained in the Agreement gives or allows any claim or right of action to any third person or entity. Any person or entity other than the City or the Contractor receiving services or benefits pursuant to the Agreement is an incidental beneficiary only.

17. NO AUTHORITY TO BIND CITY TO CONTRACTS: The Contractor lacks any authority to bind the City on any contractual matters. Final approval of all contractual matters that purport to obligate the City must be executed by the City in accordance with the City's Charter and the Denver Revised Municipal Code.

18. AGREEMENT AS COMPLETE INTEGRATION-AMENDMENTS: The Agreement is the complete integration of all understandings between the parties as to the subject matter of the Agreement. No prior, contemporaneous or subsequent addition, deletion, or other modification has any force or effect, unless embodied in the Agreement in writing. No oral representation by any officer or employee of the City at variance with the terms of the Agreement or any written amendment to the Agreement will have any force or effect or bind either Party.

19. SEVERABILITY: Except for the provisions of the Agreement requiring appropriation of funds and limiting the total amount payable by the City, if a court of competent jurisdiction finds any provision of the Agreement or any portion of it to be invalid, illegal, or unenforceable, the validity of the remaining portions or provisions will not be affected, if the intent of the parties can be fulfilled.

20. CONFLICT OF INTEREST:

A. No employee of the City shall have any personal or beneficial interest in the services or property described in the Agreement. The Contractor shall not hire, or contract for services with, any employee or officer of the City that would be in violation of the City's Code of Ethics, D.R.M.C. §2-51, et seq. or the Charter §§ 1.2.8, 1.2.9, and 1.2.12.

B. The Contractor shall not engage in any transaction, activity or conduct that would result in a conflict of interest under the Agreement. The Contractor represents that it has disclosed any and all current or potential conflicts of interest. A conflict of interest shall include transactions, activities or conduct that would affect the judgment, actions or work of the Contractor by placing the Contractor's own interests, or the interests of any party with whom the Contractor has a contractual arrangement, in conflict with those of the City. The City, in its sole discretion, will determine the existence of a conflict of interest and may terminate the Agreement in the event it determines a conflict exists, after it has given the Contractor written notice describing the conflict and provided Contractor thirty (30) days after receipt of such notice to eliminate or cure the alleged conflict of interest in a manner that is acceptable to the City.

21. NOTICES: All notices required by the terms of the Agreement must be hand delivered, sent by overnight courier service, mailed by certified mail, return receipt requested, or mailed via United States mail, postage prepaid, if to Contractor at the address first above written, and if to the City at:

Chief Information Officer or Designee
201 West Colfax Avenue, Dept. 301
Denver, Colorado 80202

With a copy of any such notice to:

Denver City Attorney's Office
1437 Bannock St., Room 353
Denver, Colorado 80202

Notices hand delivered or sent by overnight courier are effective upon delivery. Notices sent by certified mail are effective upon receipt. Notices sent by mail are effective upon deposit with the U.S. Postal Service. The parties may designate substitute addresses where or persons to whom notices are to be mailed or delivered. However, these substitutions will not become effective until actual receipt of written notification.

22. DISPUTES: All disputes between the City and Contractor arising out of or regarding the Agreement will be resolved by administrative hearing pursuant to the procedure established by D.R.M.C. § 56-106(b)-(f). For the purposes of that administrative procedure, the City official rendering a final determination shall be the Manager as defined in this Agreement. Contractor will have the right to challenge any final determination in a court of competent jurisdiction as determined under Section 23.

23. GOVERNING LAW; VENUE: The Agreement will be construed and enforced in accordance with applicable federal law, the laws of the State of Colorado, and the Charter, Revised Municipal Code, ordinances, regulations and Executive Orders of the City and County of Denver, which are expressly incorporated into the Agreement. Unless otherwise specified,

any reference to statutes, laws, regulations, charter or code provisions, ordinances, executive orders, or related memoranda, includes amendments or supplements to same. Venue for any legal action relating to the Agreement will be in the District Court of the State of Colorado, Second Judicial District.

24. NO DISCRIMINATION IN EMPLOYMENT: In connection with the performance of work under the Agreement, the Contractor may not refuse to hire, discharge, promote or demote, or discriminate in matters of compensation against any person otherwise qualified, solely because of race, color, religion, national origin, gender, age, military status, sexual orientation, gender variance, marital status, or physical or mental disability. The Contractor shall insert the foregoing provision in all subcontracts.

25. USE, POSSESSION OR SALE OF ALCOHOL OR DRUGS: Contractor shall cooperate and comply with the provisions of Executive Order 94 and Attachment A thereto concerning the use, possession or sale of alcohol or drugs. Violation of these provisions or refusal to cooperate with implementation of the policy can result in the City barring Contractor from City facilities or participating in City operations.

26. CONFIDENTIAL INFORMATION; OPEN RECORDS:

A. City Information: The parties agree that this Agreement shall not be considered confidential or proprietary. "Proprietary Data" shall mean any materials or information which may be designated or marked "Proprietary" or "Confidential", or which would not be documents subject to disclosure pursuant to the Colorado Open Records Act or City ordinance, and provided or made available to Contractor by the City. Such Proprietary Data may be in hardcopy, printed, digital or electronic format. Contractor acknowledges and accepts that, in performance of all work under the terms of this Agreement, Contractor may have access to Proprietary data or Confidential Information that may be owned or controlled by the City, and that the disclosure of such Proprietary Data or Confidential Information may be damaging to the City or third parties. Contractor agrees that all Proprietary Data, Confidential Information or any other data or information provided or otherwise disclosed by the City to Contractor shall be held in confidence and used only in the performance of its obligations under this Agreement. Contractor shall exercise the same standard of care to protect such Proprietary Data and Confidential Information as a reasonably prudent contractor would to protect its own proprietary or confidential data.

B. Use and Protection of Proprietary Data or Confidential Information:

(a) Except as expressly provided by the terms of this Agreement, Contractor agrees that it shall not disseminate, transmit, license, sublicense, assign, lease, release, publish, post on the internet, transfer, sell, permit access to, distribute, allow interactive rights to, or otherwise make available any data, including Proprietary Data or Confidential Information or any part thereof to any other person, party or entity in any form of media for any purpose other than performing its obligations under this Agreement. Contractor further acknowledges that by providing data, Proprietary Data or Confidential Information, the City is not granting to Contractor any right or license to use such data except as provided in this

Agreement. Contractor further agrees not to disclose or distribute to any other party, in whole or in part, the data, Proprietary Data or Confidential Information without written authorization from the Manager and will immediately notify the City if any information of the City is requested from the Contractor from a third party.

(b) Contractor agrees, with respect to the Proprietary Data and Confidential Information, that: (1) Contractor shall not copy, recreate, reverse engineer or decompile such data, in whole or in part, unless authorized in writing by the Manager; (2) Contractor shall retain no copies, recreations, compilations, or decompilations, in whole or in part, of such data; and (3) Contractor shall, upon the expiration or earlier termination of the Agreement, destroy (and, in writing, certify destruction) or return all such Proprietary Data or Confidential Information to the City.

(c) Contractor shall develop, implement, maintain and use appropriate administrative, technical and physical security measures to preserve the confidentiality, integrity and availability of all electronically maintained or transmitted data received from, or on behalf of City. It is the responsibility of the Contractor to ensure that all possible measures have been taken to secure the computers or any other storage devices used for City data. This includes industry accepted firewalls, up-to-date anti-virus software, controlled access to the physical location of the hardware itself.

C. Employees and Sub-Contractor: Contractor will inform its employees and officers of the obligations under this Agreement, and all requirements and obligations of Contractor under this Agreement shall survive the expiration or earlier termination of this Agreement. Contractor shall not disclose Proprietary Data or Confidential Information to subcontractors unless such subcontractors are bound by non-disclosure and confidentiality provisions at least as strict as those contained in this Agreement.

D. Disclaimer: Notwithstanding any other provision of this Agreement, the City is furnishing Proprietary Data and Confidential Information on an "as is" basis, without any support whatsoever, and without representation, warranty or guarantee, including but not in any manner limited to, fitness, merchantability or the accuracy and completeness of the Proprietary Data or Confidential Information. Contractor is hereby advised to verify its work. The City assumes no liability for any errors or omissions herein. Specifically, the City is not responsible for any costs including, but not limited to, those incurred as a result of lost revenues, loss of use of data, the costs of recovering such programs or data, the cost of any substitute program, claims by third parties, or for similar costs. If discrepancies are found, Contractor agrees to contact the City immediately.

E. Contractor's Information: To the extent applicable in this Agreement, the City understands and agrees that the Contractor's Software and documentation including, but not limited to, source code, object code, the interface requirements document(s), acceptance test procedures, the Statement of Work, the software design, structure and organization, software screens, the user interface and the engineering know-how implemented in the software (collectively "Contractor Confidential Information") may constitute the valuable properties and trade secrets of Contractor, embodying substantial creative efforts which are secret, confidential, and not generally

known by the public, and which secure to Contractor a competitive advantage. The City agrees during the term of this Agreement and any license granted hereunder, (i) not disclose Contractor Confidential Information to any third party; (ii) not copy, reproduce, reverse engineer, de-compile or disassemble any Contractor Confidential Information; (iii) promptly notify Contractor upon discovery of any unauthorized use or disclosure of Contractor Confidential Information and take reasonable steps to regain possession of the Contractor Confidential Information and prevent further unauthorized actions or other breach of this agreement; and (iv) and thereafter, hold the Contractor Confidential Information including any copies thereof and any documentation related thereto, in strict confidence and to not permit any person or entity to obtain access to it except as required for the City's exercise of the license rights granted hereunder, and except as required by the parties understand that all the material provided or produced under this Agreement may be subject to the Colorado Open Records Act., § 24-72-201, et seq., C.R.S. In the event of a request to the City for disclosure of such information, the City shall advise Contractor of such request in order to give Contractor the opportunity to object to the disclosure of any of its Contractor Confidential Information and take necessary legal recourse. In the event of the filing of a lawsuit to compel such disclosure, the City will tender all such material to the court for judicial determination of the issue of disclosure and Contractor agrees to intervene in such lawsuit to protect and assert its claims of privilege against disclosure of such material or waive the same. Contractor further agrees to defend, indemnify and save and hold harmless the City, its officers, agents and employees, from any claim, damages, expense, loss or costs arising out of Contractor's intervention to protect and assert its claim of privilege against disclosure under this Article including but not limited to, prompt reimbursement to the City of all reasonable attorney fees, costs and damages that the City may incur directly or may be ordered to pay by such court. All Contractor Confidential Information remains the property of Contractor and will not be copied or reproduced without the express written permission of Contractor, except for copies that are necessary in order to fulfill this Agreement.

F. Proprietary Materials. City acknowledges that Contractor may use and/or provide City with access to Proprietary Materials and Derivative Proprietary Materials. The Proprietary Materials and the Derivative Proprietary Materials are the sole and exclusive property of Contractor and Contractor retains all right, title and interest in and to the Proprietary Materials and Derivative Proprietary Materials.

G. Preservation Of Contractor's Proprietary Rights: Contractor, the third party manufacturer of any Equipment, and the copyright owner of any Non-Contractor Software own and retain all of their respective Proprietary Rights in the Equipment and Software, and nothing in this Agreement is intended to restrict their Proprietary Rights. All intellectual property developed, originated, or prepared by Contractor in connection with providing to the City the Equipment, Software, or related services remain vested exclusively in Contractor, and this Agreement does not grant to the City any shared development rights of intellectual property. Except as explicitly provided in the Software License Agreement, Contractor does not grant to the City, either directly or by implication, estoppel, or otherwise, any right, title or interest in Contractor's Proprietary Rights. The City will not modify, disassemble, peel components, decompile, otherwise reverse engineer or attempt to reverse engineer, derive source code or create derivative works from, adapt, translate, merge with other software, reproduce, distribute, sublicense, sell or export the Software, or permit or encourage any third party to do so. The

preceding sentence does not apply to Open Source Software, which is governed by the standard license of the copyright owner.

27. LEGAL AUTHORITY: Contractor represents and warrants that it possesses the legal authority, pursuant to any proper, appropriate and official motion, resolution or action passed or taken, to enter into the Agreement. Each person signing and executing the Agreement on behalf of Contractor represents and warrants that he has been fully authorized by Contractor to execute the Agreement on behalf of Contractor and to validly and legally bind Contractor to all the terms, performances and provisions of the Agreement. The City shall have the right, in its sole discretion, to either temporarily suspend or permanently terminate the Agreement if there is a dispute as to the legal authority of either Contractor or the person signing the Agreement to enter into the Agreement.

28. NO CONSTRUCTION AGAINST DRAFTING PARTY: The parties and their respective counsel have had the opportunity to review the Agreement, and the Agreement will not be construed against any party merely because any provisions of the Agreement were prepared by a particular party.

29. ORDER OF PRECEDENCE: In the event of any conflicts between the language of the Agreement and the exhibits, the language of the Agreement controls.

30. SURVIVAL OF CERTAIN PROVISIONS: The terms of the Agreement and any exhibits and attachments that by reasonable implication contemplate continued performance, rights, or compliance beyond expiration or termination of the Agreement survive the Agreement and will continue to be enforceable. Without limiting the generality of this provision, the Contractor's obligations to provide insurance and to indemnify the City will survive for a period equal to any and all relevant statutes of limitation, plus the time necessary to fully resolve any claims, matters, or actions begun within that period.

31. INUREMENT: The rights and obligations of the parties herein set forth shall inure to the benefit of and be binding upon the parties hereto and their respective successors and assigns permitted under this Agreement.

32. TIME IS OF THE ESSENCE: The parties agree that in the performance of the terms, conditions, and requirements of this Agreement, time is of the essence.

33. FORCE MAJEURE: Neither party shall be responsible for failure to fulfill its obligations hereunder or liable for damages resulting from delay in performance as a result of war, fire, strike, riot or insurrection, natural disaster, unreasonable delay of carriers, governmental order or regulation, complete or partial shutdown of plant, unreasonable unavailability of equipment or software from suppliers, default of a subcontractor or vendor (if such default arises out of causes beyond their reasonable control), the actions or omissions of the other party or its officers, directors, employees, agents, vendors or elected officials and/or other substantially similar occurrences beyond the party's reasonable control ("Excusable Delay") herein. In the event of any such Excusable Delay, time for performance shall be extended for a period of time as may be reasonably necessary to compensate for such delay.

34. PARAGRAPH HEADINGS: The captions and headings set forth herein are for convenience of reference only, and shall not be construed so as to define or limit the terms and provisions hereof.

35. CITY EXECUTION OF AGREEMENT: This Agreement is expressly subject to and shall not be or become effective or binding on the City until it has been fully executed by all signatories of the City and County of Denver.

36. COUNTERPARTS OF THIS AGREEMENT: This Agreement may be executed in counterparts, each of which shall be deemed to be an original of this Agreement.

37. ELECTRONIC SIGNATURES AND ELECTRONIC RECORDS: Contractor consents to the use of electronic signatures by the City. The Agreement, and any other documents requiring a signature hereunder, may be signed electronically by the City in the manner specified by the City. The Parties agree not to deny the legal effect or enforceability of the Agreement solely because it is in electronic form or because an electronic record was used in its formation. The Parties agree not to object to the admissibility of the Agreement in the form of an electronic record, or a paper copy of an electronic document, or a paper copy of a document bearing an electronic signature, on the ground that it is an electronic record or electronic signature or that it is not in its original form or is not an original.

38. ADVERTISING AND PUBLIC DISCLOSURE: The Contractor shall not include any reference to the Agreement or to services performed pursuant to the Agreement in any of the Contractor's advertising or public relations materials without first obtaining the written approval of the Manager. Any oral presentation or written materials related to services performed under the Agreement will be limited to services that have been accepted by the City. The Contractor shall notify the Manager in advance of the date and time of any presentation. Nothing in this provision precludes the transmittal of any information to City officials.

39. PREVAILING WAGE REQUIREMENTS:

Contractor shall comply with, and agrees to be bound by, all requirements, conditions and City determinations regarding the Payment of Prevailing Wages Ordinance, Sections 20-76 through 20-79, D.R.M.C. including, but not limited to, the requirement that every covered worker working on a City owned or leased building or on City-owned land shall be paid no less than the prevailing wages and fringe benefits in effect on the date the bid or request for proposal was advertised. In the event a request for bids, or a request for proposal, was not advertised, Contractor shall pay every covered worker no less than the prevailing wages and fringe benefits in effect on the date funds for the contract were encumbered.
Date bid or request for qualifications/proposals was advertised March 7, 2017.
Prevailing wage and fringe rates will adjust on, and only on, the anniversary of the date the Contract was fully executed. Unless expressly provided for in this Agreement, Contractor will receive no additional compensation for increases in prevailing wages or fringe benefits.
Contractor shall provide the Auditor with a list of all subcontractors providing any services under the contract.

Contractor shall provide the Auditor with electronically-certified payroll records for all covered workers employed under the contract.
Contractor shall prominently post at the work site the current prevailing wage and fringe benefit rates. The posting must inform workers that any complaints regarding the payment of prevailing wages or fringe benefits may be submitted to the Denver Auditor by calling 720-913-5000 or emailing auditor@denvergov.org.
If Contractor fails to pay workers as required by the Prevailing Wage Ordinance, Contractor will not be paid until documentation of payment satisfactory to the Auditor has been provided. The City may, by written notice, suspend or terminate work if Contractor fails to pay required wages and fringe benefits.

40. LIMITATION OF LIABILITY:

Except for indemnification for third party claims, personal injury, death or damage to tangible property, Contractor's total liability, whether for breach of contract, warranty, negligence, strict liability in tort, or otherwise, will be limited to the direct damages recoverable under law, but not to exceed the total amount of this Agreement. With respect to annual Services such as maintenance and subscription Services, Contractor's total liability will be limited to the direct damages recoverable under law, but not to exceed the price of thirty-six (36) months of Services preceding the incident giving rise to the claim. ALTHOUGH THE PARTIES ACKNOWLEDGE THE POSSIBILITY OF SUCH LOSSES OR DAMAGES, THEY AGREE THAT Contractor WILL NOT BE LIABLE FOR ANY COMMERCIAL LOSS, INCONVENIENCE, LOSS OF USE, LOSS TIME, DATA, GOODWILL, REVENUES, PROFITS OR SAVINGS; OR OTHER SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES IN ANY WAY RELATED TO OR ARISING FROM THIS AGREEMENT, THE SALE OR USE OF THE EQUIPMENT OR SOFTWARE, OR THE PERFORMANCE OF SERVICES BY Contractor PURSUANT TO THIS AGREEMENT. This limitation of liability provision survives the expiration or termination of the Agreement and applies notwithstanding any contrary provision.

41. PERFORMANCE BOND AND PAYMENT BOND

A. The Contractor must procure and pay for a performance bond which, when executed by the Contractor and surety, shall be a guarantee for the faithful performance and completion of the System in strict accordance with the terms of the Agreement. The performance bond shall also be a guarantee for the repair or replacement of all System work found to be defective or otherwise unacceptable through final Acceptance and through any warranty and guarantee periods. This bond shall be in the amount of one hundred percent (100%) of the dollar value of the System. The Contractor shall utilize the Performance Bond Form set out as Exhibit G. Contractor agrees to require its bond surety to list the Financer, Banc of America Public Capital Corp as a co-obligee or list Banc of America Public Capital Corp as a co-obligee on a bond rider.

B. The Contractor must procure and pay for a payment bond which, when executed by the Contractor and surety, shall be a guarantee that all those performing labor or furnishing materials, supplies, rental items, tools, and equipment for the performance of the work

under the Contract shall be paid. This bond shall be in the amount of one hundred percent (100%) of the dollar value of the System, and it shall meet the requirements of CRS §38-26-101, et seq, as amended. The Contractor shall utilize the Payment Bond Form set out as Exhibit G.

SIGNATURE PAGE FOLLOWS

Contract Control Number:

IN WITNESS WHEREOF, the parties have set their hands and affixed their seals at Denver, Colorado as of

SEAL

CITY AND COUNTY OF DENVER

ATTEST:

By_____

_____

APPROVED AS TO FORM:

REGISTERED AND COUNTERSIGNED:

By_____

By_____

By_____

Contract Control Number:

By: _____

Name: _____
(please print)

Title: _____
(please print)

ATTEST: [if required]

By: _____

Name: _____
(please print)

Title: _____
(please print)

EXHIBIT A
MOTOROLA SOFTWARE LICENSE AGREEMENT

This Exhibit A Motorola Software License Agreement ("Agreement") is between Motorola Solutions, Inc., (“Motorola"), and the City and County of Denver (“Licensee”).

For good and valuable consideration, the parties agree as follows:

Section 1 DEFINITIONS

1.1 “Designated Products” means products provided by Motorola to Licensee with which or for which the Software and Documentation is licensed for use.

1.2 “Documentation” means product and software documentation that specifies technical and performance features and capabilities, and the user, operation and training manuals for the Software (including all physical or electronic media upon which such information is provided).

1.3 “Open Source Software” means software with either freely obtainable source code, license for modification, or permission for free distribution.

1.4 “Open Source Software License” means the terms or conditions under which the Open Source Software is licensed.

1.5 “Primary Agreement” means the agreement to which this exhibit is attached.

1.6 “Security Vulnerability” means a flaw or weakness in system security procedures, design, implementation, or internal controls that could be exercised (accidentally triggered or intentionally exploited) and result in a security breach such that data is compromised, manipulated or stolen or the system damaged.

1.7 “Software” (i) means proprietary software in object code format, and adaptations, translations, de-compilations, disassemblies, emulations, or derivative works of such software; (ii) means any modifications, enhancements, new versions and new releases of the software provided by Motorola; and (iii) may contain one or more items of software owned by a third party supplier. The term "Software" does not include any third party software provided under separate license or third party software not licensable under the terms of this Agreement.

Section 2 SCOPE

Motorola and Licensee enter into this Agreement in connection with Motorola's delivery of certain proprietary software or products containing embedded or pre-loaded proprietary software, or both. This Agreement contains the terms and conditions of the license Motorola is providing to Licensee, and Licensee’s use of the proprietary software and affiliated documentation.

Section 3 GRANT OF LICENSE

3.1. Subject to the provisions of this Agreement and the payment of applicable license fees, Motorola grants to Licensee a personal, limited, non-transferable (except as permitted in Section 7 and except as required by the Lease) and non-exclusive license under Motorola’s copyrights and Confidential Information (as defined in the Primary Agreement) embodied in the Software to use the Software, in

object code form, and the Documentation solely in connection with Licensee's use of the Designated Products. This Agreement does not grant any rights to source code.

3.2. If the Software licensed under this Agreement contains or is derived from Open Source Software, the terms and conditions governing the use of such Open Source Software are in the Open Source Software Licenses of the copyright owner and not this Agreement. If there is a conflict between the terms and conditions of this Agreement and the terms and conditions of the Open Source Software Licenses governing Licensee's use of the Open Source Software, the terms and conditions of the license grant of the applicable Open Source Software Licenses will take precedence over the license grants in this Agreement. If requested by Licensee, Motorola will use commercially reasonable efforts to: (i) determine whether any Open Source Software is provided under this Agreement; and (ii) identify the Open Source Software and provide Licensee a copy of the applicable Open Source Software License (or specify where that license may be found).

Section 4 LIMITATIONS ON USE

4.1. Licensee may use the Software only for Licensee's public safety purposes and only in accordance with the Documentation. Any commercial use of the Software is strictly prohibited. Without limiting the general nature of these restrictions, Licensee will not make the Software available for use by third parties on a "time sharing," "application service provider," or "service bureau" basis or for any other similar commercial rental or sharing arrangement unless generally accepted as part of the P25 Radio replacement.

4.2. Licensee will not, and will not allow or enable any third party to: (i) reverse engineer, disassemble, peel components, decompile, reprogram or otherwise reduce the Software or any portion to a human perceptible form or otherwise attempt to recreate the source code; (ii) modify, adapt, create derivative works of, or merge the Software; (iii) copy, reproduce, distribute, lend, or lease the Software or Documentation to any third party, grant any sublicense or other rights in the Software or Documentation to any third party, or take any action that would cause the Software or Documentation to be placed in the public domain; (iv) remove, or in any way alter or obscure, any copyright notice or other notice of Motorola's proprietary rights; (v) provide, copy, transmit, disclose, divulge or make the Software or Documentation available to, or permit the use of the Software by any third party or on any machine except as expressly authorized by this Agreement; or (vi) use, or permit the use of, the Software in a manner that would result in the production of a copy of the Software solely by activating a machine containing the Software. Licensee may make one copy of Software to be used solely for archival, back-up, or disaster recovery purposes; *provided* that Licensee may not operate that copy of the Software at the same time as the original Software is being operated. Licensee may make as many copies of the Documentation as it may reasonably require for the internal use of the Software.

4.3. Unless otherwise authorized by Motorola in writing, Licensee will not, and will not enable or allow any third party to: (i) install a licensed copy of the Software on more than one unit of a Designated Product; or (ii) copy onto or transfer Software installed in one unit of a Designated Product onto one other device. Licensee may temporarily transfer Software installed on a Designated Product to another device if the Designated Product is inoperable or malfunctioning, if Licensee provides written notice to Motorola of the temporary transfer and identifies the device on which the Software is transferred. Temporary transfer of the Software to another device must be discontinued when the original Designated Product is returned to operation and the Software must be removed from the other device. Licensee must provide prompt written notice to Motorola at the time temporary transfer is discontinued.

4.4. Licensee will maintain, during the term of this Agreement accurate records relating to this license grant to verify compliance with this Agreement. Motorola or an independent third party ("Auditor") may inspect Licensee's premises, books and records, upon reasonable prior notice to Licensee, during

Licensee's normal business hours and subject to Licensee's facility and security regulations. Motorola is responsible for the payment of all expenses and costs of the Auditor. Any information obtained by Motorola and the Auditor will be kept in strict confidence by Motorola and the Auditor and used solely for the purpose of verifying Licensee's compliance with the terms of this Agreement.

Section 5 OWNERSHIP AND TITLE

Motorola, its licensors, and its suppliers retain all of their proprietary rights in any form in and to the Software and Documentation, including, but not limited to, all rights in patents, patent applications, inventions, copyrights, trademarks, trade secrets, trade names, and other proprietary rights in or relating to the Software and Documentation (including any corrections, bug fixes, enhancements, updates, modifications, adaptations, translations, de-compilations, disassemblies, emulations to or derivative works from the Software or Documentation, whether made by Motorola or another party, or any improvements that result from Motorola's processes or, provision of information services). No rights are granted to Licensee under this Agreement by implication, estoppel or otherwise, except for those rights which are expressly granted to Licensee in this Agreement. All intellectual property developed, originated, or prepared by Motorola in connection with providing the Software, Designated Products, Documentation or related services, remains vested exclusively in Motorola, and Licensee will not have any shared development or other intellectual property rights.

Section 6 LIMITED WARRANTY; DISCLAIMER OF WARRANTY

6.1. The commencement date and the term of the Software warranty will be a period of ninety (90) days from Motorola's shipment of the Software (the "Warranty Period"). If Licensee is not in breach of any of its obligations under this Agreement, Motorola warrants that the unmodified Software, when used properly and in accordance with the Documentation and this Agreement, will be free from a reproducible defect that eliminates the functionality or successful operation of a feature critical to the primary functionality or successful operation of the Software. Whether a defect occurs will be determined by Motorola solely with reference to the Documentation. Motorola does not warrant that Licensee's use of the Software or the Designated Products will be uninterrupted, error-free, completely free of Security Vulnerabilities, or that the Software or the Designated Products will meet Licensee's particular requirements. Motorola makes no representations or warranties with respect to any third party software included in the Software. Notwithstanding, any warranty provided by a copyright owner in its standard license terms will flow through to Licensee for third party software provided by Motorola.

6.2 Motorola's sole obligation to Licensee and Licensee's exclusive remedy under this warranty is to use reasonable efforts to remedy any material Software defect covered by this warranty. A Software defect is material if it eliminates the functionality or the successful operation of the System. These efforts will involve either replacing the media or attempting to correct significant, demonstrable program or documentation errors or Security Vulnerabilities. If Motorola cannot correct the defect within a reasonable time, then at Motorola's option, Motorola will replace the defective Software with functionally-equivalent Software, license to Licensee substitute Software which will accomplish the same objective, or terminate the license and refund the Licensee's paid license fee and costs for all negatively impacted hardware and Equipment where functionality has been measurably diminished.

6.3. Warranty claims are described in the Primary Agreement.

6.4. The express warranties set forth in this Section 6 are in lieu of, and Motorola disclaims, any and all other warranties (express or implied, oral or written) with respect to the Software or Documentation, including, without limitation, any and all implied warranties of condition, title, non-infringement, merchantability, or fitness for a particular purpose or use by Licensee (whether or not Motorola knows,

has reason to know, has been advised, or is otherwise aware of any such purpose or use), whether arising by law, by reason of custom or usage of trade, or by course of dealing. In addition, Motorola disclaims any warranty to any person other than Licensee with respect to the Software or Documentation.

Section 7 TRANSFERS

Except as required by the Lease or Financer, Licensee will not transfer the Software or Documentation to any third party without Motorola's prior written consent. Motorola's consent may be withheld at its discretion and may be conditioned upon transferee paying all applicable license fees and agreeing to be bound by this Agreement. If the Designated Products are Motorola's radio products and Licensee transfers ownership of the Motorola radio products to a third party, Licensee may assign its right to use the Software (other than CPS and Motorola's FLASHport® software) which is embedded in or furnished for use with the radio products and the related Documentation; *provided* that Licensee transfers all copies of the Software and Documentation to the transferee, and Licensee and the transferee sign a transfer form to be provided by Motorola upon request, obligating the transferee to be bound by this Agreement.

Section 8 TERM AND TERMINATION

8.1 Licensee's right to use the Software and Documentation will begin when the Primary Agreement is signed by both parties and will continue for the life of the Designated Products with which or for which the Software and Documentation have been provided by Motorola, unless Licensee materially breaches this Agreement, in which case this Agreement and Licensee's right to use the Software and Documentation may be terminated immediately upon notice by Motorola if the breach involves an unauthorized use of the Software in a manner that would expose the Software to misappropriation, or for other breaches, 30 days after written notice of an alleged breach and a reasonable opportunity to cure the alleged breach.

8.2 Within thirty (30) days after termination of this Agreement, Licensee must certify in writing to Motorola that all copies of the Software have been removed or deleted from the Designated Products and that all copies of the Software and Documentation have been returned to Motorola or destroyed by Licensee and are no longer in use by Licensee.

8.3 Licensee acknowledges that Motorola made a considerable investment of resources in the development, marketing, and distribution of the Software and Documentation and that Licensee's breach of this Agreement will result in irreparable harm to Motorola for which monetary damages would be inadequate. If Licensee breaches this Agreement, Motorola may terminate this Agreement and be entitled to all available remedies at law or in equity (including immediate injunctive relief and repossession of all non-embedded Software and associated Documentation unless Licensee is a Federal agency of the United States Government).

Section 9 INTENTIONALLY DELETED

Section 10 CONFIDENTIALITY

Licensee acknowledges that the Software and Documentation contain Motorola's valuable proprietary and Confidential Information and are Motorola's trade secrets, and that the provisions in the Primary Agreement concerning Confidential Information apply.

Section 11 LIMITATION OF LIABILITY

The Limitation of Liability provision is described in the Primary Agreement.

Section 12 NOTICES

Notices are described in the Primary Agreement.

Section 13 GENERAL

13.1. COPYRIGHT NOTICES. The existence of a copyright notice on the Software will not be construed as an admission or presumption of publication of the Software or public disclosure of any trade secrets associated with the Software.

13.2. COMPLIANCE WITH LAWS. Licensee acknowledges that the Software is subject to the laws and regulations of the United States and Licensee will comply with all applicable laws and regulations, including export laws and regulations of the United States. Licensee will not, without the prior authorization of Motorola and the appropriate governmental authority of the United States, in any form export or re-export, sell or resell, ship or reship, or divert, through direct or indirect means, any item or technical data or direct or indirect products sold or otherwise furnished to any person within any territory for which the United States Government or any of its agencies at the time of the action, requires an export license or other governmental approval. Violation of this provision is a material breach of this Agreement.

13.3. ASSIGNMENTS AND SUBCONTRACTING. Motorola may assign its rights or subcontract its obligations under this Agreement, or encumber or sell its rights in any Software, without prior notice to or consent of Licensee.

13.4. GOVERNING LAW. This Agreement is governed by the laws of the United States to the extent that they apply and otherwise by the internal substantive laws of the State to which the Software is shipped if Licensee is a sovereign government entity, or the internal substantive laws of the State of Illinois if Licensee is not a sovereign government entity. The terms of the U.N. Convention on Contracts for the International Sale of Goods do not apply. In the event that the Uniform Computer Information Transaction Act, any version of this Act, or a substantially similar law (collectively "UCITA") becomes applicable to a party's performance under this Agreement, UCITA does not govern any aspect of this Agreement or any license granted under this Agreement, or any of the parties' rights or obligations under this Agreement. The governing law will be that in effect prior to the applicability of UCITA.

13.5. THIRD PARTY BENEFICIARIES. This Agreement is entered into solely for the benefit of Motorola and Licensee. No third party has the right to make any claim or assert any right under this Agreement, and no third party is deemed a beneficiary of this Agreement. Notwithstanding the foregoing, any licensor or supplier of third party software included in the Software will be a direct and intended third party beneficiary of this Agreement.

13.6. SURVIVAL. Sections 4, 5, 6.3, 7, 8, 9, 10, 11 and 13 survive the termination of this Agreement.

13.7. ORDER OF PRECEDENCE. In the event of inconsistencies between this Exhibit and the Primary Agreement, the parties agree that this Exhibit prevails, only with respect to the specific subject matter of this Exhibit, and not the Primary Agreement or any other exhibit as it applies to any other subject matter.

13.8 SECURITY. Motorola uses reasonable means in the design and writing of its own Software and the acquisition of third party Software to limit Security Vulnerabilities. While no software can be

guaranteed to be free from Security Vulnerabilities, if a Security Vulnerability is discovered, Motorola will take the steps set forth in Section 6 of this Agreement.

CITY AND COUNTY OF DENVER

PRICING SUMMARY & PAYMENT MILESTONES

P25 PUBLIC SAFETY RADIO SYSTEM REPLACEMENT PROJECT NOVEMBER 30, 2017

MOTOROLA SOLUTIONS

The tables below show the agreed up pricing of equipment and services that are being purchased at executions of this contract.

TOTAL PRICE SUMMARY	
System Equipment (Table B.2)	**Discounted Price**
System Control Equipment, Software, and Licensing	$ 1,027,571
Voice Logging Recorder Equipment, Software, and Licensing	$ 118,013
Dispatch Console Equipment, Software, and Licensing	$ 1,898,327
Network Monitoring and Fault Management Equipment, Software, and Licensing	$ 54,971
Radio System Equipment, Software, and Licensing	$ 3,872,261
Antenna Systems	$ 174,873
Networking Equipment, Software, and Licensing	$ 221,039
Site Infrastructure	$ 66,442
Microwave Equipment, Software, and Licensing	$ 481,734
Spares and Test Equipment (Table B.3)	$ 281,179
TOTAL EQUIPMENT PRICE	**$ 8,196,411**
Implementation Services (Table B.4)	
System Equipment Services	$ 1,219,381
System Engineering Services	$ 546,323
Site Development Services	$ 1,017,832
Project Management	$ 353,327
System Training	$ 255,278
Performance Bond	N/A
Other - specify	N/A
TOTAL SERVICES PRICE	**$ 3,392,140**
BASE SYSTEM PROPOSAL PRICE	**$ 11,588,551**
System Discount	$ (2,177,500)
Competitor P25 Equipment Trade-In Credit	$ (2,500,000)
BAFO Discount- Dual Diversity Receive Solution	$ (126,548)
DISCOUNTED SYSTEM PROPOSAL PRICE	**$ 6,784,503**

SYSTEM OPTIONS			
Mount Morisson - RX Only Site Add, Assumes 17 Simulcast Ch's	1	$ 419,228.00	$ 419,228
Simulcast Channel Increase- Max 5	4	$ 248,925.00	$ 995,700
Mount Morisson - Site Decommissioning	1	$ 47,485.00	$ 47,485
Loretto Heights Decommissioning	1	$ 46,587.60	$ 46,588
Console Position- Patch Console Add- located at EEB NOC	1	$ 53,292.93	$ 53,293
Antenna System Spares	1	$ 38,902.00	$ 38,902
Advanced Power Monitors	5	$ 4,326.00	$ 21,630

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KVL 4000	2	$ 3,309.00	$ 6,618
Test Equipment- de-scoped	1	$ (147,630.40)	$ (147,630)
DFD Station 2- Tower Removal	1	$ 12,500.00	$ 12,500
WAVE- BROADBAND ACCESS - 290 Mobile, 25 Channels & 1 Desktop User Licenses	1	$ 250,000.00	$ 250,000
Dispatch Console- PTT Easy Button	1	$ 7,203.00	$ 7,203
DFD Station 2- Ice Bridge	1	$ 5,318.00	$ 5,318
APX Subscriber Service Equipment	1	$ 3,575.07	$ 3,575
Additional NM Licenses (2 - Provisioning Mgr, 1 - UEM, 1- Radi Control Manager)	1	$ 33,750.00	$ 33,750
10 Additional MCC7500 Console positions at 950 Josephine	1	$ 540,430.00	$ 540,430
SYSTEM FEATURE LICENSES			
Add: Link Layer Authentication	0	$ 12,300.00	$ -
Add: Geo-Location / GPS- upto 4000 Radios	0	$ 233,280.00	$ -
Add: Short Messaging- upto 4000 Radios	0	$ 466,560.00	$ -
Add: Over-The-Air-Rekeying - upto 64,000 Radios	1	$ 232,306.35	$ 232,306
Add: Over-The-Air-Reprogramming- upto 4000 Radios	0	$ 83,700.00	$ -
Add: Subscriber Codeplug Management (per 3.11.2.J and 3.11.2.K)- up to 4000 Radios	1	$ 227,837.00	$ 227,837
MOBILE RADIOS			
High-Tier Mobile w/ Trade-in	0	$ 2,479.92	$ -
Mid-Tier Mobile w/ Trade-in	0	$ 2,399.50	$ -
Mid-Tier Motorcycle Mobile w/ Trade-in	35	$ 2,684.60	$ 93,961
Mid-Tier Fire Service Mobile w/ Trade-in	0	$ 2,415.32	$ -
Low-Tier Mobile	905	$ 1,946.46	$ 1,761,546
Add to Mobiles: Link Layer Authentication	0	$ 65.00	$ -
Add to Mobiles: Over-The-Air-Rekeying	940	$ 481.00	$ 452,140
Add to Mobiles: Over-The-Air-Reprogramming	0	$ 65.00	$ -
Add to Mobiles: GPS Antenna	0	$ 56.25	$ -
Remote Mount- Installation	905	$ 202.80	$ 183,534
Dash Mount- Installation	0	$ 206.70	$ -
Programming- Mobile	900	$ 47.45	$ 42,705
PORTABLE RADIOS			
High-Tier Portables w/ Trade-in	160	$ 2,421.10	$ 387,376
High-Tier Fire Service Portables w/ Trade-in	115	$ 2,701.60	$ 310,684
Mid-Tier Portables w/ Trade-in	0	$ 2,275.24	$ -
Low-Tier Portables w/ Trade-in	0	$ 1,791.42	$ -
Add to Portables: Link Layer Authentication	0	$ 65.00	$ -
Add to Portables: Over-The-Air-Rekeying	275	$ 481.00	$ 132,275
Add to Portables: Over-The-Air-Reprogramming	0	$ 65.00	$ -

Add to Portables: WiFI- (Mid & High Tier Only)	0	$ 195.00	$ -
Add to Portables: Replace Standard Battery with High Capacity- Non Fire Radios	160	$ 70.00	$ 11,200
Add to Portables: Secondary Battery- High Capacity- Non Fire Radios	160	$ 113.40	$ 18,144
Add to Portables: Secondary Battery- Fire Radios	115	$ 108.50	$ 12,478
Add to Portables: Vehicular Charger	0	$ 300.30	$ -
Add to Portables: Single-Unit Charger	275	$ 105.00	$ 28,875
Add to Portables: Multi-Unit Charger (6 radios min)	0	$ 346.50	$ -
Add to Portables: Speaker Mic with Audio Jack- RSM	160	$ 74.90	$ 11,984
Add to Portables: Fire Service Speaker Mic - XE RSM	115	$ 385.00	$ 44,275
Programming-Portable	275	$ 47.45	$ 13,049
SUBSCRIBER RADIO MISC.			
Mobile Repeaters	16	$ 9,017.25	$ 144,276
Programming Non MSI Subscriber	4000	$ 47.45	$ 189,800
Programming Cables- Set of 12	2	$ 585.00	$ 1,170
Flash Upgrades- Existing 4 APX Radios	2	$ 1,055.28	$ 2,111
SUPPORT SERVICES			
Technical Support- Include in Base Contract, support to Post Warranty Year- Enter 2-15	2		$ 56,948
Software Support & Upgrades- Include in Base Contract, support to Post Warranty Year- Enter 5 or 10	0		$ -
Extended Warranty- Network Monitoring- Enter 2-15	0		$ -
Extended Warranty- Dispatch Service- Enter 2-15	0		$ -
Extended Warranty- Infrastructure Repair- Enter 2-15	0		$ -
Extended Warranty- Security Update Service- Enter 2-15	2		$ 88,247
BASE CONTRACT SYSTEM TOTAL			**$ 13,566,012**
End of Year 2017 Contract -Technology Credit Equipment Incentive, not to exceed 700K		*$ 700,000.00*	$ -
End of year 2017 Contract -GPS & OTAP Features enabled on initial subscribers purchased with system- Incentive, not to exceed $550k		*$ 550,000.00*	$ -
Additional Incentive			$ (14,998.00)
TOTAL BASE CONTRACT VALUE- 2017 Contract- w/ Tech Credits offer			**$ 13,551,014**

* Technology credits must be used on Initial System Sale Contract, cannot be applied for future purchases

* 2017 Contract Incentives available only after both a Signed contract for Base Project by 12/28/2017, and FY17/18 Subscriber Refresh PO issued by 1/25/2018

*** Subscriber Refresh- Expected Contract Total- January 2018** = $ 3,202,730

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Payment Milestones

1. 10% of the Contract Price upon contract execution.
2. 35% of the Contract Price upon delivery of infrastructure equipment.
3. 25% of the Contract Price upon delivery of subscriber equipment.
4. 5% of the Contract Price upon completion of installation of infrastructure equipment.
5. 5% of the Contract Price upon completion of installation of subscribers.
6. 5% of the Contract Price upon beneficial use of system.
7. 15% of the Contract Price upon final system acceptance.

TABLE B.1 - TOTAL PRICE SUMMARY		
System Equipment (Table B.2)	**Discounted Price**	
System Control Equipment, Software, and Licensing	$	1,027,571
Voice Logging Recorder Equipment, Software, and Licensing	$	118,013
Dispatch Console Equipment, Software, and Licensing	$	1,898,327
Network Monitoring and Fault Management Equipment, Software, and Licensing	$	54,971
Radio System Equipment, Software, and Licensing	$	3,872,261
Antenna Systems	$	174,873
Networking Equipment, Software, and Licensing	$	221,039
Site Infrastructure	$	66,442
Microwave Equipment, Software, and Licensing	$	481,734
Spares and Test Equipment (Table B.3)	$	281,179
TOTAL EQUIPMENT PRICE	**$**	**8,196,411**
Implementation Services (Table B.4)		
System Equipment Services	$	1,219,381
System Engineering Services	$	546,323
Site Development Services	$	1,017,832
Project Management	$	353,327
System Training	$	255,278
Performance Bond		N/A
Other - specify		N/A
TOTAL SERVICES PRICE	**$**	**3,392,140**
BASE SYSTEM PROPOSAL PRICE	**$**	**11,588,551**
System Discount	$	(2,177,500)
Competitor P25 Equipment Trade-In Credit	$	(2,500,000)
BAFO Discount- Dual Diversity Receive Solution	$	(126,548)
DISCOUNTED SYSTEM PROPOSAL PRICE	**$**	**6,784,503**
Subscriber Technology Credit- Applicable toward Optional Radio Features listed under Table B.11.B, Incentive offered with:		

2500+ subscriber radios + bundled software and support package included with system contract = Subscriber Technology Credit valued at **$500,000**

4500+ subscriber radios + bundled software and support package included with system contract = Subscriber Technology Credit valued at **$850,000**

TABLE B.2 - SYSTEM INFRASTRUCTURE PRICES						
	ALL SITES TOTAL	Site --->	1	JOSEPHINE		
Site Description --->				Primary Master, Simulcast Prime, Dispatch- 22 Ops		
Subsystem Category	Equipment Discounted	Unit Price	Qty	Extended Price	Discount %	Discounted Price
Network Monitoring and Fault Management Equipment, Software, and Licensing						
RF SITE SDM3000	$ 20,960	$ -		$ -	0%	$ -
NM CLIENTS (Includes a Server at Master Site)	$ 34,011	$ 31,101.00	1	$ 31,101.00	22%	$ 24,295.80
	$ -	$ -		$ -	0%	$ -
SUBTOTAL	**$ 54,971**					**$ 24,295.80**
Radio System Equipment, Software and Licensing						
GTR8000 ESS	$ 2,765,228	$ -		$ -	0%	$ -
REMOTE SITE GPS	$ 12,910	$ -		$ -	0%	$ -
SURGE PROTECTOR	$ 1,460	$ -		$ -	0%	$ -
RACK	$ 1,504	$ -		$ -	0%	$ -
DC SYSTEM	$ 238,704	$ -		$ -	0%	$ -
GCM8000 SIMULCAST COMPARATOR	$ 646,275	$ 33,142.31	13	$ 430,850.00	25%	$ 323,137.50
GCP8000 SIMULCAST CONTROLLER	$ 153,113	$ 68,050.00	2	$ 136,100.00	25%	$ 102,075.00
SIMULCAST FREQUENCY REFERENCE TRAK9100	$ 53,068	$ 33,167.50	1	$ 33,167.50	20%	$ 26,534.00
	$ -	$ -		$ -	0%	$ -
SUBTOTAL	**$ 3,872,261**					**$ 451,746.50**
Antenna Systems						
ANTENNAS AND LINES	$ 76,392	$ -		$ -	0%	$ -
TOWER TOP AMP	$ 60,168	$ -		$ -	0%	$ -
DUAL DIVERSITY RECEIVE ANTENNA SYSTEM	$ 38,313	$ -		$ -	0%	$ -
SUBTOTAL	**$ 174,873**					**$ -**
Networking Equipment, Software, and Licensing						
SIMULCAST LAN SWITCHES/ROUTERS	$ 21,375	$ 7,125.00	2	$ 14,250.00	25%	$ 10,687.50
PDU/SURGE PROTECTION	$ 11,080	$ 6,925.00	1	$ 6,925.00	20%	$ 5,540.00
CABINETS	$ 4,797	$ 2,998.00	1	$ 2,998.00	20%	$ 2,398.40
CORE LAN SWITCHES/ROUTERS	$ 120,263	$ 85,500.00	1	$ 85,500.00	25%	$ 64,125.00
DISPATCH LAN SWITCHES/ROUTERS	$ 63,525	$ 23,000.00	1	$ 23,000.00	25%	$ 17,250.00
	$ -	$ -		$ -	0%	$ -
SUBTOTAL	**$ 221,039**					**$ 100,000.90**
Site Infrastructure						
TOWER- DFD Stn 2	$ 20,400	$ -		$ -	0%	$ -
HVAC for Broadway and DFD Stn 2	$ 46,042	$ -		$ -	0%	$ -
	$ -	$ -		$ -	0%	$ -
SUBTOTAL	**$ 66,442**					**$ -**
Microwave Equipment, Software, and Licensing						
MICROWAVE EQUIPMENT,SOFTWARE, & LICENSING	$ 481,734	$ 141,672.00	1	$ 141,672.00	20%	$ 113,337.60
	$ -	$ -		$ -	0%	$ -
SUBTOTAL	**$ 481,734**					**$ 113,337.60**
SUBTOTAL EQUIPMENT PRICE	**$ 4,871,321**					**$ 689,380.80**
System Control Equipment, Software, and Licensing						
CORE EQUIPMENT & SOFTWARE	$ 1,024,262	$ 1,258,325.50	1	$ 1,258,325.50	25%	$ 945,654.69
KVL 4000	$ 3,309	$ 3,676.50	1	$ 3,676.50	10%	$ 3,308.85
ISSI 8000	Included at no Cost	Included at no Cost	5	Included at no Cost	0%	Included at no Cost
	$ -	$ -		$ -	0%	$ -

TABLE B.2 - SYSTEM INFRASTRUCTURE PRICES						
	ALL SITES TOTAL	Site --->	1	JOSEPHINE		
Site Description --->				Primary Master, Simulcast Prime, Dispatch- 22 Ops		
Subsystem Category	Equipment Discounted	Unit Price	Qty	Extended Price	Discount %	Discounted Price
SUBTOTAL	$ 1,027,571					$ 948,963.54
Voice Logging Recorder Equipment, Software, and Licensing						
ARCHIVING INTERFACE SERVER (AIS)	$ 52,709	$ 34,895.00	1	$ 34,895.00	24%	$ 26,354.50
VERINT TRUNKING UPGRADE	$ 65,304	$ 87,050.00	1	$ 87,050.00	25%	$ 65,304.00
	$ -	$ -		$ -	0%	$ -
SUBTOTAL	$ 118,013					$ 91,658.50
Dispatch Console Equipment, Software, and Licensing						
MCC7500 DISPATCH CONSOLE EQUIPMENT, SOFTWARE, AND LICENSING	$ 1,898,327	$ 52,527.90	22	$ 1,155,614.00	24%	$ 873,459.96
	$ -				0%	$ -
SUBTOTAL	$ 1,898,327					$ 873,459.96
TOTAL EQUIPMENT PRICE	$ 7,915,232					$ 1,914,082.00

TABLE B.2 - SYSTEM INFRASTRUCTURE PRICES										
	Site --->	2	CCD PRIMARY DISPATCH			Site --->	3	1670 BROADWAY		
Site Description --->			Backup DSR Master, GEO- Prime, Dispatch-26 Ops					SIMULCAST REMOTE SITE 1		
Subsystem Category	**Unit Price**	**Qty**	**Extended Price**	**Discount %**	**Discounted Price**	**Unit Price**	**Qty**	**Extended Price**	**Discount %**	**Discounted Price**
Network Monitoring and Fault Management Equipment, Software, and Licensing										
RF SITE SDM3000	$ -		$ -	0%	$ -	$ 5,240.00	1	$ 5,240.00	20%	$ 4,192.00
NM CLIENTS (Includes a Server at Master Site)	$ 12,509.00	1	$ 12,509.00	22%	$ 9,714.70	$ -		$ -	0%	$ -
	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SUBTOTAL					**$ 9,714.70**					**$ 4,192.00**
Radio System Equipment, Software and Licensing										
GTR8000 ESS	$ -		$ -	0%	$ -	$ 799,485.00	1	$ 799,485.00	25%	$ 599,613.75
REMOTE SITE GPS	$ -		$ -	0%	$ -	$ 3,586.00	1	$ 3,586.00	10%	$ 3,227.60
SURGE PROTECTOR	$ -		$ -	0%	$ -	$ 365.00	1	$ 365.00	20%	$ 292.00
RACK	$ -		$ -	0%	$ -	$ 470.00	1	$ 470.00	20%	$ 376.00
DC SYSTEM	$ -		$ -	0%	$ -	$ 59,676.00	1	$ 59,676.00	20%	$ 47,740.80
GCM8000 SIMULCAST COMPARATOR	$ 33,142.31	13	$ 430,850.00	25%	$ 323,137.50	$ -		$ -	0%	$ -
GCP8000 SIMULCAST CONTROLLER	$ 68,050.00	1	$ 68,050.00	25%	$ 51,037.50	$ -		$ -	0%	$ -
SIMULCAST FREQUENCY REFERENCE TRAK9100	$ 33,167.50	1	$ 33,167.50	20%	$ 26,534.00	$ -		$ -	0%	$ -
	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SUBTOTAL					**$ 400,709.00**					**$ 651,250.15**
Antenna Systems										
ANTENNAS AND LINES	$ -		$ -	0%	$ -	$ 26,673.50	1	$ 17,619.75	20%	$ 14,095.80
TOWER TOP AMP	$ -		$ -	0%	$ -	$ 15,042.00	1	$ 15,042.00	20%	$ 12,033.60
DUAL DIVERSITY RECEIVE ANTENNA SYSTEM	$ -		$ -	0%	$ -	$ 8,747.00	1	$ 8,747.00	20%	$ 6,997.60
SUBTOTAL					**$ -**					**$ 33,127.00**
Networking Equipment, Software, and Licensing										
SIMULCAST LAN SWITCHES/ROUTERS	$ 7,125.00	2	$ 14,250.00	25%	$ 10,687.50	$ -		$ -	0%	$ -
PDU/SURGE PROTECTION	$ 6,925.00	1	$ 6,925.00	20%	$ 5,540.00	$ -		$ -	0%	$ -
CABINETS	$ 2,998.00	1	$ 2,998.00	20%	$ 2,398.40	$ -		$ -	0%	$ -
CORE LAN SWITCHES/ROUTERS	$ 74,850.00	1	$ 74,850.00	25%	$ 56,137.50	$ -		$ -	0%	$ -
DISPATCH LAN SWITCHES/ROUTERS	$ 61,700.00	1	$ 61,700.00	25%	$ 46,275.00	$ -		$ -	0%	$ -
	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SUBTOTAL					**$ 121,038.00**					**$ -**
Site Infrastructure										
TOWER- DFD Stn 2	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
HVAC for Broadway and DFD Stn 2	$ -		$ -	0%	$ -	$ 23,021.00	1	$ 23,021.00	0%	$ 23,021.00
	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SUBTOTAL					**$ -**					**$ 23,021.00**
Microwave Equipment, Software, and Licensing										
MICROWAVE EQUIPMENT,SOFTWARE, & LICENSING	$ 84,960.00	1	$ 84,960.00	20%	$ 67,968.00	$ 80,782.00	1	$ 80,782.00	20%	$ 64,625.60
	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SUBTOTAL					**$ 67,968.00**					**$ 64,625.60**
SUBTOTAL EQUIPMENT PRICE					**$ 524,224.60**					**$ 773,499.75**
System Control Equipment, Software, and Licensing										
CORE EQUIPMENT & SOFTWARE	$ 103,998.00	1	$ 103,998.50	24%	$ 78,607.30					
KVL 4000	$ -		$ -	0%	$ -					
ISSI 8000	$ -		$ -	0%	$ -					
	$ -		$ -	0%	$ -					

TABLE B.2 - SYSTEM INFRASTRUCTURE PRICES										
	Site --->	2	CCD PRIMARY DISPATCH			Site --->	3	1670 BROADWAY		
Site Description --->			Backup DSR Master, GEO- Prime, Dispatch-26 Ops					SIMULCAST REMOTE SITE 1		
Subsystem Category	**Unit Price**	**Qty**	**Extended Price**	**Discount %**	**Discounted Price**	**Unit Price**	**Qty**	**Extended Price**	**Discount %**	**Discounted Price**
SUBTOTAL					**$ 78,607.30**					
Voice Logging Recorder Equipment, Software, and Licensing										
ARCHIVING INTERFACE SERVER (AIS)	$ 34,895.00	1	$ 34,895.00	24%	$ 26,354.50					
VERINT TRUNKING UPGRADE	$ -		$ -	0%	$ -					
	$ -		$ -	0%	$ -					
SUBTOTAL					**$ 26,354.50**					
Dispatch Console Equipment, Software, and Licensing										
MCC7500 DISPATCH CONSOLE EQUIPMENT, SOFTWARE, AND LICENSING	$ 52,226.85	26	$ 1,357,893.00	25%	$ 1,024,867.48					
SUBTOTAL					**$ 1,024,867.48**					
TOTAL EQUIPMENT PRICE					**$ 1,129,829.00**					

TABLE B.2 - SYSTEM INFRASTRUCTURE PRICES										
	Site --->	4	DENVER HOUSING AUTHORITY (DHA)			Site --->	5	DENVER FIRE STATION #2 (DFD2)		
Site Description --->			SIMULCAST REMOTE SITE 2					SIMULCAST REMOTE SITE 3		
Subsystem Category	**Unit Price**	**Qty**	**Extended Price**	**Discount %**	**Discounted Price**	**Unit Price**	**Qty**	**Extended Price**	**Discount %**	**Discounted Price**
Network Monitoring and Fault Management Equipment, Software, and Licensing										
RF SITE SDM3000	$ 5,240.00	1	$ 5,240.00	20%	$ 4,192.00	$ 5,240.00	1	$ 5,240.00	20%	$ 4,192.00
NM CLIENTS (Includes a Server at Master Site)	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SUBTOTAL					**$ 4,192.00**					**$ 4,192.00**
Radio System Equipment, Software and Licensing										
GTR8000 ESS	$ 799,485.00	1	$ 799,485.00	25%	$ 599,613.75	$ 799,485.00	1	$ 799,485.00	25%	$ 599,613.75
REMOTE SITE GPS	$ 3,586.00	1	$ 3,586.00	10%	$ 3,227.60	$ 3,586.00	1	$ 3,586.00	10%	$ 3,227.60
SURGE PROTECTOR	$ 365.00	1	$ 365.00	20%	$ 292.00	$ 365.00	1	$ 365.00	20%	$ 292.00
RACK	$ 470.00	1	$ 470.00	20%	$ 376.00	$ 470.00	1	$ 470.00	20%	$ 376.00
DC SYSTEM	$ 59,676.00	1	$ 59,676.00	20%	$ 47,740.80	$ 59,676.00	1	$ 59,676.00	20%	$ 47,740.80
GCM8000 SIMULCAST COMPARATOR	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
GCP8000 SIMULCAST CONTROLLER	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SIMULCAST FREQUENCY REFERENCE TRAK9100	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SUBTOTAL					**$ 651,250.15**					**$ 651,250.15**
Antenna Systems										
ANTENNAS AND LINES	$ 30,012.25	1	$ 20,958.25	20%	$ 16,766.60	$ 30,442.75	1	$ 21,388.75	20%	$ 17,111.00
TOWER TOP AMP	$ 15,042.00	1	$ 15,042.00	20%	$ 12,033.60	$ 15,042.00	1	$ 15,042.00	20%	$ 12,033.60
DUAL DIVERSITY RECEIVE ANTENNA SYSTEM	$ 9,716.00	1	$ 9,716.00	20%	$ 7,772.80	$ 9,842.00	1	$ 9,842.00	20%	$ 7,873.60
SUBTOTAL					**$ 36,573.00**					**$ 37,018.00**
Networking Equipment, Software, and Licensing										
SIMULCAST LAN SWITCHES/ROUTERS	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
PDU/SURGE PROTECTION	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
CABINETS	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
CORE LAN SWITCHES/ROUTERS	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
DISPATCH LAN SWITCHES/ROUTERS	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SUBTOTAL					**$ -**					**$ -**
Site Infrastructure										
TOWER- DFD Stn 2	$ -		$ -	0%	$ -	$ 25,500.00	1	$ 25,500.00	20%	$ 20,400.00
HVAC for Broadway and DFD Stn 2	$ -		$ -	0%	$ -	$ 23,021.00	1	$ 23,021.00	0%	$ 23,021.00
	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SUBTOTAL					**$ -**					**$ 43,421.00**
Microwave Equipment, Software, and Licensing										
MICROWAVE EQUIPMENT,SOFTWARE, & LICENSING	$ 80,962.00	1	$ 80,962.00	20%	$ 64,769.60	$ 84,586.00	1	$ 84,586.00	20%	$ 67,668.80
	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SUBTOTAL					**$ 64,769.60**					**$ 67,668.80**
SUBTOTAL EQUIPMENT PRICE					**$ 753,293.55**					**$ 799,958.15**
System Control Equipment, Software, and Licensing										
CORE EQUIPMENT & SOFTWARE										
KVL 4000										
ISSI 8000										

TABLE B.2 - SYSTEM INFRASTRUCTURE PRICES										
	Site --->	4	DENVER HOUSING AUTHORITY (DHA)			Site --->	5	DENVER FIRE STATION #2 (DFD2)		
Site Description --->			SIMULCAST REMOTE SITE 2					SIMULCAST REMOTE SITE 3		
Subsystem Category	Unit Price	Qty	Extended Price	Discount %	Discounted Price	Unit Price	Qty	Extended Price	Discount %	Discounted Price
SUBTOTAL										
Voice Logging Recorder Equipment, Software, and Licensing										
ARCHIVING INTERFACE SERVER (AIS)										
VERINT TRUNKING UPGRADE										
SUBTOTAL										
Dispatch Console Equipment, Software, and Licensing										
MCC7500 DISPATCH CONSOLE EQUIPMENT, SOFTWARE, AND LICENSING										
SUBTOTAL										
TOTAL EQUIPMENT PRICE										

TABLE B.2 - SYSTEM INFRASTRUCTURE PRICES										
	Site --->	6	MOUNTAIN TOWERS			Site --->	7	MOUNT MORRISON		
Site Description --->			SIMULCAST REMOTE SITE 4					ASR SITE		
Subsystem Category	Unit Price	Qty	Extended Price	Discount %	Discounted Price	Unit Price	Qty	Extended Price	Discount %	Discounted Price
Network Monitoring and Fault Management Equipment, Software, and Licensing										
RF SITE SDM3000	$ 5,240.00	1	$ 5,240.00	20%	$ 4,192.00	$ 5,240.00	1	$ 5,240.00	20%	$ 4,192.00
NM CLIENTS (Includes a Server at Master Site)	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SUBTOTAL					**$ 4,192.00**					**$ 4,192.00**
Radio System Equipment, Software and Licensing										
GTR8000 ESS	$ 799,485.00	1	$ 799,485.00	25%	$ 599,613.75	$ 413,990.00	1	$ 489,030.00	25%	$ 366,773.00
REMOTE SITE GPS	$ 3,586.00	1	$ 3,586.00	10%	$ 3,227.60	$ -		$ -	0%	$ -
SURGE PROTECTOR	$ 365.00	1	$ 365.00	20%	$ 292.00	$ 365.00	1	$ 365.00	20%	$ 292.00
RACK	$ 470.00	1	$ 470.00	20%	$ 376.00	$ -		$ -	0%	$ -
DC SYSTEM	$ 59,676.00	1	$ 59,676.00	20%	$ 47,740.80	$ 59,676.00	1	$ 59,676.00	20%	$ 47,740.80
GCM8000 SIMULCAST COMPARATOR	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
GCP8000 SIMULCAST CONTROLLER	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SIMULCAST FREQUENCY REFERENCE TRAK9100	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SUBTOTAL					**$ 651,250.15**					**$ 358,525.30**
Antenna Systems										
ANTENNAS AND LINES	$ 27,051.50	1	$ 17,997.50	20%	$ 14,398.00	$ 22,892.00	1	$ 17,526.00	20%	$ 14,020.80
TOWER TOP AMP	$ 15,042.00	1	$ 15,042.00	20%	$ 12,033.60	$ 15,042.00	1	$ 15,042.00	20%	$ 12,033.60
DUAL DIVERSITY RECEIVE ANTENNA SYSTEM	$ 8,854.00	1	$ 8,853.50	20%	$ 7,082.80	$ 10,733.00	1	$ 10,733.00	20%	$ 8,586.40
SUBTOTAL					**$ 33,514.00**					**$ 34,641.00**
Networking Equipment, Software, and Licensing										
SIMULCAST LAN SWITCHES/ROUTERS	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
PDU/SURGE PROTECTION	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
CABINETS	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
CORE LAN SWITCHES/ROUTERS	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
DISPATCH LAN SWITCHES/ROUTERS	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SUBTOTAL					**$ -**					**$ -**
Site Infrastructure										
TOWER- DFD Stn 2	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
HVAC for Broadway and DFD Stn 2	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SUBTOTAL					**$ -**					**$ -**
Microwave Equipment, Software, and Licensing										
MICROWAVE EQUIPMENT,SOFTWARE, & LICENSING	$ 77,538.00	1	$ 77,538.00	20%	$ 62,030.40	$ 51,668.00	1	$ 51,668.00	20%	$ 41,334.40
	$ -		$ -	0%	$ -	$ -		$ -	0%	$ -
SUBTOTAL					**$ 62,030.40**					**$ 41,334.40**
SUBTOTAL EQUIPMENT PRICE					**$ 748,185.75**					**$ 431,437.30**
System Control Equipment, Software, and Licensing										
CORE EQUIPMENT & SOFTWARE										
KVL 4000										
ISSI 8000										

TABLE B.2 - SYSTEM INFRASTRUCTURE PRICES										
	Site --->	6	MOUNTAIN TOWERS			Site --->	7	MOUNT MORRISON		
Site Description --->			SIMULCAST REMOTE SITE 4					ASR SITE		
Subsystem Category	Unit Price	Qty	Extended Price	Discount %	Discounted Price	Unit Price	Qty	Extended Price	Discount %	Discounted Price
SUBTOTAL										
Voice Logging Recorder Equipment, Software, and Licensing										
ARCHIVING INTERFACE SERVER (AIS)										
VERINT TRUNKING UPGRADE										
SUBTOTAL										
Dispatch Console Equipment, Software, and Licensing										
MCC7500 DISPATCH CONSOLE EQUIPMENT, SOFTWARE, AND LICENSING										
SUBTOTAL										
TOTAL EQUIPMENT PRICE										

Table B.3 - SPARES AND TEST EQUIPMENT						
Itemize the recommended spare parts for the system, subsystems, and individual equipment to be purchased by the CCD with the Base Proposal system (initial outfitting). Add						
Part Number	**Item**	**Unit Price**	**Qty**	**Extended Price**	**Discount %**	**Discounted Price**
	MASTER/PRIME SITE SPARE EQUIPMENT					
DLN7009	**FRE: DL380 G9 900GB DISK WD2**	$ 26,166.00	1	$ 26,166.00	25%	$ 19,624.50
DLN6972	**FRU: DL380 G9 POWER SUPPLY**	$ 598.00	1	$ 598.00	25%	$ 448.50
DLN6970	**FRU: DL380 G9 HARD DRIVE**	$ 1,212.00	1	$ 1,212.00	25%	$ 909.00
DLN6973	**FRU: DL380 G9 FAN**	$ 81.00	1	$ 81.00	25%	$ 60.75
DLN6971	**FRU: DL380 G9 DVD DRIVE**	$ 228.00	1	$ 228.00	25%	$ 171.00
DLN6880	**DAS - CHASSIS ONLY**	$ 2,708.00	1	$ 2,708.00	25%	$ 2,031.00
DLN6878	**DAS - 600 GB SAS HARD DRIVE**	$ 941.00	1	$ 941.00	20%	$ 752.80
DLN6978	**FRU: DOTHILL 4524 RAID I/O CONTROLLER MODULE**	$ 8,459.00	1	$ 8,459.00	25%	$ 6,344.25
DLN7006	**FRU:HP DL380/DL360 G9 SERVER'S SMART STORAGE BATTERY**	$ 150.00	1	$ 150.00	25%	$ 112.50
DLN6867	**DAS POWER SUPPLY**	$ 665.00	1	$ 665.00	20%	$ 532.00
CKN6975	**CABLE, DATA,CABLE, MINI-SAS HD TO MINI-SAS HD CABLE, AWG30, LENGTH 1M"**	$ 130.00	1	$ 130.00	25%	$ 97.50
SQM01SUM0205	**GGM 8000 GATEWAY**	$ 4,200.00	1	$ 4,200.00	25%	$ 3,150.00
CA01616AA	**ADD: AC POWER**	$ -	1	$ -	25%	$ -
CLN1856	**2620-24 ETHERNET SWITCH**	$ 2,250.00	1	$ 2,250.00	25%	$ 1,687.50
CLN1858	**3800-48 ETHERNET SWITCH**	$ 9,600.00	1	$ 9,600.00	25%	$ 7,200.00
DLN6940	**460W POWER SUPPLY FOR DL380P**	$ 460.00	1	$ 460.00	0%	$ 460.00
DLN6967	**FRU: 500 GB SATA DRIVE**	$ 700.00	1	$ 700.00	10%	$ 630.00
T8126	FORTINET FIREWALL APPLIANCE	$ 3,200.00	1	$ 3,200.00	25%	$ 2,400.00
DLN6742	460 WATT POWER SUPPLY	$ 560.00	1	$ 560.00	20%	$ 448.00
DSTRAK91061	FOUR PORT DDM	$ 720.00	1	$ 720.00	20%	$ 576.00
CLN1859	**2620-48 ETHERNET SWITCH**	$ 3,600.00	1	$ 3,600.00	25%	$ 2,700.00
	RF SITE SPARE EQUIPMENT					
DLN6966	**FRU: GCP 8000/GCM 8000/GPB 8000**	$ 2,500.00	1	$ 2,500.00	25%	$ 1,875.00
DLN6781	**FRU: POWER SUPPLY**	$ 2,200.00	1	$ 2,200.00	25%	$ 1,650.00
DLN6898	**FRU: FAN MODULE**	$ 206.00	1	$ 206.00	25%	$ 154.50
DLN6885	**FRU: XCVR 7/800 MHZ V2**	$ 1,200.00	1	$ 1,200.00	25%	$ 900.00
DLN6895	**FRU: PA 7/800 MHz**	$ 1,200.00	1	$ 1,200.00	25%	$ 900.00
DLN6677	**FRU: G-SERIES XHUB**	$ 3,500.00	1	$ 3,500.00	25%	$ 2,625.00
SQM01SUM0205	**GGM 8000 GATEWAY**	$ 4,200.00	1	$ 4,200.00	25%	$ 3,150.00
CA01619AA	**ADD: DC POWER**	$ -	1	$ -	25%	$ -
	DISPATCH SPARE EQUIPMENT					
B1912	**MCC SERIES DESKTOP SPEAKER**	$ 450.00	2	$ 900.00	25%	$ 675.00
B1914	**MCC SERIES DESKTOP GOOSENECK MICROPHONE**	$ 250.00	2	$ 500.00	25%	$ 375.00
B1913	**MCC SERIES HEADSET JACK**	$ 200.00	2	$ 400.00	25%	$ 300.00
TT3106	**Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)**	$ 3,500.00	2	$ 7,000.00	20%	$ 5,600.00
B1934	**MCC 7500 VOICE PROCESSOR MODULE FRU**	$ 11,830.00	2	$ 23,660.00	25%	$ 17,745.00
CA00147AF	**ADD: MCC 7500 SECURE OPERATION**	$ 3,250.00	2	$ 6,500.00	25%	$ 4,875.00

Table B.3 - SPARES AND TEST EQUIPMENT						
Itemize the recommended spare parts for the system, subsystems, and individual equipment to be purchased by the CCD with the Base Proposal system (initial outfitting). Add						
Part Number	**Item**	**Unit Price**	**Qty**	**Extended Price**	**Discount %**	**Discounted Price**
CA00182AB	**ADD: AES ALGORITHM**	$ 750.00	2	$ 1,500.00	25%	$ 1,125.00
DDN2022	**SPARE PARTS KIT - 5000 SERIES MAX-PRO QUADCORE FOR VOIP AND TLR**	$ 1,685.00	1	$ 1,685.00	25%	$ 1,263.75
	MICROWAVE SPARE EQUIPMENT					
DQALUMPRSPARES	**ALUE MPR SPARES**	$ 35,000.00	1	$ 35,000.00	20%	$ 28,000.00
DQALURTRSSPARES	**ALU RTR SPARES**	$ 15,000.00	1	$ 15,000.00	20%	$ 12,000.00
	****SYSTEM TEST EQUIPMENT**					
TT2235	****AEROFLEX 3920B SERVICE MONITOR 1MHZ TO 1GHZ**	$ 35,288.00	2	$ 70,576.00	20%	$ 56,460.80
TT05343AA	**TRACKING GENERATOR / 390XOPT061 / R2020A**	$ 1,176.00	2	$ 2,352.00	20%	$ 1,881.60
TT05346AA	**P25 TRUNKING VHF/UHF/700/800MHZ / 390XOPT201 / R2076A**	$ 2,823.00	2	$ 5,646.00	20%	$ 4,516.80
TT05347AA	**LSM GENERATE AND RECEIVE/ANALYSIS / 390XOPT204 / R2079A**	$ 9,412.00	2	$ 18,824.00	20%	$ 15,059.20
TT05337AA	**SITE MONITORING APPLICATION / 390XOPT051 / R2111A**	$ 2,353.00	2	$ 4,706.00	20%	$ 3,764.80
TT05359AA	**P25 AES ENCRYPTION / 390XOPT240 / R2077A**	$ 2,353.00	2	$ 4,706.00	20%	$ 3,764.80
TT05356AA	**AUTOTEST II FOR P25 RADIO SYSTEMS / 390XOPT218 / R2083A**	$ 2,353.00	2	$ 4,706.00	20%	$ 3,764.80
DQ390XOPT604	**APX-7000 AUTOTEST & ALIGNMENT/ 390XOPT604**	$ 2,353.00	2	$ 4,706.00	20%	$ 3,764.80
DDN9837	**10 AMP CURRENT SHUNT 0.01 OHM / AC24011 / R1794A**	$ 281.00	2	$ 562.00	20%	$ 449.60
DDN9840	**SOFT PADDED CARRYING CASE FOR AEROFLEX 3920 / AC25012**	$ 187.00	2	$ 374.00	20%	$ 299.20
DSS412EBASE	**ANRITSU S412E BASE UNIT WITH REQ'D. OPTIONS**	$ 23,376.00	2	$ 46,752.00	20%	$ 37,401.60
DSS412EP25	**ANRITSU P25 ANALYZER AND P25 COVERAGE OPTION**	$ 7,530.00	2	$ 15,060.00	20%	$ 12,048.00
DSS412EHPS	**ANRITSU HIGH ACCURACY POWER METER AND PSN50 SENSOR**	$ 2,784.00	2	$ 5,568.00	20%	$ 4,454.40
				$ -		$ -
	TOTAL TEST EQUIPMENT AND SPARES COST>>>>			**$ 358,317.00**		**$ 281,178.95**

** Motorola has included the costs for the AEROFLEX Service Monitor as we feel this to be a critical test equipment for the system infrastructure. We have noted the statement in the RFP " CCD intends to purchase such service monitors independently of this procurement." Please note and consider these costs has been included in our proposal.

TABLE B.4 - BASE PROPOSAL SERVICES PRICES	
Description	**Services Prices**
System Equipment Services	
Staging (including SATP)	$ 329,298.00
Warehousing and Inventory Management	Included
System Installation	$ 614,657.00
Fleetmapping	Included
Coverage Testing (including CATP)	$ 95,733.21
Cutover Planning and Migration	Included
Final Acceptance Testing (including FATP)	Included
30-Day Operational Testing	Included
Decommissioning, Removal, and Disposal/Return of Legacy Equipment	$ 43,220.10
Documentation	$ 42,354.04
Decommissioning, Removal, and Disposal/Return of Zuni & DFD2	$ 94,118.00
Other - specify	N/A
System Equipment Services Subtotal	**$ 1,219,381.00**
System Engineering	
System/Network Engineering	$ 441,601.37
Interference Analyses (Table B.5)	Included in Freq Coordination
FCC License Preparation (Table B.5)	Included in Freq Coordination
Frequency Coordination (Table B.5)	$ 94,551.05
Structural Analyses (Table B.5)	$ 10,170.59
Other - specify (Table B.5)	N/A
Other - specify	N/A
System Engineering Subtotal	**$ 546,323.01**
Site Development	
Site Development (Table B.6)	$ 1,017,832.00
Other - specify	N/A
Other - specify	N/A
Site Development Subtotal	**$ 1,017,832.00**
Project Management	
Project Management	$ 314,136.23
Construction Supervisor	$ 39,191.00
Other - specify	N/A
Project Management Subtotal	**$ 353,327.23**
Technical and Operator Training	
System Planning and Configuring Training	Included in NMS Maintenance Training
System Database Administration Training	Included in NMS Maintenance Training
System Performance and Monitoring Training	$ 43,307.02
Information Assurance/Network Security Training	Included in NMS Maintenance Training
Dispatch Console System Administration Training	Included in Console Operator Training
NMS Maintenance Training	$ 37,858.19
NMS Operation Training	Included in NMS Maintenance Training
Networking/IP Programming & Service Training	Included in NMS Maintenance Training
System Maintenance & Service Training	$ 86,448.83
System Fleet Map and Subscriber Programming Training	$ 64,960.53
Portable Unit Operation Training	$ 12,654.97
Mobile Unit Operation Training	Included in Portable Unit Operation Training
Dispatch Console Operation Training	$ 10,048.25
Other - specify	N/A
Other - specify	N/A
System Training Subtotal	**$ 255,277.79**
Performance Bond	N/A
Other - specify	N/A
TOTAL SERVICES	**$ 3,392,140.00**

TABLE B.5 - SYSTEM ENGINEERING SERVICES PRICES						
	ALL SITES TOTAL	Site --->	3	1670 BROADWAY		
Site Description --->				SIMULCAST REMOTE SITE 1		
Description	Discounted	Unit Price	Qty	Extended Price	Discount %	Discounted Price
System Engineering Services						
Interference Analyses	$ -	Included in Freq Coordination		$ -		$ -
FCC License Preparation	$ -	Included in Freq Coordination		$ -		$ -
Frequency Coordination	$ 94,551.05	$ 18,910.21	1	$ 18,910.21	0.00%	$ 18,910.21
Structural Analyses	$ 10,170.59	$ 2,034.12	1	$ 2,034.12	0.00%	$ 2,034.12
TOTAL	**$ 104,721.64**					**$ 20,944.33**

TABLE B.5 - SYSTEM ENGINEERING SERVICES PRICES										
	Site --->	4	DENVER HOUSING AUTHORITY (DHA)			Site --->	5	DENVER FIRE STATION #2 (DFD2)		
Site Description --->			SIMULCAST REMOTE SITE 2					SIMULCAST REMOTE SITE 3		
Description	Unit Price	Qty	Extended Price	Discount %	Discounted Price	Unit Price	Qty	Extended Price	Discount %	Discounted Price
System Engineering Services										
Interference Analyses	Included in Freq Coordination		$ -		$ -	Included in Freq Coordination		$ -		$ -
FCC License Preparation	Included in Freq Coordination		$ -		$ -	Included in Freq Coordination		$ -		$ -
Frequency Coordination	$ 18,910.21	1	$ 18,910.21	0.00%	$ 18,910.21	$ 18,910.21	1	$ 18,910.21	0.00%	$ 18,910.21
Structural Analyses	$ 2,034.12	1	$ 2,034.12	0.00%	$ 2,034.12	$ 2,034.12	1	$ 2,034.12	0.00%	$ 2,034.12
TOTAL					**$ 20,944.33**					**$ 20,944.33**

TABLE B.5 - SYSTEM ENGINEERING SERVICES PRICES										
	Site --->	6	MOUNTAIN TOWERS			Site --->	7	MOUNT MORRISON		
Site Description --->			SIMULCAST REMOTE SITE 4					ASR SITE		
Description	Unit Price	Qty	Extended Price	Discount %	Discounted Price	Unit Price	Qty	Extended Price	Discount %	Discounted Price
System Engineering Services										
Interference Analyses	Included in Freq Coordination		$ -		$ -	Included in Freq Coordination		$ -		$ -
FCC License Preparation	Included in Freq Coordination		$ -		$ -	Included in Freq Coordination		$ -		$ -
Frequency Coordination	$ 18,910.21	1	$ 18,910.21	0.00%	$ 18,910.21	$ 18,910.21	1	$ 18,910.21	0.00%	$ 18,910.21
Structural Analyses	$ 2,034.12	1	$ 2,034.12	0.00%	$ 2,034.12	$ 2,034.12	1	$ 2,034.12	0.00%	$ 2,034.12
TOTAL					**$ 20,944.33**					**$ 20,944.33**

TABLE B.5 - SYSTEM ENGINEERING SERVICES PRICES						
	ALL SITES TOTAL	Site --->	3	1670 BROADWAY		
Site Description --->				SIMULCAST REMOTE SITE 1		
Description	Discounted	Unit Price	Qty	Extended Price	Discount %	Discounted Price
Site Development Services						
A&E Services	$ 83,716.11	$ 13,929.41	1	$ 13,929.41		$ 13,929.41
Tower work, Antennas & Lines Install	$ 303,129.76	$ 59,358.62	1	$ 59,358.62		$ 59,358.62
Site Preparation	$ 416,573.96	$ 196,991.76	1	$ 196,991.76		$ 196,991.76
Roof Top Crane	$ 126,176.47	$ 42,058.82	1	$ 42,058.82		$ 42,058.82
Dual Diversity Antenna Solution	$ 88,235.29	$ 17,647.06	1	$ 17,647.06		$ 17,647.06
TOTAL	**$ 1,017,832.00**					**$ 329,986.00**

TABLE B.5 - SYSTEM ENGINEERING SERVICES PRICES										
	Site --->	4	DENVER HOUSING AUTHORITY (DHA)			Site --->	5	DENVER FIRE STATION #2 (DFD2)		
Site Description --->			SIMULCAST REMOTE SITE 2					SIMULCAST REMOTE SITE 3		
Description	Unit Price	Qty	Extended Price	Discount %	Discounted Price	Unit Price	Qty	Extended Price	Discount %	Discounted Price
Site Development Services										
A&E Services	$ 13,929.41	1	$ 13,929.41		$ 13,929.41	$ 26,591.99	1	$ 26,591.99		$ 26,591.99
Tower work, Antennas & Lines Install	$ 46,221.56	1	$ 46,221.56		$ 46,221.56	$ 87,742.57	1	$ 87,742.57		$ 87,742.57
Site Preparation	$ 35,674.19	1	$ 35,674.19		$ 35,674.19	$ 103,916.57	1	$ 103,916.57		$ 103,916.57
Roof Top Crane	$ 42,058.82	1	$ 42,058.82		$ 42,058.82			$ -		$ -
Dual Diversity Antenna Solution	$ 17,647.06	1	$ 17,647.06		$ 17,647.06	$ 17,647.06	1	$ 17,647.06		$ 17,647.06
TOTAL					**$ 155,531.00**					**$ 235,898.00**

TABLE B.5 - SYSTEM ENGINEERING SERVICES PRICES										
	Site --->	6	MOUNTAIN TOWERS			Site --->	7	MOUNT MORRISON		
Site Description --->			SIMULCAST REMOTE SITE 4					ASR SITE		
Description	Unit Price	Qty	Extended Price	Discount %	Discounted Price	Unit Price	Qty	Extended Price	Discount %	Discounted Price
Site Development Services										
A&E Services	$ 13,929.41	1	$ 13,929.41		$ 13,929.41	$ 15,335.88	1	$ 15,335.88		$ 15,335.88
Tower work, Antennas & Lines Install	$ 59,243.26	1	$ 59,243.26		$ 59,243.26	$ 50,563.74	1	$ 50,563.74		$ 50,563.74
Site Preparation	$ 42,748.38	1	$ 42,748.38		$ 42,748.38	$ 37,243.07	1	$ 37,243.07		$ 37,243.07
Roof Top Crane	$ 42,058.82	1	$ 42,058.82		$ 42,058.82			$ -		$ -
Dual Diversity Antenna Solution	$ 17,647.06	1	$ 17,647.06		$ 17,647.06	$ 17,647.06	1	$ 17,647.06		$ 17,647.06
TOTAL					**$ 175,627.00**					**$ 120,790.00**

TABLE B.7 - SYSTEM LIFECYCLE SUPPORT

These items and services will be considered for purchase in the future (not delivered as part of initial system replacement project). CCD plans on purchasing items and services at a fixed discount rate off of the List Price published at the time of purchase.

Table B.7.A - DISPATCH CONSOLE EQUIPMENT

Description	List Price	Fixed Discount % Off of List Price	Discounted Price
MCC7500 Console Position	$ 41,684.00	25%	$ 31,263.00
Licensing for Dispatch Position - 5 positions per license	$ 5,000.00	25%	$ 3,750.00
			$ -

Table B.7.B - OTHER EQUIPMENT AND COMPONENTS

Description	List Price	Fixed Discount % Off of List Price	Discounted Price
FRE: DL380 G9 900GB DISK WD2	$ 26,166.00	25%	$ 19,624.50
FRU: DL380 G9 POWER SUPPLY	$ 598.00	25%	$ 448.50
FRU: DL380 G9 HARD DRIVE	$ 1,212.00	25%	$ 909.00
FRU: DL380 G9 FAN	$ 81.00	25%	$ 60.75
FRU: DL380 G9 DVD DRIVE	$ 228.00	25%	$ 171.00
DAS - CHASSIS ONLY	$ 2,708.00	25%	$ 2,031.00
DAS - 600 GB SAS HARD DRIVE	$ 941.00	20%	$ 752.80
FRU: DOTHILL 4524 RAID I/O CONTROLLER MODULE	$ 8,459.00	25%	$ 6,344.25
FRU:HP DL380/DL360 G9 SERVER'S SMART STORAGE BATTERY	$ 150.00	25%	$ 112.50
DAS POWER SUPPLY	$ 665.00	20%	$ 532.00
CABLE, DATA,CABLE, MINI-SAS HD TO MINI-SAS HD CABLE, AWG30, LENGTH 1M"	$ 130.00	25%	$ 97.50
GGM 8000 GATEWAY	$ 4,200.00	25%	$ 3,150.00
ADD: AC POWER	$ -	25%	$ -
2620-24 ETHERNET SWITCH	$ 2,250.00	25%	$ 1,687.50
3800-48 ETHERNET SWITCH	$ 9,600.00	25%	$ 7,200.00
460W POWER SUPPLY FOR DL380P	$ 460.00	0%	$ 460.00
FRU: 500 GB SATA DRIVE	$ 700.00	10%	$ 630.00
FORTINET FIREWALL APPLIANCE	$ 3,200.00	25%	$ 2,400.00
460 WATT POWER SUPPLY	$ 560.00	20%	$ 448.00
FOUR PORT DDM	$ 720.00	20%	$ 576.00
2620-48 ETHERNET SWITCH	$ 3,600.00	25%	$ 2,700.00
FRU: GCP 8000/GCM 8000/GPB 8000	$ 2,500.00	25%	$ 1,875.00
FRU: POWER SUPPLY	$ 2,200.00	25%	$ 1,650.00
FRU: FAN MODULE	$ 206.00	25%	$ 154.50
FRU: XCVR 7/800 MHZ V2	$ 1,200.00	25%	$ 900.00
FRU: PA 7/800 MHz	$ 1,200.00	25%	$ 900.00
FRU: G-SERIES XHUB	$ 3,500.00	25%	$ 2,625.00
GGM 8000 GATEWAY	$ 4,200.00	25%	$ 3,150.00
ADD: DC POWER	$ -	25%	$ -
ALUE MPR SPARES	$ 35,000.00	20%	$ 28,000.00
ALU RTR SPARES	$ 15,000.00	20%	$ 12,000.00
AEROFLEX 3920B SERVICE MONITOR 1MHZ TO 1GHZ	$ 35,288.00	20%	$ 28,230.40
TRACKING GENERATOR / 390XOPT061 / R2020A	$ 1,176.00	20%	$ 940.80
P25 TRUNKING VHF/UHF/700/800MHZ / 390XOPT201 / R2076A	$ 2,823.00	20%	$ 2,258.40
LSM GENERATE AND RECEIVE/ANALYSIS / 390XOPT204 / R2079A	$ 9,412.00	20%	$ 7,529.60
SITE MONITORING APPLICATION / 390XOPT051 / R2111A	$ 2,353.00	20%	$ 1,882.40
P25 AES ENCRYPTION / 390XOPT240 / R2077A	$ 2,353.00	20%	$ 1,882.40
AUTOTEST II FOR P25 RADIO SYSTEMS / 390XOPT218 / R2083A	$ 2,353.00	20%	$ 1,882.40
APX-7000 AUTOTEST & ALIGNMENT/ 390XOPT604	$ 2,353.00	20%	$ 1,882.40
10 AMP CURRENT SHUNT 0.01 OHM / AC24011 / R1794A	$ 281.00	20%	$ 224.80
SOFT PADDED CARRYING CASE FOR AEROFLEX 3920 / AC25012	$ 187.00	20%	$ 149.60
ANRITSU S412E BASE UNIT WITH REQ'D. OPTIONS	$ 23,376.00	20%	$ 18,700.80

TABLE B.7 - SYSTEM LIFECYCLE SUPPORT

These items and services will be considered for purchase in the future (not delivered as part of initial system replacement project). CCD plans on purchasing items and services at a fixed discount rate off of the List Price published at the time of purchase.

ANRITSU P25 ANALYZER AND P25 COVERAGE OPTION	$ 7,530.00	20%	$ 6,024.00
ANRITSU HIGH ACCURACY POWER METER AND PSN50 SENSOR	$ 2,784.00	20%	$ 2,227.20
			$ -

Table B.7.C - FUTURE SERVICES

Description	List Price	Fixed Discount % Off of List Price	Discounted Price
Project Management- Manday	$ 2,135.00	30%	$ 1,494.50
Engineering Manday	$ 2,135.00	30%	$ 1,494.50
System Technologist Manday	$ 2,135.00	30%	$ 1,494.50
Programming Portables per Unit	$ 73.00	35%	$ 47.45
Programming Mobiles per Unit	$ 73.00	35%	$ 47.45
Installation of Mobile (Dash Mount)	$ 319.00	35%	$ 207.35
			$ -

TABLE B.8 - OPTIONAL SUBSCRIBER UPGRADES

This Table is for software upgrades (to existing radios) that may be procured by the CCD as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.

Table B.8.A - PORTABLE RADIOS

Part Number	Item	Unit Price	Qty	Extended Price	Discount %	Discounted Price
	APX4000 UPGRADE- Phase 2	$ 811.75	2	$ 1,623.50	35%	$ 1,055.28
	APX7000 UPGRADE- Phase 2	$ 811.75	2	$ 1,623.50	35%	$ 1,055.28
	Motorola XTS2500- *	N/A		N/A		N/A
	Motorola XTS5000- **	N/A		N/A		N/A
	TOTAL PORTABLE UPGRADES COST>>>>			**$ 3,247.00**		**$ 2,110.55**

Table B.8.B - MOBILE RADIOS

Part Number	Item	Unit Price	Qty	Extended Price	Discount %	Discounted Price
	Motorola XTL5000- **	N/A		N/A		N/A
	TOTAL MOBILE UPGRADES COST>>>>			**$ -**		**$ -**

***Phase 2 is not suppored on XTS/XTL series radios**

****Upgrade software for XTS/XTL 5000 series radios are no longer available for purchase**

TABLE B.9 - OPTIONAL EQUIPMENT AND SERVICES

This Table is for equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.

Table B.9.A - SYSTEM EQUIPMENT AND FEATURES

Enter the List Price and the Fixed Discount off of List for each item that can be provided. The Discount % entered for each item would stay the same during the life of the contract. Add additional rows as needed.

Description	Costs for All Hardware and Software to Enable Feature for 4,000 Radios			Cost For All Hardware and Software to Enable Feature for Additional Bundles of 100 Radios (After Initial 4,000 Have Been Enabled)		
	List Price	% Discount	Sales Price	List Price	% Discount	Sales Price
Add: Link Layer Authentication	$ 16,400	25%	$ 12,300.00			
Add: Geo-Location / GPS	$ 259,200	10%	$ 233,280.00	$ 6,480.00	10%	$ 5,832.00
Add: Short Messaging	$ 518,400	10%	$ 466,560.00	$ 12,960.00	10%	$ 11,664.00
Add: Over-The-Air-Rekeying (UP TO 64,000 USERS)	$ 244,533	5%	$ 232,306.35			
Add: Over-The-Air-Reprogramming	$ 93,000	10%	$ 83,700.00	$ 2,325.00	10%	$ 2,092.50
Add: Subscriber Codeplug Management (per 3.11.2.J and 3.11.2.K)	$ 253,152	10%	$ 227,837.00	$ 100.00	40%	$ 60.00
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						

Table B.9.B - SUBSCRIBER EQUIPMENT AND FEATURES

DO NOT USE TABLE B.9.B FOR NEW SUBSCRIBER RADIOS - SEE NEW TABLE B.11

Description	List Price	Fixed Discount % Off of List Price

Table B.9.C - OPTIONAL PTT Application Integration

Enter the List Price and the Fixed Discount off of List for each item that can be provided. The Discount % entered for each item would stay the same during the life of the contract. Add additional rows as needed.

Description	List Price	Fixed Discount % Off of List Price
BROADBAND ACCESS (WAVE) for up to 500 users (350 mobile, 150 desktop)	$ 532,747	10%
BROADBAND ACCESS (WAVE) for additional 100 mobile users	$ 30,149	10%
BROADBAND ACCESS (WAVE) for additional 100 desktop users	$ 81,249	10%

TABLE B.9 - OPTIONAL EQUIPMENT AND SERVICES

Table B.9.D - SYSTEM AND SUBSCRIBER SERVICES

DO NOT USE TABLE B.9.D FOR SUBSCRIBER RADIO IMPLEMENTATION SERVICES - SEE NEW TABLE B.11.E

Description	List Price	Fixed Discount % Off of List Price

Table B.9.E - OPTIONAL Decommissioning of Loretto Heights

Description	List Price	Fixed Discount % Off of List Price
OPTIONAL DECOMMISSIONING OF LORETTO HEIGHTS	$ 51,764	10%

Table B.9.F - OTHER OPTIONAL ITEMS (CONSOLE DESCK MICS, ISSI "OTHER SYSTEM" GATEWAY, OTHER ITEMS)

Enter the List Price and the Fixed Discount off of List for each item that can be provided. The Discount % entered for each item would stay the same during the life of the contract. Add additional rows as needed.

Description	List Price	Fixed Discount % Off of List Price
Desk Microphone for Dispatch Console	$ 250	25%
An ISSI expansion for an ISSI-enabled external system manufactured/installed by your firm*	$ 2,050,000	*30%
A new ISSI gateway for a non-ISSI-enabled external system manufactured/installed by your firm*	$ 2,089,850	*30%
***if Purchased at time of System sale, these ISSI items marked above will be offered at 305k sales price each**		
Channel expansion at proposed sites (no antenna subsystem expansion) SIMULCAST	$ 331,900	25%
Channel expansion at proposed sites (no antenna subsystem expansion) ASR	$ 58,960	25%
Please list quantity of expansion channels allowed before antenna subsystem expansion is required.		
- Simulcast cells can expand to 18 channels without additional equipment or antennas		
- ASR can expand to 12 channels without additional equipment or antennas		
Site expansion at proposed capacity (no shelter/tower costs)	$ 1,038,125	25%

TABLE B.10 - OPTIONAL SYSTEM POST-WARRANTY SUPPORT

IMPORTANT NOTE: CCD expects the useful life of the system to be 15 years.

This Table is for OPTIONAL SYSTEM POST-WARRANTY SUPPORT that the CCD may or may not choose to purchase in conjunction with the Base Proposal components. IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.

Table B.10.A - TECHNICAL SUPPORT SERVICE

List the price for post-warranty TECHNICAL SUPPORT for Years 2 - 15 that may be purchased in conjunction with the Base Proposal system.

Description	Services Price
Technical Support for Year 2	$ 56,947.84
Technical Support for Year 3	$ 58,656.27
Technical Support for Year 4	$ 60,415.96
Technical Support for Year 5	$ 62,228.44
Technical Support for Year 6	$ 64,095.29
Technical Support for Year 7	$ 66,018.15
Technical Support for Year 8	$ 67,998.69
Technical Support for Year 9	$ 70,038.66
Technical Support for Year 10	$ 72,139.81
Technical Support for Year 11	$ 74,304.01
Technical Support for Year 12	$ 76,533.13
Technical Support for Year 13	$ 78,829.12
Technical Support for Year 14	$ 81,194.00
Technical Support for Year 15	$ 83,629.82
Bundled Technical Support for Years 2-15	$ 895,186.85

Table B.13.B - SOFTWARE SUPPORT AND UPGRADES

List the price for post-warranty SOFTWARE SUPPORT AND UPGRADES for Years 2 - 15 may be purchased in conjunction with the Base Proposal system.

Description	Services Price	
Software Support and Upgrades for Year 2	$ -	
Software Support and Upgrades for Year 3	$ -	
Software Support and Upgrades for Year 4	$ -	
Software Support and Upgrades for Year 5	$ 528,308.00	$ 606,356.00
Software Support and Upgrades for Year 6	$ -	
Software Support and Upgrades for Year 7	$ -	
Software Support and Upgrades for Year 8	$ -	
Software Support and Upgrades for Year 9	$ -	
Software Support and Upgrades for Year 10	$ 561,202.00	$ 641,897.28
Software Support and Upgrades for Year 11	$ -	
Software Support and Upgrades for Year 12	$ -	
Software Support and Upgrades for Year 13	$ -	
Software Support and Upgrades for Year 14	$ -	
Software Support and Upgrades for Year 15	$ -	
Bundled Software Support and Upgrades for Years 2-15	$ 1,002,349.20	$ 1,123,427.95

THIS OPTION USED IN SUMMARY TOOL

WITH 17 ADDITIONAL Rx only BASE STATIONS, 4 ch add at 4 simulcast sites, 1 MORE AIS, 1 MORE CONSOLE

Table B.13.C - EXTENDED WARRANTY

List prices for all EXTENDED WARRANTY available after the full 1-year manufacturer's warranty. The EXTENDED WARRANTY for Years 2 - 15 may be purchased in conjunction with the Base Proposal system. NOTE: Extended Warranty does not include On Site respone or Preventative Maintenance as it us assumed that CCD will handle these responsibilities.

Description	Services Price
Extended Warranty for Year 2	$ 266,179.87
Extended Warranty for Year 3	$ 274,165.30
Extended Warranty for Year 4	$ 282,389.66
Extended Warranty for Year 5	$ 290,861.16
Extended Warranty for Year 6	$ 299,587.18
Extended Warranty for Year 7	$ 308,575.24
Extended Warranty for Year 8	$ 317,832.06
Extended Warranty for Year 9	$ 327,367.50
Extended Warranty for Year 10	$ 337,188.62
Extended Warranty for Year 11	$ 347,303.64
Extended Warranty for Year 12	$ 357,722.98
Extended Warranty for Year 13	$ 368,455.25
Extended Warranty for Year 14	$ 379,508.26
Extended Warranty for Year 15	$ 390,894.01
Bundled Extended Warranty for Years 2-15	$ 4,184,188.27

ORIGINAL PROPOSED STATION QUANTITIES

Network Monitoring	Dispatch Service	Infrastructure Repair	Security Update Service
$39,483	$17,891	$135,874	$72,932
$40,668	$18,428	$139,950	$75,120
$41,888	$18,981	$144,148	$77,374
$43,144	$19,550	$148,473	$79,695
$44,439	$20,136	$152,927	$82,086
$45,772	$20,741	$157,515	$84,548
$47,145	$21,363	$162,240	$87,085
$48,559	$22,004	$167,107	$89,697
$50,016	$22,664	$172,121	$92,388
$51,517	$23,344	$177,284	$95,160
$53,062	$24,044	$182,603	$98,015
$54,654	$24,765	$188,081	$100,955
$56,294	$25,508	$193,723	$103,984
$57,983	$26,274	$199,535	$107,103

TABLE B.10 - OPTIONAL SYSTEM POST-WARRANTY SUPPORT

IMPORTANT NOTE: CCD expects the useful life of the system to be 15 years.

This Table is for OPTIONAL SYSTEM POST-WARRANTY SUPPORT that the CCD may or may not choose to purchase in conjunction with the Base Proposal components. IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.

Table B.10.A - TECHNICAL SUPPORT SERVICE

List the price for post-warranty TECHNICAL SUPPORT for Years 2 - 15 that may be purchased in conjunction with the Base Proposal system.

Description	Services Price
Technical Support for Year 2	$ 56,947.84
Technical Support for Year 3	$ 58,656.27
Technical Support for Year 4	$ 60,415.96
Technical Support for Year 5	$ 62,228.44
Technical Support for Year 6	$ 64,095.29
Technical Support for Year 7	$ 66,018.15
Technical Support for Year 8	$ 67,998.69
Technical Support for Year 9	$ 70,038.66
Technical Support for Year 10	$ 72,139.81
Technical Support for Year 11	$ 74,304.01
Technical Support for Year 12	$ 76,533.13
Technical Support for Year 13	$ 78,829.12
Technical Support for Year 14	$ 81,194.00
Technical Support for Year 15	$ 83,629.82
Bundled Technical Support for Years 2-15	$ 895,186.85

Table B.13.B - SOFTWARE SUPPORT AND UPGRADES

List the price for post-warranty SOFTWARE SUPPORT AND UPGRADES for Years 2 - 15 may be purchased in conjunction with the Base Proposal system.

Description	Services Price
Software Support and Upgrades for Year 2	$ -
Software Support and Upgrades for Year 3	$ -
Software Support and Upgrades for Year 4	$ -
Software Support and Upgrades for Year 5	$ 528,308.00
Software Support and Upgrades for Year 6	$ -
Software Support and Upgrades for Year 7	$ -
Software Support and Upgrades for Year 8	$ -
Software Support and Upgrades for Year 9	$ -
Software Support and Upgrades for Year 10	$ 561,202.00
Software Support and Upgrades for Year 11	$ -
Software Support and Upgrades for Year 12	$ -
Software Support and Upgrades for Year 13	$ -
Software Support and Upgrades for Year 14	$ -
Software Support and Upgrades for Year 15	$ -
Bundled Software Support and Upgrades for Years 2-15	$ 1,002,349.20

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Table B.13.C - EXTENDED WARRANTY

List prices for all EXTENDED WARRANTY available after the full 1-year manufacturer's warranty. The EXTENDED WARRANTY for Years 2 - 15 may be purchased in conjunction with the Base Proposal system. NOTE: Extended Warranty does not include On Site respone or Preventative Maintenance as it us assumed that CCD will handle these responsibilities.

Description	Services Price
Extended Warranty for Year 2	$ 266,179.87
Extended Warranty for Year 3	$ 274,165.30
Extended Warranty for Year 4	$ 282,389.66
Extended Warranty for Year 5	$ 290,861.16
Extended Warranty for Year 6	$ 299,587.18
Extended Warranty for Year 7	$ 308,575.24
Extended Warranty for Year 8	$ 317,832.06
Extended Warranty for Year 9	$ 327,367.50
Extended Warranty for Year 10	$ 337,188.62
Extended Warranty for Year 11	$ 347,303.64
Extended Warranty for Year 12	$ 357,722.98
Extended Warranty for Year 13	$ 368,455.25
Extended Warranty for Year 14	$ 379,508.26
Extended Warranty for Year 15	$ 390,894.01
Bundled Extended Warranty for Years 2-15	$ 4,184,188.27

WITH 13 ADDITIONAL Rx only BASE STATIONS, 1 MORE AIS, 1 MORE CONSOLE			
Network Monitoring	Dispatch Service	Infrastructure Repair	Security Update Service
$40,709	$18,245	$148,502	$76,467
$41,930	$18,792	$152,957	$78,761
$43,188	$19,356	$157,545	$81,123
$44,484	$19,936	$162,272	$83,557
$45,818	$20,535	$167,140	$86,064
$47,193	$21,151	$172,154	$88,646
$48,609	$21,785	$177,319	$91,305
$50,067	$22,439	$182,638	$94,044
$51,569	$23,112	$188,118	$96,866
$53,116	$23,805	$193,761	$99,771
$54,710	$24,519	$199,574	$102,765
$56,351	$25,255	$205,561	$105,848
$58,041	$26,012	$211,728	$109,023
$59,783	$26,793	$218,080	$112,294

4 channel add at 4 simulcast sites (17 ch total)			
Network Monitoring	Dispatch Service	Infrastructure Repair	Security Update Service
$39,483	$17,891	$148,681	$72,932
$40,668	$18,428	$153,141	$75,120
$41,888	$18,981	$157,735	$77,374
$43,144	$19,550	$162,467	$79,695
$44,439	$20,136	$167,341	$82,086
$45,772	$20,741	$172,362	$84,548
$47,145	$21,363	$177,533	$87,085
$48,559	$22,004	$182,859	$89,697
$50,016	$22,664	$188,344	$92,388
$51,517	$23,344	$193,995	$95,160
$53,062	$24,044	$199,814	$98,015
$54,654	$24,765	$205,809	$100,955
$56,294	$25,508	$211,983	$103,984
$57,983	$26,274	$218,343	$107,103

TABLE B.10 - OPTIONAL SYSTEM POST-WARRANTY SUPPORT

IMPORTANT NOTE: CCD expects the useful life of the system to be 15 years.

This Table is for OPTIONAL SYSTEM POST-WARRANTY SUPPORT that the CCD may or may not choose to purchase in conjunction with the Base Proposal components. IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.

Table B.10.A - TECHNICAL SUPPORT SERVICE

List the price for post-warranty TECHNICAL SUPPORT for Years 2 - 15 that may be purchased in conjunction with the Base Proposal system.

Description	Services Price
Technical Support for Year 2	$ 56,947.84
Technical Support for Year 3	$ 58,656.27
Technical Support for Year 4	$ 60,415.96
Technical Support for Year 5	$ 62,228.44
Technical Support for Year 6	$ 64,095.29
Technical Support for Year 7	$ 66,018.15
Technical Support for Year 8	$ 67,998.69
Technical Support for Year 9	$ 70,038.66
Technical Support for Year 10	$ 72,139.81
Technical Support for Year 11	$ 74,304.01
Technical Support for Year 12	$ 76,533.13
Technical Support for Year 13	$ 78,829.12
Technical Support for Year 14	$ 81,194.00
Technical Support for Year 15	$ 83,629.82
Bundled Technical Support for Years 2-15	$ 895,186.85

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Table B.13.B - SOFTWARE SUPPORT AND UPGRADES

List the price for post-warranty SOFTWARE SUPPORT AND UPGRADES for Years 2 - 15 may be purchased in conjunction with the Base Proposal system.

Description	Services Price
Software Support and Upgrades for Year 2	$ -
Software Support and Upgrades for Year 3	$ -
Software Support and Upgrades for Year 4	$ -
Software Support and Upgrades for Year 5	$ 528,308.00
Software Support and Upgrades for Year 6	$ -
Software Support and Upgrades for Year 7	$ -
Software Support and Upgrades for Year 8	$ -
Software Support and Upgrades for Year 9	$ -
Software Support and Upgrades for Year 10	$ 561,202.00
Software Support and Upgrades for Year 11	$ -
Software Support and Upgrades for Year 12	$ -
Software Support and Upgrades for Year 13	$ -
Software Support and Upgrades for Year 14	$ -
Software Support and Upgrades for Year 15	$ -
Bundled Software Support and Upgrades for Years 2-15	$ 1,002,349.20

Table B.13.C - EXTENDED WARRANTY

THIS OPTION USED IN SUMMARY TOOL

List prices for all EXTENDED WARRANTY available after the full 1-year manufacturer's warranty. The EXTENDED WARRANTY for Years 2 - 15 may be purchased in conjunction with the Base Proposal system. NOTE: Extended Warranty does not include On Site respone or Preventative Maintenance as it us assumed that CCD will handle these responsibilities.

WITH 17 ADDITIONAL Rx only BASE STATIONS, 4 ch add at 4 simulcast sites, 1 MORE AIS, and 11 MORE CONSOLES

Description	Services Price	Network Monitoring	Dispatch Service	Infrastructure Repair	Security Update Service
Extended Warranty for Year 2	$ 266,179.87	$ 40,709.06	$ 18,244.64	$ 175,622.00	$ 88,247.00
Extended Warranty for Year 3	$ 274,165.30	$ 41,930.34	$ 18,791.98	$ 180,890.66	$ 90,894.41
Extended Warranty for Year 4	$ 282,389.66	$ 43,188.25	$ 19,355.74	$ 186,317.38	$ 93,621.24
Extended Warranty for Year 5	$ 290,861.16	$ 44,483.89	$ 19,936.42	$ 191,906.90	$ 96,429.88
Extended Warranty for Year 6	$ 299,587.18	$ 45,818.41	$ 20,534.51	$ 197,664.11	$ 99,322.78
Extended Warranty for Year 7	$ 308,575.24	$ 47,192.96	$ 21,150.54	$ 203,594.03	$ 102,302.46
Extended Warranty for Year 8	$ 317,832.06	$ 48,608.75	$ 21,785.06	$ 209,701.85	$ 105,371.53
Extended Warranty for Year 9	$ 327,367.50	$ 50,067.01	$ 22,438.61	$ 215,992.91	$ 108,532.68
Extended Warranty for Year 10	$ 337,188.62	$ 51,569.02	$ 23,111.77	$ 222,472.70	$ 111,788.66
Extended Warranty for Year 11	$ 347,303.64	$ 53,116.10	$ 23,805.12	$ 229,146.88	$ 115,142.32
Extended Warranty for Year 12	$ 357,722.98	$ 54,709.58	$ 24,519.28	$ 236,021.28	$ 118,596.59
Extended Warranty for Year 13	$ 368,455.25	$ 56,350.87	$ 25,254.85	$ 243,101.92	$ 122,154.49
Extended Warranty for Year 14	$ 379,508.26	$ 58,041.39	$ 26,012.50	$ 250,394.98	$ 125,819.12
Extended Warranty for Year 15	$ 390,894.01	$ 59,782.63	$ 26,792.87	$ 257,906.83	$ 129,593.69
Bundled Extended Warranty for Years 2-15	$ 4,184,188.27				

TABLE B.11 - NEW SUBSCRIBER RADIOS

This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.

	High Tier Portable (Configured to Meet Section 3.11.3.2.A)			High Tier Fire Service Portable (Configured to Meet Sections 3.11.3.2.A & B)		
	List Price	% Discount	Sales Price	List Price	% Discount	Sales Price
Table B.11.A - Costs & Discounts for Subscriber Base Models						
***CCD Package pricing reflective of radio trade-in and volume incentives- MSI replacement of CCD full inventory of current susbcriber equipment per Appendix E, over life of contract term.**						
All Hardware and Software Required to Meet the Following RFP Sections: - Section 3.1.2 (including AES with multiple keys) except options listed in Table B.11.B - Section 3.11.2 except sections 3.11.2.J and 3.11.2.K - Section 3.11.3 (for portables) - Section 3.11.4 (for mobiles)	$ 2,921.10	N/A	$ 2,921.10	$ 3,201.60	N/A	$ 3,201.60
Trade-In Price-Deduction for Existing CCD Radio of Any Manufacturer (If available, please state as a negative number to confirm cost savings)			$ (500.00)			$ (500.00)
Table B.11.B - Costs & Discounts to Add Optional Features to Each Radio						
Add: Link Layer Authentication	$ 100.00	35%	$ 65.00	$ 100.00	35%	$ 65.00
Add: Geo-Location / GPS	Included			Included		
Add: Short Messaging	Included			Included		
Add: Over-The-Air-Rekeying	$ 740.00	35%	$ 481.00	$ 740.00	35%	$ 481.00
Add: Over-The-Air-Reprogramming	$ 100.00	35%	$ 65.00	$ 100.00	35%	$ 65.00
Add: Multi-Band Capability - Add UHF	N/A					
Add: Multi-Band Capability - Add VHF	N/A					
Add: Bluetooth	Included			Included		
Add: WiFI	$ 300.00	35%	$ 195.00	$ 300.00	35%	$ 195.00
Add: 4G/LTE	N/A					
Add: Subscriber Codeplug Management (per 3.11.2.J and 3.11.2.K)	$ -	N/A	$ -	$ -	N/A	$ -
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Table B.11.C - Costs & Discounts to Add Accessories to Each Radio						
Add to Portables: High Capacity Battery	$ 162.00	30%	$ 113.40	$ 179.00	30%	$ 125.30
Add to Portables: Single-Unit Charger	$ 150.00	30%	$ 105.00	$ 150.00	30%	$ 105.00
Add to Portables: Multi-Unit Charger (6 radios min)	$ 1,250.00	30%	$ 875.00	$ 1,250.00	30%	$ 875.00
Add to Portables: Basic Accessory Package (excluding radio base model)	$ 419.00	30%	$ 293.30	$ 879.00	30%	$ 615.30
Add to Portables: Shoulder Mic Accessory Package (excluding radio base model)	$ 107.00	30%	$ 74.90			
Add to Portables: Fire Service Speaker Mic Package (excluding radio base model)				$ 550.00	30%	$ 385.00
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Table B.11.D - Programming Equipment						
12 Sets of Programming Equipment (excluding programming computers)	$ 900.00	35%	$ 585.00	$ 900.00	35%	$ 585.00
Table B.11.E - Costs & Discounts for Radio Implementation Services						
Service: Program Portable with Approved Codeplug	$ 73.00	35%	$ 47.45	$ 73.00	35%	$ 47.45
Service: Program Mobile with Approved Codeplug						
Service: Develop Mobile Codeplug per Templates & Fleetmap						
Service: Install Dash Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)						
Service: Install Remote Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)						
Service: Install Dash Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)						
Service: Install Remote Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)						

TABLE B.11 - NEW SUBSCRIBER RADIOS

This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.

	High Tier Portable (Configured to Meet Section 3.11.3.2.A)			High Tier Fire Service Portable (Configured to Meet Sections 3.11.3.2.A & B)		
	List Price	% Discount	Sales Price	List Price	% Discount	Sales Price
Service: *Additional Service (Add Description)*						
Service: *Additional Service (Add Description)*						
Service: *Additional Service (Add Description)*						

***CCD Subscriber Package pricing listed within this table is reflective of volume incentives- MSI replacement of CCD full inventory of current susbcriber equipment per Appendix E, over life of contract term.**

****Subscriber Technology Credit- Applicable toward Optional Radio Features listed under Table B.11.B, Incentive offered with:**

2500+ subscriber radios + bundled software and support package included with system contract = Subscriber Technology Credit valued at **$500,000**

4500+ subscriber radios + bundled software and support package included with system contract = Subscriber Technology Credit valued at **$850,000**

TABLE B.11 - NEW SUBSCRIBER RADIOS						
This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.						
	Mid-Tier Portable (Configured to Meet Section 3.11.3.3)			Low-Tier Portable (Configured to Meet Section 3.11.3.4)		
	List Price	% Discount	Sales Price	List Price	% Discount	Sales Price
Table B.11.A - Costs & Discounts for Subscriber Base Models						
***CCD Package pricing reflective of radio trade-in and volume incentives- MSI replacement of CCD full inventory of current susbcriber equipment per Appendix E, over life of contract term.**						
All Hardware and Software Required to Meet the Following RFP Sections:						
- Section 3.1.2 (including AES with multiple keys) except options listed in Table B.11.B						
- Section 3.11.2 except sections 3.11.2.J and 3.11.2.K						
- Section 3.11.3 (for portables)						
- Section 3.11.4 (for mobiles)	$ 2,775.24	N/A	$ 2,775.24	$ 2,291.42	N/A	$ 2,291.42
Trade-In Price-Deduction for Existing CCD Radio of Any Manufacturer (If available, please state as a negative number to confirm cost savings)			$ (500.00)			$ (500.00)
Table B.11.B - Costs & Discounts to Add Optional Features to Each Radio						
Add: Link Layer Authentication	$ 100.00	35%	$ 65.00	$ 100.00	35%	$ 65.00
Add: Geo-Location / GPS	Included			Included		
Add: Short Messaging	Included			Included		
Add: Over-The-Air-Rekeying	$ 740.00	35%	$ 481.00	$ 740.00	35%	$ 481.00
Add: Over-The-Air-Reprogramming	$ 100.00	35%	$ 65.00	$ 100.00	35%	$ 65.00
Add: Multi-Band Capability - Add UHF						
Add: Multi-Band Capability - Add VHF						
Add: Bluetooth	Included					
Add: WiFI	$ 300.00	35%	$ 195.00			
Add: 4G/LTE						
Add: Subscriber Codeplug Management (per 3.11.2.J and 3.11.2.K)	$ -	N/A	$ -	$ -	N/A	$ -
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Table B.11.C - Costs & Discounts to Add Accessories to Each Radio						
Add to Portables: High Capacity Battery	$ 162.00	30%	$ 113.40	$ 162.00	30%	$ 113.40
Add to Portables: Single-Unit Charger	$ 150.00	30%	$ 105.00	$ 69.00	30%	$ 48.30
Add to Portables: Multi-Unit Charger (6 radios min)	$ 1,250.00	30%	$ 875.00	$ 495.00	30%	$ 346.50
Add to Portables: Basic Accessory Package (excluding radio base model)	$ 419.00	30%	$ 293.30	$ 419.00	30%	$ 293.30
Add to Portables: Shoulder Mic Accessory Package (excluding radio base model)	$ 107.00	30%	$ 74.90	$ 107.00	30%	$ 74.90
Add to Portables: Fire Service Speaker Mic Package (excluding radio base model)						
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Table B.11.D - Programming Equipment						
12 Sets of Programming Equipment (excluding programming computers)	$ 900.00	35%	$ 585.00	$ 900.00	35%	$ 585.00
Table B.11.E - Costs & Discounts for Radio Implementation Services						
Service: Program Portable with Approved Codeplug	$ 73.00	35%	$ 47.45	$ 73.00	35%	$ 47.45
Service: Program Mobile with Approved Codeplug						
Service: Develop Mobile Codeplug per Templates & Fleetmap						
Service: Install Dash Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)						
Service: Install Remote Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)						
Service: Install Dash Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)						
Service: Install Remote Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)						

TABLE B.11 - NEW SUBSCRIBER RADIOS

This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.

	Mid-Tier Portable (Configured to Meet Section 3.11.3.3)			Low-Tier Portable (Configured to Meet Section 3.11.3.4)		
	List Price	% Discount	Sales Price	List Price	% Discount	Sales Price
Service: *Additional Service (Add Description)*						
Service: *Additional Service (Add Description)*						
Service: *Additional Service (Add Description)*						

***CCD Subscriber Package pricing listed within this table is reflective of volume incentives- MSI replacement of CCD**

****Subscriber Technology Credit- Applicable toward Optional Radio Features listed under Table B.11.B, Incentive o**

2500+ subscriber radios + bundled software and support package included with system contract = Subscriber

4500+ subscriber radios + bundled software and support package included with system contract = Subscriber

TABLE B.11 - NEW SUBSCRIBER RADIOS

This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.

	High-Tier Mobile (Configured to Meet Section 3.11.4.2)			Mid-Tier Mobile (Configured to Meet Sections 3.11.4.3.A-C)		
	List Price	% Discount	Sales Price	List Price	% Discount	Sales Price
Table B.11.A - Costs & Discounts for Subscriber Base Models						
***CCD Package pricing reflective of radio trade-in and volume incentives- MSI replacement of CCD full inventory of current susbcriber equipment per Appendix E, over life of contract term.**						
All Hardware and Software Required to Meet the Following RFP Sections: - Section 3.1.2 (including AES with multiple keys) except options listed in Table B.11.B - Section 3.11.2 except sections 3.11.2.J and 3.11.2.K - Section 3.11.3 (for portables) - Section 3.11.4 (for mobiles)	$ 2,979.92	N/A	$ 2,979.92	$ 2,899.50	N/A	$ 2,899.50
Trade-In Price-Deduction for Existing CCD Radio of Any Manufacturer (If available, please state as a negative number to confirm cost savings)			$ (500.00)			$ (500.00)
Table B.11.B - Costs & Discounts to Add Optional Features to Each Radio						
Add: Link Layer Authentication	$ 100.00	35%	$ 65.00	$ 100.00	35%	$ 65.00
Add: Geo-Location / GPS						
Add: Short Messaging						
Add: Over-The-Air-Rekeying	$ 740.00	35%	$ 481.00	$ 740.00	35%	$ 481.00
Add: Over-The-Air-Reprogramming	$ 100.00	35%	$ 65.00	$ 100.00	35%	$ 65.00
Add: Multi-Band Capability - Add UHF						
Add: Multi-Band Capability - Add VHF						
Add: Bluetooth						
Add: WiFI						
Add: 4G/LTE						
Add: Subscriber Codeplug Management (per 3.11.2.J and 3.11.2.K)	$ -	N/A	$ -	$ -	N/A	$ -
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Table B.11.C - Costs & Discounts to Add Accessories to Each Radio						
Add to Portables: High Capacity Battery						
Add to Portables: Single-Unit Charger						
Add to Portables: Multi-Unit Charger (6 radios min)						
Add to Portables: Basic Accessory Package (excluding radio base model)						
Add to Portables: Shoulder Mic Accessory Package (excluding radio base model)						
Add to Portables: Fire Service Speaker Mic Package (excluding radio base model)						
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Table B.11.D - Programming Equipment						
12 Sets of Programming Equipment (excluding programming computers)	$ 900.00	35%	$ 585.00	$ 900.00	35%	$ 585.00
Table B.11.E - Costs & Discounts for Radio Implementation Services						
Service: Program Portable with Approved Codeplug						
Service: Program Mobile with Approved Codeplug	$ 73.00	35%	$ 47.45	$ 73.00	35%	$ 47.45
Service: Develop Mobile Codeplug per Templates & Fleetmap	Included	N/A	Included	Included	N/A	Included
Service: Install Dash Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)	$ 318.00	35%	$ 206.70	$ 318.00	35%	$ 206.70
Service: Install Remote Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)	$ 312.00	35%	$ 202.80	$ 312.00	35%	$ 202.80
Service: Install Dash Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)	$ 318.00	35%	$ 206.70	$ 318.00	35%	$ 206.70
Service: Install Remote Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)	$ 312.00	35%	$ 202.80	$ 312.00	35%	$ 202.80

TABLE B.11 - NEW SUBSCRIBER RADIOS

This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.

	High-Tier Mobile (Configured to Meet Section 3.11.4.2)			Mid-Tier Mobile (Configured to Meet Sections 3.11.4.3.A-C)		
	List Price	% Discount	Sales Price	List Price	% Discount	Sales Price
Service: *Additional Service (Add Description)*						
Service: *Additional Service (Add Description)*						
Service: *Additional Service (Add Description)*						

***CCD Subscriber Package pricing listed within this table is reflective of volume incentives- MSI replacement of CCD**

****Subscriber Technology Credit- Applicable toward Optional Radio Features listed under Table B.11.B, Incentive o**

2500+ subscriber radios + bundled software and support package included with system contract = Subscriber

4500+ subscriber radios + bundled software and support package included with system contract = Subscriber

TABLE B.11 - NEW SUBSCRIBER RADIOS						
This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.						
	Mid-Tier Motorcycle Mobile (Configured to Meet Sections 3.11.4.3.A-D)			Mid-Tier Fire Service Mobile (Configured to Meet Sections 3.11.4.3.A-C & E)		
	List Price	% Discount	Sales Price	List Price	% Discount	Sales Price
Table B.11.A - Costs & Discounts for Subscriber Base Models						
***CCD Package pricing reflective of radio trade-in and volume incentives- MSI replacement of CCD full inventory of current susbcriber equipment per Appendix E, over life of contract term.**						
All Hardware and Software Required to Meet the Following RFP Sections: - Section 3.1.2 (including AES with multiple keys) except options listed in Table B.11.B - Section 3.11.2 except sections 3.11.2.J and 3.11.2.K - Section 3.11.3 (for portables) - Section 3.11.4 (for mobiles)	$ 3,184.60	N/A	$ 3,184.60	$ 2,915.32	N/A	$ 2,915.32
Trade-In Price-Deduction for Existing CCD Radio of Any Manufacturer (If available, please state as a negative number to confirm cost savings)			$ (500.00)			$ (500.00)
Table B.11.B - Costs & Discounts to Add Optional Features to Each Radio						
Add: Link Layer Authentication	$ 100.00	35%	$ 65.00	$ 100.00	35%	$ 65.00
Add: Geo-Location / GPS						
Add: Short Messaging						
Add: Over-The-Air-Rekeying	$ 740.00	35%	$ 481.00	$ 740.00	35%	$ 481.00
Add: Over-The-Air-Reprogramming	$ 100.00	35%	$ 65.00	$ 100.00	35%	$ 65.00
Add: Multi-Band Capability - Add UHF						
Add: Multi-Band Capability - Add VHF						
Add: Bluetooth						
Add: WiFI						
Add: 4G/LTE						
Add: Subscriber Codeplug Management (per 3.11.2.J and 3.11.2.K)	$ -	N/A	$ -	$ -	N/A	$ -
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Table B.11.C - Costs & Discounts to Add Accessories to Each Radio						
Add to Portables: High Capacity Battery						
Add to Portables: Single-Unit Charger						
Add to Portables: Multi-Unit Charger (6 radios min)						
Add to Portables: Basic Accessory Package (excluding radio base model)						
Add to Portables: Shoulder Mic Accessory Package (excluding radio base model)						
Add to Portables: Fire Service Speaker Mic Package (excluding radio base model)						
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Table B.11.D - Programming Equipment						
12 Sets of Programming Equipment (excluding programming computers)	$ 900.00	35%	$ 585.00	$ 900.00	35%	$ 585.00
Table B.11.E - Costs & Discounts for Radio Implementation Services						
Service: Program Portable with Approved Codeplug						
Service: Program Mobile with Approved Codeplug	$ 73.00	35%	$ 47.45	$ 73.00	35%	$ 47.45
Service: Develop Mobile Codeplug per Templates & Fleetmap	Included	N/A	Included	Included	N/A	Included
Service: Install Dash Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)						
Service: Install Remote Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)	$ 312.00	35%	$ 202.80			
Service: Install Dash Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)				$ 318.00	35%	$ 206.70
Service: Install Remote Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)				$ 312.00	35%	$ 202.80

TABLE B.11 - NEW SUBSCRIBER RADIOS

This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.

	Mid-Tier Motorcycle Mobile (Configured to Meet Sections 3.11.4.3.A-D)			Mid-Tier Fire Service Mobile (Configured to Meet Sections 3.11.4.3.A-C & E)		
	List Price	% Discount	Sales Price	List Price	% Discount	Sales Price
Service: *Additional Service (Add Description)*						
Service: *Additional Service (Add Description)*						
Service: *Additional Service (Add Description)*						

***CCD Subscriber Package pricing listed within this table is reflective of volume incentives- MSI replacement of CCD**

****Subscriber Technology Credit- Applicable toward Optional Radio Features listed under Table B.11.B, Incentive o**

2500+ subscriber radios + bundled software and support package included with system contract = Subscriber

4500+ subscriber radios + bundled software and support package included with system contract = Subscriber

TABLE B.11 - NEW SUBSCRIBER RADIOS						
This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.						
	Low-Tier Mobile (Configured to Meet Section 3.11.4.5)			Control Station Mobile (Configured to Meet Section 3.11.4.4.A.1)		
	List Price	% Discount	Sales Price	List Price	% Discount	Sales Price
Table B.11.A - Costs & Discounts for Subscriber Base Models						
***CCD Package pricing reflective of radio trade-in and volume incentives- MSI replacement of CCD full inventory of current susbcriber equipment per Appendix E, over life of contract term.**						
All Hardware and Software Required to Meet the Following RFP Sections: - Section 3.1.2 (including AES with multiple keys) except options listed in Table B.11.B - Section 3.11.2 except sections 3.11.2.J and 3.11.2.K - Section 3.11.3 (for portables) - Section 3.11.4 (for mobiles)	$ 2,446.46	N/A	$ 2,446.46	$ 2,845.50	N/A	$ 2,845.50
Trade-In Price-Deduction for Existing CCD Radio of Any Manufacturer (If available, please state as a negative number to confirm cost savings)			$ (500.00)			
Table B.11.B - Costs & Discounts to Add Optional Features to Each Radio						
Add: Link Layer Authentication	$ 100.00	35%	$ 65.00	$ 100.00	35%	$ 65.00
Add: Geo-Location / GPS						
Add: Short Messaging						
Add: Over-The-Air-Rekeying	$ 740.00	35%	$ 481.00	$ 740.00	35%	$ 481.00
Add: Over-The-Air-Reprogramming	$ 100.00	35%	$ 65.00	$ 100.00	35%	$ 65.00
Add: Multi-Band Capability - Add UHF						
Add: Multi-Band Capability - Add VHF						
Add: Bluetooth						
Add: WiFI						
Add: 4G/LTE						
Add: Subscriber Codeplug Management (per 3.11.2.J and 3.11.2.K)	$ -	N/A	$ -	$ -	N/A	$ -
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Table B.11.C - Costs & Discounts to Add Accessories to Each Radio						
Add to Portables: High Capacity Battery						
Add to Portables: Single-Unit Charger						
Add to Portables: Multi-Unit Charger (6 radios min)						
Add to Portables: Basic Accessory Package (excluding radio base model)						
Add to Portables: Shoulder Mic Accessory Package (excluding radio base model)						
Add to Portables: Fire Service Speaker Mic Package (excluding radio base model)						
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Table B.11.D - Programming Equipment						
12 Sets of Programming Equipment (excluding programming computers)	$ 900.00	35%	$ 585.00	$ 900.00	35%	$ 585.00
Table B.11.E - Costs & Discounts for Radio Implementation Services						
Service: Program Portable with Approved Codeplug						
Service: Program Mobile with Approved Codeplug	$ 73.00	35%	$ 47.45	$ 73.00	35%	$ 47.45
Service: Develop Mobile Codeplug per Templates & Fleetmap	Included	N/A	Included	Included	N/A	Included
Service: Install Dash Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)	$ 318.00	35%	$ 206.70			
Service: Install Remote Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)	$ 312.00	35%	$ 202.80			
Service: Install Dash Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)	$ 318.00	35%	$ 206.70			
Service: Install Remote Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)	$ 312.00	35%	$ 202.80			

TABLE B.11 - NEW SUBSCRIBER RADIOS

This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.

	Low-Tier Mobile (Configured to Meet Section 3.11.4.5)			Control Station Mobile (Configured to Meet Section 3.11.4.4.A.1)		
	List Price	% Discount	Sales Price	List Price	% Discount	Sales Price
Service: *Additional Service (Add Description)*						
Service: *Additional Service (Add Description)*						
Service: *Additional Service (Add Description)*						

***CCD Subscriber Package pricing listed within this table is reflective of volume incentives- MSI replacement of CCD**

****Subscriber Technology Credit- Applicable toward Optional Radio Features listed under Table B.11.B, Incentive o**

2500+ subscriber radios + bundled software and support package included with system contract = Subscriber

4500+ subscriber radios + bundled software and support package included with system contract = Subscriber

TABLE B.11 - NEW SUBSCRIBER RADIOS						
This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.						
	Consolette (Configured to Meet Section 3.11.4.4.A.2)			Vehicle Repeater		
	List Price	% Discount	Sales Price	List Price	% Discount	Sales Price
Table B.11.A - Costs & Discounts for Subscriber Base Models						
***CCD Package pricing reflective of radio trade-in and volume incentives- MSI replacement of CCD full inventory of current susbcriber equipment per Appendix E, over life of contract term.**						
All Hardware and Software Required to Meet the Following RFP Sections: - Section 3.1.2 (including AES with multiple keys) except options listed in Table B.11.B - Section 3.11.2 except sections 3.11.2.J and 3.11.2.K - Section 3.11.3 (for portables) - Section 3.11.4 (for mobiles)	$ 3,784.50	N/A	$ 3,784.50	$ 9,017.25	N/A	$ 9,017.25
Trade-In Price-Deduction for Existing CCD Radio of Any Manufacturer (If available, please state as a negative number to confirm cost savings)						
Table B.11.B - Costs & Discounts to Add Optional Features to Each Radio						
Add: Link Layer Authentication	$ 100.00	35%	$ 65.00	$ 100.00	35%	$ 65.00
Add: Geo-Location / GPS						
Add: Short Messaging						
Add: Over-The-Air-Rekeying	$ 740.00	35%	$ 481.00	$ 740.00	35%	$ 481.00
Add: Over-The-Air-Reprogramming	$ 100.00	35%	$ 65.00	$ 100.00	35%	$ 65.00
Add: Multi-Band Capability - Add UHF						
Add: Multi-Band Capability - Add VHF						
Add: Bluetooth						
Add: WiFI						
Add: 4G/LTE						
Add: Subscriber Codeplug Management (per 3.11.2.J and 3.11.2.K)	$ -	N/A	$ -	$ -	N/A	$ -
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Table B.11.C - Costs & Discounts to Add Accessories to Each Radio						
Add to Portables: High Capacity Battery						
Add to Portables: Single-Unit Charger						
Add to Portables: Multi-Unit Charger (6 radios min)						
Add to Portables: Basic Accessory Package (excluding radio base model)						
Add to Portables: Shoulder Mic Accessory Package (excluding radio base model)						
Add to Portables: Fire Service Speaker Mic Package (excluding radio base model)						
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Table B.11.D - Programming Equipment						
12 Sets of Programming Equipment (excluding programming computers)	$ 900.00	35%	$ 585.00	$ 900.00	35%	$ 585.00
Table B.11.E - Costs & Discounts for Radio Implementation Services						
Service: Program Portable with Approved Codeplug						
Service: Program Mobile with Approved Codeplug	$ 73.00	35%	$ 47.45	$ 73.00	35%	$ 47.45
Service: Develop Mobile Codeplug per Templates & Fleetmap	Included	N/A	Included	Included	N/A	Included
Service: Install Dash Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)						
Service: Install Remote Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)						
Service: Install Dash Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)						
Service: Install Remote Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)						

TABLE B.11 - NEW SUBSCRIBER RADIOS

This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.

	Consolette (Configured to Meet Section 3.11.4.4.A.2)			Vehicle Repeater		
	List Price	% Discount	Sales Price	% Discount	Sales Price	
Service: *Additional Service (Add Description)*						
Service: *Additional Service (Add Description)*						
Service: *Additional Service (Add Description)*						

***CCD Subscriber Package pricing listed within this table is reflective of volume incentives- MSI replacement of CCD**

****Subscriber Technology Credit- Applicable toward Optional Radio Features listed under Table B.11.B, Incentive o**

2500+ subscriber radios + bundled software and support package included with system contract = Subscriber

4500+ subscriber radios + bundled software and support package included with system contract = Subscriber

TABLE B.11 - NEW SUBSCRIBER RADIOS						
This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.						
	Ultra High Tier Portable (Configured to Meet Section 3.11.3.2.A)			Ultra High Tier Mobile (Configured to Meet Section 3.11.4.2)		
	List Price	% Discount	Sales Price	List Price	% Discount	Sales Price
Table B.11.A - Costs & Discounts for Subscriber Base Models						
***CCD Package pricing reflective of radio trade-in and volume incentives- MSI replacement of CCD full inventory of current susbcriber equipment per Appendix E, over life of contract term.**						
All Hardware and Software Required to Meet the Following RFP Sections: - Section 3.1.2 (including AES with multiple keys) except options listed in Table B.11.B - Section 3.11.2 except sections 3.11.2.J and 3.11.2.K - Section 3.11.3 (for portables) - Section 3.11.4 (for mobiles)	$ 3,722.48	N/A	$ 3,722.48	$ 3,663.00	N/A	$ 3,663.00
Trade-In Price-Deduction for Existing CCD Radio of Any Manufacturer (If available, please state as a negative number to confirm cost savings)			$ (500.00)			-500
Table B.11.B - Costs & Discounts to Add Optional Features to Each Radio						
Add: Link Layer Authentication	$ 100.00	35%	$ 65.00	$ 100.00	35%	65
Add: Geo-Location / GPS	Included			Included		
Add: Short Messaging	Included			Included		
Add: Over-The-Air-Rekeying	$ 740.00	35%	$ 481.00	$ 740.00	35%	481
Add: Over-The-Air-Reprogramming	$ 100.00	35%	$ 65.00	$ 100.00	35%	65
Add: Multi-Band Capability - Add UHF	$ 800.00	35%	$ 520.00	$ 800.00	35%	520
Add: Multi-Band Capability - Add VHF	$ 800.00	35%	$ 520.00	$ 800.00	35%	520
Add: Bluetooth	Included			Included		
Add: WiFI	$ 300.00	35%	$ 195.00	$ 300.00	35%	195
Add: 4G/LTE						
Add: Subscriber Codeplug Management (per 3.11.2.J and 3.11.2.K)	$ -	N/A	$ -	$ -	N/A	0
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Table B.11.C - Costs & Discounts to Add Accessories to Each Radio						
Add to Portables: High Capacity Battery	$ 162.00	30%	$ 113.40			
Add to Portables: Single-Unit Charger	$ 150.00	30%	$ 105.00			
Add to Portables: Multi-Unit Charger (6 radios min)	$ 1,250.00	30%	$ 875.00			
Add to Portables: Basic Accessory Package (excluding radio base model)	$ 419.00	30%	$ 293.30			
Add to Portables: Shoulder Mic Accessory Package (excluding radio base model)	$ 107.00	30%	$ 74.90			
Add to Portables: Fire Service Speaker Mic Package (excluding radio base model)						
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Table B.11.D - Programming Equipment						
12 Sets of Programming Equipment (excluding programming computers)	$ 900.00	35%	$ 585.00	$ 900.00	35%	585
Table B.11.E - Costs & Discounts for Radio Implementation Services						
Service: Program Portable with Approved Codeplug	$ 73.00	35%	$ 47.45			
Service: Program Mobile with Approved Codeplug				$ 73.00	35%	47.45
Service: Develop Mobile Codeplug per Templates & Fleetmap				Included	N/A	Included
Service: Install Dash Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)				$ 318.00	35%	206.7
Service: Install Remote Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)				$ 312.00	35%	202.8
Service: Install Dash Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)						
Service: Install Remote Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)						

TABLE B.11 - NEW SUBSCRIBER RADIOS

This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.

	Ultra High Tier Portable (Configured to Meet Section 3.11.3.2.A)			Ultra High Tier Mobile (Configured to Meet Section 3.11.4.2)		
	List Price	% Discount	Sales Price	List Price	% Discount	Sales Price
Service: *Additional Service (Add Description)*						
Service: *Additional Service (Add Description)*						
Service: *Additional Service (Add Description)*						

***CCD Subscriber Package pricing listed within this table is reflective of volume incentives- MSI replacement of CCD**

****Subscriber Technology Credit- Applicable toward Optional Radio Features listed under Table B.11.B, Incentive o**

2500+ subscriber radios + bundled software and support package included with system contract = Subscriber

4500+ subscriber radios + bundled software and support package included with system contract = Subscriber

TABLE B.11 - NEW SUBSCRIBER RADIOS This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.	*Low Cost Alternative Low Tier Portable (No AES Encryption Available)*			*Low Cost Alternative Low Tier Mobile (No AES Encryption Available)*		
		% Discount	Sales Price		% Discount	Sales Price
Table B.11.A - Costs & Discounts for Subscriber Base Models						
***CCD Package pricing reflective of radio trade-in and volume incentives- MSI replacement of CCD full inventory of current susbcriber equipment per Appendix E, over life of contract term.**						
All Hardware and Software Required to Meet the Following RFP Sections: - Section 3.1.2 (including AES with multiple keys) except options listed in Table B.11.B - Section 3.11.2 except sections 3.11.2.J and 3.11.2.K - Section 3.11.3 (for portables) - Section 3.11.4 (for mobiles)	$ 1,621.00	N/A	$ 1,621.00	$ 1,842.00	N/A	$ 1,842.00
Trade-In Price-Deduction for Existing CCD Radio of Any Manufacturer (If available, please state as a negative number to confirm cost savings)			$ (500.00)			$ (500.00)
Table B.11.B - Costs & Discounts to Add Optional Features to Each Radio						
Add: Link Layer Authentication						
Add: Geo-Location / GPS	Included			Included		
Add: Short Messaging						
Add: Over-The-Air-Rekeying						
Add: Over-The-Air-Reprogramming	$ 100.00	35%	$ 65.00	$ 100.00	35%	$ 65.00
Add: Multi-Band Capability - Add UHF						
Add: Multi-Band Capability - Add VHF						
Add: Bluetooth						
Add: WiFI						
Add: 4G/LTE						
Add: Subscriber Codeplug Management (per 3.11.2.J and 3.11.2.K)	$ -	N/A	$ -	$ -	N/A	$ -
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Add: *Additional Feature (Add Description)*						
Table B.11.C - Costs & Discounts to Add Accessories to Each Radio						
Add to Portables: High Capacity Battery						
Add to Portables: Single-Unit Charger						
Add to Portables: Multi-Unit Charger (6 radios min)						
Add to Portables: Basic Accessory Package (excluding radio base model)						
Add to Portables: Shoulder Mic Accessory Package (excluding radio base model)						
Add to Portables: Fire Service Speaker Mic Package (excluding radio base model)						
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Add: *Additional Accessory (Add Description)*						
Table B.11.D - Programming Equipment						
12 Sets of Programming Equipment (excluding programming computers)	$ 900.00	35%	$ 585.00	$ 900.00	35%	$ 585.00
Table B.11.E - Costs & Discounts for Radio Implementation Services						
Service: Program Portable with Approved Codeplug	$ 73.00	35%	$ 47.45			
Service: Program Mobile with Approved Codeplug				$ 73.00	35%	$ 47.45
Service: Develop Mobile Codeplug per Templates & Fleetmap				Included	N/A	Included
Service: Install Dash Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)				$ 318.00	35%	$ 206.70
Service: Install Remote Mount Mobile Radio to Police /Passenger Vehicle (Include Removal of Existing Radio)				$ 312.00	35%	$ 202.80
Service: Install Dash Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)						
Service: Install Remote Mount Mobile Radio to Fire/EMS Vehicle (Include Removal of Existing Radio)						

TABLE B.11 - NEW SUBSCRIBER RADIOS

This Table is for subscriber radio equipment and services that may be procured by the City as part of the contract and/or future purchase(s). IT IS NOT OPTIONAL FOR THE OFFEROR -- ALL PRICES MUST BE INCLUDED.

	Low Cost Alternative Low Tier Portable (No AES Encryption Available)		*Low Cost Alternative Low Tier Mobile (No AES Encryption Available)*	
	% Discount	Sales Price	% Discount	Sales Price
Service: *Additional Service (Add Description)*				
Service: *Additional Service (Add Description)*				
Service: *Additional Service (Add Description)*				

***CCD Subscriber Package pricing listed within this table is reflective of volume incentives- MSI replacement of CCD**

****Subscriber Technology Credit- Applicable toward Optional Radio Features listed under Table B.11.B, Incentive o**

2500+ subscriber radios + bundled software and support package included with system contract = Subscriber

4500+ subscriber radios + bundled software and support package included with system contract = Subscriber

CITY AND COUNTY OF DENVER

SECTION 2.1

SYSTEM DESIGN

P25 PUBLIC SAFETY RADIO SYSTEM REPLACEMENT PROJECT NOVEMBER 20, 2017

REQUEST FOR PROPOSAL NO. 28435Q

MOTOROLA SOLUTIONS

TABLE OF CONTENTS

Section 2.1

SECTION 2.1

SYSTEM DESIGN

2.1.1 SYSTEM DESCRIPTION

2.1.1.1 Technology and System Architecture

2.1.1.1.1 Proposed System Technology

ASTRO® 25 is the most widely used Project 25, Mission-Critical, Integrated Voice and Data (IV&D) communication network for public safety agencies. Installed worldwide, ASTRO 25 solutions meet and exceed IV&D requirements for day-to-day operations, as well as emergency response in the most demanding situations. ASTRO 25 is a wireless platform that combines uncompromising, real-world performance and the legendary reliability of Motorola Solutions, Inc. (Motorola).

Motorola is pleased to offer the City and County of Denver (CCD) a compliant solution in response to the request for an 800 MHz P25 Phase II TDMA Trunked Radio System. Motorola has carefully reviewed the Request for Proposal (RFP), and has proposed a system solution that provides the maximum value to both the users in terms of system reliability and functionality, as well as the CCD administrators in terms of total cost. Motorola is proud to propose its latest-generation of ASTRO 25 systems to CCD.

Motorola's ASTRO 25 Project 25 technology has been deployed in hundreds of systems across the US and hundreds more worldwide, making Motorola the World's leader in accepted P25 systems. Motorola is also proud to be the global leader in accepted P25 Phase II systems.

From single-site systems to nationwide deployments, ASTRO 25 is a flexible, modular network with advanced call processing capabilities designed to meet the needs of public safety. ASTRO 25 has been designed to be adaptable and can accommodate thousands of additional users, increased geographic coverage, enhanced data applications, and connectivity to other networks—all to ensure an efficient and cost-effective mission-critical solution for years to come.

Motorola's proposed solution provides an integrated network that includes Project 25 TDMA voice infrastructure, dispatch consoles, conventional channel gateways for interoperability, user radio equipment, and encryption capabilities.

It includes the following features and benefits for CCD and its agencies:

Optimized Coverage within CCD's Combined Service Area

Motorola has extensively analyzed the coverage capabilities available through the use of the eight existing sites included in this RFP. Through extensive design alterations to the site selection and antenna design, Motorola has developed a design that will provide the optimal coverage capabilities for CCD's new system. For portable radios using ½ wave antennas, this design provides for 98percent outbound (worse direction) reliability throughout the entire service area based on building losses as defined in the RFP. For portable radios using ¼ wave antennas, this design provides for 95.8percent inbound (worse direction) reliability throughout the entire service area based on building losses as defined in the RFP. Portable radios using either antenna type receive greater than 99percent on street reliability for both inbound and outbound communications.

Beyond the base coverage design and in-building coverage guarantees, our coverage analysis indicates that even if any of the simulcast sites experiences catastrophic failure (such as in the case of an extreme storm event or terrorist attack), first responders using a ½ wave antenna will still experience 97.7percent reliable in-building coverage or greater throughout the service area and those using a ¼ wave antenna will still experience 98.5percent or greater coverage, simply by removing their radios from their belt clips to transmit and receive.

System Capacity and Expandability Now and For the Future

The proposed system is highly scalable. It is designed to the meet CCD's current requirement to support 30,000 users today (licensed for 7,500 users) with the ability to support future growth in radio users, dispatch sites, dispatch consoles and RF sites as needed.

Increased System Functionality and Security

Enhanced programming, security, roaming, and interoperability capabilities are proposed using both Project 25 standard functionality and optional Motorola data and value-added capabilities:

- **Communication with other agencies is assured,** with shared encryption, enhanced roaming, and system wide access to dispatchers using the proposed MCC 7500E consoles.
- **Users will be able to roam seamlessly throughout the simulcast coverage area**, providing simplified operation without the need to manually switch between different areas of the system.
- **Interoperability through the optional ISSI 8000 P25 system interface** can provide automatic roaming between the proposed system and other systems in the region, while maintaining constant communications with home dispatch. Advanced features are also available, such as the ability to use encryption on other networks, rather than simply patching audio from one system to the other.
- **Dispatch centers will have increased integration with the system radios resources** through the use of Motorola's MCC 7500E dispatch technology. The MCC 7500E integrates directly into the system's core, providing access to all authorized resources system wide. The MCC 7500E dispatch console uses a highly configurable Graphical User Interface (GUI), allowing for a customized interface to help make the transition as easy as possible for dispatch users.

Mission Critical Reliability Provided by Geographic and Equipment Redundancy

Geographic redundancy of the master and simulcast prime sites, combined with component-level redundancy at the RF and dispatch sites, eliminates any single point of failure in the system. The proposed design ensures that users can continue to communicate and maintain full featured functionality in the event of major or multiple failures. The redundant master and simulcast prime sites are configured in a hot-standby configuration with automatic switch-over capability.

In addition to providing protection against catastrophic failure of the main master or primary prime site, the hot-standby nature of the redundant site design allows for automatic protection against component failures as well.

2.1.1.1.2 Proposed System Architecture

Motorola's proposed design for the CCD is a Project 25 Phase I and Phase II 800 MHz, digital trunked communications system specifically designed to comply with the RFP's requirements.

Motorola's ASTRO 25 trunked design meets the P25 standards for interoperability and will provide wide-area, high-capacity voice communications to all user agencies. The figure below illustrates the proposed P25 radio system topology, including the overall system design, radio and dispatch site elements and geographically redundant master and simulcast prime sites.

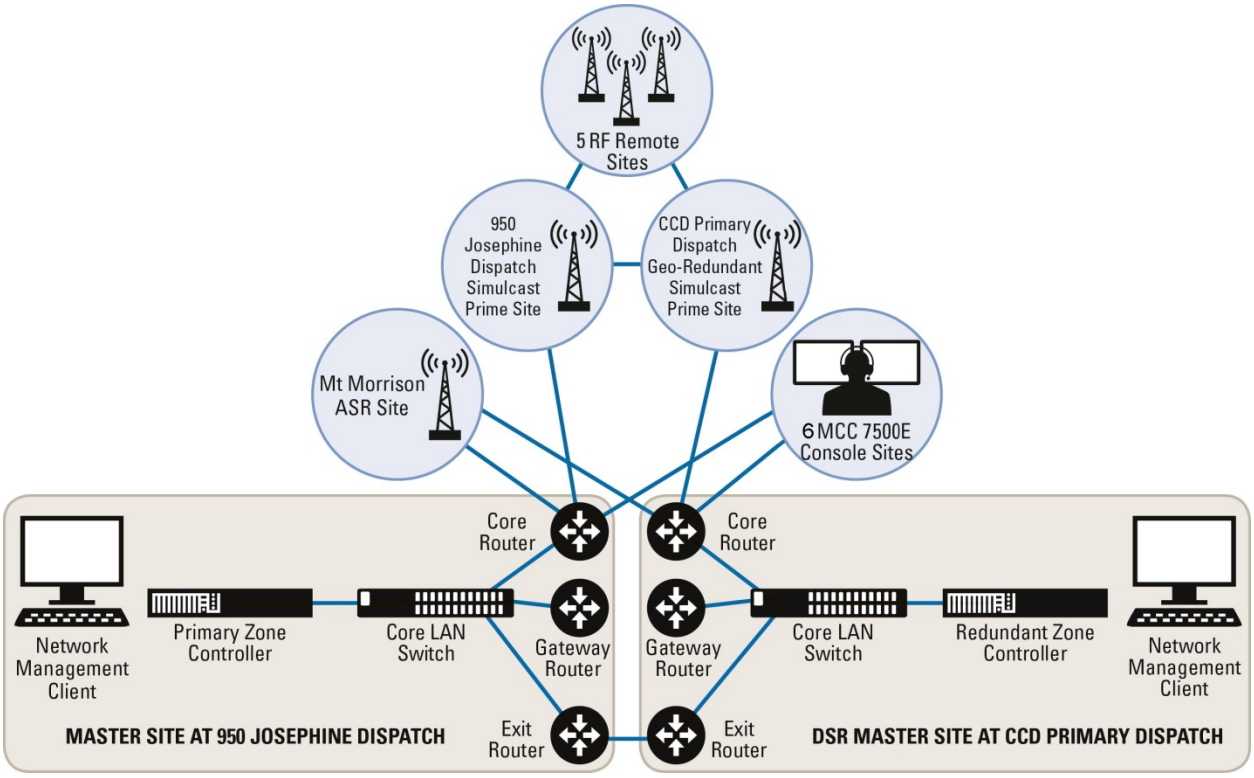


Figure 2-1: Proposed P25 Radio System Topology

The trunked system architecture is Internet Protocol (IP)-based, and includes an advanced network of computer servers and workstations, high speed local area networks (LAN), wide area networks (WAN), sophisticated databases and management software, and radio frequency (RF) equipment. Connectivity will be provided by the proposed MPLS-based microwave system.

Radio coverage across CCD's service area will be provided by a total of five RF sites configured as a single simulcast cell (four sites configured as transmit and receive, one site configured as receive only) and an additional ASTRO Site Repeater (ASR) site. The simulcast cell is equipped with seventeen TDMA, 800 MHz channels per RF site and provides 32 TDMA talkpaths. The ASR site is equipped with nine TDMA, 800 MHz channels per RF site and provides 16 TDMA talkpaths. The design includes five Nokia microwave links that when combined with existing CCD microwave links will create a loop protected microwave system to provide connectivity between the master site, simulcast prime sites, simulcast RF remote sites, ASR site and primary and backup dispatch sites. A map showing the geographic location of each RF site is provided in the figure below.

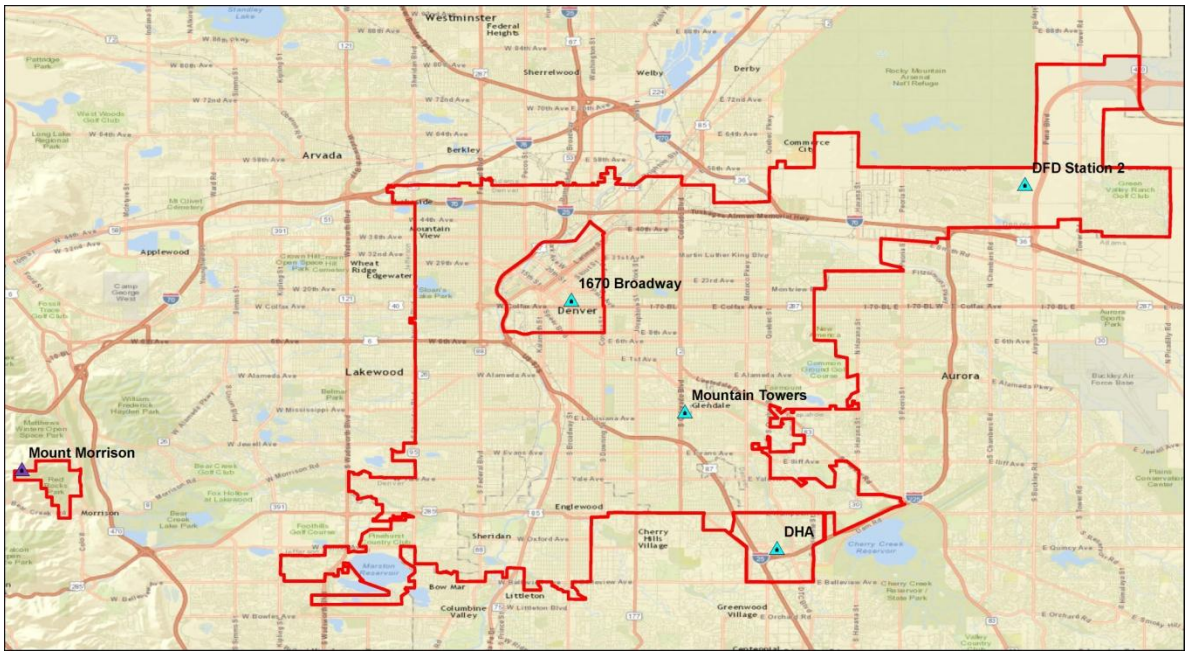


Figure 2-2: Map showing Geographic Location of Each Site

2.1.1.1.3 Site Selection

The proposed radio communications system is comprised of a simulcast cell with five RF sites (four transmit and receive sites and one receive only site) and an ASR site. The simulcast cell will provide coverage for CCD, along with the City of Sheridan and the City of Englewood. The ASR site provides coverage for the Red Rocks Mountain Park. This design provides fully compliant coverage and consists of the following sites:

- Simulcast Cell
  - 1670 Broadway
  - Denver Housing Authority
  - DFD Station 2
  - Mountain Towers
  - Mount Morrison (receive only)
- ASR Site
  - Mount Morrison

The RF sites were selected based on the preference to use existing sites specified in the RFP and an in-depth evaluation of coverage.

2.1.1.1.4 Traffic Loading Analysis

Traffic loading was based on CCD's defined busy hour call profiles as provided by CCD on October 16, 2017, shown in the following table.

Table 2-1: CCD Busy Hour Load

System/User Group	Total Number of Calls	Average Call Duration
Public Safety Users / Public Safety System	5,948	3.49 Sec
Public Utility Users / Public Utility System	2474	3.80 Sec

Using the above information and modeling traffic as 25percent greater than the busy hour data results in a total of 10.47 Erlangs.

For the simulcast cell, assuming involvement in 100 percent of calls, the 10.47 Erlangs require twenty talkpaths in order to provide a 1 percent GOS. As required, using five talkpaths as FDMA and the remainder as TDMA, the simulcast cell requires a total of fourteen channels (one control and thirteen voice). As request by CCD, the simulcast cell has been equipped with a total of seventeen channels (32 TDMA talkpaths) to provide additional capacity for future growth and interoperability. When fully operational as TDMA, the simulcast cell will provide a 1 percent GOS for a loading 240percent greater than the current busy hour loading.

For the ASR site, it was assumed that the current eleven talkpaths for this site were sufficient. As required, using five talkpaths as FDMA and the remainder as TDMA, the simulcast cell requires a total of nine channels (one control and eight voice). When fully operational as TDMA, this site will provide sixteen total talkpaths, a growth of 45 percent from what is currently available.

2.1.1.1.5 Use of Available (Current) Radio Spectrum and Frequency Selection

CCD currently operates a twenty-channel simulcast system within the 800 MHz public safety band across CCD's existing simulcast cell. The proposed ASTRO 25 system will reuse thirteen of those channels. The new system was designed with minimal variations to the existing licenses. For the nine channels required for the ASR site, Motorola is proposing the use of frequencies included in call sign KNNR200 licensed for the backup system at Mount Morrison. These existing licenses will require modifications to account for new emissions designators and antenna heights. Motorola will work with CCD to modify the existing licenses to operate on the new system.

Based on CCD's current licenses (as referenced in Appendix D of the RFP), Motorola has determined a set of suggested frequencies to be used for the simulcast cell and the ASR site. These frequencies were chosen based on existing licensing, adjacent and co-channel avoidance between the simulcast cell and the ASR site and maximizing frequency separation within the combining systems. The tables below detail the suggested frequencies at each of the sites.

Table 2-2: Frequency Plan for Simulcast Cell

Channel	Frequency (MHz)	Existing Call Sign
1	859.7375	WQHE237
2	859.4875	WQHE237
3	859.2375	WQHE237
4	858.7375	WQHE237
5	858.2375	WQHE237
6	857.7375	WQHE237
7	857.4875	WQHE237

Channel	Frequency (MHz)	Existing Call Sign
8	857.2375	WQHE237
9	856.7375	WQHE237
10	856.4875	WQHE237
11	856.2375	WQHE237
12	855.9875	WQHE237
13	855.7375	WQHE237
14	855.2375	WQHE237
15	854.9875	WQHE237
16	854.4375	WQHE237
17	854.0625	WQHE237

Table 2-3: Frequency Plan for ASR Site

Channel	Frequency (MHz)	Existing Call Sign
1	859.6125	KRRN200
2	858.4625	KRRN200
3	858.1375	KRRN200
4	857.6375	KRRN200
5	857.0625	KRRN200
6	856.6375	KRRN200
7	856.1375	KRRN200
8	855.4625	KRRN200
9	854.5875	KRRN200

2.1.1.1.6 Standards-Based System and Interoperability with Other Systems

Built on technology that is fully compliant with Project 25 standards, the proposed solution enables interoperability with both other P25 radio systems, and with non-P25 systems. In addition, it supports full, seamless communications between Project 25 Phase I and Phase II radios, dynamically switching between FDMA and TDMA modulations as necessary. Finally, our proposed infrastructure has been proven to support radios from other vendors, with combined fleets in operation on many of the hundreds of ASTRO 25 systems servicing public safety agencies. This section addresses our commitment to Project 25 standards testing and innovation, and describes in detail how the proposed system supports interoperability.

Commitment to Project 25 Standards

Motorola is proud to be part of the P25/TIA-102 standardization process. Since the 1990s Motorola has invested in P25, developing the ASTRO 25 portfolio of networks, devices, applications and services. With over 500 ASTRO 25 systems and more than 3 million P25 capable units deployed worldwide, Motorola is committed to the standard and supports public safety agencies as they meet their interoperability requirements. Motorola continues to champion the P25 standard by holding 18 P25 committee chair and vice chair positions, participating in the P25 Technology Interest Group and P25 CAP testing with ten subscriber vendors and seven infrastructure vendors.

Motorola provides a dedicated laboratory specifically for P25 interoperability testing and has this system available to other P25 manufacturers who would like to test their P25 products with Motorola

P25 systems. This system includes eight RF sites along with Console Dispatch and a Network Manager. This is not simulation testing. Testing is conducted using a live ASTRO 25 system that includes trunking and conventional, dispatch sites, with features that include TDMA P25 Phase II, ISSI, Console Subsystem Interface (CSSI), Data, Encryption, OTAR, Radio Authentication and Location. This equipment is not only used for P25 CAP Compliance Testing, but is also used by P25 manufacturers for P25 interoperability testing for subscribers, ISSI and consoles for CSSI.

Included within this proposal is the availability of the following P25 standard features:

- Talk Prohibit Tones (Busy Indicator)
- Busy Queuing / Callback
- Automatic Retry
- Recent User Priority
- Misdirected Talkgroup Protection
- Continuous Assignment Updating
- Group Call and Broadcast Call
- Emergency Alarm
- Emergency Group Call (ruthless preemption and top of queue)
- Individual Voice Call
- Announcement Group Call
- Radio Check
- Call Alert
- In-Call Call Alert
- Radio Inhibit / Uninhibit
- Radio Unit Monitoring
- Status Query / Status Update
- AES Encryption
- Talkgroup Priorities
- Talkgroup Message and Transmission Trunking
- Registration and Affiliation.

Also included within this proposal is optional pricing for the following P25 standard features:

- Authentication
- Over-The-Air Rekeying (OTAR)
- GPS Location Services
- Short Messaging Services.

Though not included in this proposal, Motorola also provides several non-P25 features which may be added to the proposed system at an additional cost. The list below highlights some of these features. Each of these features requires a Motorola APX radio.

- Enhanced Data – Increased capacity for inbound only data transmissions (i.e. cadenced based location reporting)
- Location on PTT – Transmission of geographical location data from the subscriber units upon PTT over the voice channel
- Enhanced Geo-Select – Designated geographical locations dictate subscriber characteristics such as talkgroup selected, radio user alert and transmit power level
- Interference Locator – Detection of an interfering RF signal located within the coverage area the system utilizing a simulcast subsystem (included within this proposal)
- APX Personnel Accountability – Provides on-scene incident commanders the ability to monitor and manage emergency personnel during critical incidents

- User Login Alias Update – Updates a subscriber units alias based on user login to the device
- Over-The-Air Software Updates – Firmware and flashcode updates to subscriber units of the radio system
- Talkgroup Text Messaging - Ability to quickly send a text message to a specific voice talkgroup reaching all APX radios simultaneously
- Alias Group Download – Call list PTT-ID aliases update over the radio system without the need to reprogram radios.

Interoperability with Project 25 Radio Systems

The proposed system will accommodate additional users and system growth through a modularly expandable design that will scale as CCD's needs change. It supports interoperability with other Project 25 systems in the region. CCD's new system can interconnect with these systems either through an ISSI gateway or directly without the need for an ISSI connection when connecting to one of the many Motorola Project 25 systems in the area.

Connectivity to Other Project 25 Systems

Motorola's ISSI 8000 solution is built to Project 25 standards, and enables disparate P25 networks to connect. This includes systems on different RF bands (VHF, UHF, 700/800MHz), with different system or WACN IDs, and using both P25 Phase I (FDMA) and Phase II (TDMA) technology. When linking two systems with Motorola's Project 25 technology, it enables significantly increased functionality, including a wide variety of call types, PTT IDs and aliases passed between the systems, and the ability to monitor and patch talkgroup traffic between the systems.

The ISSI 8000 subsystem includes a server, the ISSI 8000 application and firewall. As shown in the following figure, it uses an ISSI link to connect to other ISSI subsystems over a Wide Area Network (WAN), as shown in the figure below. The ISSI link is an Ethernet link, which requires a fixed IP address. Public safety agencies who require interconnectivity can select from a variety of last-mile and WAN solutions.

Figure 2-3: ISSI System Connectivity

The ISSI 8000 interface supports up to 24 ISSI connections, with licenses required for each. It is fully compliant with P25 ISSI standards, while offering additional features and benefits beyond the ISSI standard. The ISSI 8000 gateway provides for both manual and automatic radio roaming.

With manual inter-system roaming, an authorized radio roaming onto the proposed system must have a pre-assigned radio unit ID assigned on the system. This unit ID is used to register the radio to the proposed system. Once registered, the radio can then affiliate to a talkgroup on its home system. Similarly, one of CCD's radios can manually roam onto a neighboring P25 system by first registering with a pre-assigned radio unit ID on the neighboring system and then affiliating to a talkgroup on the proposed system.

Automatic System Roaming allows a radio to roam seamlessly between two systems using the radio unit ID of its home system. This is accomplished through Intra-WACN system roaming in which the unique Wide Area Control Network (WACN) ID and System ID of the radio is used to determine the IP address of the home system's ISSI interface.

Both manual and inter-system roaming requires pre-planning and coordination between the two system owners to define the necessary radio and network parameters required for the connection. The capabilities available through the ISSI connection are dependent upon the common feature sets available on each system's ISSI gateway. Additionally, for automatic roaming, the radio must support and be programmed for Inter-WACN roaming.

Included with the proposed system are five ISSI 8000 automatic roaming licenses and associated hardware to connect to five outside systems. Any hardware, software or licensing required to be added to the outside systems is not included within the scope of this project.

Interoperability with Non-P25 Systems

The proposed ASTRO 25 system can communicate with existing systems through the use of Motorola's Conventional Channel Gateway (CCGW). The CCGW provides dispatch operators access to 4-wire analog interfaces. These interfaces are tied to radios with access to outside systems, giving dispatch operators access to outside systems as if they were a subscriber unit within that system. The CCGW interface is a resource to the dispatch operator, and therefore can be patched with other resources through the dispatch position. By using a patch between a talkgroup resource on CCD's new ASTRO 25 system and a CCGW interface to a radio on an outside system, users within the patched talkgroup will have access to the outside system through CCD's ASTRO 25 system.

Project 25 Phase I/Phase II Radio Field Unit Interoperability

Keeping interoperability with other Project 25 systems deployed in the region in mind, Motorola has developed advanced capabilities to ensure that Phase II systems can support Phase I user radios. Dynamic Dual-Mode provides the capability for any base station in the system to dynamically operate in either FDMA or TDMA mode. The mode is determined by the capabilities of the units participating in the call, with no user intervention.

Motorola's proposed ASTRO 25 digital trunked system supports P25 Phase I FDMA and Phase II TDMA operation, and includes Dynamic Dual Mode (DDM) functionality in order to enable interoperability between Phase I FDMA users and Phase II TDMA users. Interoperability between FDMA and TDMA users is done dynamically on a per-channel basis without radio user intervention.

The system will enable P25 FDMA and P25 TDMA subscribers to communicate transparently with other users, requiring no intervention from users or network operators. Similarly, dispatch operators will be able to automatically coordinate between P25 TDMA radio users and P25 FDMA radio users with no need to track or patch users together.

Due to the power of the dedicated control channel on Motorola systems, Dynamic Dual Mode enables users to interoperate between P25 FDMA and TDMA call types on the same channel. DDM includes two features: Dynamic Channel Assignment and Dynamic Talkgroup Assignment:

- Dynamic Channel Assignment—Dynamic Channel Assignment provides efficient system operation by dynamically switching the base station between P25 FDMA mode and P25 TDMA mode based on the needs for the call assigned to the station. Any station can potentially be configured as FDMA-only, TDMA-only or Dynamic (FDMA/TDMA).
- Dynamic Talkgroup Assignment—Dynamic Talkgroup Assignment improves interoperability by allowing FDMA and TDMA users to operate in the same talkgroup. When a dynamic talkgroup has both FDMA user and TDMA users affiliated with the system, the talkgroup call will proceed in FDMA mode without requiring any user intervention. Should P25 TDMA-only users be affiliated with a talkgroup, the call will take place in the P25 TDMA.

With DDM, the control channel remains at 9600 bps speed to handle both FDMA and TDMA calls, and to coordinate voice channel assignment as required for FDMA-only calls, TDMA-only calls, and FDMA /TDMA interoperability calls.

Dynamic Dual-Mode offers several advantages with the implementation of Project 25 Phase II TDMA software:

- Provides flexible migration to Phase II TDMA with support for both Phase I and Phase II TDMA user radios
- Ensures continued compatibility with neighboring Phase I systems
- Minimizes system resources—Other systems partition channels for exclusive operation in either the Phase I or Phase II mode which increases the number of base stations and frequencies necessary to operate the system effectively.

The proposed system includes licensing to allow for Dynamic Channel Assignment on all voice channels within the system and Dynamic Talkgroup Assignment on all talkgroups and sites within the system.

Interoperability with Project 25 Radios from Other Vendors

The P25 common air interface (CAI) specifies the type and content of signals transmitted by compliant radios. The system proposed has been tested and documented through the P25 Compliance Assessment Program (CAP) in a P25 CAP-recognized laboratory. This evaluation process ensures that tests are conducted correctly and that results are reliable. The P25 TIA test documents used for this testing were created by industry and user subject matter experts as part of the standards development process. The purpose of the P25 Standard test documents is to ensure all implementations are tested in the same manner. Motorola works directly with other P25 equipment vendors for P25 product verification and testing.

Through the Project 25 Compliance Assessment Program, radios from the following vendors have been successfully tested on the proposed Motorola Infrastructure:

- Motorola
- EF Johnson
- Harris
- Icom
- Kenwood
- PowerTrunk
- Relm
- TAIT
- Technisonic
- Thales.

The results of the tests are documented in Motorola’s Project 25 Compliance Assessment Program Summary Test Reports published on the FEMA Lessons Learned Information Sharing (LLIS) Website (https://www.llis.dhs.gov/knowledgebase/certifications-declarations/).

2.1.1.1.7 Capacity of Proposed System and System Expansion Capabilities

The proposed system is designed with expandability and future migration in mind. ASTRO 25 is an IP-based, standards-based, scalable technology. This fact, in conjunction with our experience in designing and implementing solutions to specifically address our customers' needs, makes us uniquely suited to solve CCD’s current communications requirements. It also provides a system that will grow as the needs of the CCD’s system users increase.

Motorola’s solution is modular and scalable, with controllers that can accommodate drastic expansion in RF sites, channels, console positions, and subscribers. As shown in the following table, the proposed and expansion capabilities of the new system ensure that our solution will meet CCD’s

needs now and in the future. The proposed system facilitates future expansion by allowing system elements to be added over time as needed, including the addition of radio sites, channels, dispatch sites and consoles.

Table 2-4: Capacity Expansion for Each Element of the Proposed P25 Radio System

Proposed Technology	Proposed Capacity	Maximum Capacity As Proposed	Maximum Capacity With Expansion
Master Sites			
Master site zones	1	1	7
Total Number of Sites Supported	17 (5 Simulcast Remote Sites + 1 ASR Site+ 6 Dispatch Sites + 5 ISSI Gateways)	75 (Note 1)	150 per zone
Total Number of System Channels Supported	56 (32 Simulcast Trunked Talkpaths + 16 ASR Trunked Talkpaths + 8 Conventional from CCGWs)	500 (Note 2)	1000 per zone
Total Number of Simulcast cells	1	64 (Note 7)	64
Total Number of Multicast Sites	1	75 (Note 1)	150 per zone
Total Number of Dispatch Sites	6	75 (Note 1)	100 per zone
Total Number of Dispatch positions per Dispatch Site	27-CCD Primary Dispatch (Note 3) 27-950 Josephine Dispatch (Note 4) 1-Denver Criminal Court 2-Sheriff's Department Detention Center 3-Denver Right of Way Services 1-EEB	50	50
Total Number of Dispatch Consoles	61 (Note 5)	125 (Note 5)	500 per zone 2000 per system
Total number of radios (Unit ID / Alias) that can be programmed in the system	7,500 (Note 6)	30,000 (Note 6)	150,000 per zone 250,000 per system
Talkgroups	12,000	12,000	20,000
Simulcast Cell			
Simulcast cells	1	64 (Note 7)	64

Proposed Technology	Proposed Capacity	Maximum Capacity As Proposed	Maximum Capacity With Expansion
Simulcast Remote Sites per Simulcast Cell	5	32	32
Channels per Simulcast Cell	17	30	30
Talkpaths per Simulcast Cell	32 Talkpaths	36 Talkpaths	36 Talkpaths
ASR Site			
Channels per ASR Site	9	28	28
Talkpaths per ASR Site	16 Talkpaths	36 Talkpaths	36 Talkpaths

Note 1: The number counts against the "Total Site Count" which in this proposal is the sum of all multicast sites, simulcast remote sites, dispatch sites and ISSI gateways. The "Total Site Count" cannot exceed 75. Additional sites require a Zone level site license.

Note 2: Channels include Trunked FDMA channel, Trunked TDMA talkpath, and conventional channels.

Note 3: CCD Primary Dispatch contains 26 MCC 7500E console positions plus one Archive Interface Server (AIS).

Note 4: 950 Josephine Dispatch contains 26 MCC 7500E console positions plus one Archive Interface Server (AIS).

Note 5: The system includes 59 total MCC 7500E console position plus two AIS's. The system includes 65 console licenses.

Note 6: Unit IDs are the sum of the following: Trunking radio IDs and Console IDs. Each subscriber radio utilizes one Unit ID on the system. Each console operator position utilizes one Unit ID on the system. Each additional radio unit ID beyond the 7,500 included requires a system level license. Radios entering the system using ISSI auto roaming do not count against the ID limits.

Note 7: Due to the multiple site architecture of a simulcast cell, the limit of 75 total sites will be reached before the limit of 64 total simulcast cells is reached.

Software Licenses and System Expansion Capabilities

The proposed system is designed so that, other than the actual hardware being added (additional zones, RF sites and channels, console sites and positions), only associated licenses are required for expansion.

2.1.1.1.8 End-to-End Encryption on the Proposed System

Encryption assures that only authorized units in the system can listen to transmissions. Encrypted calls are protected end-to-end throughout the network. Starting at the subscriber unit, which encrypts/decrypts the call signal, calls are encrypted all the way through to the MCC 7500E dispatch operator position, which contains the encryption key in each dispatcher operator position. The Radio Network Infrastructure is secure and transparent to the user.

The proposed system for CCD uses the Project 25 algorithm AES, DES-OFB, and can support multiple algorithms and encryption keys. Radios operated by other agencies can communicate with

the CCD's encrypted voice calls at CCD's discretion. CCD would be required to share their Common Key Reference (CKR) numbers and encryption keys with these other agencies.

An encryption key is a variable used in combination with an encryption algorithm to encrypt and decrypt voice, data, or key messages. Encryption is based on subjecting digitized signals to numerical variables so the signals cannot be interpreted by anyone but the intended parties. Subscriber units (for example, radios) without encryption keys cannot communicate in secure mode.

2.1.1.2 Master Network Site Configuration

At the heart of the proposed radio system for CCD is the Master Network Controller (MNC), or master site. The proposed Project 25 MNC site provides connectivity between the simulcast sub-system, ASR site, dispatch sites, and radio users, along with P25 data capabilities. The MNC for the proposed system will be distributed between the 950 Josephine Dispatch site and the CCD Primary Dispatch site.

The Project 25 MNC is the central call processing center, delivering mission critical voice and data communications. Designed for maximum availability and dependability, the core is the central source of network services and control. It is a fully IP-based, flexible, modular network with advanced call processing capabilities designed to meet the mission critical needs of CCD's system users.

The Project 25 MNC houses redundant zone controllers and redundant master site servers. Redundant core networking equipment, redundant master GPS time source, and redundant data interface for applications residing in the customer network. The master GPS time source is used to provide the common time source for dispatch and network management computers on the network domain.

Each of the two master site locations includes the following components:

- Virtual Management Server (provides the hardware for Zone Controller and other Network Management servers such as the Provisioning Manager, Unified Event Manager, and Unified Network Configurator)
- Core router
- Gateway router
- Exit router
- Enterprise LAN switch
- Backhaul switch
- GGSN router
- TRAK GPS time / frequency reference
- 16-port terminal server
- Network management client with rack mount KVM
- Ethernet surge protectors
- Two Type 3 AC EDGE Devices with breakers
- 7' Cabinet.

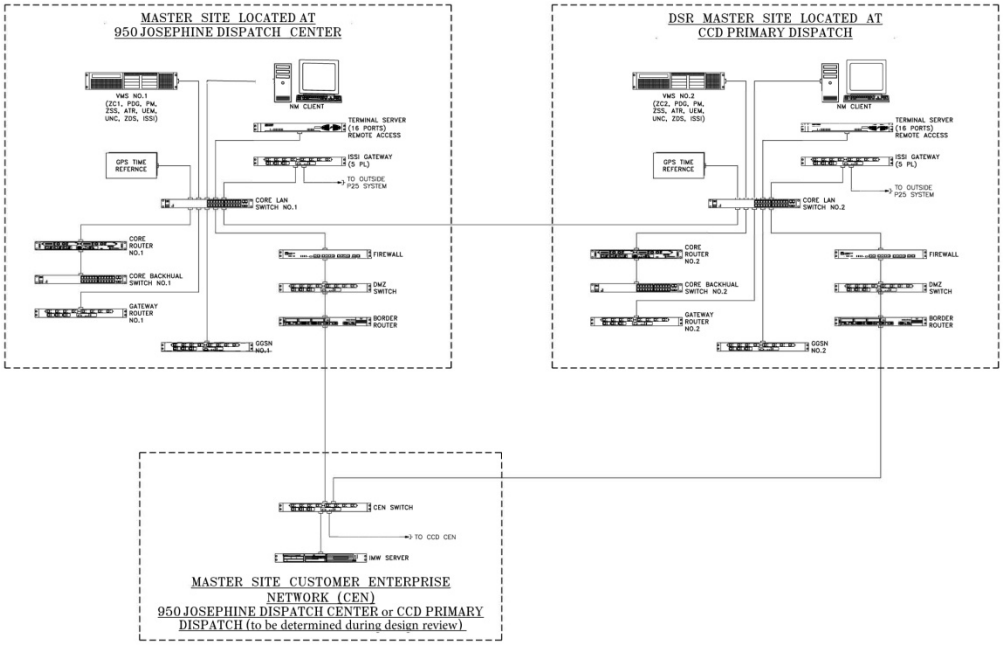


Figure 2-4: Proposed Master Site Network Diagram

2.1.1.2.1 Network Management System

The Network Management System (NMS) for the proposed CCD system uses a high-performance client/server architecture that combines virtualized network management servers with software applications and user interfaces. Network managers use these applications and interfaces to configure and manage the proposed P25 system and its components. Motorola's software-based core allows the customer to add additional features and expand capacity with an updated system license. The licenses for network management system applications have been included in the proposed solution.

The key benefits of the NMS are:

- One common database providing ease of administration and access for authorized users from management terminals
- Management of network element configuration and operational state
- Real time monitoring of network element status, faults and alarms
- Statistical and historical reporting of system utilization.

Motorola has provided three Windows 10-based network management terminals to be located at the 950 Josephine Dispatch master site, CCD Primary Dispatch master site and at a third location yet to be determined. The functional capabilities of these are described below.

2.1.1.2.2 Database Management

All settings are controlled by the database management system. The database management system allows for configuring of the network elements, including the modifying of the repeater site parameters. Elements can be enabled or disabled through the database management system. The multiple levels of access are assigned within the database management solution. Users are logged when they access the system. Security partitioning allows the creation of security groups in order to limit access to selected database records. It allows system administrators to control access to network management data by department, geography, or individual user.

Provisioning Manager (PM) and Zone Database Server (ZDS)

The PM is a system management interface working with the ZDS to enable network managers to efficiently configure the capabilities of the radio network. PM and ZDS servers and application instances are located at the master site. Subscriber profiles, talkgroups, system timers, site information, and console parameters are among the configurable elements of the PM. The PM facilitates global administration for network management such as:

- Creating/Removing user account and profiles
- Enabling/Disabling user account capabilities
- Managing authentication and authorization across agencies.

The following table describes additional features and functionality of the Provisioning Manager.

Table 2-5: Features and functionality of Provisioning Manager

Feature	Functionality
Central point for all User Configuration Information	Minimizes configuration conflicts created by multiple entry points. Enables simplified control and consistency for subscriber provisioning.
Radio User Capabilities	Efficient configuration capabilities across multiple agencies and system.
Reuse Configuration information using Profiles	Minimize configuration data re-entry through the creation of profiles that are shared across several radio users and talkgroups.
Intuitive Navigation	Provides a web-based navigation with objects arranged logically allowing the user to navigate to their required task.
Fleet Management	Allows the user to easily create subscriber, talkgroup and agency group mapping.
Agency Partitioning	Offers the capabilities to create security groups to partition system management resources among various agencies and users.
Concurrent User Access	Enables distributed configuration management from multiple users.
MCC 7500E Console Information Synchronization	MCC 7500E consoles are automatically synchronized with radio user configuration information from the system minimizing data entry and allowing for a cohesive view of configuration information.
Manage Data Distribution	Provides users with control over the distribution of modified information to the various network devices in the system.

2.1.1.2.3 Configuration Management

The configuration management system provides managers with access to configuration repositories for data entry and retrieval, record keeping, and adjustment of the system operating and efficiency parameters. The configuration management system enforces access control on all configuration requests. Operators are only allowed to configure those infrastructure and/or application elements for which they have been given permissions. It enables authorized operators to have direct access to equipment parameters from any user terminal.

Unified Network Configurator (UNC)

The UNC is a network change and configuration management application that enables users to efficiently manage the configurations of network elements and devices in the system. UNC servers and application instances are located at the master site. The UNC is built on Voyence Control, which is an automated compliance, change and configuration management system. Some key UNC benefits include efficient role-based user setup and auto-discovery of devices/configurations, which reduces

configuration errors and initial configuration time by providing minimal data entry. As shown in the following figure, the UNC provides the capability for another user to approve and implement changes, which can allow for distribution of the changes during off hours when system loading is minimal.

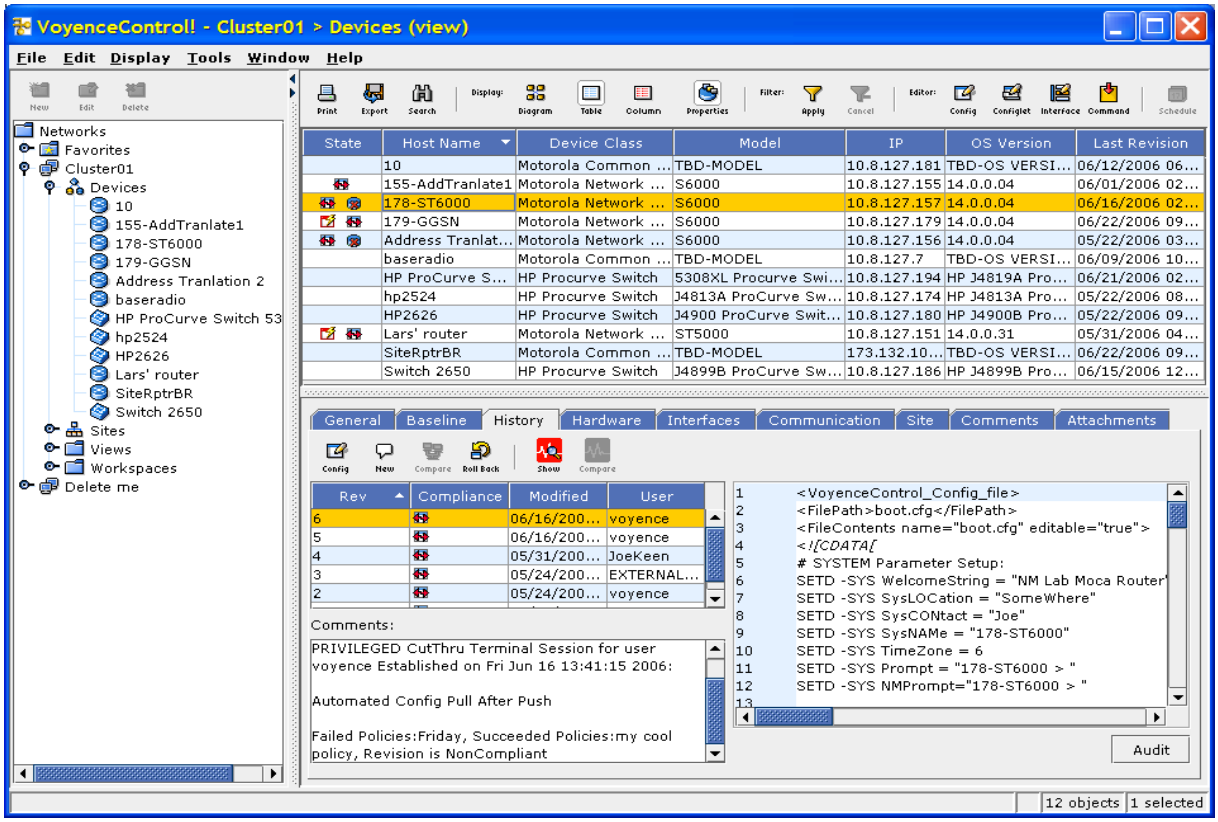


Figure 2-5: Configuration Management Screenshot

Historical configuration information is easily accessible along with forensic information and the ability to roll back to previous versions. A valuable tool provided by the application is the ability to create a configuration and not implement it immediately. The UNC provides the capability for another user to approve and implement changes, which can allow for distribution of the changes during off hours when system loading is minimal.

The UNC application allows system management personnel to see planned and current configurations simultaneously for quick comparison. This application offers easy editing screens and configuration “wizards” to reduce data entry.

The following table provides a summary of Unified Network Configurator features and functionality.

Table 2-6: Features and functionality of the Unified Network Configurator

Feature	Functionality
Built in Network Tool kit to enable features	Tools provide a methodical process to enable features in the system with minimal labor and chance of error. Examples of these are turning on Authentication on a set of protocols within the Gateways, Locking Ethernet switch ports, setting delay and jitter alarm thresholds.
Auto Discovery of Devices	Components are automatically discovered and their configurations are added to the database without the need for any manual entry of data.
Scheduled Distribution	Users can determine the time of day when they would like configurations to be sent to the devices, or delay the distribution of a configuration change until approved.
Distribution Monitoring	View the status of configuration changes such as whether the change is in progress, successfully completed or failed.
Change Logging/Audit Trail	Maintains a log of various user interactions with the configuration system that can be used to assist in diagnosing issues
Configuration Versioning	Constantly tracks and logs versions that have changed and provides the ability to view or compare versions
Management of Credentials	SSH & SNMP Passwords can be managed. Automated mechanism to allow seamless password and passphrase rolling which can be performed automatically if desired.
Wizards for common operations	Radio system administrators can perform common operations using a simple web-based interface specifically developed for LMR users. Provides an intuitive guide to assist in easy-to-follow setup procedures.
Rollback to Previous Version	Immediately reverts the device configuration to a previously created version.

2.1.1.2.4 Fault Management

The fault management system provides an advanced application that is common across the system and can be managed from a single screen.. The UEM application provides the ability to manage devices securely (using SNMPv3). For system administrators, historical and real-time traffic screens provide access to infrastructure events, status, and alarms.

Unified Event Manager (UEM)

The UEM provides a central location for managing all radio, transport, and environmental devices on the system. UEM servers and application instances are located at the master site. The UEM application automatically discovers devices on the network to determine their real-time status. Color-coded symbols displayed on a topography map provide a geographical and hierarchical representation of the entire network. The UEM allows each user to filter out and customize the pertinent information important to their roles and responsibilities.

The UEM can detect and report fault notifications, classifying them in levels of severity, indicated by a severity color and an alarm or event message. The action required depends on the severity of the alarm. In addition to the networked equipment, Motorola has provided an SDM 3000 remote terminal unit (RTU) at each RF site to provide the capability to monitor external and environmental alarms via the UEM.

The following table highlights key features and functionality of the Unified Event Manager.

Table 2-7: Features and functionality of the Unified Event Manager

Feature	Functionality
Optimized Discovery	FM application supports auto discovery of network infrastructure. This translates to an efficient device discovery process.
Centralized View of the Communications Network	System Managers can view LMR system status and quickly isolate problems to the board level.
Intuitive Graphical User Interface (GUI)	System Managers are quickly notified of failures on the system and can diagnose network equipment problems. Summary and Detail maps provide a graphical display of site status in the geographical location within the system
Active Alarms View and Alarm Summary	Persistent single view of all failure conditions (“What’s Inoperable”) in the network and a quick reference summary of alarms by severity, allowing users to quickly pinpoint the highest priority failures.
Secure Device Access	SNMPv3 protocol with SHA, and AES-128 bit encryption to prevent security breach attempts.
Role Based Access Control	Assignment of user privileges for access to views and operational capabilities.
Email Notifications	User-specified event notifications are sent via secure email or forwarded to a mobile device, which allows remote notification of any system event.
Fault Reporting Capabilities	Event history data is auto-archived and exported for further analysis and reporting.

2.1.1.2.5 Performance Management

Each of the network performance management applications provide various activity statistics, which can be archived, tracked, and consolidated into reports. The performance management servers collect utilization statistics for system, zone, site, channel and user data.

Zone Statistical Server (ZSS)

The ZSS utilization data allows network managers to generate reports on system activity. ZSS servers and application instances are located at the master site. The ZSS statistical data is gathered at specific, predefined time intervals. Historical data is stored in time-based intervals. For each interval type, the oldest interval in storage is removed as a new interval is added to storage. Statistics are aggregated into detailed and summarized reports and are available on an hourly basis for 10 days, daily for 62 days and monthly for one year.

The ZSS scheduler application can be used to schedule reports to occur automatically at specified times and able to output the report to a printer or data file. Reports can be exported to one of the following formats:

- Comma Separated Values (CSV)
- HTML
- Adobe Portable Document Format (PDF).
- Extensible Markup Language (XML).

All statistics can also be archived onto removable media. User call logging statistics continue to log call data while reports are being run or when downloading to the storage media.

The following table highlights report type and description of the Zone Statistical Server.

Table 2-8: Report type and description of the Zone Statistical Server

Report	Description
User at system	Provides details of a specific user's call activity throughout the system
System busy	Provides a breakdown of average and maximum busy duration by call type throughout the system
System data detail	Provides a summary of data call activity throughout the system
System voice detail	Provides details of call activity throughout the system
System summary	Provides a summary of call activity throughout the system
System voice and data detail	Provides a summary of data call and limited voice call activity throughout the system
Talkgroup at system	Provides details of a specific talkgroup's call activity throughout the system
Site busy	Provides a breakdown of average and maximum busy duration by call type of each site within the system
Site busy (FDMA and TDMA)	Provides a breakdown of average and maximum busy duration by FDMA call or TDMA call types
Site data/voice detail (FDMA and TDMA)	Provides a summary of call and data activity of each site within the system, by FDMA TDMA call types
Site resource busy	Provides a percentage analysis by the number of calls per busy by site
Talkgroup at site	Provides a summary of call activity by talkgroup in each site
Talkgroups system-wide (FDMA and TDMA)	Provides details of talkgroup call activity within the system, by FDMA or TDMA call types
Zone busy (FDMA and TDMA)	Provides a breakdown of average and maximum busy duration by call type
Zone voice/data detail (FDMA and TDMA)	Provides a summary of data call activity throughout the system and details of successful and unsuccessful calls by FDMA or TDMA call types

2.1.1.2.6 Alarm Reporting

The proposed fault management system will monitor the radio system components, networking equipment, included microwave backhaul equipment, and environmental site alarms from each site location.

All major equipment provided for the trunking system sends SNMP traps into the Unified Event Manager (UEM), part of the overall network management system (NMS). The proposed email alarm notification feature forwards configured alarms/events in the UEM application to a CCD provided email server in the customer enterprise network. These Alarms/Events can then be forwarded to any device which can interpret SMTP messages (mobile device, such as a cellular phone or PDA). The UEM monitors and displays alarm conditions and general status of network elements in the following views:

- Alarms
- Maps
- Network events
- Network database.

The UEM can be used for the following actions within the network management system:

- Processing fault notifications
- Detecting and reporting loss of communication with managed devices
- Making sure that the status reported is up-to-date
- Discovering a device within the system
- Troubleshooting faults
- Sending commands to network elements.

UEM provides the capability to manage devices securely (using SNMPv3). UEM can detect and report loss of fault notifications, classifying them in levels of severity, indicated by a severity color and an alarm or event message as shown in the following table. The action required depends on the severity of the alarm.

Table 2-9: Severity Categories.

Severity	Value	Color
Comm Failure	1 (highest severity)	Black
Critical	2	Red
Major	3	Orange
Minor	4	Yellow
Warning	5	Cyan
Clear	6 (lowest severity)	Green
Info	7	White
Unknown	8	Gray

The UEM can quickly update without constantly polling the devices. Please see the following figure, which provides a screenshot of the UEM and its display of events and their severities.

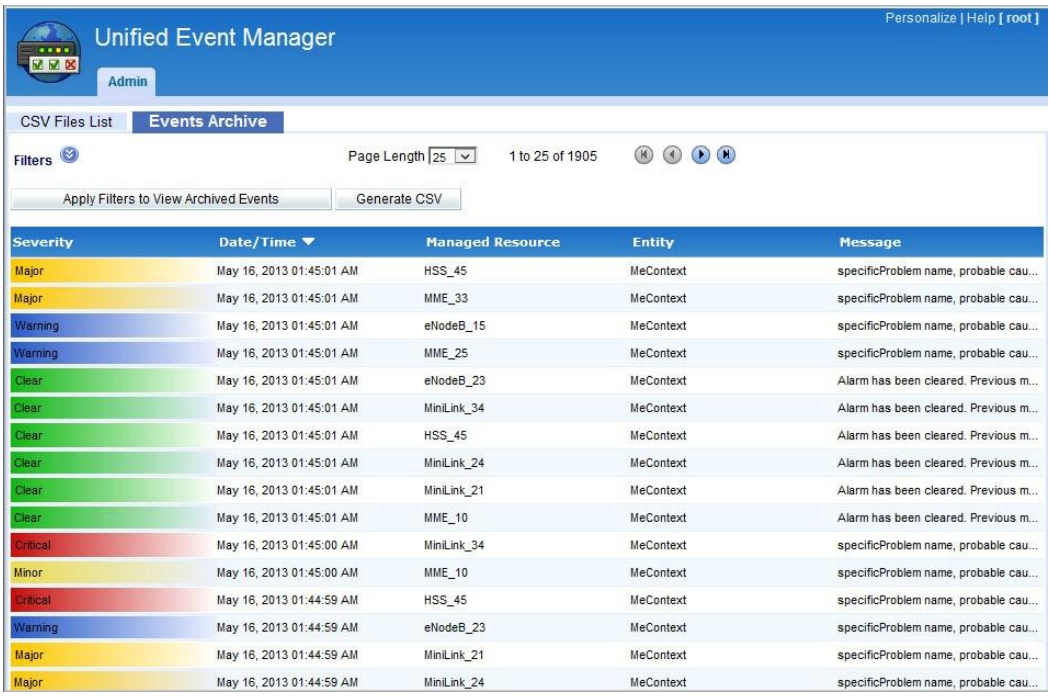


Figure 2-6: Sample Screenshot of the Unified Event Manager, Showing Event Severity Levels

The UEM is placed on Hewlett Packard DL380p G9 servers, located at the master sites.

In addition to the networked equipment, Motorola has provided an SDM 3000 remote terminal unit (RTU) at each site to provide the capability to monitor external alarms via the UEM. The SDM 3000 RTUs are equipped with two Ethernet LAN ports, four RS-232 ports, one RS- 232/RS-485 port, 48 Alarm Inputs, 16 Control Outputs, and 8 Analog Inputs.

The Motorola RTUs support non-SNMP alarms, such as environmental alarms, to the UEM-based SNMP alarming system. While the UEM monitors the system's radio equipment directly, the SDM 3000 RTU enables the UEM to monitor and control equipment such as microwave radios, stations, receivers, generators, tower lights, UPS units, site security, and more at remote sites in ASTRO 25 systems. Most device alarms are generated and monitored via SNMPv3 traps routed to the SDM 3000 and the UEM server. Discrete relay and I/O alarms are monitored via the 48 alarm inputs on the SDM 3000. All events and alarms are time stamped, stored in the appropriate files and can be printed for hard copy records. History files allow for retrieval of information at all times. The UEM manages devices from the following sites:

- Master sites
- Simulcast sites
- ASR sites
- Dispatch sites
- Conventional only sites.

Please see the following tables for the specific devices, events, alarms, and management types for the devices at each of these sites.

Table 2-10: Devices Managed in the Simulcast Sites

Device Name	Device Events and Alarms	Management Type
Conventional Channel Gateway (CCGW)	Motorola Network Resource	SNMPv3
Ethernet Switch	HP Switch	SNMPv3
GCM 8000 Comparator	Motorola Comparator - GCM 8000 - MS Alarms	SNMPv3
GPB 8000 Reference Distribution Module (RDM)	GPB 8000 Reference Distribution Module Alarms	SNMPv3
GTR 8000 Multisite Base Radio (MSBR)	Motorola Base Radio—MS Aarms	SNMPv3
IP Simulcast Backhaul Switch	HP Switch Extreme Switch - E4G-200/400	SNMPv3
Site Router	Motorola Network Resource	SNMPv3

Table 2-11: Devices Managed in the Console Sites

Device Name	Device Events and Alarms	Management Type
Conventional Channel Gateway (CCGW)	Motorola Network Resource	SNMPv3
Conventional Site Controller	Motorola Conventional Site Controller - GCP 8000 - CSC	SNMPv3
Ethernet Switch	HP Switch	SNMPv3
MCC 7500E	MCC 7500E Console	SNMPv3
Site Router	Motorola Network Resource	SNMPv3
Virtual Server Platform	ESXi	SNMPv1/web services

Table 2-12: Devices Managed in the Master Network Site

Device Name	Device Events and Alarms	Management Type
Air Traffic Router (ATR)	Motorola Network Management Air Traffic Router	SNMPv3
Backup and Restore Server	Backup and Restore Backup and Restore Client	SNMPv3
Core Router	Motorola Network Resource	SNMPv3
Direct Attached Storage (DAS) Management Controller	Direct Attached Storage - DH3520	SNMPv3
Domain Controller	Non-NMA Domain Controller Domain Controller	SNMPv3
Gateway Router	Motorola Network Resource	SNMPv3
Core Backhaul Switch	HP Switch	SNMPv3
Generic Application Server (GAS)	Motorola Generic Application Server	SNMPv3
GGSN	Motorola Network Resource - GGM8000	SNMPv3
IVD Packet Data Router	Motorola IVD Packet Data Gateway	SNMPv3
LAN Switch Network Management Interface (Backup/Tertiary/Primary)	HP Switch	SNMPv3
Terminal Server	MRV Terminal Server	SNMPv3
TRAK (NTP Server)	TRAK-9100	SNMPv3
Unified Event Manager (UEM) (NM Server)	Motorola Network Management General Purpose Server	SNMPv3

Device Name	Device Events and Alarms	Management Type
vCenter Server	VMware vCenter Server	Webservices
Virtual Server Platform	ESXi	SNMPv1/web services
Zone Controller	Motorola Zone Controller - MZC 5000	SNMPv3
Zone Database Server (NM Server)	Motorola Network Management General Purpose Server	SNMPv3
Zone Statistics Server (ZSS) (NM Server)	Motorola Network Management General Purpose Server	SNMPv3

2.1.1.2.7 Activity Reporting and Archiving

As described above, the collection of management applications that together form the Network Management System for the proposed solution can be grouped into the following four categories:

- Database Management
- Configuration Management
- Fault Management
- Performance Management.

Each of these management areas of the network provides the dispatchers and administrators with various activity statistics, which can be archived, tracked, and consolidated into reports. Statistics are stored on the servers for zone, site, channel, and user reports as follows:

- Hourly reports—10 days
- Daily reports—62 days
- Monthly reports—1 year.

All statistics can be archived onto removable media. Reports can be downloaded in HTML, XML, PDF, CSV, or sent to a printer. User call logging statistics continue to log call data while reports are being run or when downloading to the storage media. A common time source may be used to synchronize time-stamping of the recorded events.

The proposed NMS will monitor the Air Traffic Interface Application (ATIA) traffic, which includes detailed information about subscriber, talkgroup, site, and system activity. The ATIA traffic is decoded, stored, analyzed, and thresholds reported. This information is used by the NMS to produce detailed reports of the system's activity, including a comprehensive set of performance data and analysis.

The proposed NMS includes the following performance management applications:

- Affiliation display
- Dynamic reports
- Historical reports
- Radio Control Manager
- ZoneWatch.

The four categories of network management activity reporting are described in detail below, including sample report screenshots as appropriate.

Dynamic Reports

With Dynamic Reports, system managers can monitor and report usage trends to improve system management. Data from the reports and graphs can be used to make changes in radio and talkgroup management. This display provides system-level, real-time line charts that illustrate channel utilization for all call types—group, private, and control channel. System managers can closely examine what happens during a shift or set period of time. For example, they can look at the busy count and see if calls are being queued. Using dynamic reports, the system manager can make informed decisions about expansion and improving communication.

Dynamic statistical data objects are presented in time-based intervals. At the end of each interval, a new set of statistical values is added to the display. The timed intervals are defined as follows: 15 seconds (default), 1 minute, or 15 minutes for 1 to 100 intervals. The Dynamic Reports supported by the proposed LMR system are provided every 15 seconds (Figure 2-7) and include:

- Call count
- Emergency call count
- Denied call count
- Denied emergency call count
- Secure call count
- Clear call count.

These statistics are aggregated into detailed and summarized reports on a systemwide basis and are available on an hourly basis for 10 days, daily for 62 days, and monthly for one year. Graphs can be run at the system, site, and console site level to understand how often and why busy conditions occur on the system to increase system efficiency as well as insight into how the system is being utilized. The following figure shows a sample screenshot of a Crystal Dynamic Report. These reports can be output to the client PC workstation display, printer, or file for convenient access.

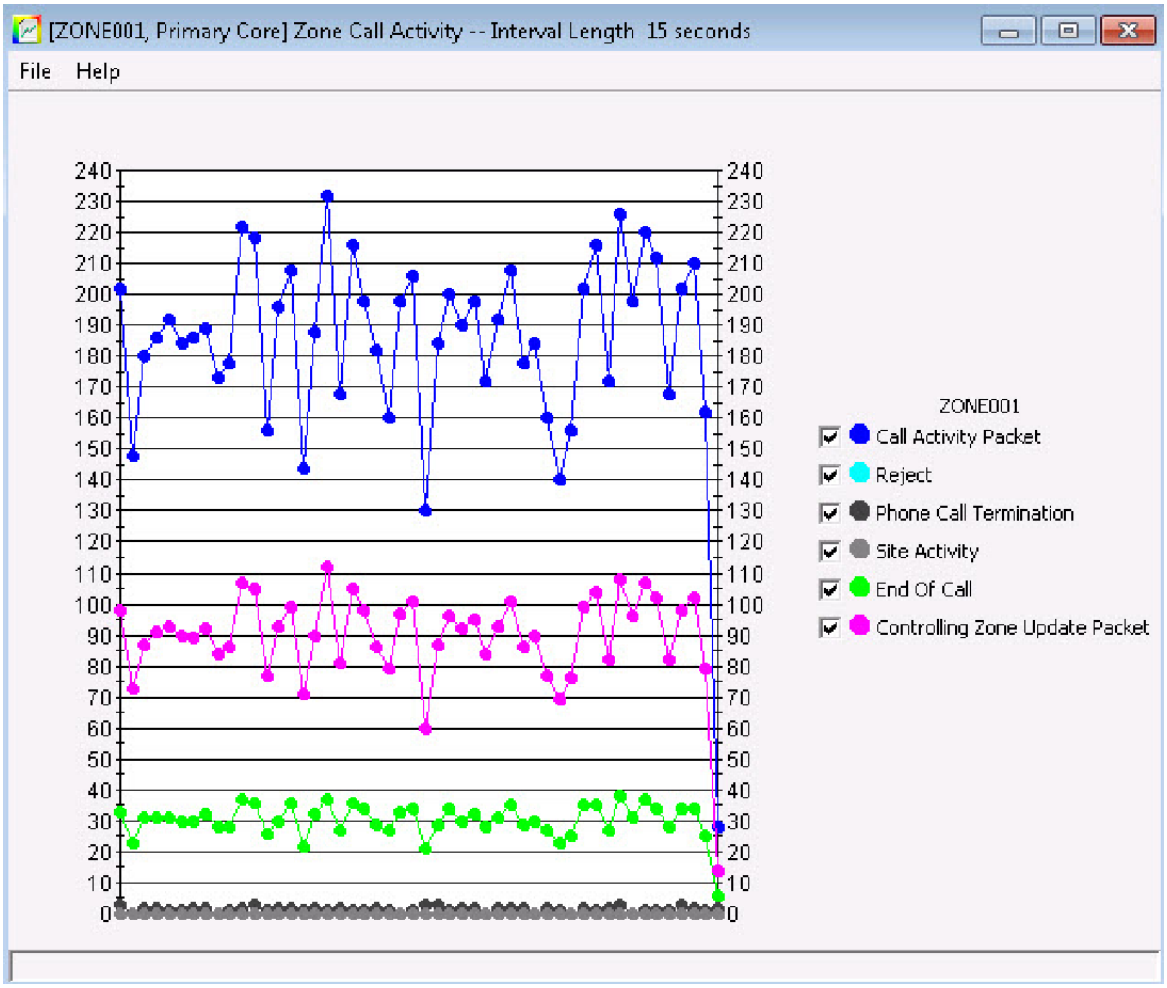


Figure 2-7: Example of Dynamic Report: Zone Call Activity - 15 second period.

Historical Reports

Historical Reports generates reports on system wide activity. The reports contain statistical data that is gathered at specific, predefined time intervals. Historical reports monitor and analyze information about zones, sites, channels, talkgroups, and users to assist a system manager in understanding how the system is performing and utilized to more efficiently manage resources. The Report scheduler window allows users to schedule system-wide reports to occur automatically at specified times with an output to a printer or data file.

The standard system reports supported by Historical Reports include:

- User at system—Provides details of a specific user's call activity throughout the system
- System busy—Provides a breakdown of average and maximum busy duration by call type throughout the system
- System data detail—Provides a summary of data call activity throughout the system
- System voice detail—Provides details of call activity throughout the system
- System summary—Provides a summary of call activity throughout the system
- System voice and data detail—Provides a summary of data call and limited voice call activity throughout the system
- Talkgroup at system—Provides details of a specific talkgroup's call activity throughout the system

- The standard system reports supported by Historical Reports include:
  - Channel
  - User at site
  - Shared service site detail
- Site busy—Provides a breakdown of average and maximum busy duration by call type of each site within the system
- Site busy (FDMA and TDMA)—Provides a breakdown of average and maximum busy duration by FDMA call or TDMA call types
- Site data/voice detail (FDMA and TDMA)—Provides a summary of call and data activity of each site within the system, by FDMA TDMA call types
- Site resource busy—Provides a percentage analysis by the number of calls per busy by site
- Talkgroup at site—Provides a summary of call activity by talkgroup in each site.
- Talkgroups system wide (FDMA and TDMA)—Provides details of talkgroup call activity within the system, by FDMA or TDMA call types
- Zone busy (FDMA and TDMA)—Provides a breakdown of average and maximum busy duration by call type
- Zone voice/data detail (FDMA and TDMA)—Provides a summary of data call activity throughout the system and details of successful and unsuccessful calls by FDMA or TDMA call types.

With Crystal Dynamic Historical Reports, such as the one shown in Figure 2-8, the user can create variations of these reports to meet specific needs.

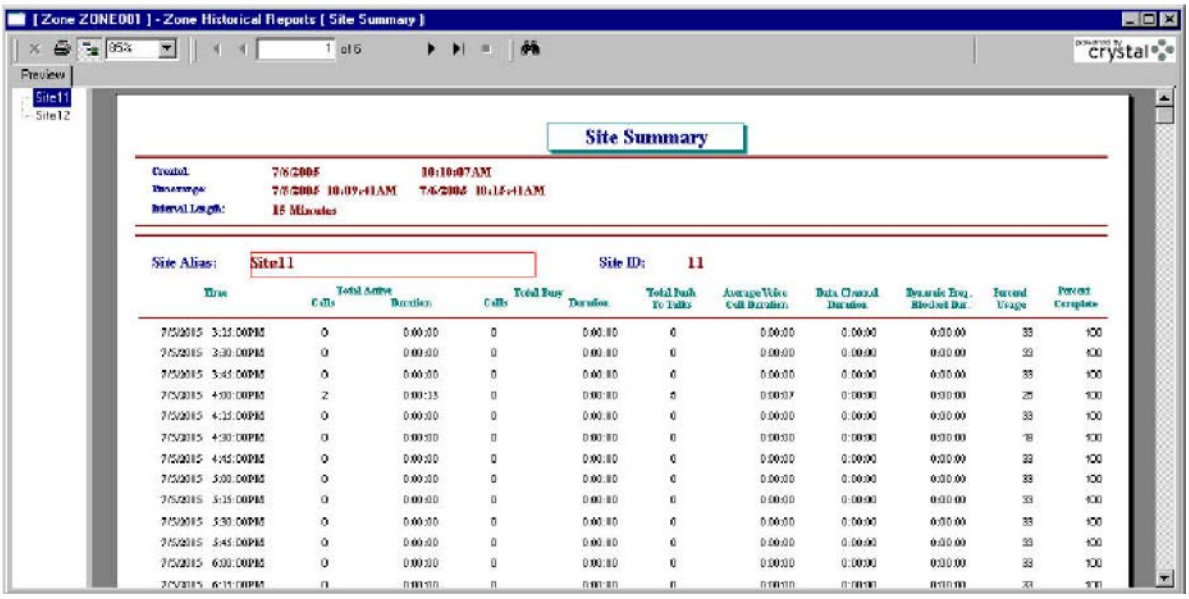


Figure 2-8: Crystal Dynamic Historical Report Screenshot

ZoneWatch

ZoneWatch is a performance management tool that has customizable displays and grids to monitor real-time communications activity in the system. The information shows real-time unit and talkgroup assignment active on the system, such as that in Figure 2-9. ZoneWatch also receives fault information relating to repeater sites or talkpaths and displays a color-coded status of the site and channel conditions.

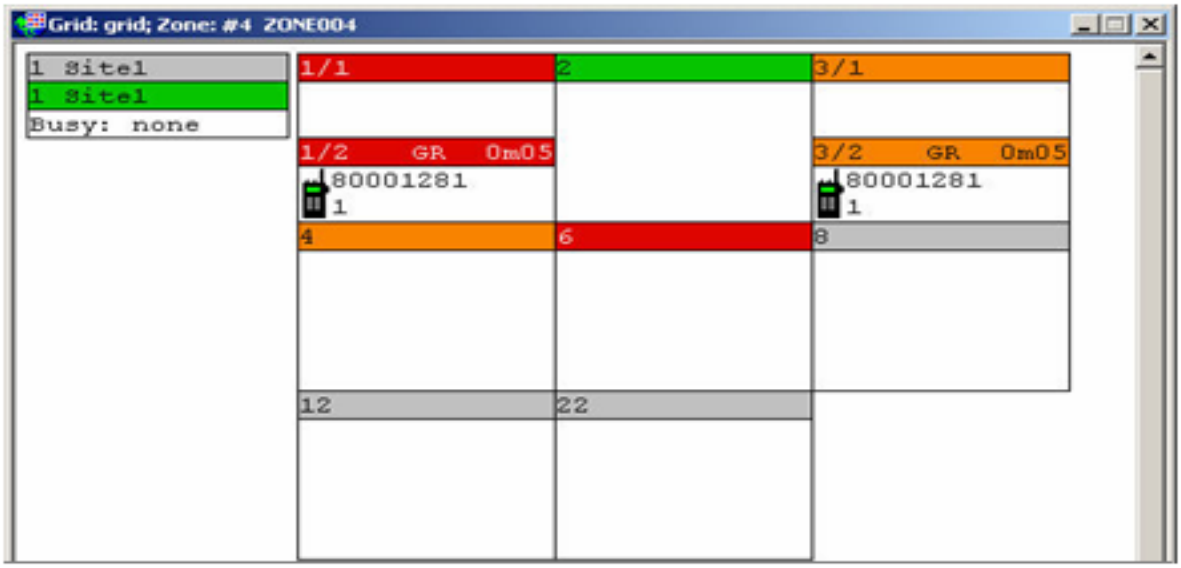


Figure 2-9: ZoneWatch Functionality Screenshot

Radio Control Manager

The Radio Control Manager (RCM) is a Private Radio Network Management (PRNM) Suite application used primarily by dispatchers to monitor and manage radio events, issue and monitor commands, and make informational queries of the system database. The RCM runs on a local PC client and, depending upon the configuration in the User Configuration Manager (UCM), can access multiple zones. The types of radio commands that can be issued from the RCM are as follows:

- Regroup
- Cancel regroup
- Selector lock
- Cancel lock
- Regroup and lock
- Cancel regroup and lock
- Selective inhibit
- Cancel inhibit
- Storm plan.

Radio units can be selectively disabled (Selective Inhibit) and enabled (Cancel Inhibit) through the RCM. The RCM client application can be installed and run on an MCC 7500E console position. Radio Control Manager (RCM) Reports are a Motorola Private Radio Network Management (PRNM) Suite application that is used to create, view, print, schedule, and export standard reports from RCM. These reports use a common format so the data can be used in spreadsheets. The report information reflects the actual RCM server database information except the Emergency Alarms. RCM Reports can be used to present and analyze data showing RCM activity on the system.

- Emergency Alarms Reports—Provides a historical listing of all Emergency Alarms received by the RCM in a selected period of time. The report can display all Emergency Alarms in the active or historical events queues.
- Current Login Sessions Reports—View who is currently logged in to the application: Time of Login, User Alias, User ID, User Type, Host IP Address.
- Radio Command Reports—Shows the commands that have been sent to radio users, such as Regroup, Inhibit, and Selector Lock.

Reports from the Radio Control Manager can be exported to one of the following formats:

- Comma Separated Values (CSV)
- HTML
- Adobe Portable Document Format (PDF)
- Extensible Markup Language (XML).

Once exported to any of these formats, network management reports can be printed on standard office-quality printers.

In the event that a subscriber radio needs to be inhibited from communicating on a system, the Selective Inhibit command can be issued. The Selective Inhibit command is issued to the radio, which will process the command immediately. This effectively disables the radio. In the event the radio is not within range of the system or is powered off during the time the Selective Inhibit command was issued, the moment the radio registers, the system will issue the Inhibit command to it. The Inhibit command remains in effect until it is canceled by the Cancel Inhibit command is issued. During the Inhibited period, the radio will not be able to perform in any communications (listed or talk).

2.1.1.2.8 Disaster Recovery

ASTRO 25 system Backup and Restore (BAR) services provide mechanisms to backup and restore important files. A BAR server works in tandem with BAR Client software to provide the means to backup and restore data for workstations and server devices in the radio system. The server that provides the BAR function exists as a single virtual machine on a Virtual Server host. In systems with Dynamic System Resiliency, such as included in this proposal, a BAR server is included in both the primary and backup cores.

The included BAR service supports the following BAR clients:

- Linux-based Network Management servers and zone controllers
- Packet Data Gateway
- License Manager
- Domain Controllers
- Authentication Center (AuC) server (if implemented)

The Network Attached Storage (NAS) device is a hardware storage device used to support BAR services, providing an off-site archive for backing up Virtual Management Server platforms. It is connected to the virtual server hardware platform through the BAR NAS Connection Port on the extender panel. The port on the panel is connected to the server with a permanent dedicated cable.

The centralized data Backup and Restore (BAR) service collects and stores volatile data from supported devices at the same location. Later, the backed-up data can be restored to the device in the event of a disaster that necessitates recovery of the device.

The BAR service backs up volatile data received from devices in the same location as identified for backup and loaded with the BAR Client software. Volatile data is defined as any information that cannot be derived from any other service or device in the system. Backup functionality of the individual BAR clients is performed through the BAR server. The backup process can be performed manually or automatically based on a configurable schedule per BAR client. If the backup fails, an alarm will be reported within the UEM.

Backups to offsite storage are available through the BAR server, where the BAR server acts as an SFTP server. Using the open source WinSCP utility included on the ASTRO 25 system Windows Supplemental Media, an offsite device can transfer backup data to and from the BAR server. The recommended bandwidth to off-site storage is 12.5 Mbps.

The restoration of backed up data is performed manually through the BAR server. Upon completion of the restoration process, the user will be informed by the BAR server of the successful or failed operation.

2.1.1.2.9 Network Management Licenses

Access to the network management applications is available through the licensing of each individual application. Licensing is based on a concurrent use license. Per conversations with CCD, the following quantities of concurrent use licenses for the network management applications have been included. The maximum purchasable quantities for the system as designed are indicated within the parenthesis.

- Provisioning Manager: 3 (max 16)
- UNC: 1 (max 7)
- UEM: 2 (max 16)
- ZoneWatch: 1 (max 5)
- Historical Reports: 1 (max 3)
- Dynamic Reports: 1 (max 5)
- Affiliation User Reports: 1 (max 3)
- Radio Control Manager: 2 (max 10)

2.1.1.2.10 Network Management Remote Access

The ASTRO 25 system provides the ability to perform network management functionality remotely. Included at each of the two master site locations is a Fortinet 100D firewall and GGM 8000 border router. Together, these provide the interface between the ASTRO 25 radio network and a customer enterprise network (CEN). If granted access through the firewall settings, a remote computer residing on the CEN can use the network management applications. Access to the network management applications can be done in one of two methods. The first method is to use Microsoft's Remote Desktop to access a network management client residing within the ASTRO 25 radio network. The second method is to enable the remote computer to run the network management applications directly from the remote computer. Though some applications such as the PM are web based, most network management applications require Motorola's Network Management Client software to be loaded on the remote computer when run directly from the remote computer.

2.1.1.3 RF Site System Description

The MNC will control a five-site simulcast cell (four sites configured as transmit and receive and one site configured as receive only) that provides coverage throughout the City and County of Denver along with the Cities of Sheridan and Englewood using an ASR site located at Mount Morrison to provide coverage though the Red Rocks Mountain Park. This section describes the architecture of the proposed simulcast cell and ASR site, and provides information regarding the system's simulcast operation.

2.1.1.3.1 Simulcast System Description

Prime Simulcast Site Locations

The proposed design includes geographically redundant simulcast prime sites located at:

- **Prime simulcast prime site**—950 Josephine Dispatch (39-43-52.2 N, 104-57-29.8 W).
- **Backup simulcast prime—** CCD Primary Dispatch (39-46-42.9 N, 104-50-58.65 W).

Remote Trunked Simulcast Site Locations

The system includes the following four simulcast RF remote sites described in the following table:

Table 2-13: Simulcast Remote Sites.

Site Name	Latitude	Longitude	Site Type	Structure Height	APN	Ownership	Permitting Jurisdiction
1670 Broadway	39-44-34.4 N	104-59-12.2 W	Building (Existing)	480’	0234935027000	1670 Broadway Investors LLC	City and County of Denver, CO
Denver Housing Authority	39-38-18.0 N	104-53-59.9 W	Building (Existing)	110’	070920003100	Denver Housing Corporation	City and County of Denver, CO
DFD Station 2	39-47-29.7 N	104-47-42.8 W	Tower (Existing site, New Tower	100’	0017100018000	City and County of Denver Fire Department	City and County of Denver, CO
Mountain Towers	39-41-45.1 N	104-56-20.0 W	Building (Existing)	310’	1973-19-2-02-009	DV Colorado LLC	Glendale, Arapahoe County, CO
Mount Morrison (Receive Only)	39-44-34.4 N	104-59-12.2 W	Tower (Existing)	272’	40-273-00-002	Bear Creek Development Corp	Jefferson County, CO

Simulcast Prime Site

The simulcast cell includes geographically redundant equipment such that either of two sites can take primary control of each simulcast cell. For the simulcast cell, the primary control site includes redundant controller equipment. The backup control site is also provided with a site controller and redundant comparators. The comparators in either site can take primary voting functionality without a complete switch to the backup site. The secondary control site will take control upon a total failure of both primary site controllers or upon a site link failure to a remote site.

The figure below illustrates a simplified geographically redundant simulcast primary network layout.

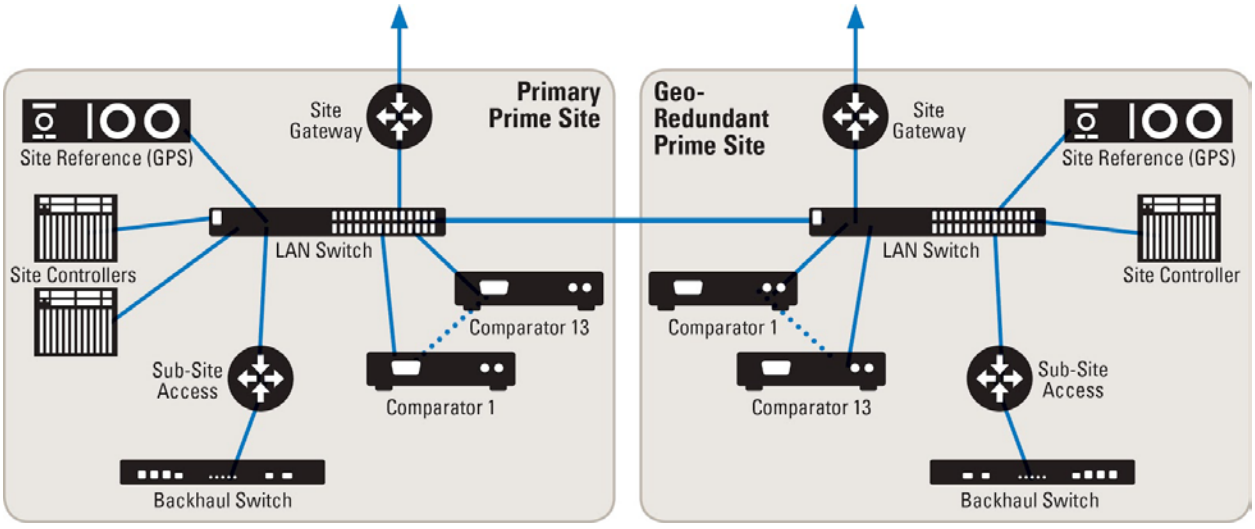


Figure 2-10: Geographically Redundant Prime Site Network Diagram

The table below shows the summary of equipment at each of the simulcast prime sites.

Table 2-14: Equipment at Public Safety Layer Prime Sites.

Location	Type of Simulcast Site	Equipment (Quantity)
950 Josephine Dispatch	Simulcast Prime	- GCP 8000 Prime site controllers (2). - GCM 8000 Comparators (17). - GGM8000 Prime Site Gateways (1). - TRAK 9100 GPS Time/Frequency Reference (1) {shared with Co-located MNC at 950 Josephine Dispatch}. - GGM8000 Subsite Access Gateway (1). - HP 2620-24 Ethernet LAN Switch (1). - HP 2620-24 Backhaul Switch (1). - Two Type 3 AC EDGE Devices with breakers. - 7' Cabinet (1).
CCD Primary Dispatch	Geo-Redundant Simulcast Prime	- GCP 8000 Prime site controllers (1). - GCM 8000 Comparators (17). - GGM8000 Prime Site Gateway (1). - TRAK 9100 GPS Time/Frequency Reference (1) {shared with Co-located MNC at CCD Primary Dispatch}. - GGM8000 Subsite Access Gateway (1). - HP 2620-24 Ethernet LAN Switch (1). - HP 2620-24 Backhaul Switch (1). - Two Type 3 AC EDGE Devices with breakers. - 7' Cabinet (1).

Simulcast Comparators and Voting

The prime simulcast controller serves as a control and audio center for the simulcast cell. Audio from the user radios is received by the GTR 8000 simulcast receivers at the sites, packetized, and routed to the prime site. At the prime site, a GCM 8000 voting comparator votes the multiple audio streams from different sites on a frame-by-frame basis. The resulting voted composite signal is better than any one site can provide. This "voted" audio at the prime site is again packetized and routed to two destinations. First, the audio is redistributed to each site in the simulcast cell, which simultaneously transmits the voted audio to the user radios operating in that cell. This allows all members of the call to receive optimum quality audio. The prime site also routes the voted audio to the MNC. The MNC services the audio to dispatch centers, simulcast cells/ repeater sites or other P25 zones that require participation in the call.

The following topics provide information relevant to the proposed simulcast technology:

Renetting Interval - The use of high stability frequency standards removes the need to regularly adjust or renet the base station frequencies, as the base station is continuously disciplined by the frequency standard.

Simulcast Time Delay Control - The voting receivers manage the amount of path delay compensation based on the particular system design. The maximum amount of path delay compensation is 250 msec.

Frequency Stability - The GTR 8000 base radios frequency is synchronized by the GPS frequency standard. Internal to the GTR ESS at each of the remote sites are redundant highly stable ovenized crystal oscillators provided by the GPB 8000 RDM's.

Inbound Traffic Comparison - The GCM 8000 reconstructs the inbound audio stream as a composite from each simulcast sub-site. As such, the GCM 8000 does not vote a single site since it is reconstructing the best possible audio stream from each received audio stream. This is done on the basis of error correction codes applied to the inbound Logical Data Units (LDU) which carry the inbound vocoded audio. Motorola's Configuration Service Software (CSS) can be connected to a comparator to identify the simulcast site that is receiving the strongest inbound radio signal.

Distribution of Simulcast Information - The simulcast information distribution occurs over the IP network.

Simulcast Site

The GTR 8000 site system is at the core of the simulcast cell. The GTR 8000 platform requires low power, minimized rack space, and uses an IP-based transport layer, which allows increased backhaul flexibility and capacity.

Subscriber audio is received and packetized by the stations. The internal GPB 8000 provides both LAN routing and GPS services for each station at the site. The packetized audio is routed via the GPB 8000 and the local redundant site routers to the microwave backhaul network. The microwave routes the audio to the active prime site to be voted.

The proposed IP simulcast subsystems do not require site controllers at the remote sites in order to operate under control of the GCP 8000 site controllers at the simulcast prime sites. Simulcast site controllers control the simulcast site over 100 BaseT Ethernet IP links. This reduces equipment cost and eliminates a potential point of failure. In addition, each site uses redundant site gateways and reference distribution modules for network transport, switching, and GPS reference functions. All equipment is provided with alarm outputs to deliver status information to the network management system.

The table below summarizes the equipment at each of the simulcast cell sites.

Table 2-15: Equipment at Simulcast Sites.

Location	Type of Simulcast Site	Equipment at Each Site

1670 Broadway
Denver Housing Authority
DFD Station 2
Mountain Towers
	Simulcast Remote	▪ GTR8000 ESS Rack #1 (1)
		  ▪ GTR8000 Base Radios (6)
		  ▪ GPB8000 RDM (2)
		  ▪ GGM8000 Site Gateways (2)
		  ▪ 6 Port Combiner (1)
		  ▪ 800MHz Transmit Filter (1)
		  ▪ Site RMC (2)
		  ▪ Cabinet RMC (2)
		  ▪ GTR8000 Power Supplies (6)
		  ▪ 7’ x 19” Rack (1)
		▪ GTR8000 ESS Rack #2 (1)
		  ▪ GTR8000 Base Radios (6)
		  ▪ High Availability XHUB (2)
		  ▪ 6 Port Combiner (1)
		  ▪ 800MHz Transmit Filter (1)
		  ▪ Cabinet RMC (2)
		  ▪ GTR8000 Power Supplies (6)
		  ▪ 7’ x 19” Rack (1)
		▪ GTR8000 ESS Rack #3 (1)
		  ▪ GTR8000 Base Radios (5)
		  ▪ High Availability XHUB (2)
		  ▪ 6 Port Combiner (1)
		  ▪ Phasing Harness (1)
		  ▪ Cabinet RMC (2)
		  ▪ GTR8000 Power Supplies (5)
		  ▪ 7’ x 19” Rack (1)
		▪ Transmit antennas (2).
		▪ Receive antennas (2).
		▪ Two 7/8” Heliax transmit lines (site specific lengths).
		▪ Two 7/8” Heliax receive line (site specific lengths).
		▪ One 1/2” Heliax receive test line (site specific lengths).
		▪ Bird Technologies 437-83I series Tower Top Amplifier (1).
		▪ Bird Technologies 437-83I series Control Monitoring Unit (1).
		▪ SDM3000 Alarm Interface (1).
		▪ Eltek Flatpack2 DC power system with 12 hour backup battery
		▪ RFI APM8796K2 advanced power meter (1) with SP7496-4440-DFF1RU antenna line coupler (2)

Location	Type of Simulcast Site	Equipment at Each Site
Mount Morrison	Simulcast Receive Only Remote	▪ GPW8000 Receivers (17). ▪ GPB8000 RDM (2). ▪ XHUB (4). ▪ GGM8000 Site Gateways (2) ▪ 7’ x 19” Rack (1). ▪ See description of the ASTRO Site Repeater site at Mount Morrison for addition equipment included at this location.

2.1.1.3.2 ASTRO Site Repeater (ASR) System Description

Motorola has proposed a standalone trunked ASTRO 25 repeater site to provide coverage for the Red Rocks Mountain Park. This site extends the P25 digital trunking coverage beyond the coverage provided by the simulcast cell, with users roaming seamlessly throughout the coverage area, without any manual intervention.

This site is designed with nine channels, with one being used for the control channel and the remaining eight providing two talkpaths each using TDMA modulation, for a total of sixteen talkpaths. Unlike the simulcast remotes sites, which connect to a prime site, the standalone trunking sites will connect directly to the master sites. The standalone trunked repeater site will accommodate two site links for dual transport paths to the master sites.

The ASR site will be located at the following location:

Table 2-16: ASR Site.

Site Name	Latitude	Longitude	Site Type	Structure Height	APN	Ownership	Permitting Jurisdiction
Mount Morrison	39-44-34.4 N	104-59-12.2 W	Tower (Existing)	272’	40-273-00-002	Bear Creek Development Corp	Jefferson County, CO

The table below summarizes the equipment at the ASR site.

Table 2-17: Equipment at ASR Site.

Location	Type of Simulcast Site	Equipment at Each Site
Mount Morrison	ASR Site	▪ GTR8000 ESS Rack #1 (1) ▪ GTR8000 Base Radios (5) ▪ GCP8000 Site Controller (2) ▪ GGM8000 Site Gateways (2) ▪ 6 Port Combiner (1) ▪ 800MHz Transmit Filter (1) ▪ Site RMC (1) ▪ Cabinet RMC (1) ▪ GTR8000 Power Supplies (5) ▪ 7’ x 19” Rack (1) ▪ GTR8000 ESS Rack #2 (1) ▪ GTR8000 Base Radios (4) ▪ XHUB (2) ▪ 6 Port Combiner (1) ▪ Phasing Harness (1) ▪ Cabinet RMC (1) ▪ GTR8000 Power Supplies (4) ▪ 7’ x 19” Rack (1) ▪ Transmit antenna (1). ▪ Receive antennas (2). ▪ One 7/8” Heliax transmit line (300’). ▪ Two 7/8” Heliax receive lines (300’). ▪ One 1/2” Heliax receive test line (300’’). ▪ Bird Technologies 437-83I series Tower Top Amplifier (1). ▪ Bird Technologies 32 port 437-83I series Receive Multicoupler (1). ▪ SDM3000 Alarm Interface (1). ▪ Eltek Flatpack2 DC power system with 12 hour backup battery ▪ RFI APM8796K2 advanced power meter (1) with SP7496-4440-DFF1RU antenna line coupler (1)

2.1.1.3.3 RF Distribution System

The simulcast remote sites and ASR site use GTR 8000 ESS (Expandable Site Subsystem) racks, a space-efficient, single-rack design that integrates up to six GTR 8000 base radios, power supply modules, redundant GPB 8000 Reference Distribution Modules (simulcast remote site only), redundant Ethernet LAN switches, redundant site gateways, transmit combiner, and receiver multicouplers. A diagram of the GTR8000 ESS is shown in the figure below (GPS receivers only present on simulcast remote sites).

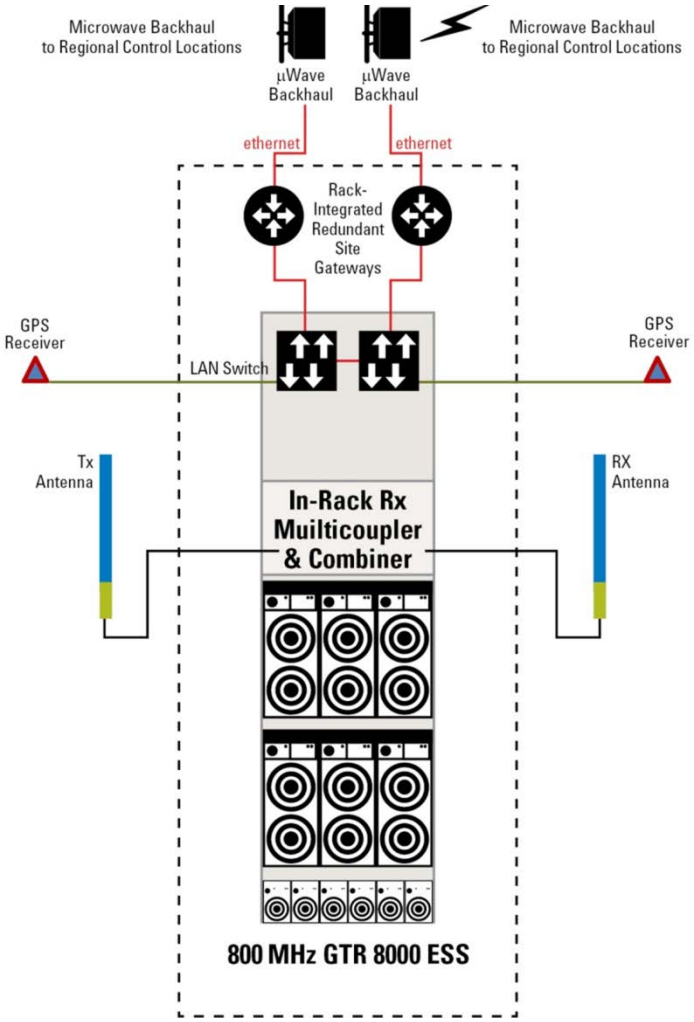


Figure 2-11: GTR8000 ESS Layout

The trunked antenna systems at each RF site are comprised of two main components: the Receive Distribution Network and the Transmit Distribution Network.

Transmit Distribution System

The built-in six-channel Motorola combiner prepares the output signals from all the RF carriers in the GTR8000 ESS for transmission on a single antenna. The cavity combiner has a built-in single stage circulator at each input. Each input to the combiner has a tuning and locking mechanism for each cavity to provide on-site frequency selection/tuning and to prevent unintentional detuning. Circulator loads are on the back of the combiner on a common heat sink. The transmit output from each GTR8000 ESS can then either be sent to a dedicated transmit antenna, or combined with a second GTR8000 ESS through a phasing harness.

Custom combiners are developed by Filtronics specifically for the GTR 8000. The PCD013-V6 compact transmit combiners included in this proposal operate in the (800 MHz) 851-870 MHz band. Low loss, low IM circulators route the incoming signal to our state-of-the-art, high Q ceramic loaded cavities. The signals are then combined using a rugged slab-line manifold.

For each simulcast remote site, the proposed solution includes two transmit antennas to accommodate the thirteen total channels. GTR8000 ESS Rack #1 will consist of six channels and transmit through a dedicated antenna. The combiner outputs from GTR8000 ESS Rack #2 consisting of four channels

and GTR8000 ESS Rack #3 consisting of three channels will be combined through a phasing harness and utilize a second antenna.

As designed, the current transmit antenna system will accommodate an additional eleven channels at each simulcast remote site for a total of twenty-four total channels. This will allow CCD to expand the channel quantities at the simulcast remote sites by 84percent without the need for additional transmit antennas.

For ASR site, the proposed solution includes one transmit antenna to accommodate the nine total channels. The combiner outputs from GTR8000 ESS Rack #1 consisting of five channels and GTR8000 ESS Rack #2 consisting of four channels will be combined through a phasing harness and utilize a dedicated antenna.

As designed, the current transmit antenna system will accommodate an additional three channels at the ASR site for a total of twelve total channels. This will allow CCD to expand the channel quantities at the ASR site by 33percent without the need for additional transmit antennas.

Receive Distribution System

The Receive Distribution Network at each RF site is designed as a dual diversity receive system. A dual diversity receive system consists of two receive paths that work in conjunction with each other, providing the gains necessary to offset the receive degradation inherent in TDMA as compared to FDMA. The dual diversity receive system supports both Phase I and Phase II by utilizing a single path during Phase I operation and both paths during Phase II operation.

The Receive Distribution Network at each RF site consists of two receive antennas, a TTA, a TTA control monitoring unit and two receive multicouplers. The specific antennas used at each site are based on coverage needs and are listed below.

The TTA system consists of two components: the TX/RX 437-83I-01 tower-top amplifier mounted close to the antennas and the corresponding control monitoring unit located with the site equipment.

The TTA has two paths, each with two separate amplifiers used for automatic redundancy. If an amplifier failure occurs the backup amplifier is automatically switched in for full redundancy. The amplifier selection is controlled by the control monitoring unit. A test port that allows the injection of a test signal for sensitivity validation is included. The test port provides a 50-ohm match and has 30 dB of isolation from the antenna network. This isolation allows non-intrusive testing during normal operation. The preselector in the TTA ensures no out of band signals will overdrive the amplifier.

The GTR8000 receive multicoupler consists of the GTR8000 ESS site and cabinet receive multicouplers. At each RF site, two site receive multicouplers are used, one for each of the receive diversity paths. The site receive multicoupler is the primary receive multicoupler, receiving and distributing the input from the associated antenna network to up to four cabinet receive multicouplers. The cabinet receive multicouplers then distribute that input to the radios included in the corresponding GTR8000 ESS rack. Two cabinet receive multicouplers are included within each GTR8000 ESS rack to provide distribution of the receive signal from each of the two diversity receive antennas.

At each of the simulcast transmit and receive remote sites, the proposed design provides support for up to eighteen receivers with the ability to expand to twenty-four receivers with the addition of one GTR 8000 ESS rack and corresponding cabinet receive multicoupler. This will allow CCD to expand the channel quantities at the simulcast remote sites by 84percent without the need for additional receive antennas.

At the simulcast receive only site, the proposed design includes a 32 port receive multicoupler to communicate with the TTA. This receive multicoupler will be used to provide the receive signal directly to the seventeen simulcast receivers. In addition, the receive multicoupler will provide the receive signal to the ASR site located at the same location. In total, eighteen of the total 32 ports on the receive multicoupler will be used, leaving fourteen ports available for future expansion of the receive only site.

For the ASR site, the proposed design provides support for up to twelve receivers with the ability to expand to twenty-four receivers with the addition of two GTR 8000 ESS racks and corresponding cabinet receive multicouplers. This will allow CCD to expand the channel quantities at the simulcast remote sites by 166percent without the need for additional receive antennas.

Proposed Trunked Antenna Systems (800 MHz)

Table 2-18: Receive Antennas (2 per site)

Site	Make	Model	Gain (dBd)	Height n(ft)	Orientation
1670 Broadway	Sinclair	SC412-HF2LDF	11.5	480	0
Denver Housing Authority	Sinclair	SC412-HF2LDF	11.5	110	0
DFD Station 2	Sinclair	SC412-HF2LDF	11.5	100	0
Mountain Towers	Sinclair	SC412-HF2LDF	11.5	310	0
Mount Morrison	RFS	BMR8-A (6DT)	7.7	145	130

Table 2-19: Transmit Antennas

Site	Make	Model	Gain (dBd)	Height (ft)	Orientation	Qty
1670 Broadway	Sinclair	SC476-HF1LDF	6.5	480	0	2
Denver Housing Authority	Sinclair	SC476-HF1LDF	6.5	110	0	2
DFD Station 2	Sinclair	SC476-HF1LDF	6.5	100	0	2
Mountain Towers	Sinclair	SC476-HF1LDF	6.5	310	0	2
Mount Morrison	RFS	BMR8-A (6DT)	11.5	165	130	1

The transmission lines will be uniform throughout the infrastructure and are categorized in the table below.

Table 2-20: System Transmission Line Summary

Site Name	Transmission Line Size/Type	Lightning Surge Suppression
Transmit Transmission Line	AVA5-50, HELIAX® Andrew Virtual Air™ Coaxial Cable, corrugated copper, 7/8 in.	Polyphaser TSX-DFM-BF
Receive Transmission Line (Main)	AVA5-50, HELIAX® Andrew Virtual Air™ Coaxial Cable, corrugated copper, 7/8 in.	Polyphaser 109-0501W-A
Receive Transmission Line (Test)	LDF4-50A, HELIAX® Low Density Foam Coaxial Cable, corrugated copper, 1/2 in.	Polyphaser 109-0501W-A

2.1.1.3.4 Channel Interference Mitigation

In the event that interference is incurred on a specific channel, a configurable Illegal Carrier timer is triggered. If the interference remains for the duration of the timer, the corresponding site controller will remove the channel from service until the interference is eliminated. If the affected channel is part of the simulcast cell, the corresponding channel will also be removed from service at each of the remaining simulcast remote sites until which time the affected channel is able to be returned to service. In the event that interference is incurred at a single simulcast remote site, it will be the responsibility of the system administrator to determine if system capacity is required over provided coverage from the reduced capacity site and manually remove the affected site from service.

To determine the source of the interferer, CCD can use an existing CCD Aeroflex 3920B service monitor to perform signal level measurements to utilize in locating the interferer.

Included as part of this design, Motorola's simulcast subsystem provides the Interference Locator feature, in which information collected from the simulcast remote sites can be utilized to determine the location of the interfering signal. The comparator coordinates the base radios to capture the interference and informs the UNC of the incident. The UNC then collects the data from the base radios, process the event, determines the location and displays the location on the GUI. The size of the reported area is based on the number of simulcast remotes sites within the simulcast cell. Based on the four-site configuration of the proposed CCD simulcast cell, the resultant search area will be less than one square mile.

2.1.1.4 Proposed Microwave Backhaul Network

For the proposed microwave system, Motorola has included a solution from Nokia to provide the CCD system with a robust loop protected, high capacity microwave network. The solution is based on the following products:

- Nokia 9500 Microwave Packet Radio (MPR)
- Nokia 7705 Service Aggregation Router (SAR)
- Nokia 5620 SAM.

2.1.1.4.1 Microwave Network Architecture

The proposed microwave solution creates a single ring solution by providing six new microwave links along with the use of a CCD provided microwave link. As specified in the RFP, a new link will be available between the CCD Primary Dispatch and 950 Josephine. Through the addition of six links, Motorola will create a microwave loop design necessary to meet the needs of CCD. This physical architecture is based on licensed Microwave utilizing the Radio Frequency (RF) components of the 9500 Microwave Packet Radio (MPR). To guarantee the high availability of the network, the radio frequencies selected for all Microwave links are lower 6 GHz and 11 GHz. The figure below shows the physical topology of the architecture.

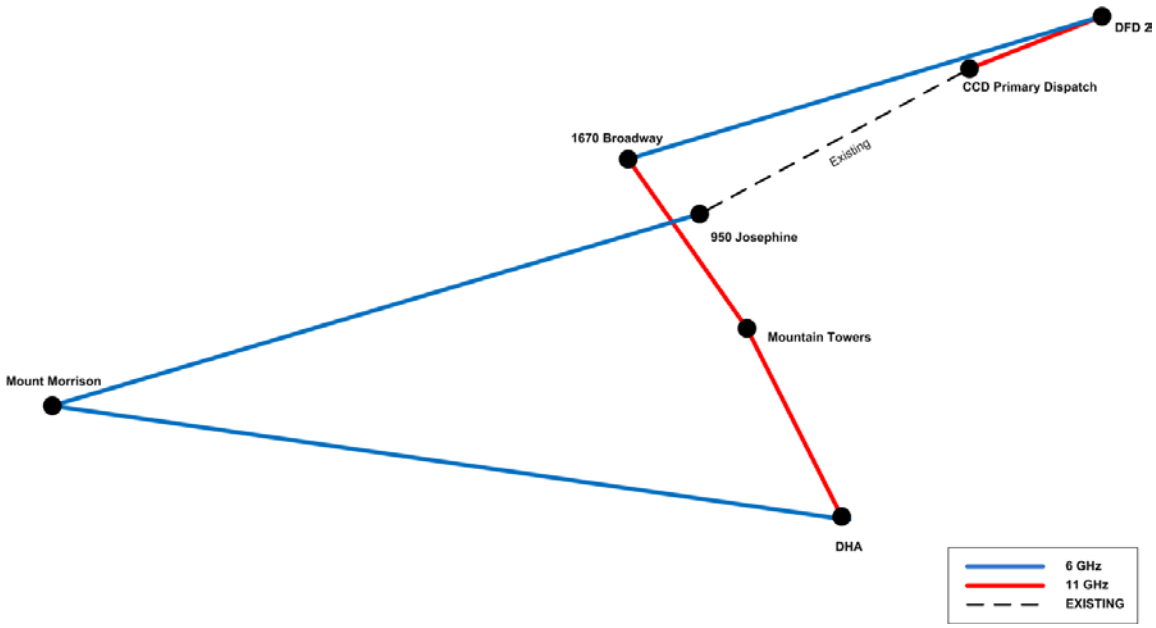


Figure 2-12: Proposed Microwave Topology

Due to the ring topology, all paths were designed as non-standby, with no space diversity needed on any paths to meet the availability requirements. The ring architecture also provides greater reliability in the event of hardware failure (i.e. a 1+1 link), but also a path failure.

To achieve the required 99.999percent annual 2-way availability with minimum 160 Mbps bandwidth capacity for the new links, the proposed links have been designed to support 128 QAM fixed modulation (it is understood that the existing link between 990 Josephine and CCD Primary Dispatch will be implemented with adaptive modulation).

2.1.1.4.2 Microwave System Bandwidth Utilization

As designed, the microwave system provides 160 Mbps capacity on each new link to meet the bandwidth requirements of the proposed radio system and also allow for considerable future growth. The proposed radio system has the following bandwidth requirements:

- 5.2 Mbps for inter-master site link
- 10 Mbps for the inter-simulcast prime site link
- 784 kbps for simulcast prime site links to the master sites
- 4.3 Mbps for five remote site links to prime sites (856 kbps each link)
- 784 kbps for Mount Morrison ASR site links to the master sites
- 2.3 Mbps for CCD Primary Dispatch site links to master sites
- 1.9 Mbps for 950 Josephine Dispatch site links to master sites
- 6.8 Mbps for remaining four dispatch sites site links to master sites (1.7 Mbps each)
- 2.0 Mbps for Customer Enterprise Network traffic to/from the master site.

The total bandwidth required on the microwave system for the proposed radio system is 34.1 Mbps. The microwave design provides for over 400percent growth.

2.1.1.4.3 IP/MPLS Mission Critical Communication Router

For the IP/MPLS requirements, the 7705 Service Aggregation Router (SAR-8) Carrier class service router has been selected to provide all the intelligence required in routing the P25 traffic from remote

sites to the master site, as well as the video surveillance camera that will be backhauled. What differentiates the 7705 SAR-8 from enterprise class routers is the built-in full redundancy in Control and Switching, -48V Power, Ethernet port cards.

The Nokia 7705 SAR-8 is a two-rack unit (2 RU) with industry-leading access density. The platform can be configured with a redundant control and switch module and Media Dependent Adapters (MDAs). The SAR-8 has eight slots, two are allocated for Control and Switch modules (CSMs), with the remaining six being available for MDAs, which are port-by-port configurable as access or network facing ports with no limitation.

The proposed solution for CCD incorporates the use of a Packet Microwave Card (PMC), which eliminates the need of having an independent Radio I/O Interface chassis. In the case of the 9500 MPR, it eliminates the need to deploy the MSS-8 chassis, which housed all the Ethernet/T1/T3/OC3 interfaces.

The PMC MDA is an 8-port GE module. All ports can be used as either access (i.e. towards site router) or network (i.e. towards fiber or microwave) facing ports. Two ports are RJ45-based, and six are SFP-based. Of the total 8 ports, 4 ports are Microwave Aware and can be used in split mount or all indoor configurations. All 8-ports can be used in the traditional non microwave deployment, with Layer 1/2/3 Virtual Private Networking capabilities.

The table below lists the 7705 SAR-8 equipment included at each site.

Table 2-21: Nokia 7705 SAR-8 Equipment At Each Site.

Location	Equipment at Each Site
1670 Broadway Denver Housing Authority DFD Station 2 Mountain Towers	- SAR-8 Shelf V2 (1) - SAR Release 8.0 OS License (1) - SAR-8 Shelf V2 Fan Module (1) - SAR Control and Switch Module Version 2 (2) - Packet Microwave Card (2) - 1-Port 1000 Base-TX SFP (8)
Mount Morrison* 950 Josephine*	- Packet Microwave Card (2) - 1-Port 1000 Base-TX SFP (8)
CCD Primary Dispatch*	- Packet Microwave Card (2) - 1-Port 1000 Base-TX SFP (6) - 1-Port 1000 Base-LX SFP (2)

* In discussions with Nokia, it was indicated to Motorola that CCD currently operates a 7705 SAR-8 at the Mount Morrison, 950 Josephine and CCD Primary Dispatch sites. This design includes the necessary PMC's and SFP's to be added to these existing shelves.

2.1.1.4.4 5620 SAM Network Management System

Both the MPR 9500 and the 7705 are managed by Nokia's 5620 Service Aware Manager (SAM). This will provide simplified training for both IP/MPLS and Microwave to CCD vs. having to learn two different management systems. In addition, the 5620 SAM has the ability to segment the network, so that specific users have access to specific nodes, while others have access to other nodes. It also enables the ability to restrict certain commands to certain individuals which may have clearance for entering/deleting additional services and user.

The 5620 SAM takes network operators well beyond the traditional boundaries of element, network, and service management. The network is easily managed through the 5620 SAM, for provisioning, operations, inventory management and troubleshooting. It enables unified, end-to-end management of the IP/MPLS network and the services they deliver. The SAM also provides strong access control functionality: by grouping users/operators in profiles, with clear scope of command based on their responsibilities, a single SAM platform can be shared by multiple departments. The user profiles define which routers a group of users can access, which commands they can execute on those routers, which protocols are allowed.

As part of its network and service management responsibility, the 5620 SAM also takes care of security management. Creating, modifying, and applying security mechanisms, as well as monitoring security incidents/alarms, troubleshooting faults, and logging breaches or unwanted configuration changes are amongst the SAM security features.

Among the capabilities the 5620 SAM provides are:

- An easy to use way to effectively manage the network proposed here
- An operator friendly GUI
- A means to easily o scale the IP/MPLS operations with effective tools to empower operators
- An automated and standardized network commissioning using policies to reduce configuration errors
- A Simplify provisioning, system to accelerate and reduces the cost of introducing new IP/MPLS-based services
- A means to proactively monitors network and service to detect degradation before services are impacted
- A tool to reduce fault isolation times by offering comprehensive OAM tools and topology views.

2.1.1.4.5 Traffic Prioritization

The proposed network is built on a MPLS (Multi Protocol Label Switching) solution. This architecture provides a range of advantages.

By using QoS mechanisms, MPLS effectively supports the convergence of multiple services over a common packet-based infrastructure. It enables the network to discriminate among various types of traffic based on a rich set of classification attributes and prioritizes the transmission of higher-priority traffic. Features such as Hierarchical QoS (H-QoS) also allow lower-priority traffic to burst to fill available bandwidth when higher-priority applications go idle. H-QoS uses an advanced scheduling mechanism to implement service hierarchies, which provide maximum isolation and fairness across different traffic while optimizing uplink utilization. H-QoS will provide a mechanism to increase the effective available bandwidth across the proposed microwave links.

The 7705 SAR-8 IP/MPLS router has been designed from the ground up to be able to differentiate services. To accomplish prioritization of certain services over others, a sophisticated mechanism for Quality of Service (QoS) and Traffic Management is required from a platform. Unlike traditional switches that can only implement 8 queues per switch port, the 7705 SAR-8 IP/MPLS router has the ability to provide 8 queues per service per port.

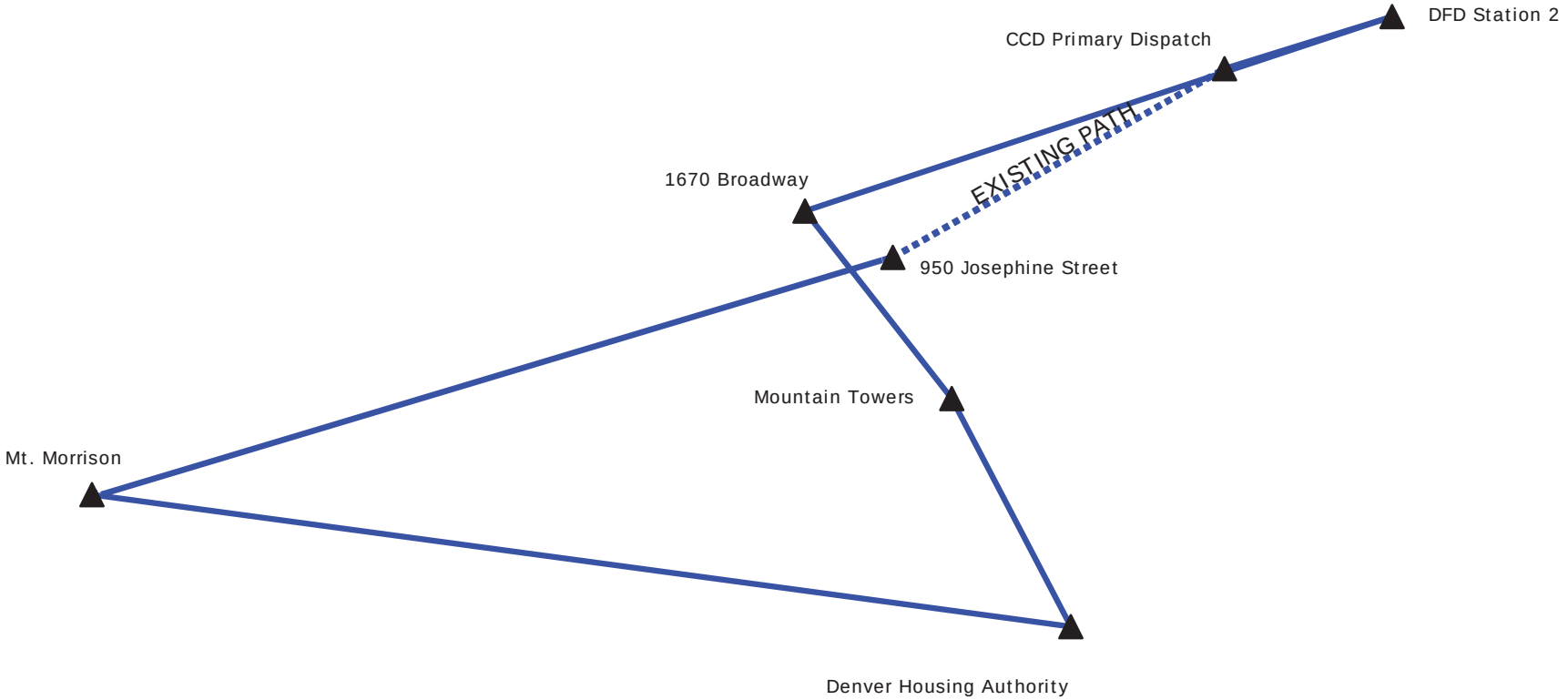
Traffic Management is also as important. It enables the different applications to allocate specific amounts of bandwidth across the Microwave network and guarantee each application's service. If the bandwidth is not being used by one application (i.e. P25), the proposed solution will dynamically hand back any unused bandwidth to other applications and agencies to re-use until it needs the bandwidth again.

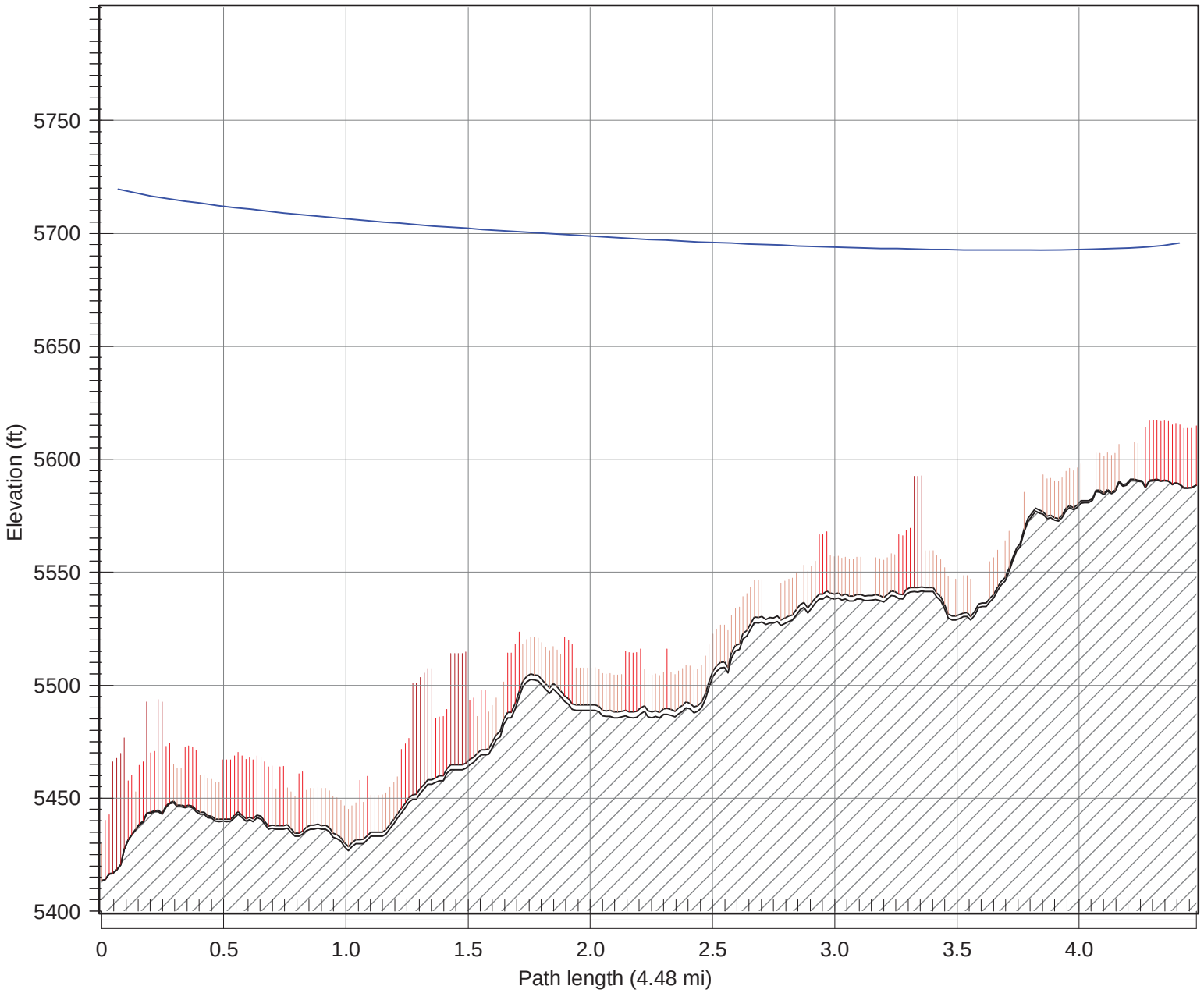
2.1.1.4.6 Microwave Path Profiles

The information below provides the path profiles for each hop within the proposed Nokia microwave system. All paths were calculated based on known database information and were not based on actual site surveys. When the physical site survey is complete, if the path will not meet reliability requirements, a change order at an additional cost may be required.

2.1.1.4.7 Nokia Microwave Path Profiles

Nokia Microwave Path Profiles are included on the pages the follow.


DFD Station 2
CCD Primary Dispatch
EXISTING PATH
1670 Broadway
950 Josephine Street
Mountain Towers
Mt. Morrison
Denver Housing Authority



Mountain Towers	
Latitude	39 41 45.07 N
Longitude	104 56 20.01 W
Azimuth	152.38°
Elevation	5413 ft ASL
Antenna CL	310.0 ft AGL

Frequency (MHz) = 11200.0
K = 1.33
%F1 = 60.00

Denver Housing Authority	
Latitude	39 38 18.00 N
Longitude	104 53 59.90 W
Azimuth	332.41°
Elevation	5589 ft ASL
Antenna CL	110.0 ft AGL

Transmission details (Mountain Towers-Denver Housing Authority.pl5)

	Mountain Towers	Denver Housing Authority
Latitude	39 41 45.07 N	39 38 18.00 N
Longitude	104 56 20.01 W	104 53 59.90 W
True azimuth (°)	152.38	332.41
Elevation (ft)	5413.39	5588.58
Tower height (ft)	310.00	110.00
Tower type	roof mount	building mount
Antenna model	SC3-W100 (TR)	SC3-W100 (TR)
Antenna gain (dBi)	38.30	38.30
Antenna diameter (ft)	3.00	3.00
Antenna height (ft)	310.00	110.00
TX line model	E105	E105
TX line unit loss (dB/100 ft)	2.75	2.75
TX line length (ft)	50.00	50.00
TX line loss (dB)	1.38	1.38
Connector loss (dB)	0.50	0.50
Circulator branching loss (dB)	0.70	0.70
TX filter loss (dB)	1.40	1.40
RX filter loss (dB)	1.70	1.70
TX loss (dB)	3.98	3.98
RX loss (dB)	4.28	4.28
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	4.48	
Free space loss (dB)	130.61	
Configuration	NSB - Diplexer	NSB - Diplexer
Radio model	95MPR11-L128F30-161	95MPR11-L128F30-161
TX power (dBm)	30.50	30.50
Emission designator	30M0D7W	30M0D7W
EIRP (dBm)	64.82	64.82
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-74.00	-74.00
Maximum receive signal (dBm)	-22.00	-22.00
Receive signal (dBm)	-31.87	-31.87
Thermal fade margin (dB)	42.13	42.13
Dispersive fade margin (dB)	57.00	57.00
Effective fade margin (dB)	42.06	42.06

	Mountain Towers	Denver Housing Authority
Annual multipath availability (%)	99.99999	99.99999
Annual multipath unavailability (sec)	1.70	1.70
Annual 2 way multipath availability (%)	99.99999	
Annual 2 way multipath unavailability (sec)	3.40	
Annual rain availability (%)	99.99999	
Annual rain unavailability (min)	0.04	
Annual rain + multipath availability (%)	99.99998	
Annual rain + multipath unavailability (min)	0.10	

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

Mt. Morrison	
Latitude	39 40 17.51 N
Longitude	105 13 07.81 W
Azimuth	97.57°
Elevation	7683 ft ASL
Antenna CL	20.0 ft AGL

Frequency (MHz) = 6100.0
K = 1.33
%F1 = 60.00

Denver Housing Authority	
Latitude	39 38 18.00 N
Longitude	104 53 59.90 W
Azimuth	277.77°
Elevation	5589 ft ASL
Antenna CL	110.0 ft AGL

Transmission details (Mt. Morrison-Denver Housing Authority.pl5)

	Mt. Morrison	Denver Housing Authority
Latitude	39 40 17.51 N	39 38 18.00 N
Longitude	105 13 07.81 W	104 53 59.90 W
True azimuth (°)	97.57	277.77
Elevation (ft)	7683.10	5588.58
Tower height (ft)	20.00	110.00
Tower type	building mount	building mount
Antenna model	PAD6-59 (TR)	PAD6-59 (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna diameter (ft)	6.00	6.00
Antenna height (ft)	20.00	110.00
TX line model	E60	E60
TX line unit loss (dB/100 ft)	1.19	1.19
TX line length (ft)	70.00	50.00
TX line loss (dB)	0.83	0.60
Connector loss (dB)	0.50	0.50
Circulator branching loss (dB)	0.60	0.60
TX filter loss (dB)	1.30	1.30
RX filter loss (dB)	1.60	1.60
TX loss (dB)	3.63	3.40
RX loss (dB)	3.93	3.70
Frequency (MHz)	6100.00	
Polarization	Vertical	
Path length (mi)	17.17	
Free space loss (dB)	137.00	
Configuration	NSB - Diplexer	NSB - Diplexer
Radio model	95MPR61-L128F30-161	95MPR61-L128F30-161
TX power (dBm)	32.50	32.50
Emission designator	30M0D7W	30M0D7W
EIRP (dBm)	67.57	67.80
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-74.50	-74.50
Maximum receive signal (dBm)	-22.00	-22.00
Receive signal (dBm)	-34.67	-34.67
Thermal fade margin (dB)	39.83	39.83
Dispersive fade margin (dB)	57.00	57.00

	Mt. Morrison	Denver Housing Authority
Effective fade margin (dB)	39.79	39.79
Annual multipath availability (%)	99.99996	99.99996
Annual multipath unavailability (sec)	13.71	13.71
Annual 2 way multipath availability (%)	99.99991	
Annual 2 way multipath unavailability (sec)	27.42	
Annual rain availability (%)	100.00000	
Annual rain unavailability (min)	0.00	
Annual rain + multipath availability (%)	99.99991	
Annual rain + multipath unavailability (min)	0.46	

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

Mt. Morrison	
Latitude	39 40 17.51 N
Longitude	105 13 07.81 W
Azimuth	73.43°
Elevation	7683 ft ASL
Antenna CL	20.0 ft AGL

Frequency (MHz) = 6100.0
K = 1.33
%F1 = 60.00

950 Josephine Street	
Latitude	39 43 52.16 N
Longitude	104 57 29.00 W
Azimuth	253.59°
Elevation	5398 ft ASL
Antenna CL	100.0 ft AGL

Transmission details (Mt. Morrison-950 Josephine Street.pl5)

	Mt. Morrison	950 Josephine Street
Latitude	39 40 17.51 N	39 43 52.16 N
Longitude	105 13 07.81 W	104 57 29.00 W
True azimuth (°)	73.43	253.59
Elevation (ft)	7683.10	5398.10
Tower height (ft)	20.00	180.00
Tower type	building mount	self supporting
Antenna model	PAD6-59 (TR)	PAD6-59 (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna diameter (ft)	6.00	6.00
Antenna height (ft)	20.00	100.00
TX line model	E60	E60
TX line unit loss (dB/100 ft)	1.19	1.19
TX line length (ft)	70.00	150.00
TX line loss (dB)	0.83	1.79
Connector loss (dB)	0.50	0.50
Circulator branching loss (dB)	0.60	0.60
TX filter loss (dB)	1.30	1.30
RX filter loss (dB)	1.60	1.60
TX loss (dB)	3.63	4.59
RX loss (dB)	3.93	4.89
Frequency (MHz)	6100.00	
Polarization	Vertical	
Path length (mi)	14.50	
Free space loss (dB)	135.54	
Configuration	NSB - Diplexer	NSB - Diplexer
Radio model	95MPR61-L128F30-161	95MPR61-L128F30-161
TX power (dBm)	32.50	32.50
Emission designator	30M0D7W	30M0D7W
EIRP (dBm)	67.57	66.61
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-74.50	-74.50
Maximum receive signal (dBm)	-22.00	-22.00
Receive signal (dBm)	-34.36	-34.36
Thermal fade margin (dB)	40.14	40.14
Dispersive fade margin (dB)	57.00	57.00

	Mt. Morrison	950 Josephine Street
Effective fade margin (dB)	40.10	40.10
Annual multipath availability (%)	99.99999	99.99999
Annual multipath unavailability (sec)	3.84	3.84
Annual 2 way multipath availability (%)	99.99998	
Annual 2 way multipath unavailability (sec)	7.68	
Annual rain availability (%)	100.00000	
Annual rain unavailability (min)	0.00	
Annual rain + multipath availability (%)	99.99998	
Annual rain + multipath unavailability (min)	0.13	

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

CCD Primary Dispatch	
Latitude	39 46 42.91 N
Longitude	104 50 58.65 W
Azimuth	72.78°
Elevation	5318 ft ASL
Antenna CL	25.0 ft AGL

Frequency (MHz) = 11200.0
K = 1.33
%F1 = 60.00

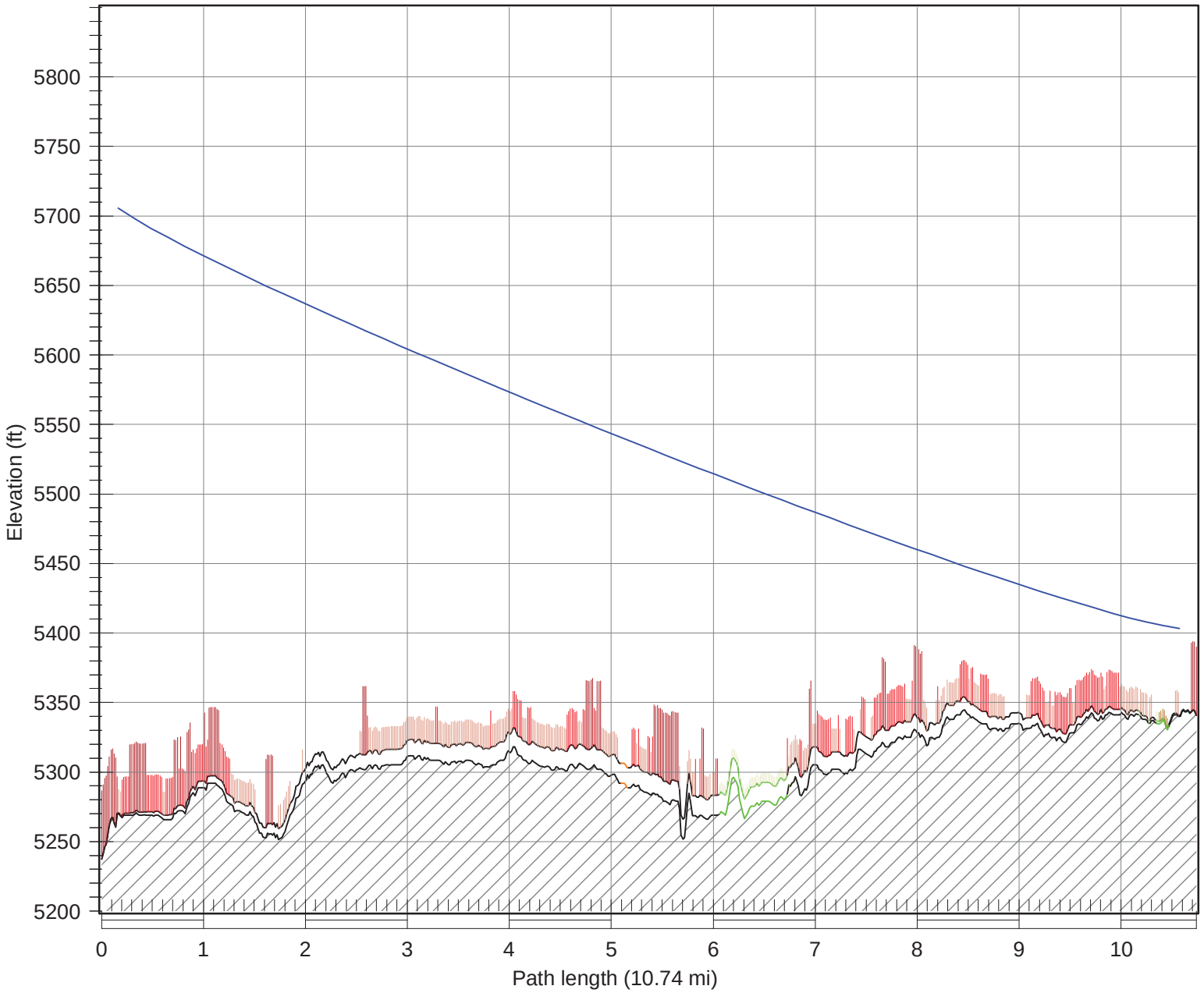
DFD Station 2	
Latitude	39 47 29.70 N
Longitude	104 47 42.80 W
Azimuth	252.81°
Elevation	5341 ft ASL
Antenna CL	85.0 ft AGL

Transmission details (CCD Primary Dispatch-DFD Station 2.pl5)

	CCD Primary Dispatch	DFD Station 2
Latitude	39 46 42.91 N	39 47 29.70 N
Longitude	104 50 58.65 W	104 47 42.80 W
True azimuth (°)	72.78	252.81
Elevation (ft)	5318.24	5340.68
Tower height (ft)	25.00	85.00
Tower type	roof mount	self supporting
Antenna model	SC3-W100 (TR)	SC3-W100 (TR)
Antenna gain (dBi)	38.30	38.30
Antenna diameter (ft)	3.00	3.00
Antenna height (ft)	25.00	85.00
TX line model	E105	E105
TX line unit loss (dB/100 ft)	2.75	2.75
TX line length (ft)	75.00	135.00
TX line loss (dB)	2.06	3.72
Connector loss (dB)	0.50	0.50
Circulator branching loss (dB)	0.70	0.70
TX filter loss (dB)	1.40	1.40
RX filter loss (dB)	1.70	1.70
TX loss (dB)	4.66	6.32
RX loss (dB)	4.96	6.62
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	3.03	
Free space loss (dB)	127.22	
Configuration	NSB - Diplexer	NSB - Diplexer
Radio model	95MPR11-L128F30-161	95MPR11-L128F30-161
TX power (dBm)	30.50	30.50
Emission designator	30M0D7W	30M0D7W
EIRP (dBm)	64.14	62.48
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-74.00	-74.00
Maximum receive signal (dBm)	-22.00	-22.00
Receive signal (dBm)	-31.48	-31.48
Thermal fade margin (dB)	42.52	42.52
Dispersive fade margin (dB)	57.00	57.00
Effective fade margin (dB)	42.45	42.45

	CCD Primary Dispatch	DFD Station 2
Annual multipath availability (%)	100.00000	100.00000
Annual multipath unavailability (sec)	0.49	0.49
Annual 2 way multipath availability (%)	100.00000	
Annual 2 way multipath unavailability (sec)	0.98	
Annual rain availability (%)	100.00000	
Annual rain unavailability (min)	0.01	
Annual rain + multipath availability (%)	100.00000	
Annual rain + multipath unavailability (min)	0.02	

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



1670 Broadway	
Latitude	39 44 34.40 N
Longitude	104 59 12.20 W
Azimuth	71.70°
Elevation	5237 ft ASL
Antenna CL	480.0 ft AGL

Frequency (MHz) = 6100.0
K = 1.33
%F1 = 60.00

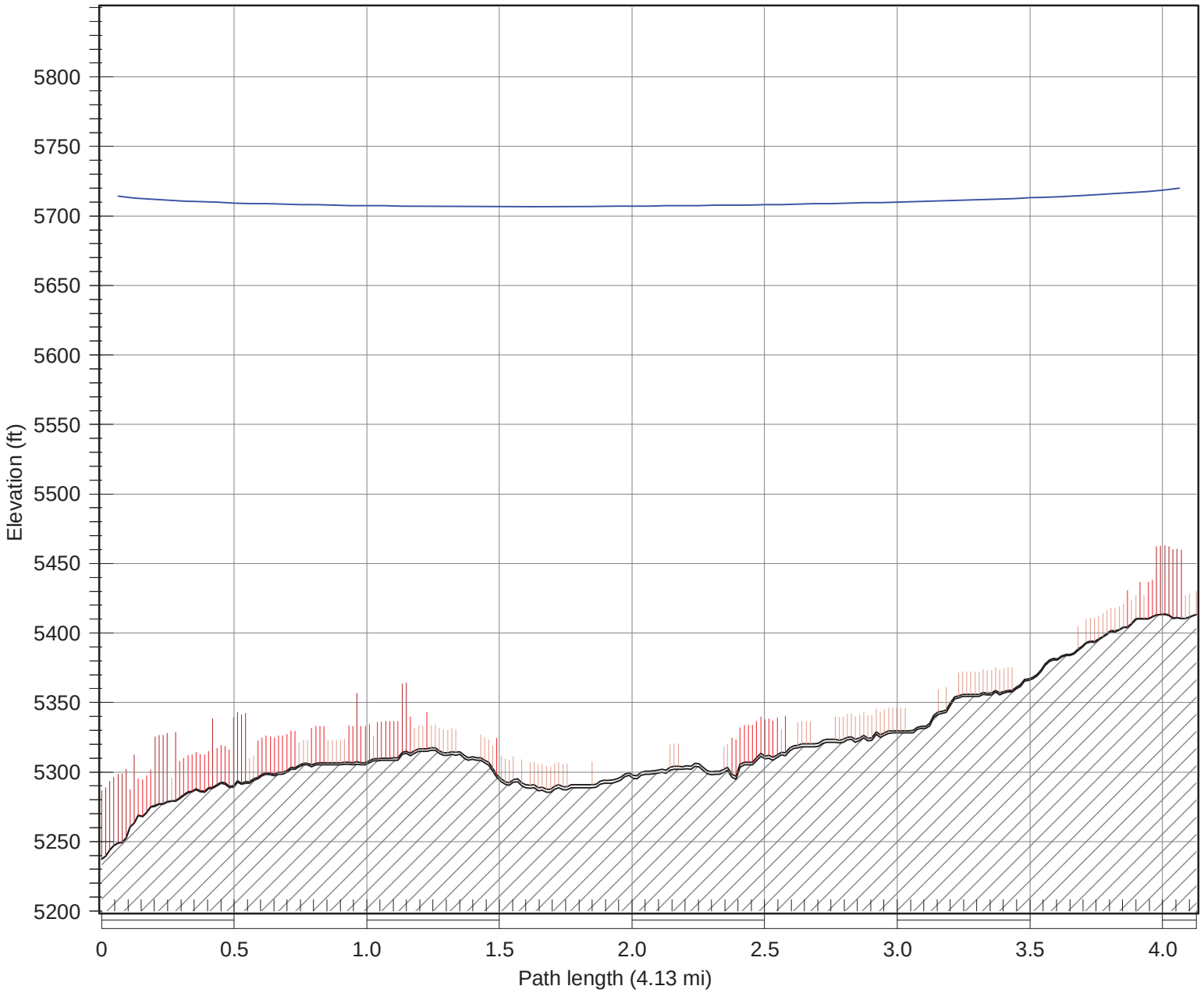
DFD Station 2	
Latitude	39 47 29.70 N
Longitude	104 47 42.80 W
Azimuth	251.82°
Elevation	5341 ft ASL
Antenna CL	65.0 ft AGL

Transmission details (1670 Broadway-DFD Station 2.pl5)

	1670 Broadway	DFD Station 2
Latitude	39 44 34.40 N	39 47 29.70 N
Longitude	104 59 12.20 W	104 47 42.80 W
True azimuth (°)	71.70	251.82
Elevation (ft)	5237.20	5340.68
Tower height (ft)	480.00	85.00
Tower type	building mount	self supporting
Antenna model	PAD6-59 (TR)	PAD6-59 (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna diameter (ft)	6.00	6.00
Antenna height (ft)	480.00	65.00
TX line model	E60	E60
TX line unit loss (dB/100 ft)	1.19	1.19
TX line length (ft)	50.00	115.00
TX line loss (dB)	0.60	1.37
Connector loss (dB)	0.50	0.50
Circulator branching loss (dB)	0.60	0.60
TX filter loss (dB)	1.30	1.30
RX filter loss (dB)	1.60	1.60
TX loss (dB)	3.40	4.17
RX loss (dB)	3.70	4.47
Frequency (MHz)	6100.00	
Polarization	Vertical	
Path length (mi)	10.74	
Free space loss (dB)	132.92	
Configuration	NSB - Diplexer	NSB - Diplexer
Radio model	95MPR61-L128F30-161	95MPR61-L128F30-161
TX power (dBm)	32.50	32.50
Emission designator	30M0D7W	30M0D7W
EIRP (dBm)	67.80	67.03
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-74.50	-74.50
Maximum receive signal (dBm)	-22.00	-22.00
Receive signal (dBm)	-31.04	-31.04
Thermal fade margin (dB)	43.46	43.46
Dispersive fade margin (dB)	57.00	57.00

	1670 Broadway	DFD Station 2
Effective fade margin (dB)	43.37	43.37
Annual multipath availability (%)	99.99994	99.99994
Annual multipath unavailability (sec)	19.03	19.03
Annual 2 way multipath availability (%)	99.99988	
Annual 2 way multipath unavailability (sec)	38.06	
Annual rain availability (%)	100.00000	
Annual rain unavailability (min)	0.00	
Annual rain + multipath availability (%)	99.99988	
Annual rain + multipath unavailability (min)	0.63	

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



1670 Broadway	
Latitude	39 44 34.40 N
Longitude	104 59 12.20 W
Azimuth	141.84°
Elevation	5237 ft ASL
Antenna CL	480.0 ft AGL

Frequency (MHz) = 11200.0
K = 1.33
%F1 = 60.00

Mountain Towers	
Latitude	39 41 45.07 N
Longitude	104 56 20.01 W
Azimuth	321.87°
Elevation	5413 ft ASL
Antenna CL	310.0 ft AGL

Transmission details (1670 Broadway-Mountain Towers.pl5)

	1670 Broadway	Mountain Towers
Latitude	39 44 34.40 N	39 41 45.07 N
Longitude	104 59 12.20 W	104 56 20.01 W
True azimuth (°)	141.84	321.87
Elevation (ft)	5237.20	5413.39
Tower height (ft)	480.00	310.00
Tower type	building mount	roof mount
Antenna model	SC3-W100 (TR)	SC3-W100 (TR)
Antenna gain (dBi)	38.30	38.30
Antenna diameter (ft)	3.00	3.00
Antenna height (ft)	480.00	310.00
TX line model	E105	E105
TX line unit loss (dB/100 ft)	2.75	2.75
TX line length (ft)	50.00	50.00
TX line loss (dB)	1.38	1.38
Connector loss (dB)	0.50	0.50
Circulator branching loss (dB)	0.70	0.70
TX filter loss (dB)	1.40	1.40
RX filter loss (dB)	1.70	1.70
TX loss (dB)	3.98	3.98
RX loss (dB)	4.28	4.28
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	4.13	
Free space loss (dB)	129.90	
Configuration	NSB - Diplexer	NSB - Diplexer
Radio model	95MPR11-L128F30-161	95MPR11-L128F30-161
TX power (dBm)	30.50	30.50
Emission designator	30M0D7W	30M0D7W
EIRP (dBm)	64.82	64.82
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-74.00	-74.00
Maximum receive signal (dBm)	-22.00	-22.00
Receive signal (dBm)	-31.15	-31.15
Thermal fade margin (dB)	42.85	42.85
Dispersive fade margin (dB)	57.00	57.00
Effective fade margin (dB)	42.76	42.76

	1670 Broadway	Mountain Towers
Annual multipath availability (%)	100.00000	100.00000
Annual multipath unavailability (sec)	1.13	1.13
Annual 2 way multipath availability (%)	99.99999	
Annual 2 way multipath unavailability (sec)	2.26	
Annual rain availability (%)	99.99999	
Annual rain unavailability (min)	0.03	
Annual rain + multipath availability (%)	99.99999	
Annual rain + multipath unavailability (min)	0.07	

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

2.1.1.5 System Failure Analysis and Reliability Features

2.1.1.5.1 Avoidance of Single Points of Failure

The proposed system is designed so that no single point of failure will disable seamless wide-area communication. The system is comprised of dual master network controllers, redundant core network equipment, dual RF, console and network management site links, loop diversity microwave, redundant prime site simulcast controller equipment with geographically separated redundancy, and redundant network and voice processing hardware. A complete redundancy and failure analysis is contained below.

The failure mode analysis contained here is comprehensive and represents Motorola's proposed design. We are also willing and able to demonstrate the robust nature of the proposed system in presence of these induced failures at the oral presentation and demonstrations, so that the CCD's system users can see firsthand how the system performs when put in a compromised state.

Motorola has included a comprehensive analysis of failure scenarios and reliability features for the proposed system design. We have provided in response to this section a full failure analysis narrative and block diagrams for each major component failure possible for the proposed system, including the following elements:

- Master site
- Simulcast prime site
- Simulcast remote site
- Multicast ASR site
- Dispatch site.

2.1.1.5.2 Master Site Redundancy

The Master Site included in the proposed system consists of full redundancy of critical components necessary to maintain wide-area communications in the event of a single point of failure. This redundancy is distributed across the two Master Sites locations (950 Josephine Dispatch and CCD Primary Dispatch). Included in this are dual master network controllers. Both master network controllers will have the same system components and will be live on the system, with the primary master network controller actively processing traffic and the second in a mirrored configuration, immediately ready to take over processing without requiring re-affiliation of radios or consoles. Failure of the active master network controller will result in the automatic switch-over of control to the backup master network controller. During the switchover period between the master controllers, the system temporarily enters into site trunking mode. This usually lasts for less than 30 seconds, is typically only a few seconds, and many users may not even be aware that a switch has occurred.

In the seconds during switchover, when the system is in site trunking mode, the subscriber units in the field will have a visual and audible indication that the system is in site trunking, and that they do not have wide area communication. During this period, subscriber users will maintain communications to other subscriber users, but will lose direct communication to dispatch consoles. Communication to dispatch users will be processed through backup radios at dispatch. Once the backup master network controller takes over control and the system is back in wide-area operation, the subscriber units and dispatch operations go back to normal wide-area operation. No deaffiliation or reaffiliation takes place during this period. During the period when the entire system is in site trunking mode (usually a few seconds), dispatch users will have a visual and audible indication of not having wide area access to trunked resources on the system.

System managers have the ability to manually switch between the active master network controller and the backup master network controller using the configuration tool. This manual switchover will result in the system going into site trunking mode for a period of up to 30 seconds before the previous backup master network controller becomes the active master network controller.

In addition to box-level redundancy of the master network controllers, each master network controller also consists of redundant power supplies and network interface cards. In the event of failure of either of these components, operation of the master network controller is not impacted, and wide area communication is maintained without interruption.

As with the master network controllers, redundant core network equipment is also included as part of the proposed system. Each piece of core network equipment critical to wide area communications includes a redundant piece of equipment. In the event of a network component failure, reconvergence through the secondary device is virtually instantaneous and wide-area communications is maintained throughout and transparent to the end-users.

2.1.1.5.3 Simulcast Prime Site Redundancy

The proposed system includes geographically redundant prime sites, with the main prime site located at 950 Josephine Dispatch and the backup prime site located at CCD Primary Dispatch. Three prime site controllers are included, with two located at the main prime site and one at the backup prime site. During normal operating conditions, one prime site controller acts as the active controller, processing all calls, and the other two controllers act as standby controllers. Failure of the active site controller will cause automatic and immediate switchover to one of the standby prime site controllers without affecting normal wide area operation. This switchover is transparent to the system users.

For each channel, a comparator module is included at each of the two prime sites. Failure of the active comparator module for a specific channel will result in the automatic and immediate switchover to the corresponding standby comparator module. This switchover is transparent to the system's users.

Prime sites include full redundancy of all network equipment, distributed across the two prime sites. The failure of a site gateway or site access gateway will cause traffic to be rerouted through the corresponding secondary gateway without any impact on communications. The failure of an Ethernet LAN switch will cause all equipment with connections to the failed switch to lose communications. The impact of a failed Ethernet LAN switch is dependent on the location of the active prime site controller. If the active prime site controller resides on the Ethernet LAN switch for which a failure occurred, the site will leave wide trunking operation for up to 30 seconds. If the active prime site controller is not on the failed Ethernet LAN switch, the failure is transparent to the system users.

2.1.1.5.4 Simulcast Remote Site Redundancy

All simulcast remote sites have redundant site gateways to connect to the simulcast prime site, as well as dual site links and redundant Ethernet LAN switches to protect against single point of failure. Failure of the primary site gateway, site link, or Ethernet LAN switch will cause automatic and immediate switchover to the corresponding redundant module without any loss of normal wide-area trunking operations. The switchover is transparent to the system's users.

2.1.1.5.5 Failure Mode Analysis Narrative and Diagrams

Motorola has designed the system to be inherently fault-tolerant, ensuring reliable communications for all end-users. Redundant components and network component distribution ensure maximum system availability for end-users. Site and system component failures are detected by the unified

event manager (UEM) at the master site, and will be reported to the appropriate personnel. This section demonstrates the redundancy and self-healing features of Motorola's system design by explaining required loss and recovery scenarios for the proposed system.

The failure mode analysis contained here is comprehensive and represents Motorola's proposed design. We have provided in response to this section a full failure analysis narrative and block diagrams for each major component failure possible for the proposed system, including the following scenarios:

Master Site Failure Scenarios

- Zone Controller failure at master site core
- Site Wide Failure at Master site core
- Network component failure at main master site core
- Link failure between dispatch/simulcast prime/conventional site and the master site.

Simulcast Prime Site Failure Scenarios

- Simulcast prime site controller
- Both simulcast prime site controllers at main prime site
- Comparator at prime site
- Single gateway (or site link) to master site
- Single Ethernet switch
- Prime site reference (GPS)
- Prime site main site access gateway to remote sites.

Simulcast Remote Site Failure Scenarios

- Simulcast remote site main gateway (or site link)
- Simulcast remote site main Ethernet LAN switch
- Simulcast remote site single control channel or voice channel.

Multicast Site (ASR) Failure Scenarios

- Multicast site (ASR) main gateway (or site link)
- Multicast site (ASR) main Ethernet LAN switch
- Multicast site (ASR) main site controller
- Multicast site (ASR) single control channel or voice channel.

Dispatch Site Failure Scenarios

- Dispatch operator position
- Ethernet switch at dispatch site
- Main site gateway or site link at dispatch site.

2.1.1.5.6 Master Site Failure Scenarios

As shown in the figure below, the proposed radio system includes a master site with redundant Zone Controllers, LAN switches, gateways and backhaul switches distributed across two locations to provide a high level of redundancy. The Zone Controllers provide the connectivity between the prime simulcast sites, ASR site and the console dispatch site.

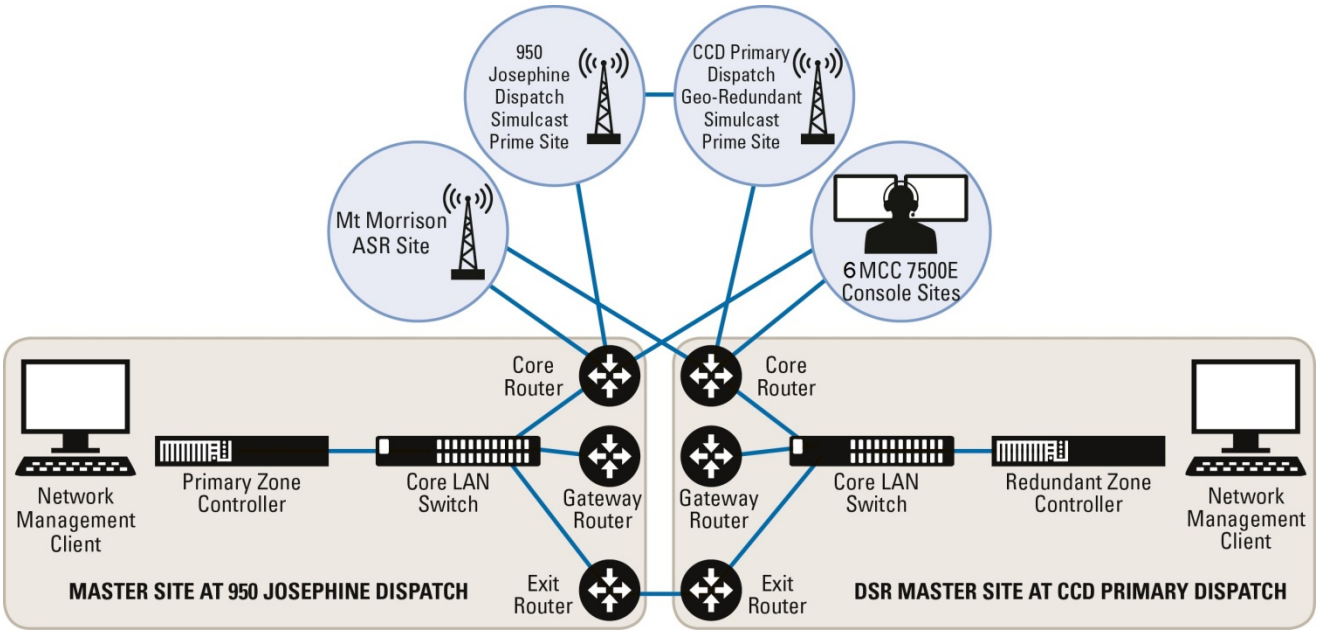


Figure 2-13: Proposed Master Site Network Diagram

Failure of Zone Controller at Master Site Core

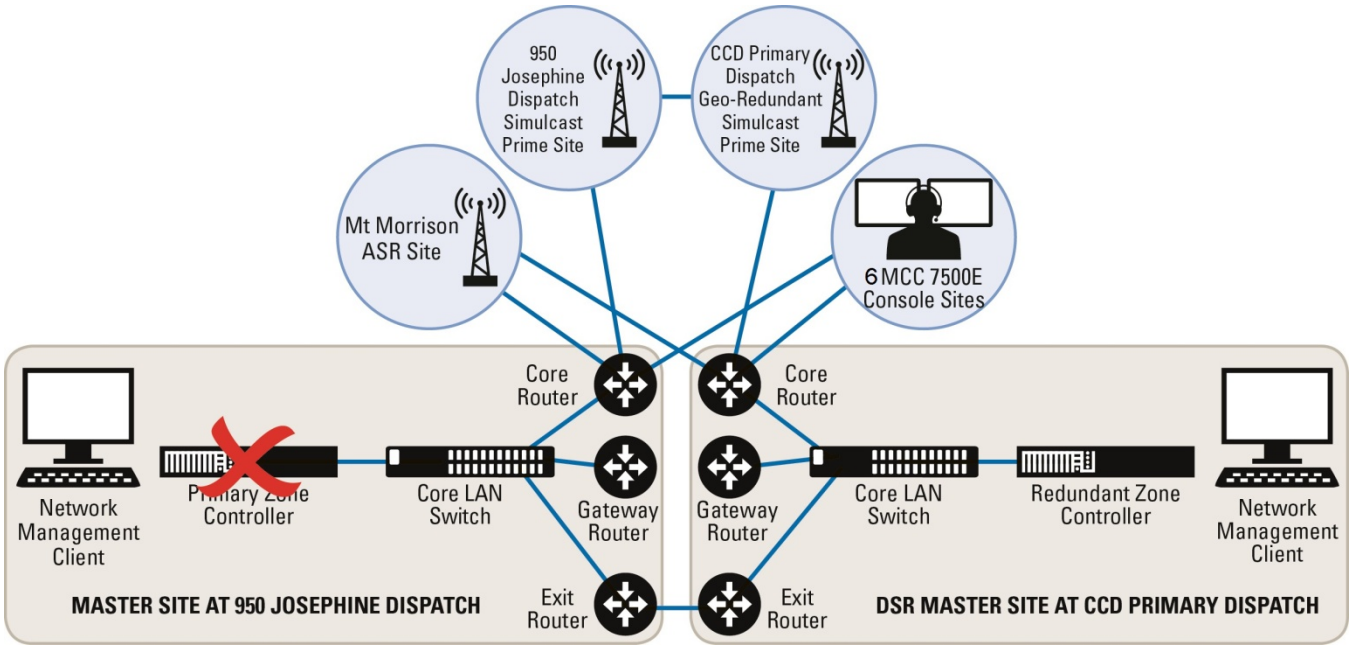


Figure 2-14: Failure of Zone Controller at Master Site Core

Scenario:	Failure of Zone Controller.
Result:	The master site cores consist of redundant Zone Controllers. In the event that a failure of the active Zone Controller occurs, operations will automatically switchover to the standby Zone Controller. As the switchover process takes place, the system will temporarily enter site trunking mode. Wide area trunking will be restored when the switchover process is complete (typically less than 30 seconds). Any and all calls generated after automatic switchover to the backup Zone Controller

	will not observe any change of service. Once the primary Zone Controller is restored to operation, the remote sites will not switch back automatically unless there is a subsequent failure of the backup Zone Controller. This prevents unnecessary switching should the restoration of service be transient or intermittent.
Subscriber Impact:	Subscriber radio units in the field will temporarily go into site trunking mode until the backup Zone Controller takes over system operation. At that point they will revert back to wide area trunking mode of operation. During the switchover period between the Zone Controllers when the system temporarily enters into site trunking mode, the subscriber units can communicate with other subscriber users affiliated to the same simulcast cell / ASR site.
Dispatch Impact:	The dispatch sites will temporarily lose wide area connectivity and will not have access to trunking resources, until the backup Zone Controller takes over system operation. During the switchover period between the Zone Controllers when the system temporarily enters into site trunking mode, the dispatch users can communicate to the subscriber units in the field using backup control stations.
Data Impact:	No impact. Data and configuration information is replicated across master sites.
Protection:	Redundant Zone Controllers.
Detection:	Alarm on Network Management Terminal (UEM).

Site Wide Failure at Master Site Core

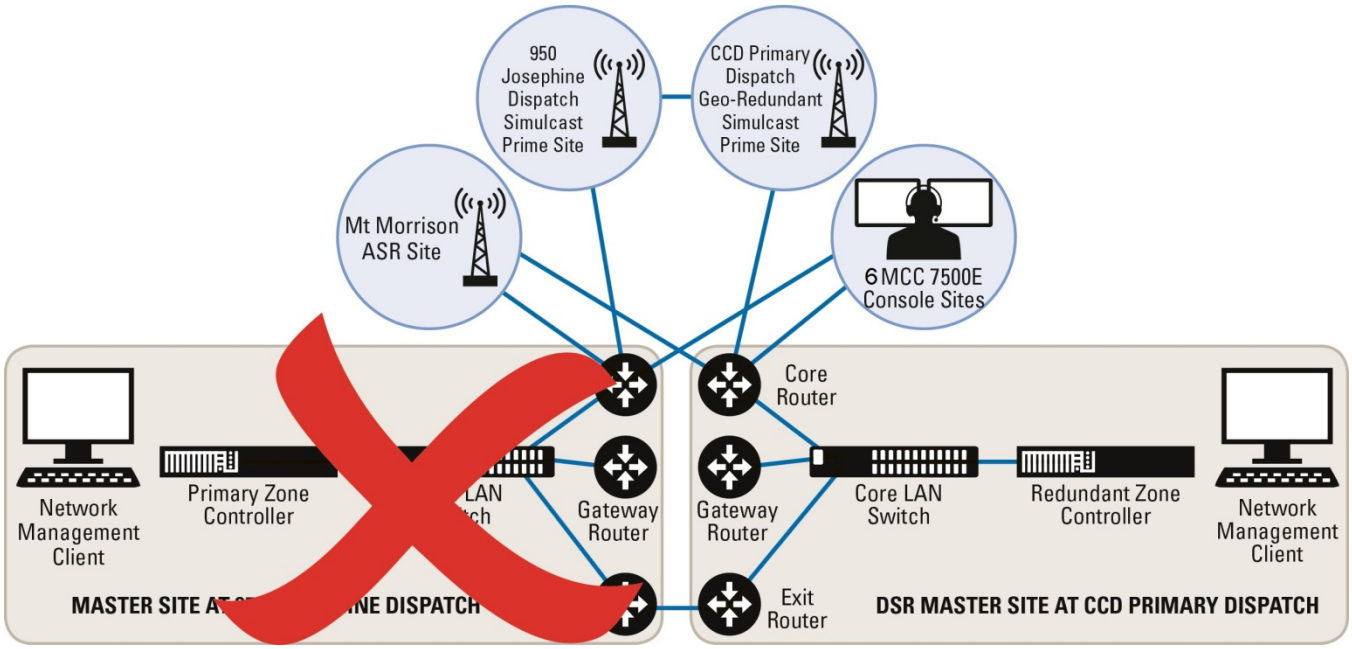


Figure 2-15: Site-Wide Failure at Master Site Core

Scenario:	Catastrophic event at a Master Site, Failure of Core LAN Switch.
Result:	The master site cores consist of redundant Zone Controllers and network equipment distributed over two locations. In the event that a catastrophic event occurs at one of the two master site locations, or during the failure of the Core LAN Switch at the active master site, operations will automatically switchover to the secondary master site location. As the switchover process takes place, the system will temporarily enter site trunking mode. Wide area trunking will be restored when the switchover process is complete (typically less than 30 seconds). Any and all calls generated after automatic switchover to the backup master will not

	observe any change of service. Once the primary master site is restored to operation, the remote sites will not switch back automatically unless there is a subsequent failure of the backup Zone Controller. This prevents unnecessary switching should the restoration of service be transient or intermittent.
Subscriber Impact:	Subscriber radio units in the field will temporarily go into site trunking mode until the backup Zone Controller takes over system operation. At that point they will revert back to wide area trunking mode of operation. During the switchover period between the Zone Controllers when the system temporarily enters into site trunking mode, the subscriber units can communicate with other subscriber users affiliated to the same simulcast cell / ASR site.
Dispatch Impact:	The dispatch sites will temporarily lose wide area connectivity and will not have access to trunking resources, until the backup Zone Controller takes over system operation. During the switchover period between the Zone Controllers when the system temporarily enters into site trunking mode, the dispatch users can communicate to the subscriber units in the field using backup control stations.
Data Impact:	No impact. Data and configuration information is replicated across master sites.
Protection:	Geo-Redundant Master Sites.
Detection:	Alarm on Network Management Terminal (UEM).

Network Component Failure at Master Site Core

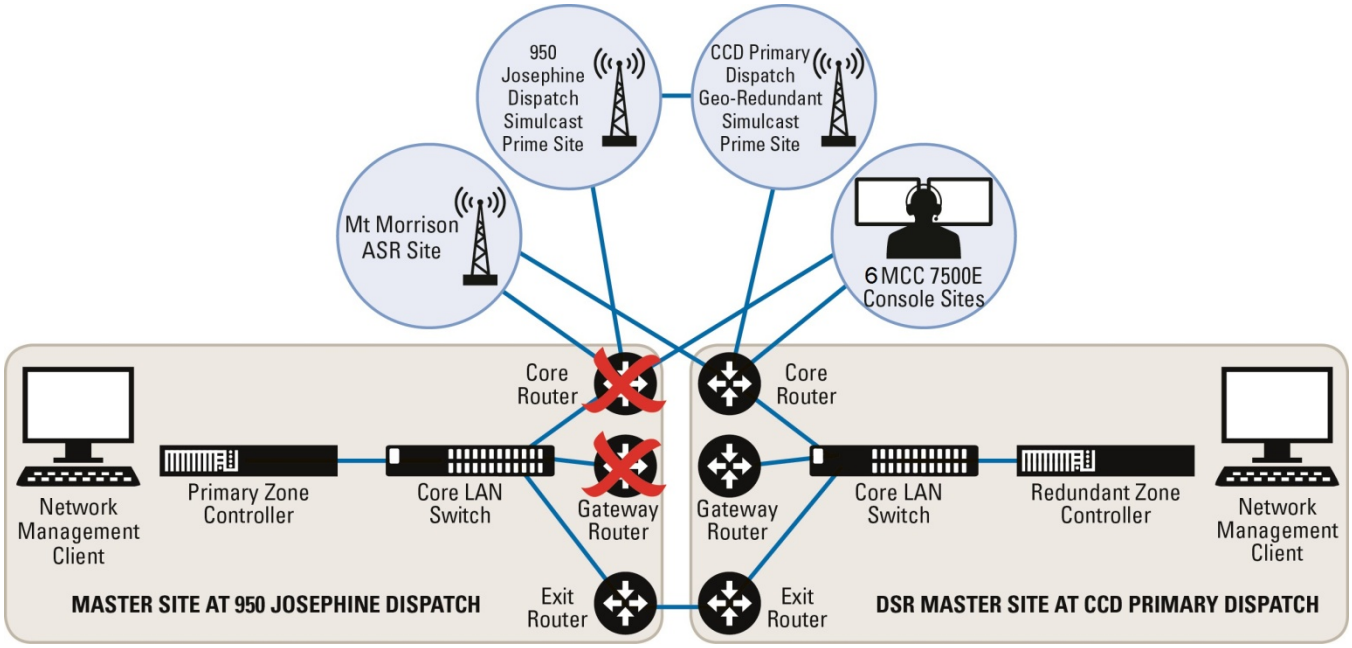


Figure 2-16: Failure of Network Component at Master Site Core

Scenario:	Failure of Core Router or Gateway Router.
Result:	Redundant components are used for each critical network component within the master site core. Failure of a core router or gateway router will result in traffic rerouting through the redundant device. Rerouting is virtually instantaneous and transparent to the end-users.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected.
Dispatch Impact:	The dispatch sites will be transparent to this failure and their normal wide area operations will not be affected.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Redundant Core Router, Redundant Gateway Router.
Detection:	Alarm on Network Management Terminal (UEM).

Link Failure between Dispatch/Simulcast Prime/ASR Site and the Master Site

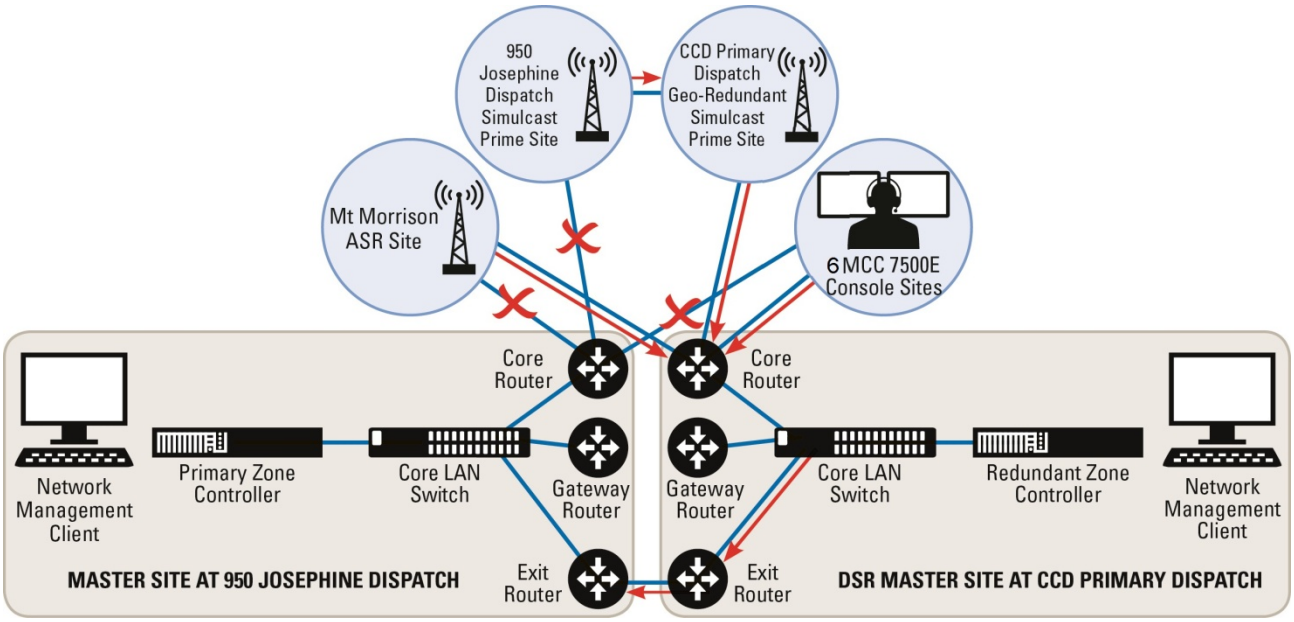


Figure 2-17: Failure of Site Link To Main Master Site

Scenario:	Failure of the site link from a Dispatch site or Simulcast Prime Site or Conventional Site to the master site.
Result:	In the event that the Simulcast Prime/Dispatch site loses communications with the Zone Controller at the master site due to site link failure, it will automatically revert to its secondary link to access the Zone Controller.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected.
Dispatch Impact:	The dispatch sites will be transparent to this failure and their normal wide area operations will not be affected.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Redundant Site Links.
Detection:	Alarm on Network Management Terminal (UEM).

2.1.1.5.7 Simulcast Prime Site Failure Scenarios

Motorola proposes to CCD a simulcast subsystem with GEO Redundant simulcast prime site redundancy. The proposed simulcast subsystem is comprised of a main simulcast prime site with co-located simulcast remote site, three simulcast remote sites and a redundant prime site geographically co-located with one of the three simulcast remote sites.

The CCD simulcast subsystem is shown below for reference.

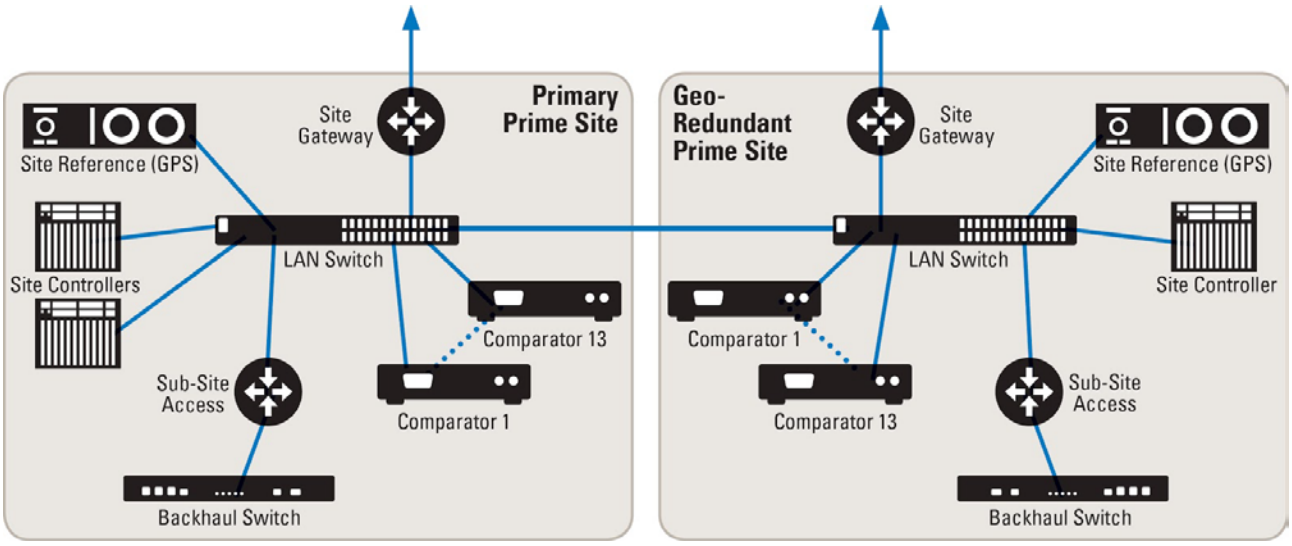


Figure 2-18: Proposed Geo-Redundant Simulcast Prime Site Network Diagram

Simulcast Prime Site Controller

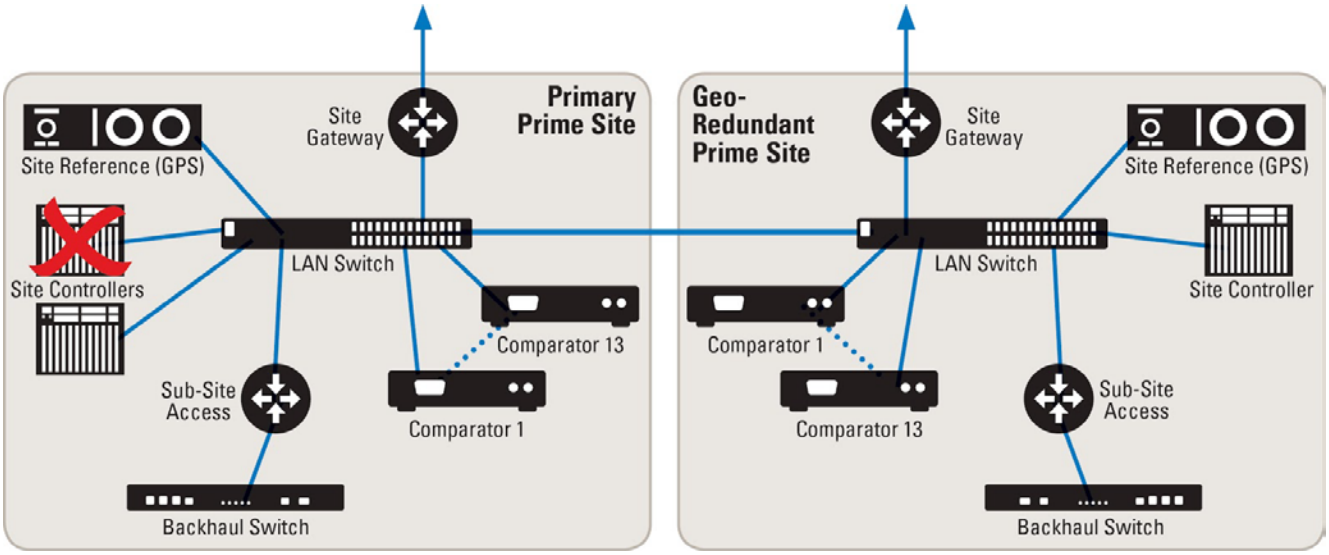


Figure 2-19: Geo-Redundant Main Prime Site: Simulcast Prime Site Controller Failure

Scenario:	Failure of the Simulcast Prime Site Controller at Prime Site.
Result:	Motorola has provided redundant simulcast prime site controllers (GCP 8000) at the main simulcast prime site. Failure of the active controller will result in automatic switchover to the redundant controller. The entire system remains in the simulcast wide area trunking mode from the primary prime site. The failure is transparent to all voice system users. Dispatch console operation remains unaffected.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected.
Dispatch Impact:	The dispatch sites will be transparent to this failure and their normal wide area operations will not be affected.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.

Protection:	Redundant Prime Simulcast Controllers, Spare Controller Modules.
Detection:	Alarm on Network Management Terminal (UEM).

Both Simulcast Prime Site Controllers

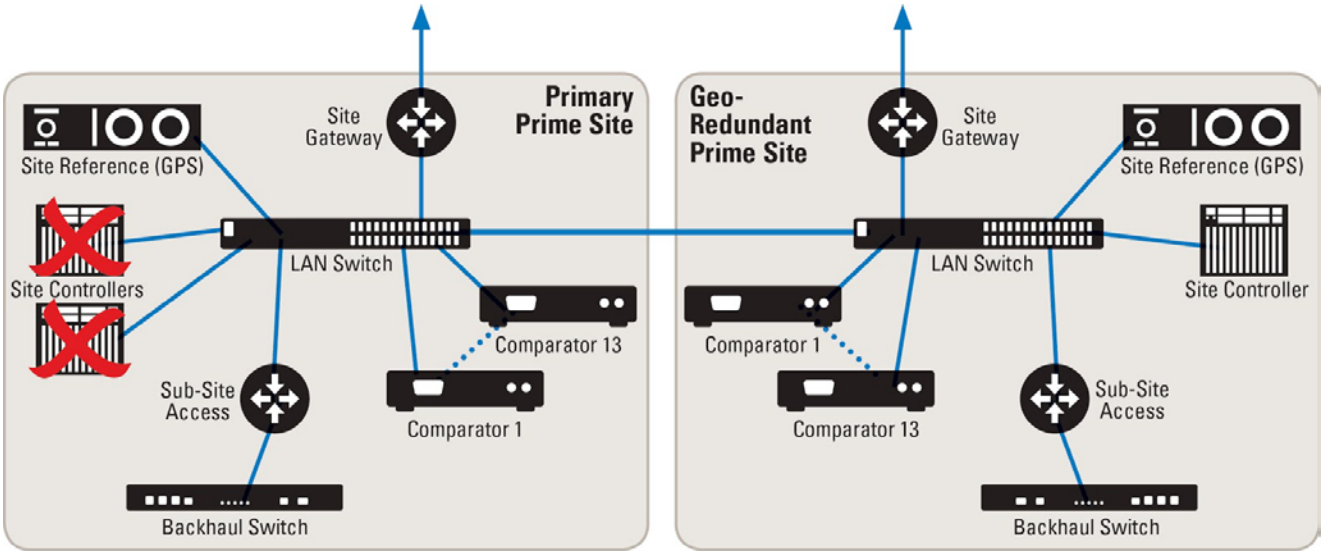


Figure 2-20: Geo-redundant Main Prime Site: Both Simulcast Prime Site Controllers Failure

Scenario:	Failure of Both Primary and Redundant Simulcast Prime Site Controllers.
Result:	In the unlikely event that both the active and the redundant main simulcast prime controllers fail at the main simulcast prime site, this will result in automatic switchover to the Geo redundant prime site controller. Subscriber radio units in the field affiliated to the simulcast site will go into fail-soft mode of operation. Subscriber units affiliated to the simulcast site and in fail-soft mode can communicate to each other on their designated channel frequency. They can communicate with the dispatch users, if the dispatch users have a backup control station affiliated to the simulcast site. Restoration to wide area trunking is typically less than 30 seconds.
Subscriber Impact:	Subscriber radio units in the field will temporarily go into failsoft mode until the backup site controller at the geo redundant prime site activates. At that point they will revert back to wide area trunking mode of operation. During the switchover period between the site controllers when the system temporarily enters into failsoft mode, the subscriber units can communicate with other subscriber users programmed for the same RF failsoft channel.
Dispatch Impact:	Dispatch wide area communication to the simulcast site will be interrupted during the transition period. During the transition period, dispatch positions will have an indication that the affected simulcast site is no longer in wide area trunking via their backup radio. Once the transition is complete, normal wide area operation is restored.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Geo Redundant Prime Simulcast Controller, Spare Controller Modules.
Detection:	Alarm on Network Management Terminal (UEM).

Comparator at Prime Site

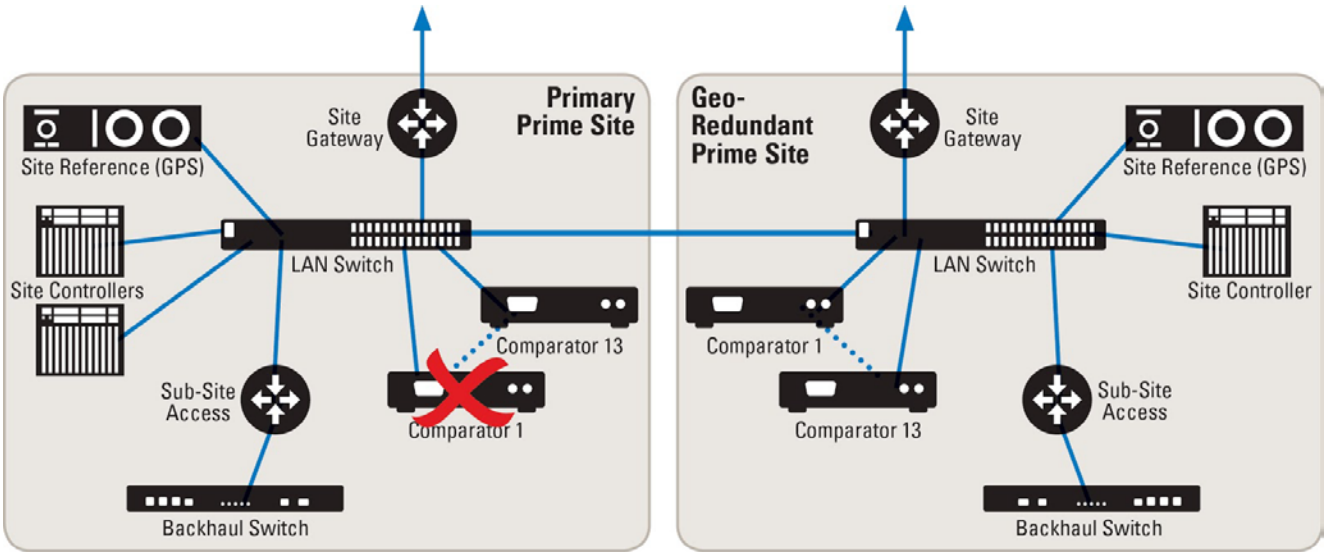


Figure 2-21: Geo Redundant Main Prime Site: Comparator Failure

Scenario:	Failure of Simulcast Comparator at main Simulcast Prime Site.
Result:	The system will recognize the failure of the comparator at the main prime site and activate the duplicate comparator on the Geo redundant prime site. The failure is transparent to all voice system users. Dispatch console operation remains unaffected.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected.
Dispatch Impact:	The dispatch sites will be transparent to this failure and their normal wide area operations will not be affected.
Data Impact: No impact. Data and configuration information is maintained at the master sites.	No impact. Data and configuration information is maintained at the master sites.
Protection:	Duplicate comparators on the Geo redundant prime site.
Detection:	Alarm on Network Management Terminal (UEM).

Prime Site––Failure of Single Gateway (or Site Link) to Master Site

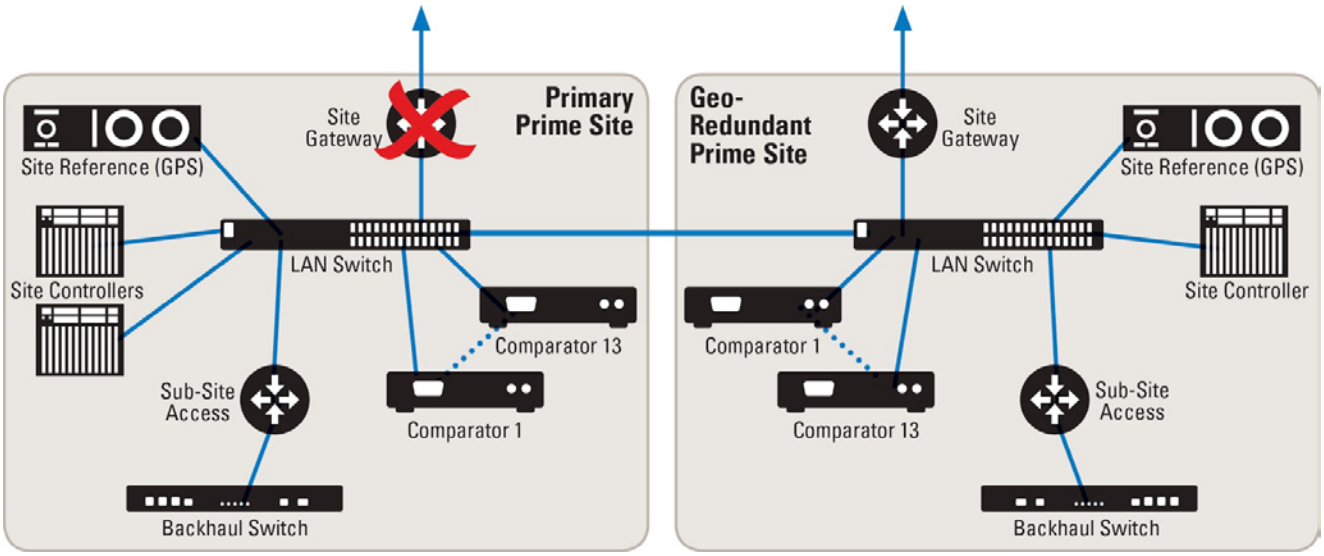


Figure 2-22: Geo-Redundant Main Prime Site: Single Gateway Failure (Or Site Link)

Scenario:	Failure of Simulcast Prime Site Gateway or Site Link to the master site.
Result:	If the primary site gateway or site link to the master site fails, the redundant site gateway will take over. The switchover is automatic. The failure is transparent to all system users. The traffic is rerouted through the redundant site gateway.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected.
Dispatch Impact:	The dispatch sites will be transparent to this failure and their normal wide area operations will not be affected.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Redundant Simulcast Prime Site Gateway, Redundant Site Links.
Detection:	Alarm on Network Management Terminal (UEM).

Single Ethernet Switch

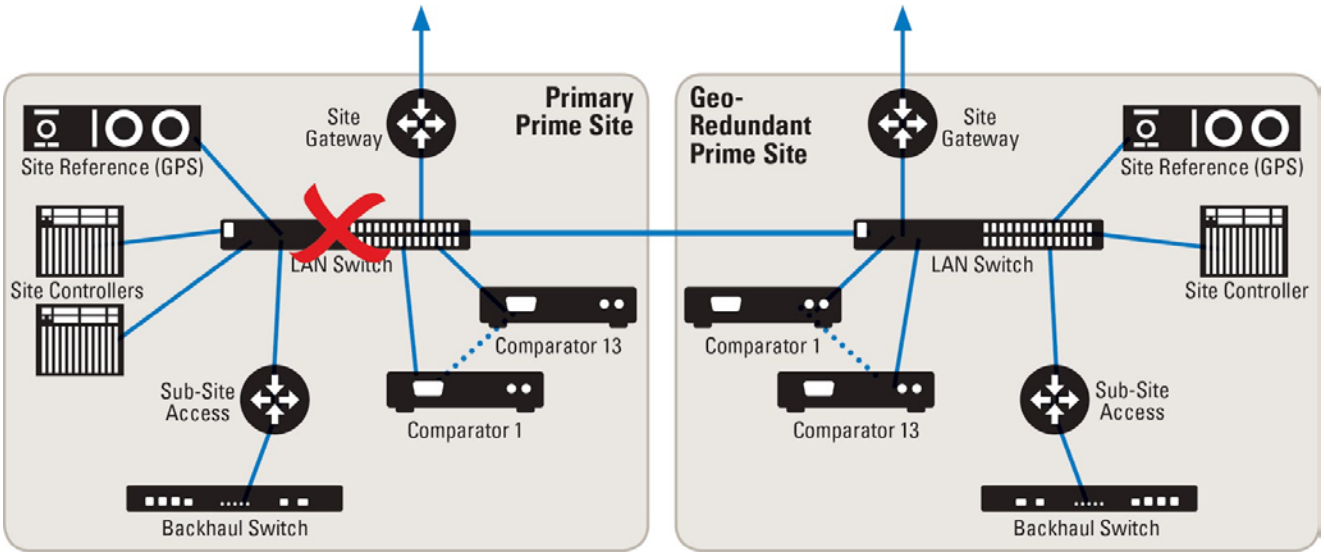


Figure 2-23: Geo-Redundant Main Prime Site: Ethernet LAN Switch Failure

Scenario:	Failure of a main Simulcast Prime Site Ethernet LAN Switch.
Result:	The failure of the Ethernet LAN switch at the main simulcast prime site will result in the automatic switchover to the Geo redundant prime Subscriber radio units in the field affiliated to the simulcast site will go into fail-soft mode of operation. Subscriber units affiliated to the simulcast site and in fail-soft mode can communicate to each other on their designated channel frequency. They can communicate with the dispatch users, if the dispatch users have a backup control station affiliated to the simulcast site. Restoration to wide area trunking is typically less than 30 seconds.
Subscriber Impact:	Subscriber radio units in the field will temporarily go into failsoft mode until the backup site controller at the geo redundant prime site activates. At that point they will revert back to wide area trunking mode of operation. During the switchover period between the site controllers when the system temporarily enters into failsoft mode, the subscriber units can communicate with other subscriber users programmed for the same RF failsoft channel.
Dispatch Impact:	Dispatch wide area communication to the simulcast site will be interrupted during the transition period. During the transition period, dispatch positions will have an indication that the affected simulcast site is no longer in wide area trunking via their backup radio. Once the transition is complete, normal wide area operation is restored.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Geo Redundant Prime Simulcast Controller, Spare Controller Modules.
Detection:	Alarm on Network Management Terminal (UEM).

Main Prime Site Reference (GPS)

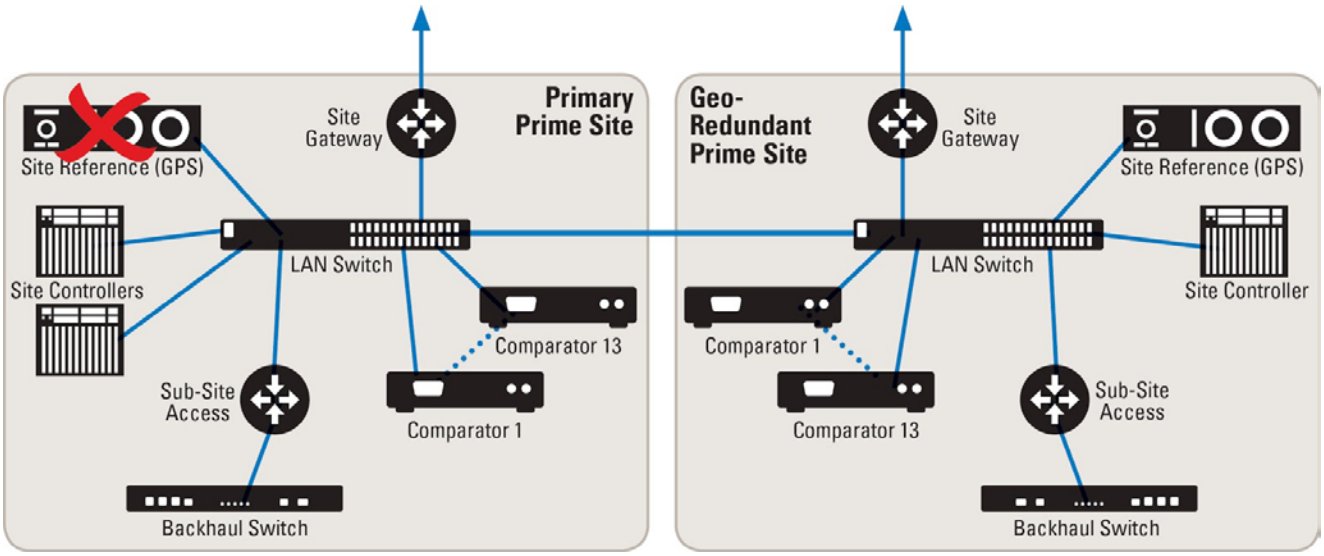


Figure 2-24: Failure of Simulcast Prime Site Reference (GPS)

Scenario:	Failure of main Simulcast Prime Site Reference (GPS).
Result:	The primary site reference is designed with a rubidium, and crystal Oscillator and redundant power supplies. If the rubidium oscillator fails then the crystal oscillator will take over and continue to provide a reference for the comparators and site controllers. If a power supply fails then the redundant power supply will take over. If the entire primary site reference fails, then the controllers and comparators will continue to run on the internal reference for up to four hours. If the primary site reference (TRAK) is down for over four hours then the system will switch to the Geo redundant prime site.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected.
Dispatch Impact:	The dispatch sites will be transparent to this failure and their normal wide area operations will not be affected.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Geo Redundant Prime Simulcast Controller, Spare Controller Modules.
Detection:	Alarm on Network Management Terminal (UEM).

Main Prime Site Main Site Access Gateway to Remote Sites

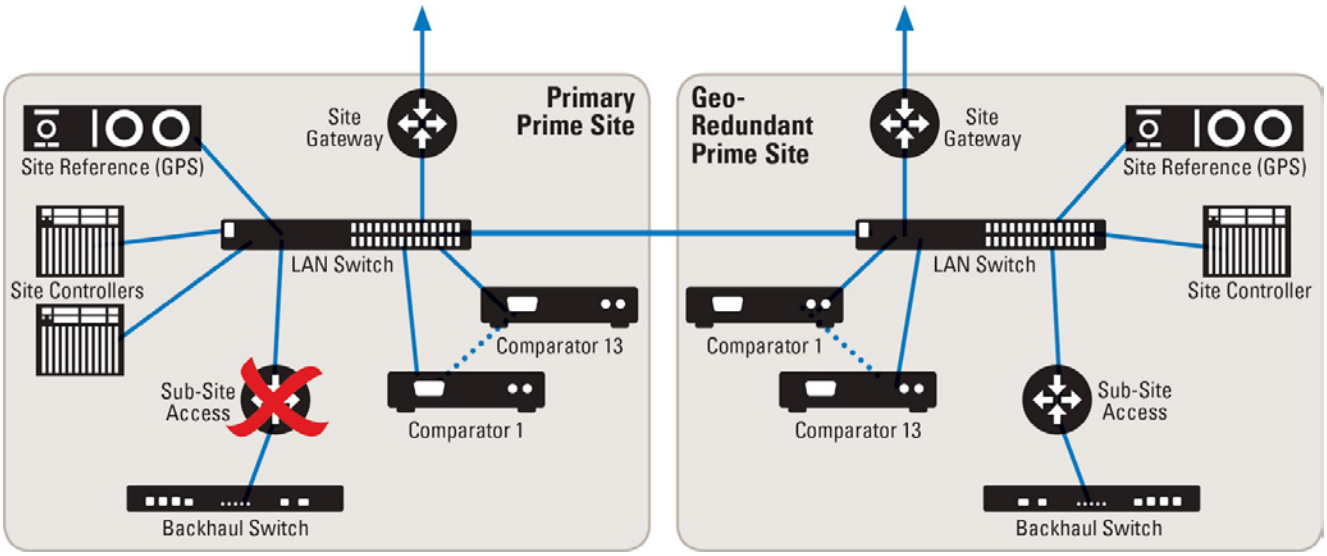


Figure 2-25: Failure of Main Site Access Gateway To Remote Sites

Scenario:	Failure of Main Site Access Gateway to Remote Sites.
Result:	At the Simulcast Prime site if the main site access gateway to the remote simulcast sites fails, the redundant site access gateway will take over. The switchover is automatic with all traffic rerouted through the site access gateway at the Geo Redundant Prime Site. The failure is transparent to all system users.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected.
Dispatch Impact:	The dispatch sites will be transparent to this failure and their normal wide area operations will not be affected.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Redundant Site Access Gateways.
Detection:	Alarm on Network Management Terminal (UEM).

2.1.1.5.8 Simulcast Remote Site Failure Scenarios

Simulcast Remote Site Main Gateway (or Site Link)

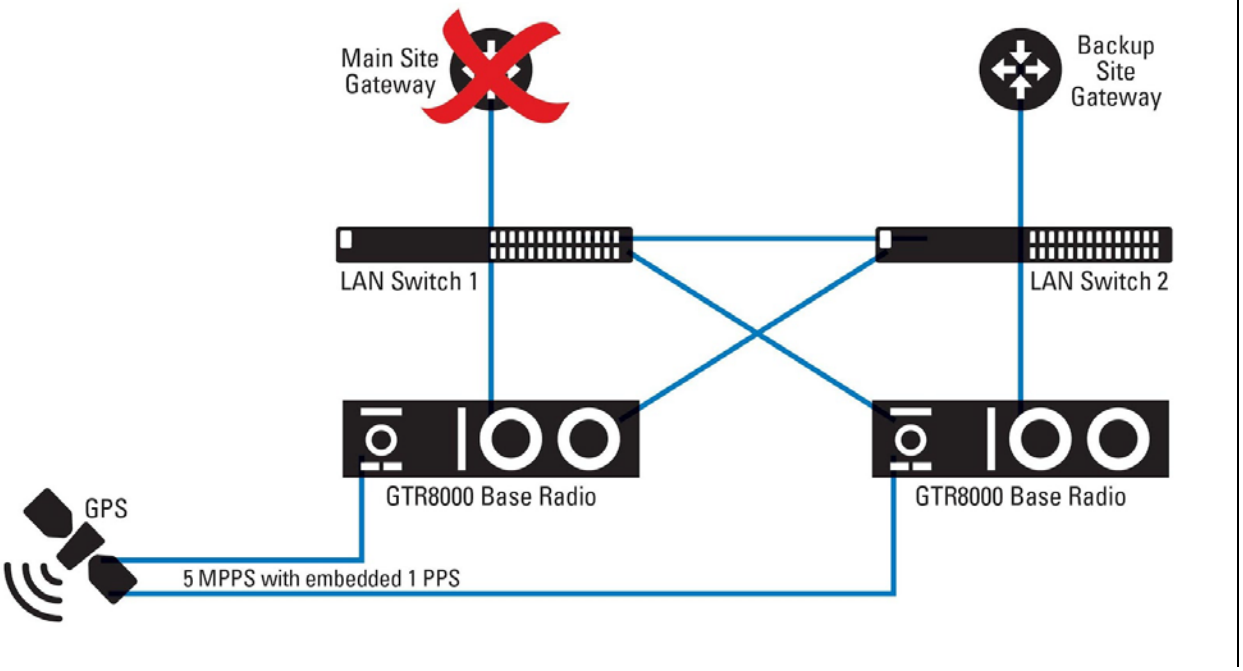


Figure 2-26: Failure of Simulcast Remote Site Main Gateway (or Site Link)

Scenario:	Failure of Simulcast Remote Site Main Gateway or Site Link.
Result:	The simulcast subsystem employs redundant site gateways and redundant site links to connect the simulcast remote sites to the simulcast prime site. Failure of main site gateway/site link at a simulcast remote site will result in automatic switchover to the redundant site gateway/site link. The entire system remains in the simulcast wide area trunking mode. The failure is transparent to all system users.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected.
Dispatch Impact:	The dispatch sites will be transparent to this failure and their normal wide area operations will not be affected.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Standby Simulcast Remote Site Gateway, Redundant Site Links.
Detection:	Alarm on Network Management Terminal (UEM).

Simulcast Remote Site Main Ethernet LAN Switch (GPB8000 / XHUB)

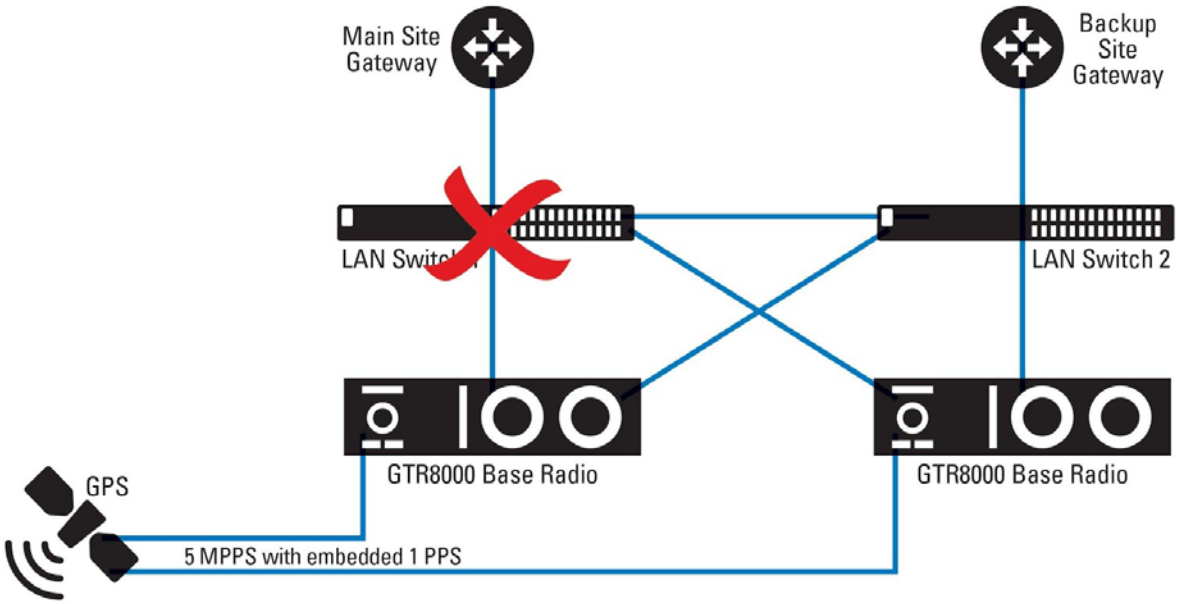


Figure 2-27: Failure of Simulcast Remote Site Main Ethernet LAN Switch

Scenario:	Failure of Simulcast Remote Site Main Ethernet LAN Switch.
Result:	Failure of the main simulcast remote site Ethernet LAN switch will result in automatic switchover to the redundant Ethernet switch. The entire system remains in the simulcast trunking mode. The failure is transparent to all system users.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected.
Dispatch Impact:	The dispatch sites will be transparent to this failure and their normal wide area operations will not be affected.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Redundant Simulcast Remote Site Ethernet switch.
Detection:	Alarm on Network Management Terminal (UEM).

Simulcast Remote Site Single Control Channel or Voice Channel

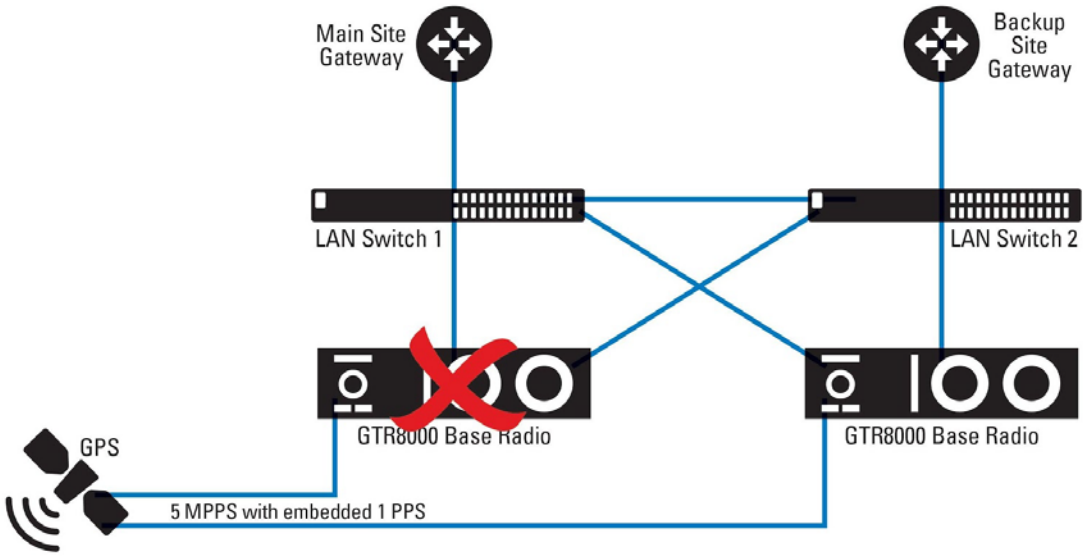


Figure 2-28: Failure of Single Control Channel or Voice Channel

Scenario:	Failure of a Single Control Channel or Voice Channel.
Result:	Motorola trunking systems provide up to four possible control channels in a simulcast cell. If the currently active control channel fails, another channel automatically takes over and the failed control channel is automatically taken out of service. All other channels within the simulcast cell remain unaffected. The simulcast cell remains in the wide-area trunking mode. The failure is transparent to all system users. Dispatch console operation remains unaffected. In a trunking system, multiple channels inherently provide redundancy for simulcast remote sites. The failure of one voice channel will be transparent to all system users. The failure of a voice channel base station will result in the zone controller removing that channel from service, resulting in some reduced channel capacity. Any calls in progress on the failed channel will be lost, and on the next push-to-talk, radio traffic will be restored on another channel. All other channels in the simulcast cell remain unaffected. The entire system remains in the wide area trunking mode. Dispatch console operation remains unaffected.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected. A subscriber unit transmitting on a failed voice channel will cease communication for the duration of the push-to-talk. On the subsequent push-to-talk, radio traffic will be restored to another voice channel.
Dispatch Impact:	The dispatch sites will be transparent to this failure and their normal wide area operations will not be affected.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Multiple potential control channels.
Detection:	Alarm on Network Management Terminal (UEM).

2.1.1.5.9 Multicast Site (ASR) Failure Scenarios

Multicast Site (ASR) Main Gateway (or Site Link)

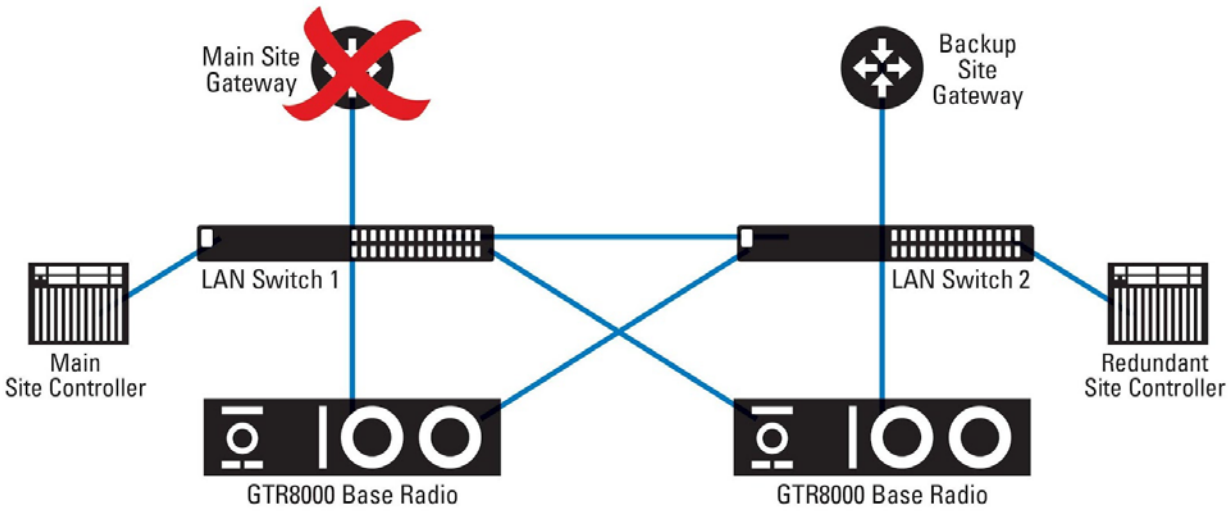


Figure 2-29: Failure of Multicast Site (ASR) Main Gateway (or Site Link)

Scenario:	Failure of Multicast Site (ASR) Main Gateway or Site Link.
Result:	The multicast sites (ASR) employ redundant site gateways and redundant site links. Failure of the main site gateway/site link at a multicast site (ASR) will result in automatic switchover to the redundant site gateway/site link. The multicast site (ASR) remains in wide area trunking mode. The failure is transparent to all system users. The traffic is rerouted through the redundant site gateway-backup master site link and the interzone link to the main master site.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected.
Dispatch Impact:	The dispatch sites will be transparent to this failure and their normal wide area operations will not be affected.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Redundant Multicast Site (ASR) Gateway, Redundant Site Links.
Detection:	Alarm on Network Management Terminal (UEM).

Multicast Site (ASR) Main Ethernet LAN Switch

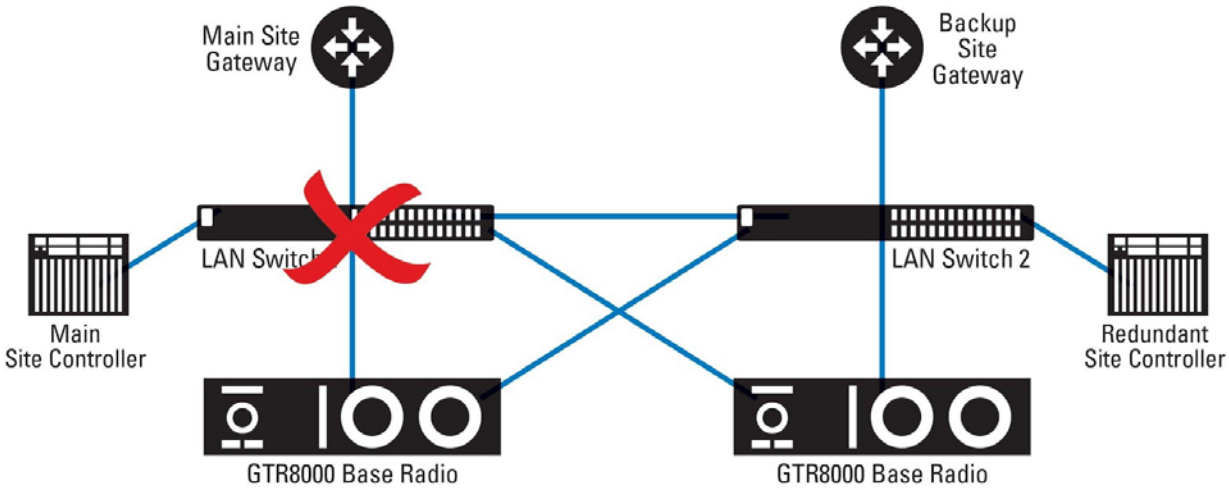


Figure 2-30: Failure of Multicast Site (ASR) Main Ethernet LAN Switch

Scenario:	Failure of Multicast Site (ASR) Main Ethernet LAN Switch.
Result:	Failure of the main multicast site (ASR) Ethernet LAN switch will result in automatic switchover to the redundant Ethernet switch. The entire system remains in the normal wide area trunking mode. The failure is transparent to all system users.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected.
Dispatch Impact:	The dispatch sites will be transparent to this failure and their normal wide area operations will not be affected.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Redundant Multicast Site (ASR) Ethernet switch.
Detection:	Alarm on Network Management Terminal (UEM).

Multicast Site (ASR) Main Site Controller

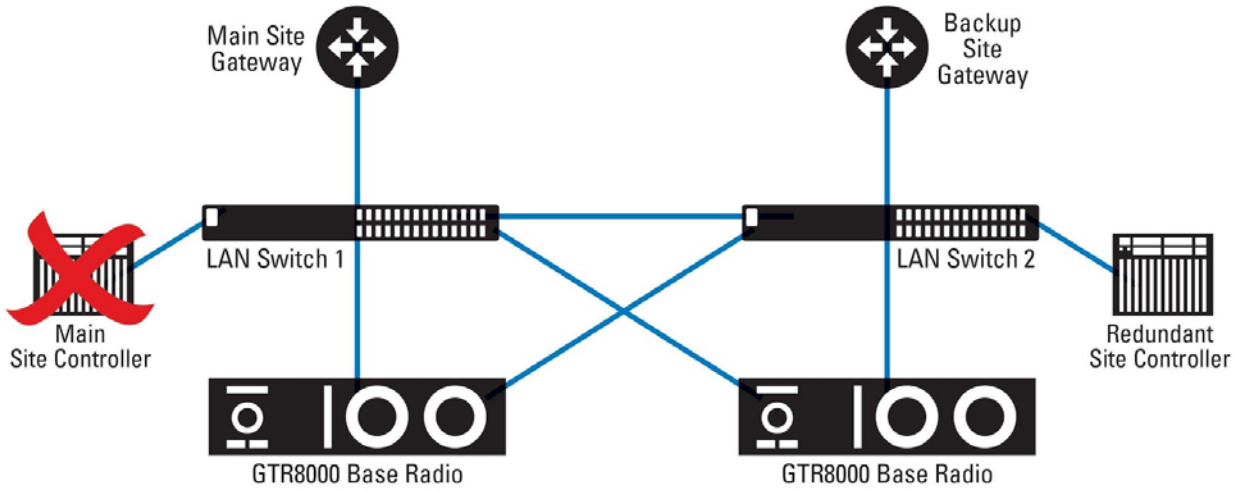


Figure 2-31: Failure of Multicast Site (ASR) Main Site Controller

Scenario:	Failure of Multicast Site (ASR) Main Site Controller.
Result:	Motorola has provided redundant site controllers (GCP 8000) at the multicast sites (ASR). Failure of the active controller will result in automatic switchover to the redundant site controller. The site remains in wide area trunking mode. The failure is transparent to all voice system users. Dispatch console operation remains unaffected.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected.
Dispatch Impact:	The dispatch sites will be transparent to this failure and their normal wide area operations will not be affected.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Redundant Multicast Site (ASR) Controller.
Detection:	Alarm on Network Management Terminal (UEM).

Multicast Site (ASR) Single Control Channel or Voice Channel

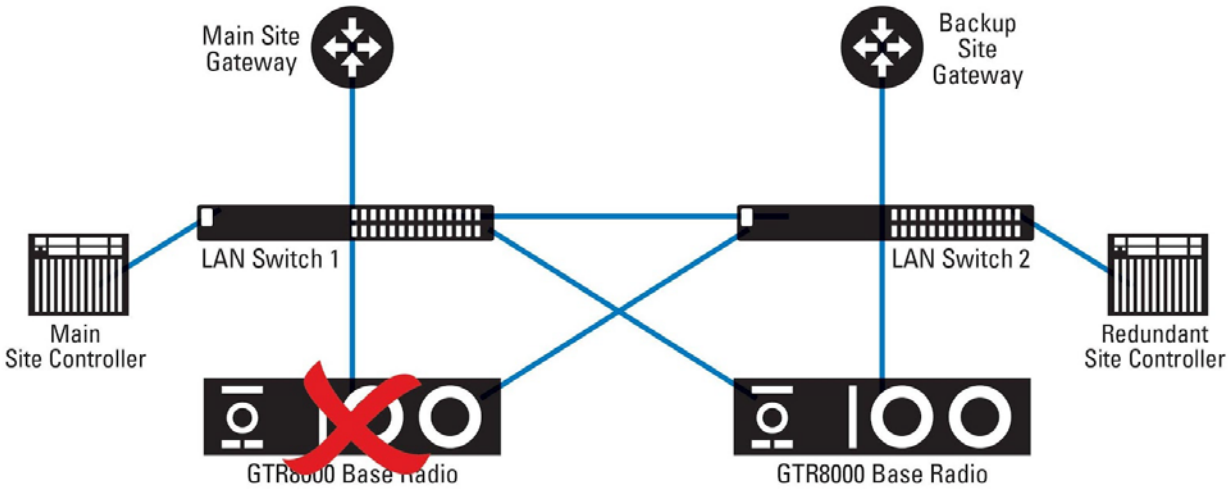


Figure 2-32: Failure of Single Control Channel or Voice Channel

Scenario:	Failure of a Single Control Channel or Voice Channel.
Result:	Motorola trunking systems provide up to four possible control channels in a Multicast site (ASR). If the currently active control channel fails, another channel automatically takes over and the failed control channel is automatically taken out of service. All other channels at the ASR remain unaffected. The Multicast site (ASR) remains in the wide-area trunking mode. The failure is transparent to all system users. Dispatch console operation remains unaffected. In a trunking system, multiple channels inherently provide redundancy for multicast sites (ASR). The failure of one voice channel will be transparent to all system users. The failure of a voice channel base station will result in the zone controller removing that channel from service, resulting in some reduced channel capacity. Any calls in progress on the failed channel will be lost, and on the next push-to-talk, radio traffic will be restored on another channel. All other channels in the simulcast cell remain unaffected. The entire system remains in the wide area trunking mode. Dispatch console operation remains unaffected.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected. A subscriber unit transmitting on a failed voice channel will cease communication for the duration of the push-to-talk. On the subsequent push-to-talk, radio traffic will be restored to another voice channel.
Dispatch Impact:	The dispatch sites will be transparent to this failure and their normal wide area operations will not be affected.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Multiple potential control channels and multiple voice channels.
Detection:	Alarm on Network Management Terminal (UEM).

2.1.1.5.10 Dispatch Site Failure Scenarios

Dispatch Operator Position

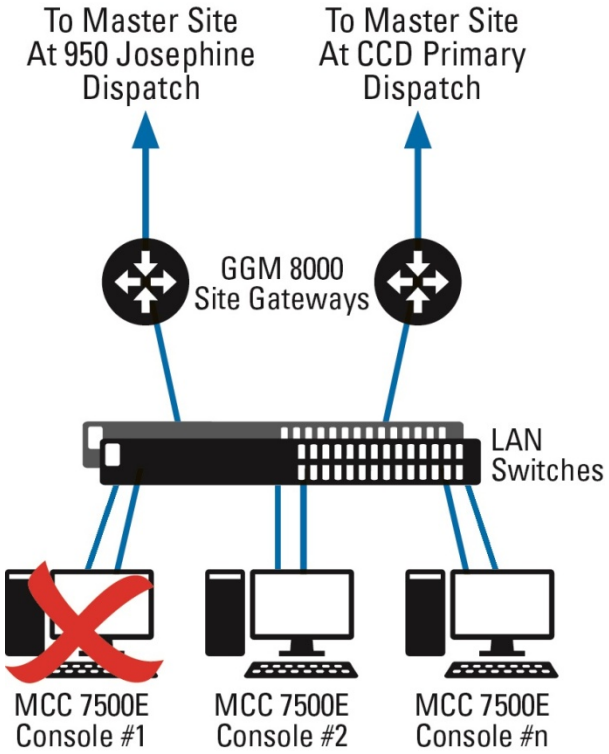


Figure 2-33: Failure of Single MCC 7500E Console Position

Scenario:	Failure of a Single Dispatch Operator Position.
Result:	The failure of a dispatch operator position would result in that particular dispatcher moving to another operator position or reverting to a fallback control station or portable radio. All other dispatch terminals operate normally and remain unaffected. The entire system remains in the wide area trunking mode.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected.
Dispatch Impact:	The failed dispatch position user will have to move to another functional position or use backup control station for communication with subscriber units. Besides the failed console position the rest of the dispatch operations are not affected. The dispatch sites remain in normal wide area operations.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Multiple Consoles, Backup Control Stations.
Detection:	Alarm on Network Management Terminal (UEM). Console User Detection, Console Diagnostics.
Comment:	The MCC 7500E console includes dual NICs. In the event that a single NIC were to fail at a dipatch operator position, the position itself will not fail and will continue with normal operations.

Ethernet Switch at Dispatch Site

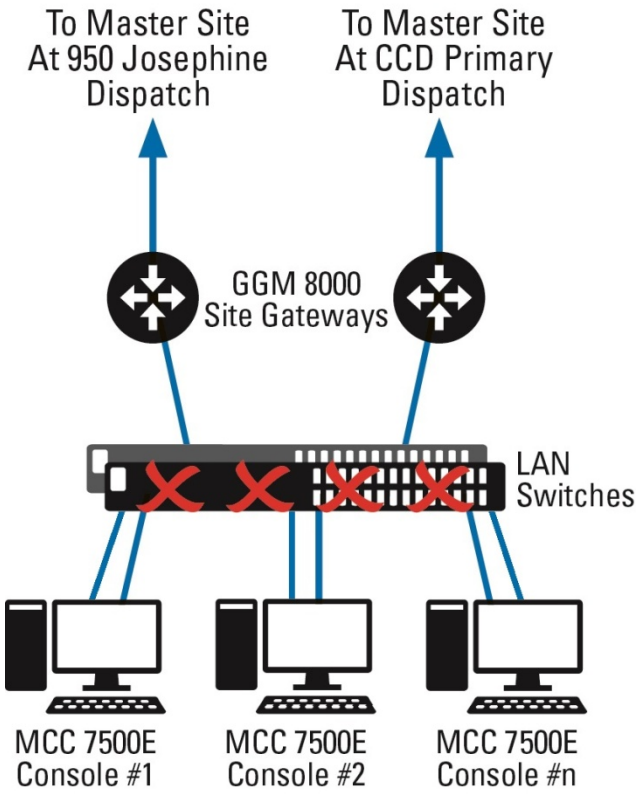


Figure 2-34: Failure of Ethernet LAN Switch at Dispatch Center

Scenario:	Failure of a Dispatch Center Ethernet LAN Switch.
Result:	The dispatch site is designed with two Ethernet LAN switches that connect the operator positions to the network. The console positions include connectivity to both Ethernet LAN switches and other critical components at the dispatch sites are distributed equally amongst the Ethernet LAN switches at the site. If an Ethernet switch fails, all operator positions continue to operate normally through the secondary Ethernet LAN switch. All dispatch positions will lose access to other dispatch site resources like conventional channel gateways, if those resources were connected to the failed Ethernet switch.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected.
Dispatch Impact:	All operator positions continue to operate normally through the secondary Ethernet LAN switch. The dispatch sites remain in normal wide area operations.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Multiple Console Positions, Redundant NICs on Console Positions, Multiple Ethernet LAN switches, Spare Ethernet LAN Switches, Backup Control Stations.
Detection:	Alarm on Network Management Terminal (UEM). Console User Detection, Console Diagnostics.

Main Site Gateway or Site Link at Dispatch Site

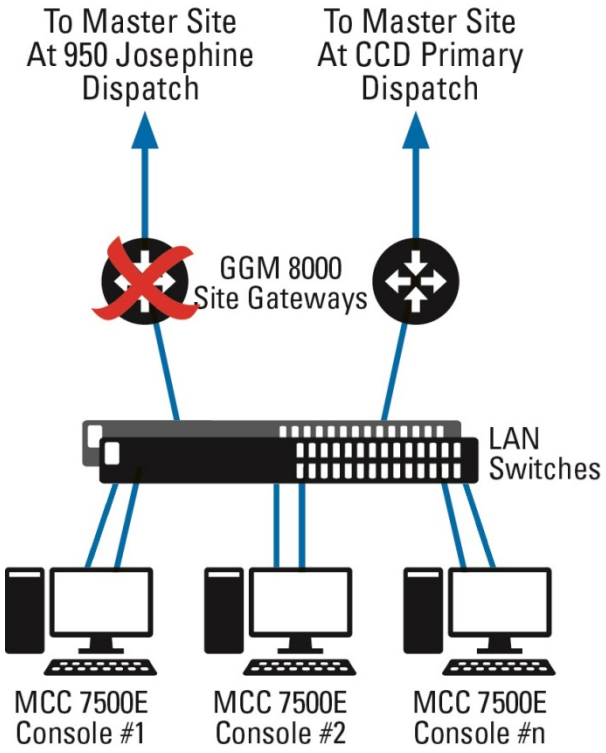


Figure 2-35: Failure of Main Dispatch Site Gateway

Scenario:	Failure of Main Dispatch Site Gateway or Site Link.
Result:	The system employs redundant site gateways and redundant site links at the dispatch site. Failure of the main site gateway/site link at a dispatch site will result in automatic switchover to the redundant site gateway/site link. The entire system remains in the wide trunking mode. The failure is transparent to all system users. The traffic is rerouted through the redundant site gateway-backup master site link to the master site.
Subscriber Impact:	Subscriber radio units in the field will be transparent to this failure and their normal wide area operations will not be affected.
Dispatch Impact:	The dispatch sites will be transparent to this failure and their normal wide area operations will not be affected.
Data Impact:	No impact. Data and configuration information is maintained at the master sites.
Protection:	Redundant Site Gateway, Spare Site Gateway, Redundant Site Links.
Detection:	Alarm on Network Management Terminal (UEM).

2.1.1.6 Spare and Test Equipment Plan

2.1.1.6.1 Spare Equipment

In the event of component failure, Motorola has included a full set of spares in order to quickly restore full system reliability and functionality. The table below provides information on the spare equipment included as part of this proposal.

Table 2-22: Proposed Spare Equipment

Category	Qty	Model	Description
Master Servers	1	DLN7009	FRE: DL380 G9 900GB DISK WD2
Master Servers	1	DLN6972	FRU: DL380 G9 POWER SUPPLY
Master Servers	1	DLN6970	FRU: DL380 G9 HARD DRIVE
Master Servers	1	DLN6973	FRU: DL380 G9 FAN
Master Servers	1	DLN6971	FRU: DL380 G9 DVD DRIVE
Master Servers	1	DLN6880	DAS - CHASSIS ONLY
Master Servers	1	DLN6878	DAS - 600 GB SAS HARD DRIVE
Master Servers	1	DLN6978	FRU: DOTHILL 4524 RAID I/O CONTROLLER MODULE
Master Servers	1	DLN7006	FRU:HP DL380/DL360 G9 SERVER'S SMART STORAGE BATTERY
Master Servers	1	DLN6867	DAS POWER SUPPLY
Master Servers	1	CKN6975	CABLE, DATA,CABLE, MINI-SAS HD TO MINI-SAS HD CABLE, AWG30, LENGTH 1M"
Master/Prime/Dispatch Networking	1	SQM01SUM0205	GGM 8000 GATEWAY
Master/Prime/Dispatch Networking	1	CA01616AA	ADD: AC POWER
Master/Prime/Dispatch Networking	1	CLN1856	2620-24 ETHERNET SWITCH
Master Networking	1	CLN1858	3800-48 ETHERNET SWITCH
Master Servers	1	DLN6940	460W POWER SUPPLY FOR DL380P
Master Servers	1	DLN6967	FRU: 500 GB SATA DRIVE
CNI Networking	1	T8126	FORTINET FIREWALL APPLIANCE
Master Servers	1	DLN6742	460 WATT POWER SUPPLY
Prime Sync	1	DSTRAK91061	FOUR PORT DDM
Prime/Dispatch Networking	1	CLN1859	2620-48 ETHERNET SWITCH
Prime Site Controller/Comparator Remote RDM	1	DLN6966	FRU: GCP 8000/GCM 8000/GPB 8000
Prime Site Controller/Comparator RF Site Radio	1	DLN6781	FRU: POWER SUPPLY

Category	Qty	Model	Description
Prime Site Controller/Comparator RF Site Radio	1	DLN6898	FRU: FAN MODULE
RF Site Radio	1	DLN6885	FRU: XCVR 7/800 MHZ V2
RF Site Radio	1	DLN6895	FRU: PA 7/800 MHz
RF Site Distribution	1	DLN6677	FRU: G-SERIES XHUB
RF Site Networking	1	SQM01SUM0205	GGM 8000 GATEWAY
RF Site Networking	1	CA01619AA	ADD: DC POWER
Dispatch	2	TT3225	Z2 MINI WORKSTATION 258G 8G NON RET
Dispatch	2	DSUSB31000S	STARTECH USB 3.0 TO GIGABIT ETHERNET ADAPTER
Dispatch	2	DSST7300U3M	STARTECH 7 PORT USB 3.0 HUB
Dispatch	2	B1941	USB AUDIO INTERFACE MODULE
Dispatch	2	CDN6673	CREATIVE LABS INSPIRE A60
Dispatch	2	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE
Dispatch	2	B1913	MCC SERIES HEADSET JACK
Logging	1	DDN2022	SPARE PARTS KIT - 5000 SERIES MAX-PRO QUADCORE FOR VOIP AND TLR
Logging	1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)
Logging	1	B1934	MCC 7500 VOICE PROCESSOR MODULE FRU
Logging	1	CA00147AF	ADD: MCC 7500 SECURE OPERATION
Logging	1	CA00182AB	ADD: AES ALGORITHM
Microwave	1	DQMWMPRSPARES	MW MPR SPARES
Microwave	1	DQMWRTRSSPARES_R5	MW RTR SPARES
RFDS	1	DSSC476HF1LDFE5749	COLLINEAR OMNI ANTENNA, 6 DBD, LOW PIM, HD, 746-869 MHZ, PIP RATED
RFDS	1	DSSC412HF2LDFE5765	COLLINEAR OMNI, 11.5DBD HD NULL FILL, PIP RATED LOW PIM 746-869 MHZ
RFDS	1	DQBMR8AB1DT6	10.3 DB 220 DEG SEC 806-869 MHZ ANTENNA WITH 6 DEG. DOWNTILT
RFDS	1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, DIN FEM/MALE BI-DIR W/ BRACKET
RFDS	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG
RFDS	1	DS43783I01T	TTA, 796-824MHZ, SINGLE / DUAL NETWORK, TEST PORT
RFDS	1	DS43783I01C48	CONTROL MONITORING UNIT, 796-824MHZ,DUAL DIVERSITY,ETHERNET,48VDC

Category	Qty	Model	Description
RFDS	1	DS43783I01M48	MULTICOUPLER UNIT, 796-824MHZ,DUAL DIVERSITY,ETHERNET,48VDC
RFDS	1	DLN6634	FRU: 700/800 MHZ SITE LNA
RFDS	1	DLN1306	FRU: 700/800 MHZ CABINET RMC MODULE
RFDS	1	DSPCD013V6	6 CHANNEL COMBINER KIT, STANDARD ISOLATION, 851-870 MHZ
RFDS	1	DSSP74964440DFF1RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796

2.1.1.6.2 Test Equipment

To facilitate RF testing and servicing of the proposed system, Motorola recommends the following equipment and options:

- Aeroflex 3920B Series Analog and Digital Radio Test Platforms with the following options included:
  - Tracking Generator
  - P25 Trunking
  - LSM Generate and Receive/Analysis
  - Site Monitoring Application
  - P25 AES Encryption
  - Autotest II for P25 Radio System
  - APX Autotest and Align
- Anritsu S412E LMR Master Land Mobile Radio Modulation Analyzers with the following options included:
  - Interference Analyzer
  - Channel Scanner
  - GPS Built-in Receiver
  - Distance Domain
  - AM,FM,PM Analyzer
  - P25 Analyzer
  - High Accuracy Power Meter

CCD has indicated that CCD is currently equipped with the Aeroflex 3920B and Anritsu S412E and will add options as needed outside of this project.

To facilitate the testing and servicing of the IP based devices within the ASTRO system, the Network Management Suite of applications will be utilized. NMS provides the means to detect, diagnose and rectify network based issues and is included with the proposed system.

2.1.1.7 Subscriber Programming and Maintenance Equipment

To facilitate the programming and maintenance of subscriber units, included is the following equipment:

- Twelve copies of Motorola's Customer Programming Software (CPS)
- Twelve APX mobile programming cables
- Twelve APX portable programming cables
- Three Key Variable Loaders (KVL) with associated mobile and portable keyloading cables

- One set of subscriber maintenance equipment (see equipment list for specific equipment details)

2.1.1.8 WAVE Cellular Gateway

WAVE is a software application suite from Motorola Solutions that enables unified work group communications. WAVE enables highly scalable, feature rich, enterprise grade push-to-talk (PTT) on broadband networks and devices so that critical, time sensitive information flows quickly and securely between mobile workers, teams and citizens.

WAVE is a software application suite designed for building and integrating group communications systems. WAVE accepts most analog or digital audio signals as input, converts the signals into VoIP packets when needed, mixes the signals together, and then routes them across an IP network to their destinations. WAVE converts VoIP traffic back into audio at the destination.

There are a number of advantages to this approach. Since WAVE is standards-based, audio inputs can originate from and be mixed with a variety of devices including cell phones, IP Phones, Defense/Public Safety Radios, Commercial Radio systems (P25, trunked, or single channel), analog and digital PBX phones, intercoms, and PCs.

WAVE is flexible and works well with any type of hardware and doesn't require the replacement of radios, radio gateways, and other communications devices you already have. Finally, WAVE Domains are created out of a handful of modular building blocks and they can be configured in an infinite number of ways.

WAVE enables users to communicate on land mobile radio (LMR) systems using their Android/iOS mobile devices and laptop/desktop computers, through a suite of software clients installed on those devices. These LMR/broadband communications include secure, high-performance push-to-talk (PTT) services that extend communications beyond the coverage provided by an LMR system itself —a capability useful in a variety of circumstances:

- Command personnel and administrators will be able to monitor events and stay in touch with their colleagues on their broadband devices, even when they are not in range of their ASTRO 25 system.
- Users will be able to communicate even within large buildings that are too dense for radio coverage to penetrate.
- Officials and agency personnel who typically are not everyday users of the radio system (such as schools and administrative officials) will be able to use WAVE on their standard mobile devices to communicate on the radio network during an emergency or major event.
- The ASTRO 25 radio system can use WAVE to connect to other radio networks (analog or conventional), providing true interoperability to address the most complex communications challenges and requirements. This capability is available as an option.

2.1.1.8.1 WAVE Solution Capabilities

The WAVE solution has several capabilities and features when enabling interoperability between LMR and Broadband users:

- Group Call: Users can make group calls with each other using any of the WAVE applications. Talkgroup participants can include both LMR and WAVE users, WAVE-only users, and LMR-only users. Users select the talkgroup they wish to use 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): Individual private calls can be made between two WAVE users using the Mobile Communicator and/or the Desktop and Advanced Desktop applications (private calls are not yet available between WAVE and LMR users). A user selects the person they wish to call from a contact list available within the application. Users communicate back and forth with one another by pressing and releasing the PTT button in their application. When they are finished they can press a hang-up button or just wait for the call to time-out and disconnect.
- Late Call Entry: Users can join in-progress talkgroup calls if they happen to miss the start of the call.
- Text Messaging: WAVE users on the Mobile. Communicators can send and receive group text messages with other WAVE users in a talkgroup. This feature is not available between WAVE and LMR users at this time but shall be available in a future release.
- Status, Presence & Location: WAVE users can see the current status, presence, and location of other WAVE users using any of the WAVE Communicators. Whether a user shares their location data with other users is configurable in the applications. This feature is not available between WAVE and LMR users at this time but shall be available in a future release.
- System Management: The WAVE Management server module provides the interface to create and manage users and talkgroups and turn on/off the ability to make private calls on an individual basis.

All communication between broadband and ASTRO 25 users are group calls; one-to-one private calls between broadband and LMR users currently is not supported for LMR networks. Because the WAVE server is an add-on to LMR radio infrastructure, it provides separate management and alarming functionality.

2.1.1.8.2 WAVE Components at a Glance

The WAVE solution consists of the following elements:

- A server that runs a set of WAVE software modules that provide an interface to the LMR system.
- Mobile Communicator apps for Android and iOS devices
- Desktop and Advanced Desktop Communicator apps for PC's.
- An ISSI 8000 server providing the interface to the ASTRO 25 system for the WAVE subsystem

Together, these elements provide a common PTT environment across both radio and broadband networks, enabling users on those networks to send group text messages and transmit user status, presence, and location information.

WAVE Server

The WAVE Server includes several software modules that provide the interface to the ASTRO 25 system and integrate WAVE Mobile Communicators and PC clients to the WAVE system. These software modules include the WAVE Proxy, Media, and Management servers and the WAVE Radio Gateway (WRG). 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 WiFi networks, and PC clients connecting over WAN/LAN networks. The single

WAVE Server included will host the Management, Media, Proxy and WRG server modules required for system operation.

The following are virtualized on the WAVE Server:

- The WAVE Management Server that configures and administers a WAVE Domain.
- The WAVE Media Server which is a media processing engine and a gateway to other networks.
- The WAVE Proxy Server that allows WAVE Mobile Communicators to join a WAVE Domain.

WAVE Management Server (Virtual)

Every WAVE Domain has at least one WAVE Management Server, which is a web-based application used to configure the domain. The WAVE Management Server defines the administrative control of the communication assets it manages. These communication assets can then be shared with other WAVE domains based on mission requirements. The collection of WAVE components controlled by a single WAVE Management Server is called a WAVE Domain.

The flexibility of WAVE allows the user to decide where to maintain the Management Server. For example, some units maintain a single Management Server for the entire unit at the headquarters level. Others maintain Management Servers at each echelon. The ability to share assets between WAVE domains is extremely beneficial during periods of task reorganization. Units can extend their collaborative capabilities across organizational boundaries as needed. The WAVE Management Server uses a SQL backend database residing on the Management Sever to maintain and modify all WAVE components within the WAVE domain.

WAVE Media Server (Virtual)

The WAVE Media Server acts as a media processing “engine” for the system, performing digitizing, mixing, and audio transcoding. The WAVE Media Server software runs as a service on a Windows Server. In most WAVE domains, a PC acting as a WAVE Media Server may also run other applications. Larger installations may have many WAVE Media Servers, and they can be located over wide geographic areas and connected via your WAN, the public Internet, or a VPN. The distributed servers also let you make local dial-in connections to globe-spanning WAVE conferences, or connect geographically-dispersed radio transmitters for better coverage.

WAVE Proxy Sever (Virtual)

The WAVE Proxy Server handles the connectivity to smartphone devices that have the WAVE Mobile communicator application loaded on it. The WAVE proxy server can handle approx. 500 simultaneous users on one server. The Proxy server will encrypt the data stream from the server to the mobile device using AES-256 bit encryption.

The WAVE proxy servers automatically operate in load balancing role in the event of a single server failure, distributing user load as reconnections happen in a real time manner, all controlled via the WAVE Management Server. This load balancing also occurs if new Proxy Servers are brought online in the event that more capacity is required.

2.1.1.8.3 Radio System Integration

Wireline integration to the existing ASTRO 25 radio system is provided through the included ISSI 8000 interface. Communications is provided between the WAVE Server and the ISSI 8000 server, bridging the WAVE system and the ASTRO 25 radio system, allowing for the WAVE clients and the ASTRO 25 talkgroups to communicate over the wireline connection. The WAVE system is capable of being configured for up to 300 talkgroups and a maximum of 50 concurrent talkgroups in use with additional licenses.

2.1.1.8.4 WAVE Clients

Three styles of WAVE clients are available for broadband communications, the Wave Mobile Communicator for use with Android and IOS mobile devices and the WAVE Desktop and Advanced Desktop Communicators for use on a Windows based PC.

A single WAVE Server can support up to 1000 clients. Client capacity can be increased to a total of 5000 total clients through the inclusion of additional WAVE Proxy Servers.

WAVE Mobile Communicator

The WAVE Mobile Communicator is a powerful front-end interface used by users of Android and IOS Mobile devices for group communication on WAVE Channels. The WAVE Mobile Communicator is a powerful communications device capable of the following features:

- Receive simultaneous audio from multiple channels
- Secure communications, secure point to point functionality
- Text messaging
- Location/mapping
- Lightweight application
- WiFi and carrier capable
- Channel mute
- Individual channel volume control
- Hardware configurable push-to-talk button

The WAVE Mobile Communicator software is downloadable from both the Apple Store and Google Marketplace.

WAVE Communicator applications enables users to access any authorized talkgroups from their device using a suitable data connection (cellular service or WiFi). Using a mobile device with the Mobile WAVE communicator installed, users can listen/talk on broadband-only talkgroups and talkgroups interconnected to LMR systems.

Versions of the WAVE Mobile Communicator are available for installation on Apple devices (iPhone, iPad, iPod), Android phones and tablets, as well as custom devices like the Motorola LEX L10. The WAVE Mobile Communicator for iOS and Android is optimized for operation over wireless networks, switching between cellular and WiFi networks to ensure the best possible network connection between the mobile device and the WAVE server.

WAVE Desktop Communicator

The WAVE Desktop Communicator enables PCs to join in with all the other phones and radios in a WAVE conference. There are two versions: one is a stand-alone Windows program and the other runs in a web browser (called the WAVE Web Communicator). Both versions have a lightweight footprint that won't use up all the resources on a user's PC, so conversations can be conducted while other work is accomplished. Just add a microphone and a pair of speakers to your PC to transmit and receive audio. The WAVE Desktop Communicator enables users to change radio channels, text message other users, record conversations, see who is talking, adjust audio signals, and speak over WAVE channels.

WAVE Advanced Desktop Communicator

The WAVE Advanced Desktop Communicator is a powerful front-end interface used by system operators to manage multiple simultaneous communications channels. This application can be used by Operation Centers to manage indirect fires, coordinate with Close Air Support, MEDEVAC, or adjacent units, coordinate missions with soldiers on the ground, or whoever is on the other end of

radios or the IP network. The Advanced Desktop Communicator allows the Operation Center personnel to dynamically patch radios to telephone calls, create ad hoc telephone conferences, and manage all communication assets.

2.1.1.8.5 WAVE CRYPTR

The WAVE CRYPTR provides the WAVE users to interact with ASTRO25 radio users utilizing encrypted communications. The WAVE CRYPTR resides between the ASTRO25 system and the WAVE Server. It decodes encrypted ASTRO25 audio to pass to the WAVE Server for transmission to the WAVE users. Likewise, it receives WAVE user audio from the WAVE Server and encrypts it to transmit through the ASTRO25 system. Though this is near end to end encryption the link between the WAVE CRYPTR and the WAVE Server consists of clear audio as each of these devices provide the encryption for their relative systems. The WAVE CRYPTR supports AES, DES-OFB and ADP encryption algorithms.

2.1.1.9 System Drawings

An index of the drawings provided in our proposal is provided in the following table. The drawing number corresponds to the first two numbers in the drawing file name. Drawings are included after the following table.

Table 2-23: System Drawings Index

No.	Drawing Type	Drawing Name	File Name	Logical Site Type	SITE
1	Block	Denver System Block Diagram	01 - 0_DENV_SYS_02_01	System	System
2	Block	Master Site System Block Diagram	02 - 0_DENV_SYS_02_02	Master	System
3	Block	Main Prime Site System Block Diagram	03 - 0_DENV_MPS_03_01	Prime	950 Josephine Dispatch
4	Block	Geo Redundant Prime Site System Block Diagram	04 - 0_DENV_GEO_03_01	Prime	CCD Primary Dispatch
5	Block	1670 Broadway Remote Site System Block Diagram	05 - 0_DENV_BRW_03_01	Remote	1670 Broadway
6	Block	Denver Housing Authority Remote Site System Block Diagram	06 - 0_DENV_DHA_03_01	Remote	Denver Housing Authority
7	Block	Denver Fire Department Station 2 Remote Site System Block Diagram	07 - 0_DENV_DFD2_03_01	Remote	DFD Station 2
8	Block	Mountain Towers Remote Site System Block Diagram	08 - 0_DENV_MT_03_01	Remote	Mountain Towers
9	Block	Mount Morrison ASR Site System Block Diagram	09 - 0_DENV_MTMR_06_01	ASR	Mount Morrison
10	Interconnect	CCD Primary Dispatch Sub-System Interconnect Block Diagram	10 - 0_DENV_PRI_03_01	Dispatch	CCD Primary Dispatch
11	Interconnect	950 Josephine Dispatch Sub-System Interconnect Block Diagram	11 - 0_DENV_JOS_03_01	Dispatch	950 Josephine Dispatch

No.	Drawing Type	Drawing Name	File Name	Logical Site Type	SITE
12	Interconnect	Denver Criminal Court Dispatch Sub-System Interconnect Block Diagram	12 - 0_DENV_DCC_03_01	Dispatch	Denver Criminal Court
13	Interconnect	Sheriff's Department Detention Center Dispatch Sub-System Interconnect Block Diagram	13 - 0_DENV_SDDC_03_01	Dispatch	Sheriff's Department Detention Center
14	Interconnect	Denver Right of Way Services Dispatch Sub-System Interconnect Block Diagram	14 - 0_DENV_DRWS_03_01	Dispatch	Denver Right of Way Services
15	Interconnect	1670 Broadway Site TX Antenna Interconnect Diagram	15 - 0_DENV_BRW_11_02	Remote	1670 Broadway
16	Interconnect	Denver Housing Authority Site TX Antenna Interconnect Diagram	16 - 0_DENV_DHA_11_02	Remote	Denver Housing Authority
17	Interconnect	Denver Fire Department Station 2 Site TX Antenna Interconnect Diagram	17 - 0_DENV_DFD2_11_02	Remote	DFD Station 2
18	Interconnect	Mountain Towers Site TX Antenna Interconnect Diagram	18 - 0_DENV_MT_11_02	Remote	Mountain Towers
19	Interconnect	Mount Morrison Site TX Antenna Interconnect Diagram	19 - 0_DENV_MTMR_11_02	ASR	Mount Morrison
20	Interconnect	1670 Broadway Site RX Antenna Interconnect Diagram	20 - 0_DENV_BRW_11_01	Remote	1670 Broadway
21	Interconnect	Denver Housing Authority Site RX Antenna Interconnect Diagram	21 - 0_DENV_DHA_11_01	Remote	Denver Housing Authority
22	Interconnect	Denver Fire Department Station 2 Site RX Antenna Interconnect Diagram	22 - 0_DENV_DFD2_11_01	Remote	DFD Station 2
23	Interconnect	Mountain Towers Site RX Antenna Interconnect Diagram	23 - 0_DENV_MT_11_01	Remote	Mountain Towers
24	Interconnect	Mount Morrison Site RX Antenna Interconnect Diagram	24 - 0_DENV_MTMR_11_01	ASR	Mount Morrison
25	Rack Face	1670 Broadway Rack Face Layout	25 - 0_DENV_BRW_09_01	Remote	1670 Broadway
26	Rack Face	Denver Housing Authority Rack Face Layout	26 - 0_DENV_DHA_09_01	Remote	Denver Housing Authority
27	Rack Face	Denver Fire Department Station 2 Rack Face Layout	27 - 0_DENV_DFD2_09_01	Remote	DFD Station 2
28	Rack Face	Mountain Towers Rack Face Layout	28 - 0_DENV_MT_09_01	Remote	Mountain Towers
29	Rack Face	Mount Morrison Rack Face Layout	29 - 0_DENV_MTMR_09_01	ASR	Mount Morrison
30	Rack Face	CCD Primary Dispatch Rack Face Layout	30 - 0_DENV_PRI_09_01	Master/Prime/Dispatch	CCD Primary Dispatch

No.	Drawing Type	Drawing Name	File Name	Logical Site Type	SITE
31	Rack Face	950 Josephine Dispatch Rack Face Layout	31 - 0_DENV_JOS_09_01	Master/Prime/Dispatch	950 Josephine Dispatch
32	Rack Face	Denver Criminal Court Rack Face Layout	32 - 0_DENV_DCC_09_01	Dispatch	Denver Criminal Court
33	Rack Face	Sheriff's Department Detention Center Rack Face Layout	33 - 0_DENV_SDDC_09_01	Dispatch	Sheriff's Department Detention Center
34	Rack Face	Denver Right of Way Services Rack Face Layout	34 - 0_DENV_DRWS_09_01	Dispatch	Denver Right of Way Services
35	Floor Plan	1670 Broadway Floor Plan	35 - 0_DENV_BRW_06_01	Remote	1670 Broadway
36	Floor Plan	Denver Housing Authority Floor Plan	36 - 0_DENV_DHA_06_01	Remote	Denver Housing Authority
37	Floor Plan	Denver Fire Department Station 2 Floor Plan	37 - 0_DENV_DFD2_06_01	Remote	DFD Station 2
38	Floor Plan	Mountain Towers Floor Plan	38 - 0_DENV_MT_06_01	Remote	Mountain Towers
39	Floor Plan	Mount Morrison Floor Plan	39 - 0_DENV_MTMR_09_01	ASR	Mount Morrison
40	Floor Plan	950 Josephine Dispatch Floor Plan	40 - 0_DENV_JOS_06_01	Master/Prime/Dispatch	950 Josephine Dispatch
41	Map	Denver Microwave System Map	41 - 0_DENV_SYS_16_01	Microwave	System

2.1.1.9.1 System Drawings

System Drawings are included on the pages that follow.

MT. MORRISON ASR SITE

ROUTER

ROUTER

950 JOSEPHINE MASTER SITE

ZONE CONTROLLER

ROUTER

NM CLIENT

CCD PRIMARY DISPATCH DSR MASTER SITE

ZONE CONTROLLER

ROUTER

NM CLIENT

ROUTER

ROUTER

MCC 7500 DISPATCH CONSOLE

CCD PRIMARY DISPATCH CENTER

1670 BROADWAY REMOTE SITE

ROUTER

ROUTER

950 JOSEPHINE PRIME SITE

ROUTER

ROUTER

CCD PRIMARY DISPATCH GEO REDUNDANT PRIME SITE

ROUTER

ROUTER

950 JOSEPHINE MASTER SITE

ROUTER

ROUTER

MCC 7500 DISPATCH CONSOLE

SHERIFF'S DEPT. DETENTION DISPATCH CENTER

ROUTER

ROUTER

MCC 7500 DISPATCH CONSOLE

DENVER HOUSING AUTHORITY REMOTE SITE

ROUTER

ROUTER

DFD STATION NO.2 REMOTE SITE

ROUTER

ROUTER

MOUNTAIN TOWERS REMOTE SITE

ROUTER

ROUTER

DENVER RIGHT OF WAY SERVICES DISPATCH CENTER

ROUTER

ROUTER

MCC 7500 DISPATCH CONSOLE

DENVER CRIMINAL COURT DISPATCH CENTER

ROUTER

ROUTER

MCC 7500 DISPATCH CONSOLE

REV NO.	DATE:	ENGR:	DESCRIPTION:
O	5-17-17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: SYSTEM BLOCK DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: L. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DEN_SYS_02_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

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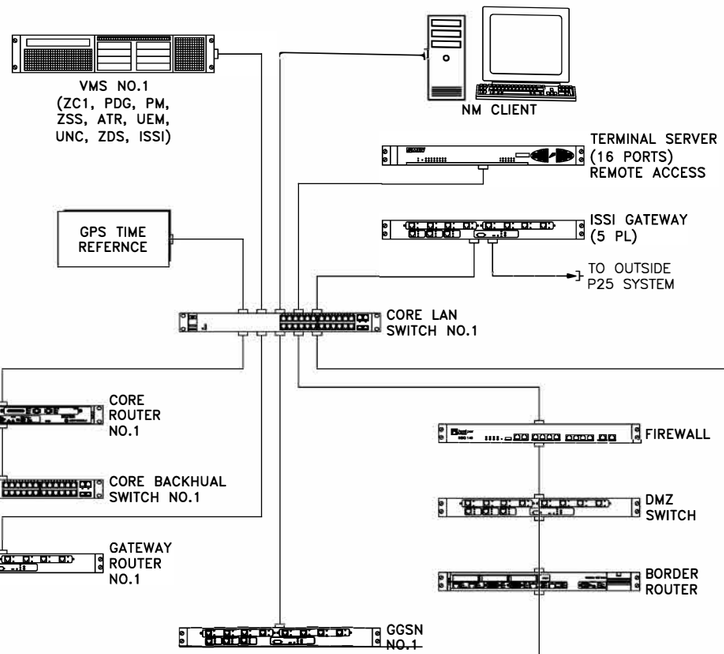
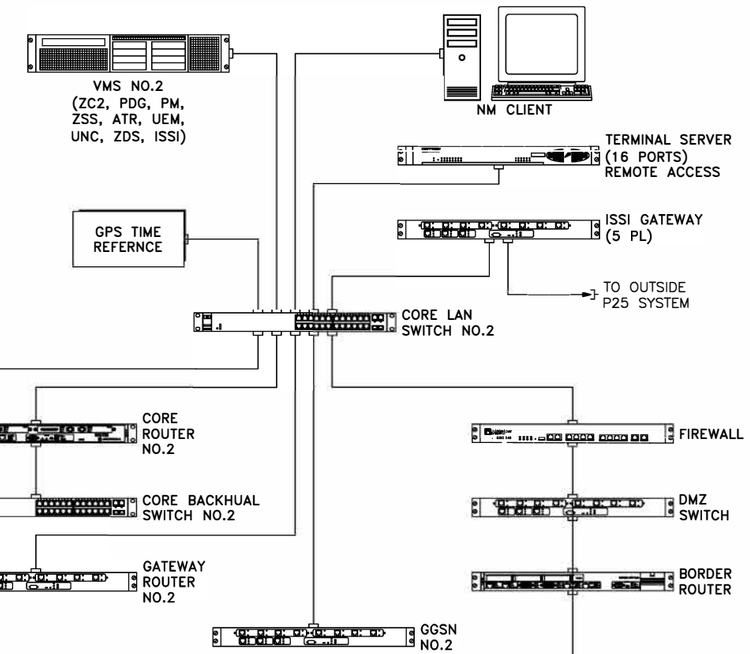
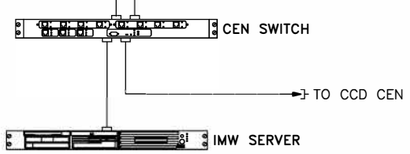


DSR MASTER SITE LOCATED AT CCD PRIMARY DISPATCH



MASTER SITE CUSTOMER ENTERPRISE NETWORK (CEN)



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MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP ASTRO 25 RADIO SYSTEM

TITLE: MASTER SITE SYSTEM BLOCK DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: R. SALDARRIAGA	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_SYS_02_02	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

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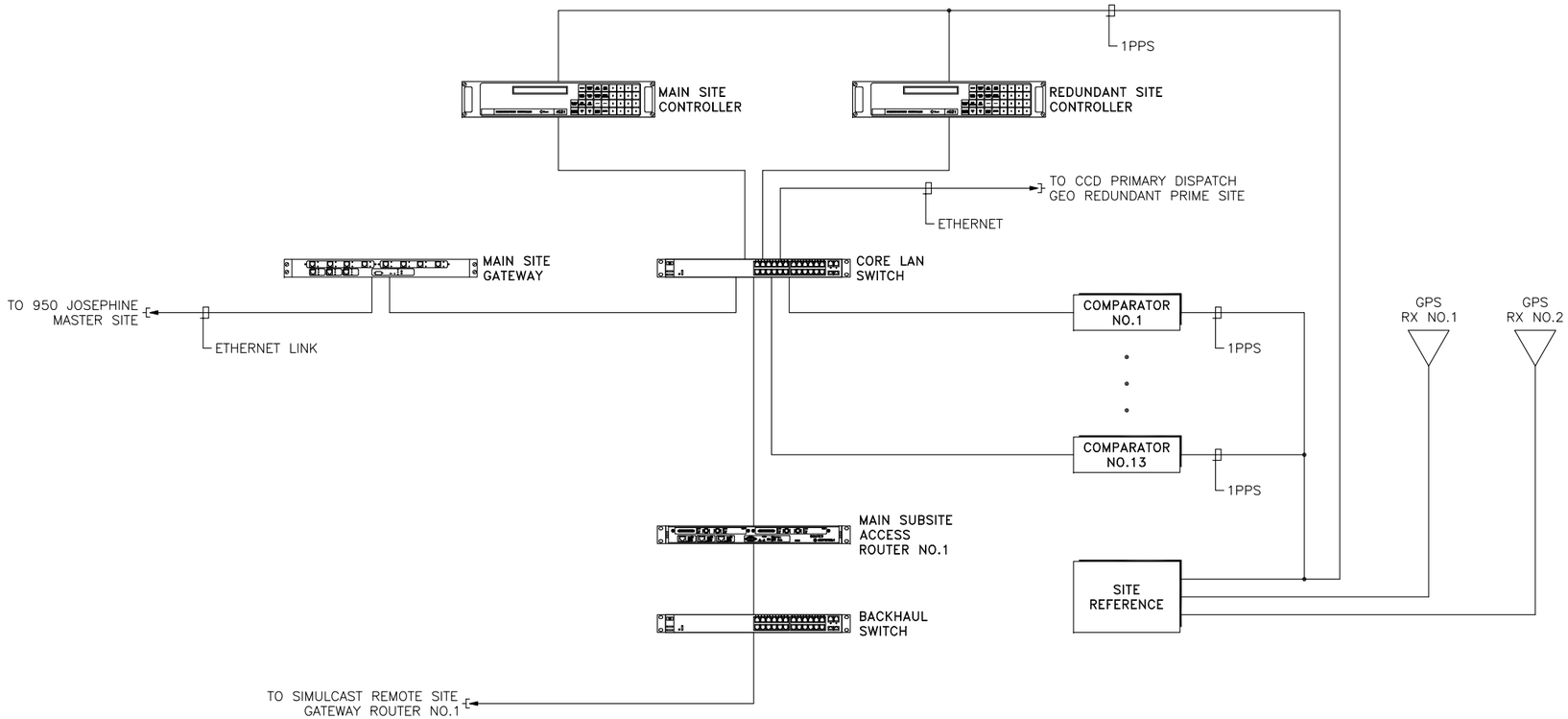

950 JOSEPHINE MAIN PRIME SITE

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MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP ASTRO 25 RADIO SYSTEM				
TITLE: MAIN PRIME SITE SYSTEM BLOCK DIAGRAM				
CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: R. SALDARRIAGA	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
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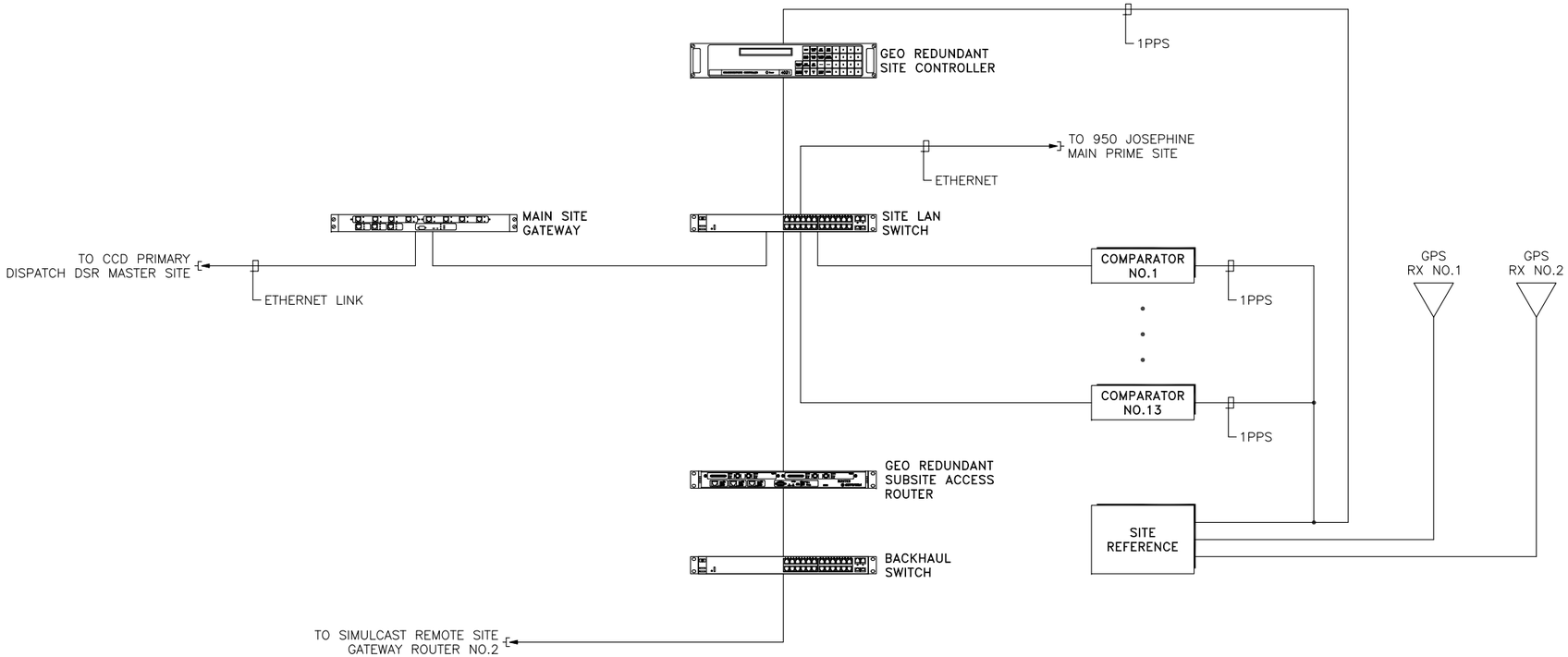

CCD PRIMARY DISPATCH
GEO REDUNDANT PRIME SITE

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MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: GEO REDUNDANT PRIME SITE
SYSTEM BLOCK DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: R. SALDARRIAGA	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
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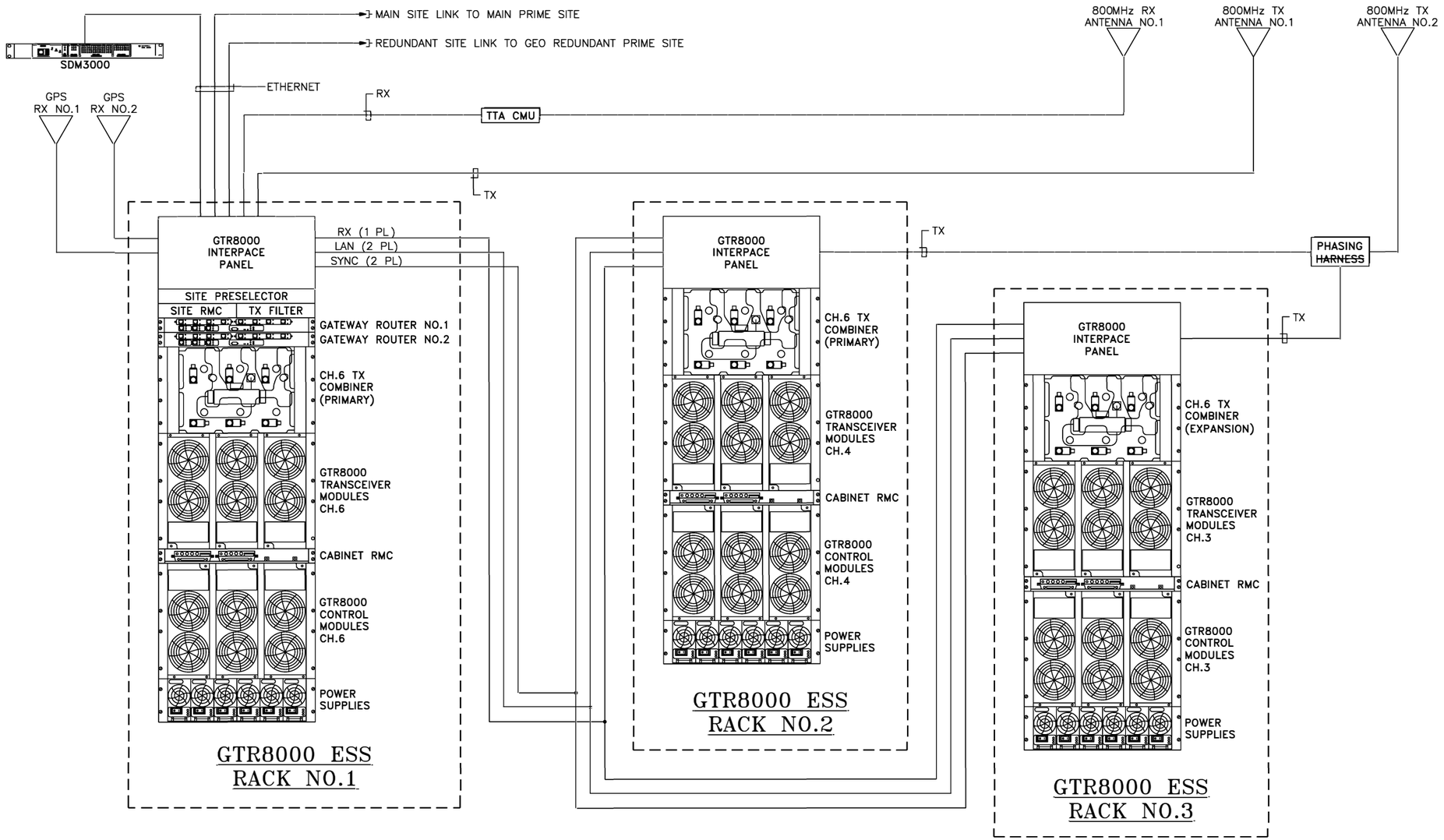

REV NO:	DATE:	ENGR:	DESCRIPTION:
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MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: 1670 BROADWAY REMOTE SITE
SYSTEM BLOCK DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: D_DENV_BRW_03_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

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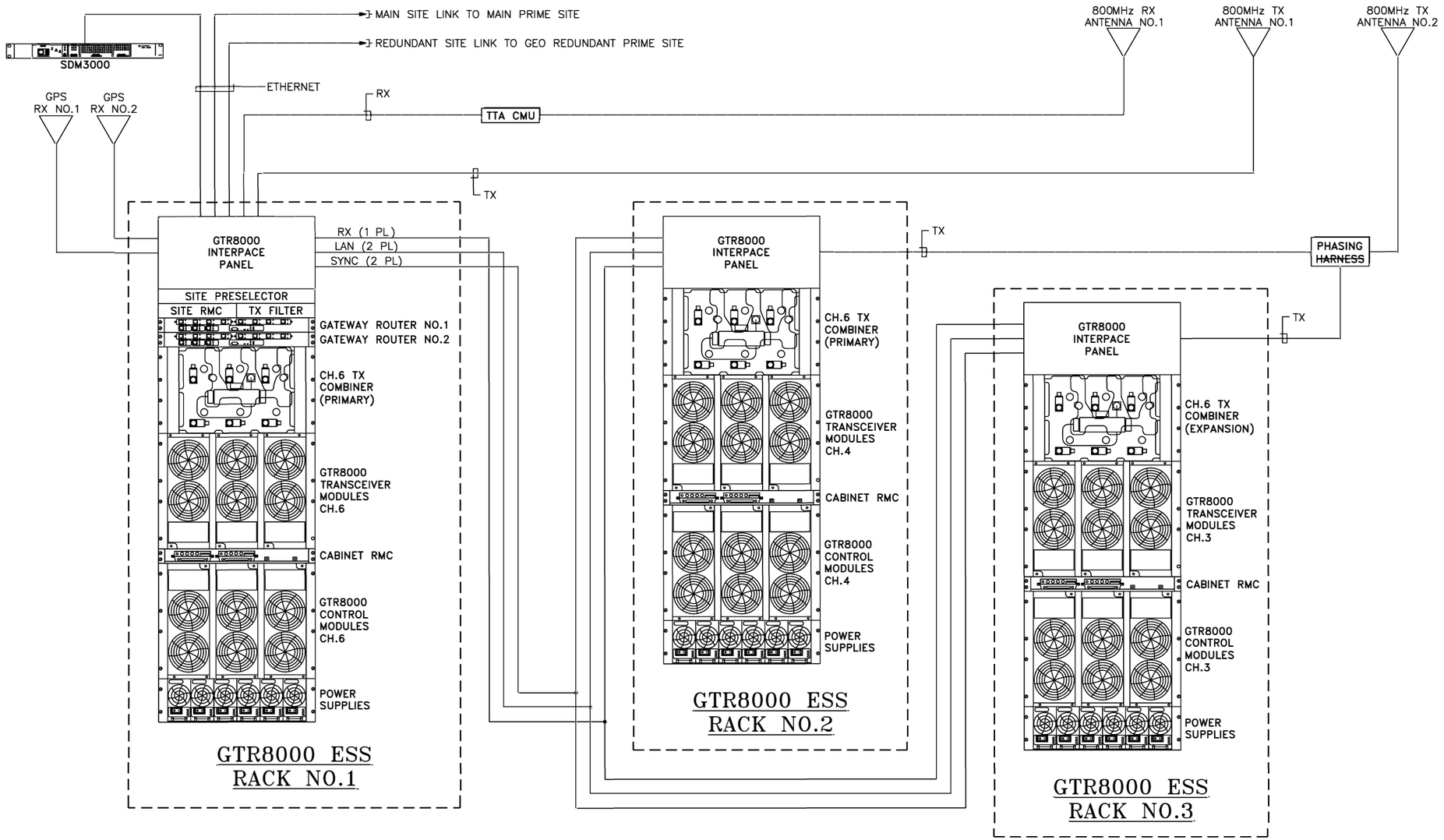

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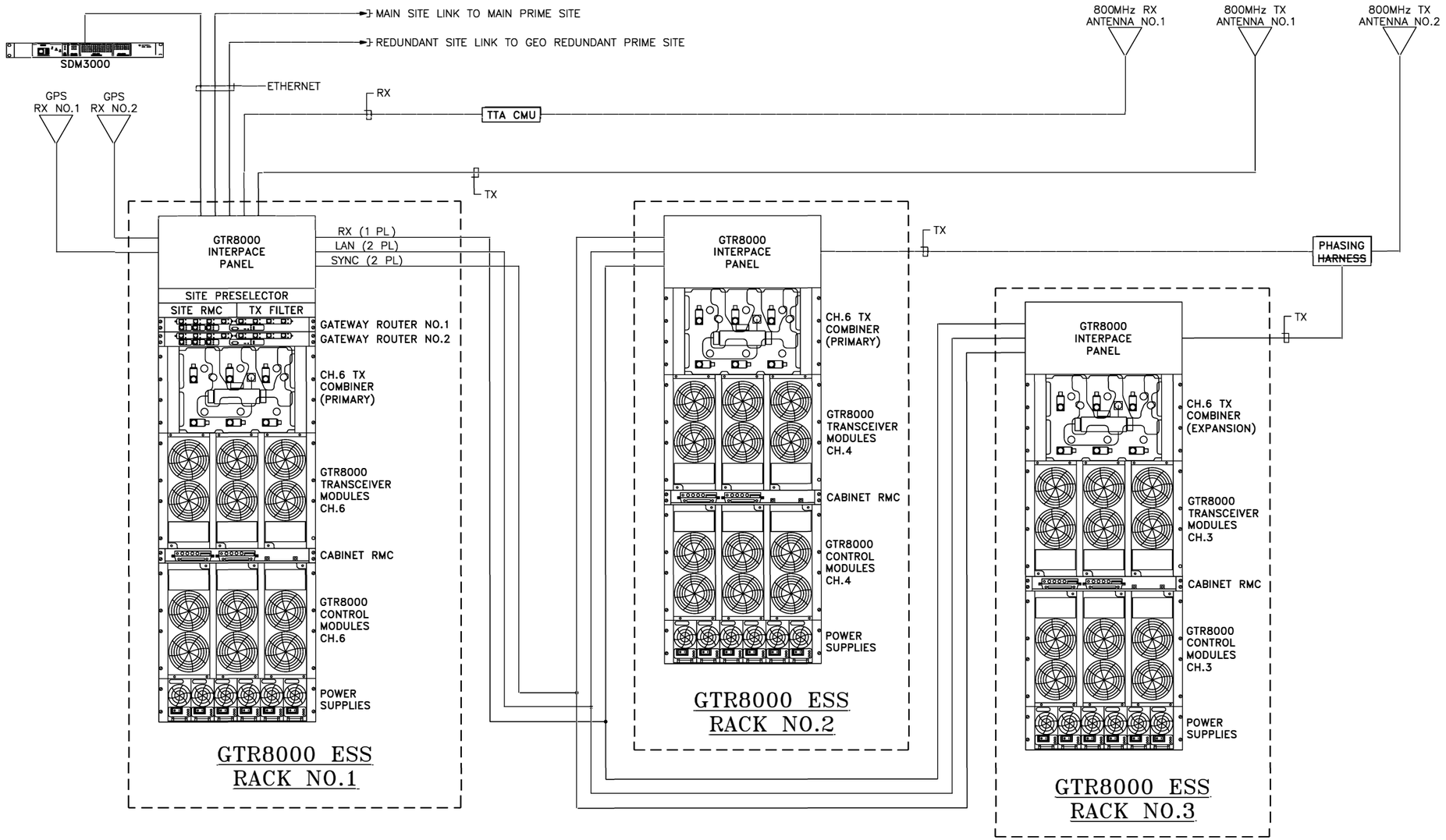
MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: DENVER HOUSING AUTHORITY SITE
SYSTEM BLOCK DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: D_DENV_DHA_03_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

ORIGINAL DOCUMENT SIZE IS 22X34, CORRECT SCALE IS NOT GUARANTEED IF REDUCED OR ENLARGED



REV NO:	DATE:	ENGR:	DESCRIPTION:
O	5-17-17	J.L.	ORIGINAL RELEASE

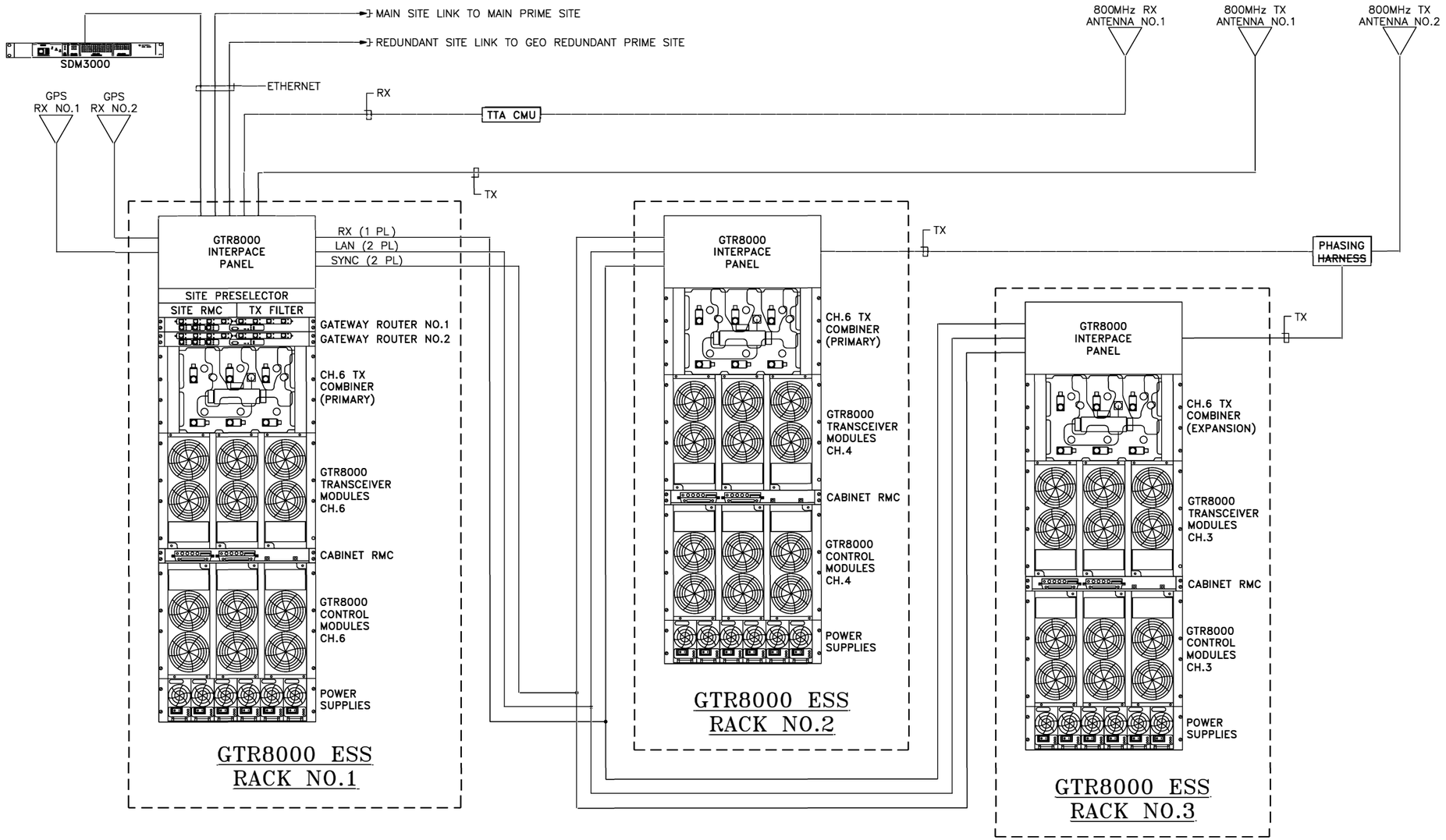
MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: DENVER FIRE DEPARTMENT STATION NO.2 SITE SYSTEM BLOCK DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: D_DENV_DFD2_03_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

ORIGINAL DOCUMENT SIZE IS 22X34, CORRECT SCALE IS NOT GUARANTEED IF REDUCED OR ENLARGED



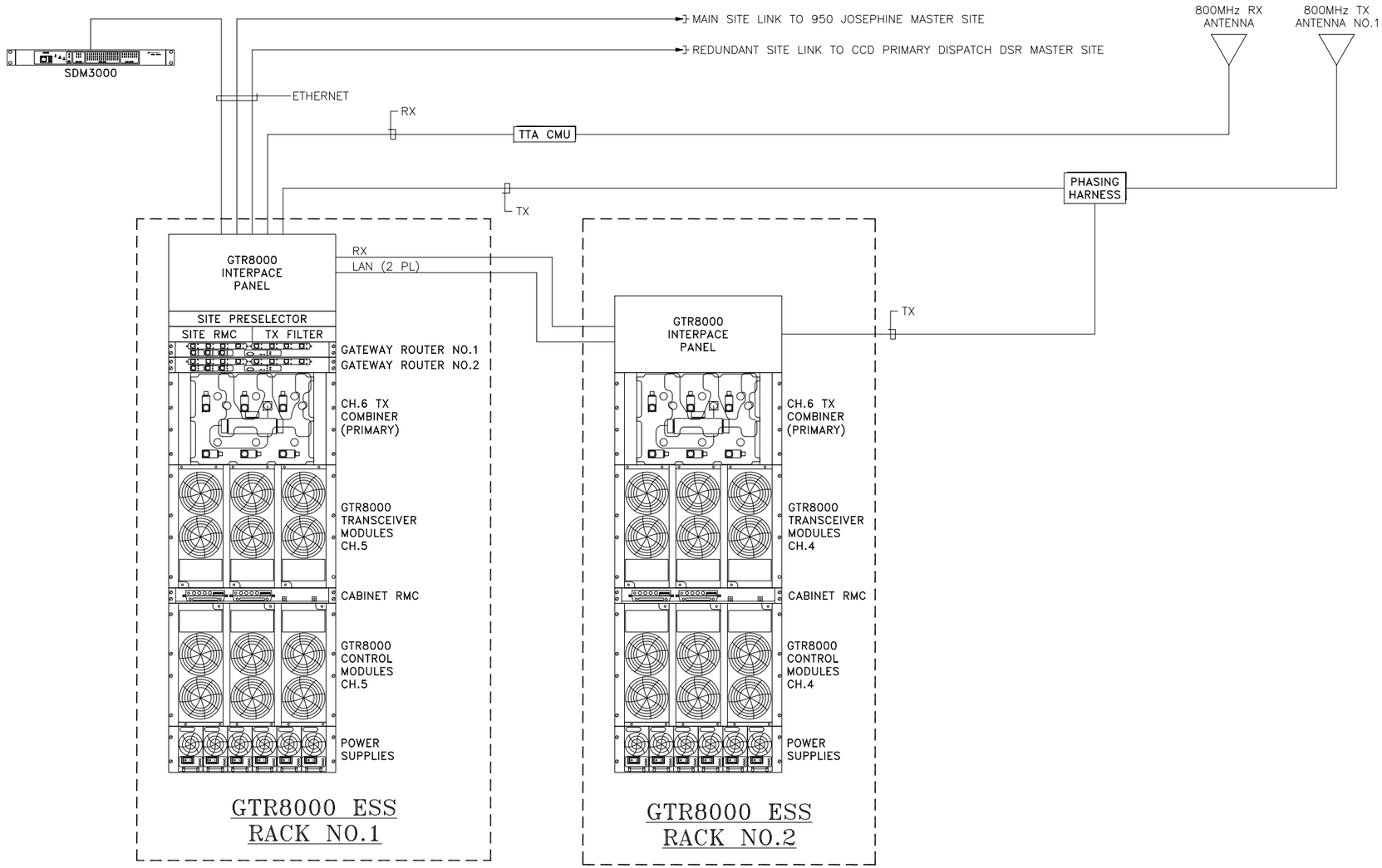
REV NO:	DATE:	ENGR:	DESCRIPTION:
O	5-17-17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: MOUNTAIN TOWERS SITE
SYSTEM BLOCK DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: D_DENV_MT_03_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	



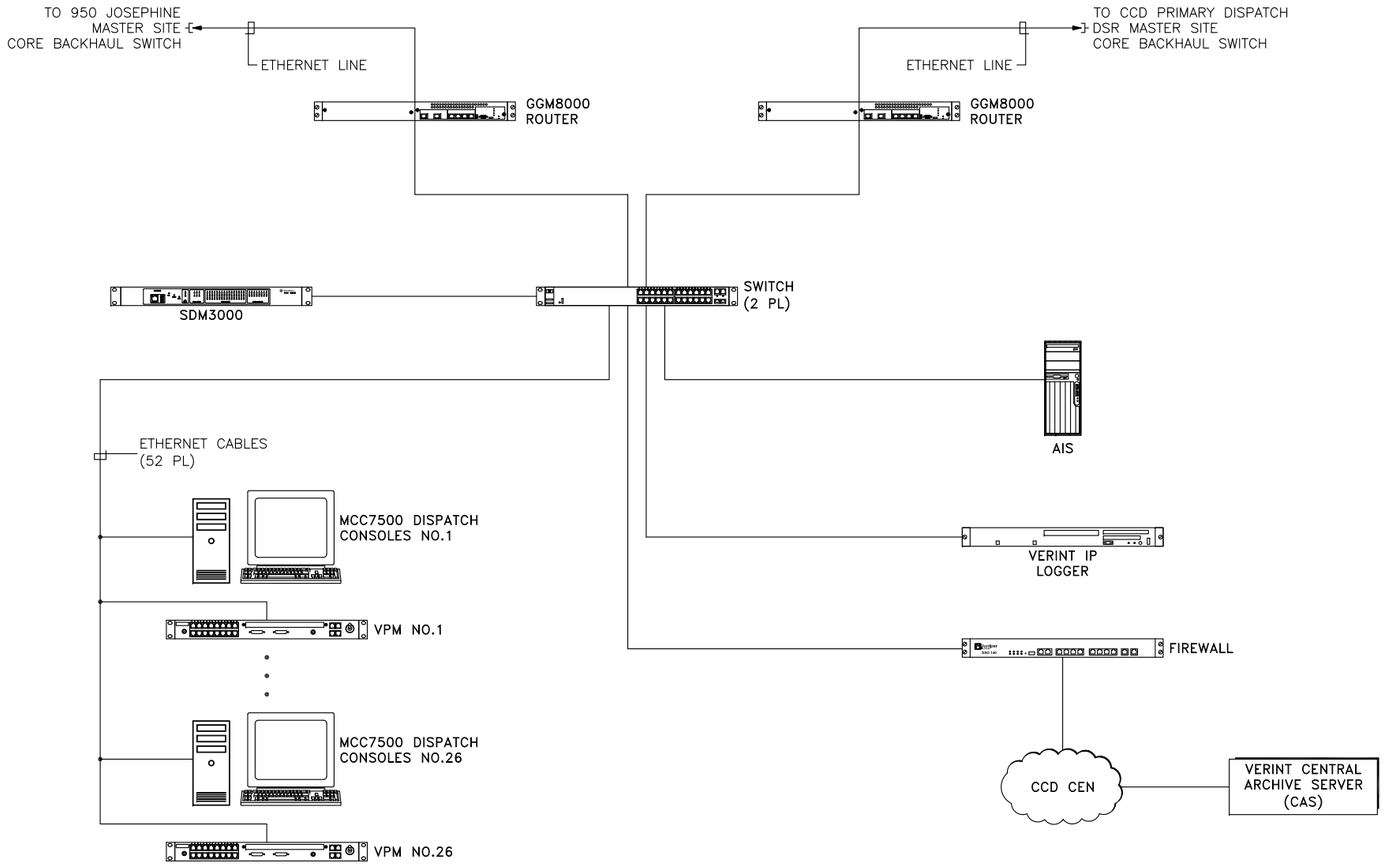
REV NO:	DATE:	ENGR:	DESCRIPTION:
O	5-22-17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: MT. MORRISON (ASR) SITE
SYSTEM BLOCK DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_MTMR_03_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	



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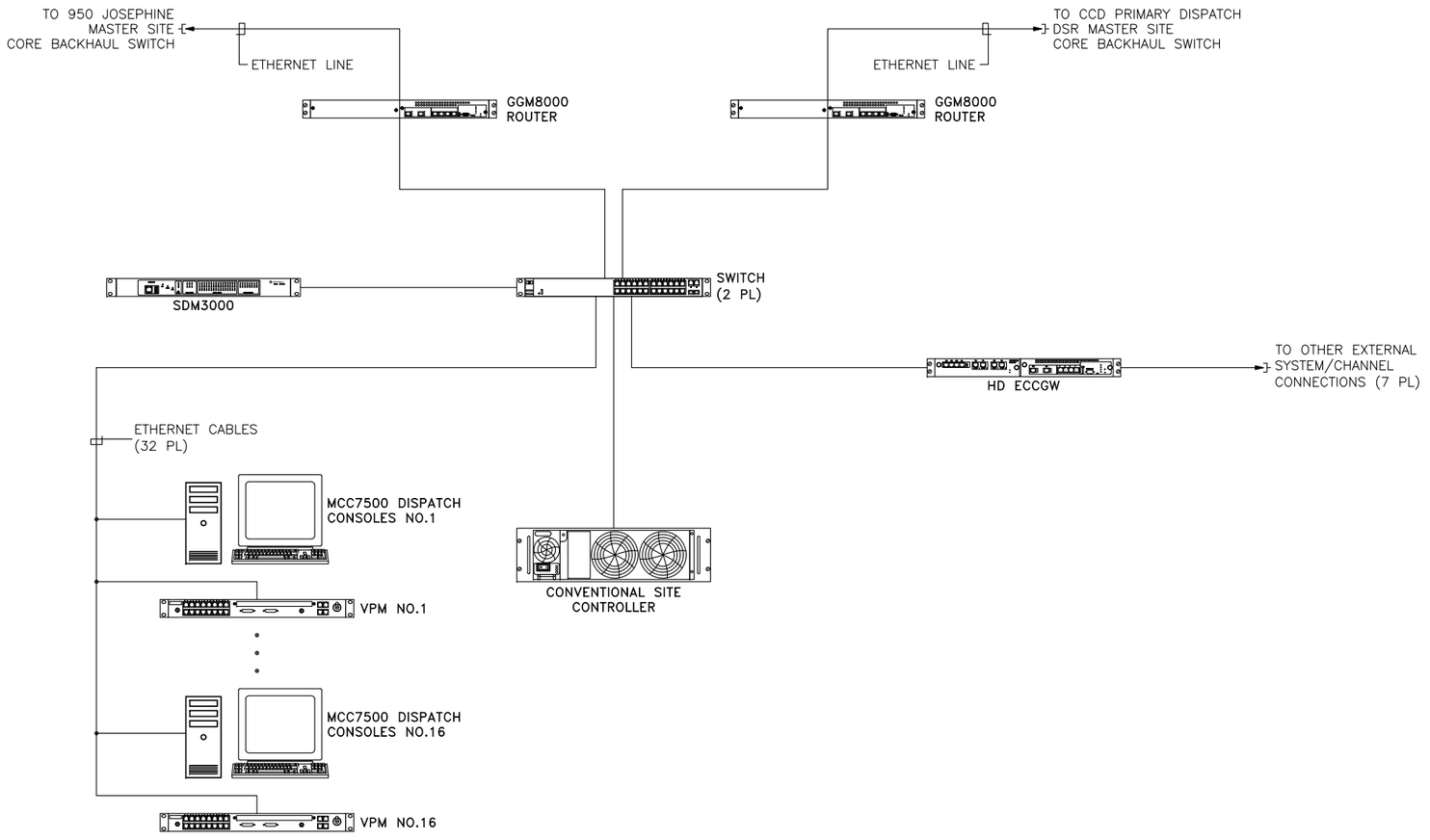
0	5-17-17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: PRIMARY DISPATCH SITE
DISPATCH SUB SYSTEM DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_PRI_03_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	



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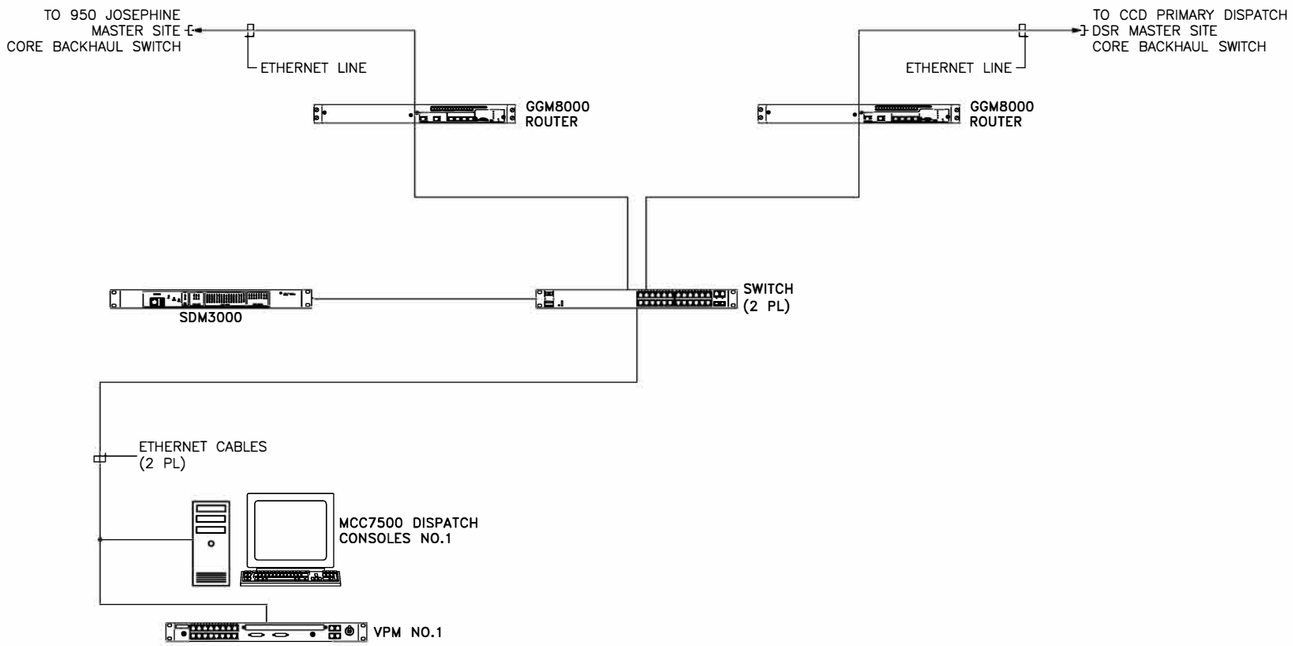
0	5–17–17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

PROJECT:
CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE:
950 JOSEPHINE PRIME SITE
DISPATCH SUB SYSTEM DIAGRAM

CONTRACT:	ENGINEER:	PROJECT MANAGER:	SCALE:	SIZE:
	J. LYNCH		NONE	D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_JOS_03_01	DATE: 5–17–17	PROJECT NUMBER: CO–16P148A	DRAWING NO:	



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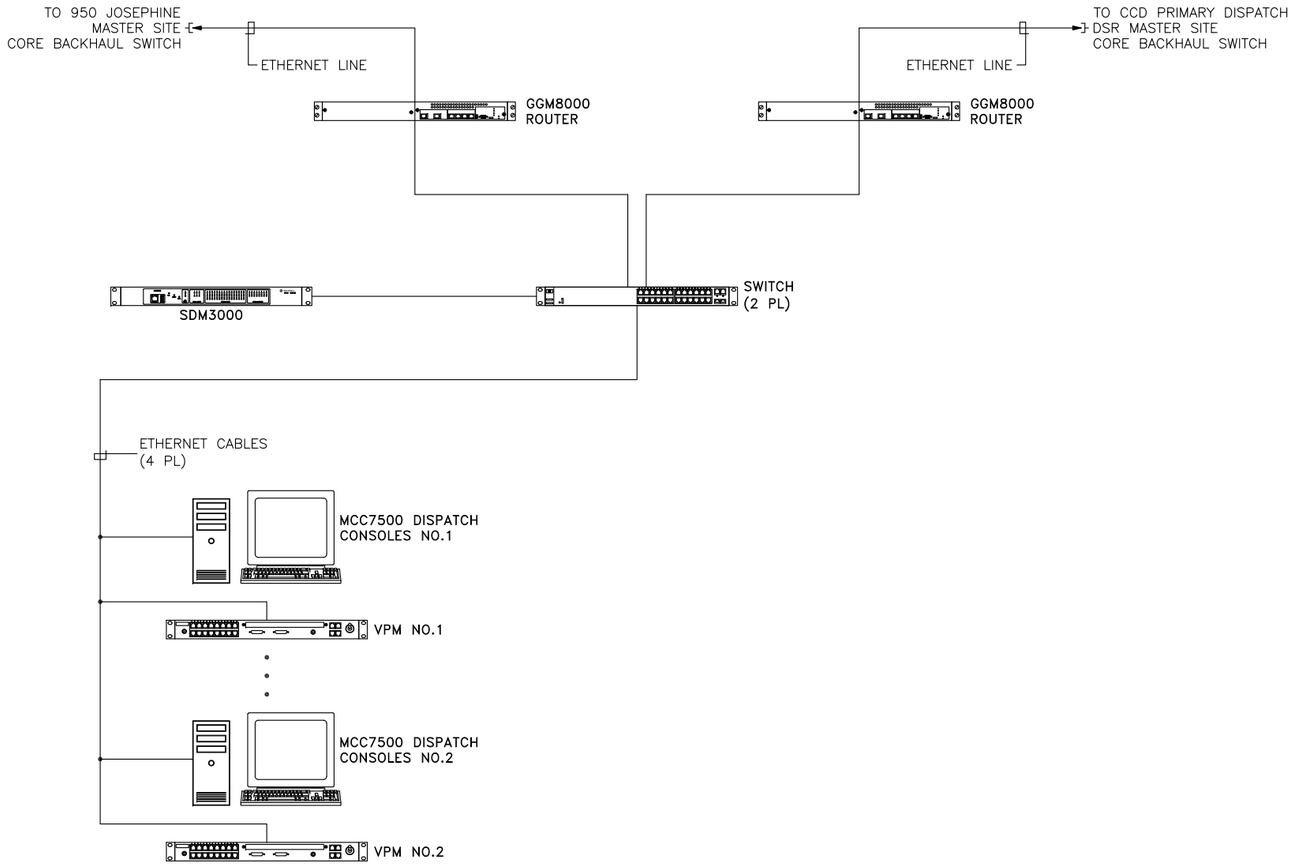
MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: DENVER CRIMINAL COURT DISPATCH
SUB SYSTEM DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: D_DENV_DCC_03_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	



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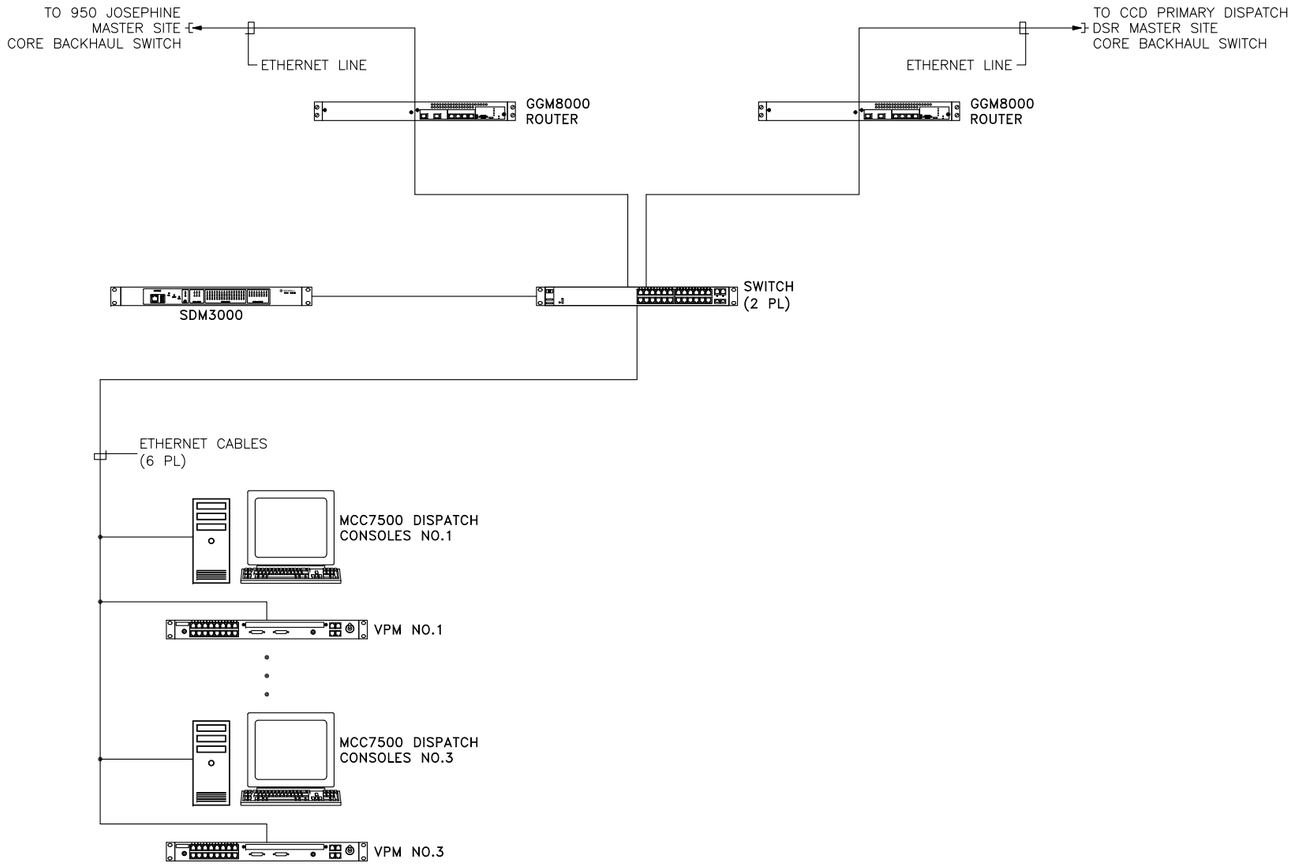
0	5-17-17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

PROJECT:
CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE:
SHERIFF'S DEPT. DETENTION DISPATCH CENTER SITE
DISPATCH SUB SYSTEM DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_SDDC_03_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	



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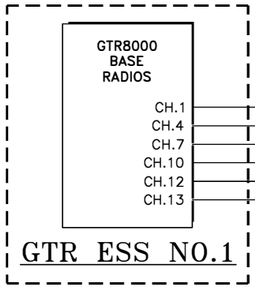
0	5-17-17	J.L.	ORIGINAL RELEASE

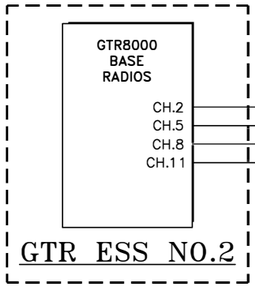
MOTOROLA SOLUTIONS

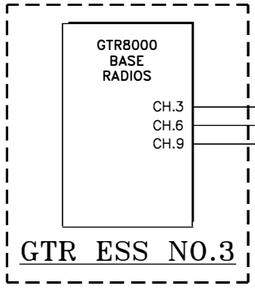
PROJECT:
CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

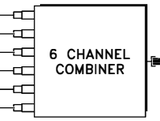
TITLE:
DENVER RIGHT OF WAY SERVICES DISPATCH CENTER SITE
DISPATCH SUB SYSTEM DIAGRAM

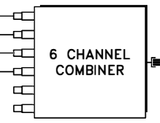
CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_DRWS_03_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

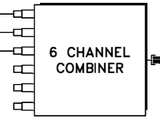


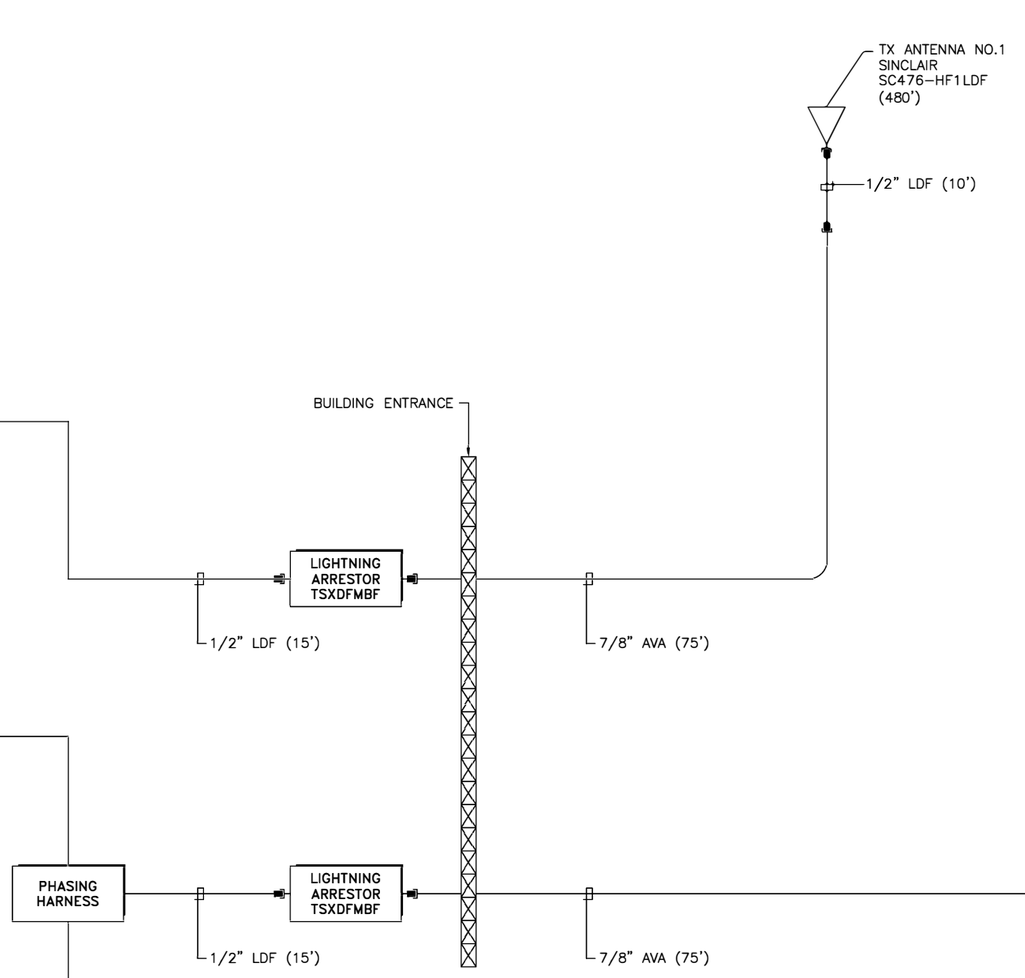












CONNECTOR/SYMBOL LEGEND

FEMALE "N" TYPE	BNC MALE	7/16 DIN FEMALE
MALE "N" TYPE	BNC FEMALE	7/16 DIN MALE
UHF MALE	MINI UHF MALE	RT	RIGHT ANGLE "N" TYPE
UHF FEMALE	MINI UHF FEMALE	RT	RIGHT ANGLE ADAPTOR
RJ45 MALE	UNKNOWN	50 OHM LOAD

*CONNECTORS AND CORRESPONDING CABLES ARE EQUAL IN SIZE UNLESS OTHERWISE SPECIFIED.

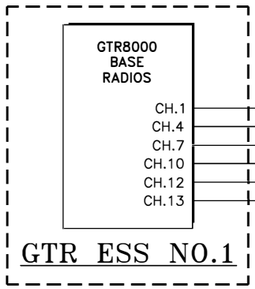
REV NO:	DATE:	ENGR:	DESCRIPTION:
O	5-17-17	J.L.	ORIGINAL RELEASE

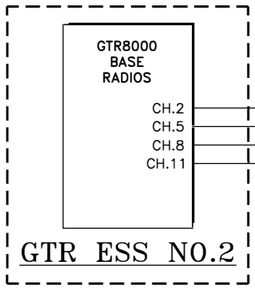
MOTOROLA SOLUTIONS

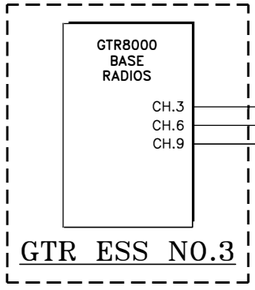
PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

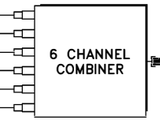
TITLE: 1670 BROADWAY REMOTE SITE
RX ANTENNA INTERCONNECT DIAGRAM

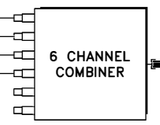
CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_BRW_11_02	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

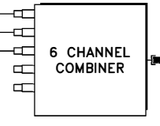


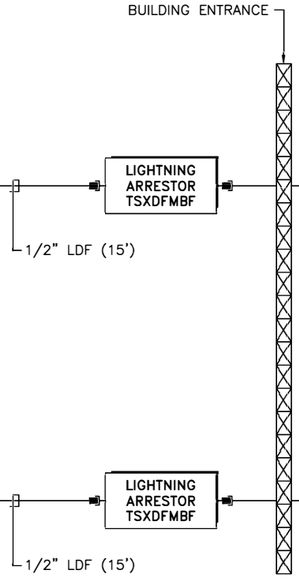


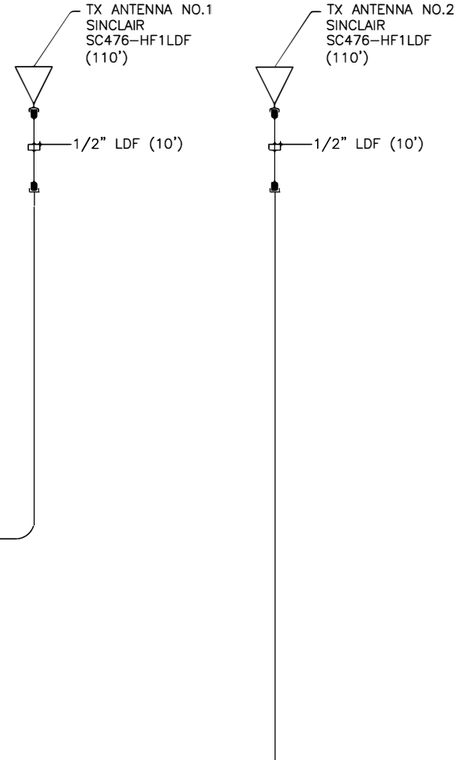












CONNECTOR/SYMBOL LEGEND

FEMALE "N" TYPE	BNC MALE	7/16 DIN FEMALE
MALE "N" TYPE	BNC FEMALE	7/16 DIN MALE
UHF MALE	MINI UHF MALE	RT	RIGHT ANGLE "N" TYPE
UHF FEMALE	MINI UHF FEMALE	RT	RIGHT ANGLE ADAPTOR
RJ45 MALE	UNKNOWN	50 OHM LOAD

*CONNECTORS AND CORRESPONDING CABLES ARE EQUAL IN SIZE UNLESS OTHERWISE SPECIFIED.

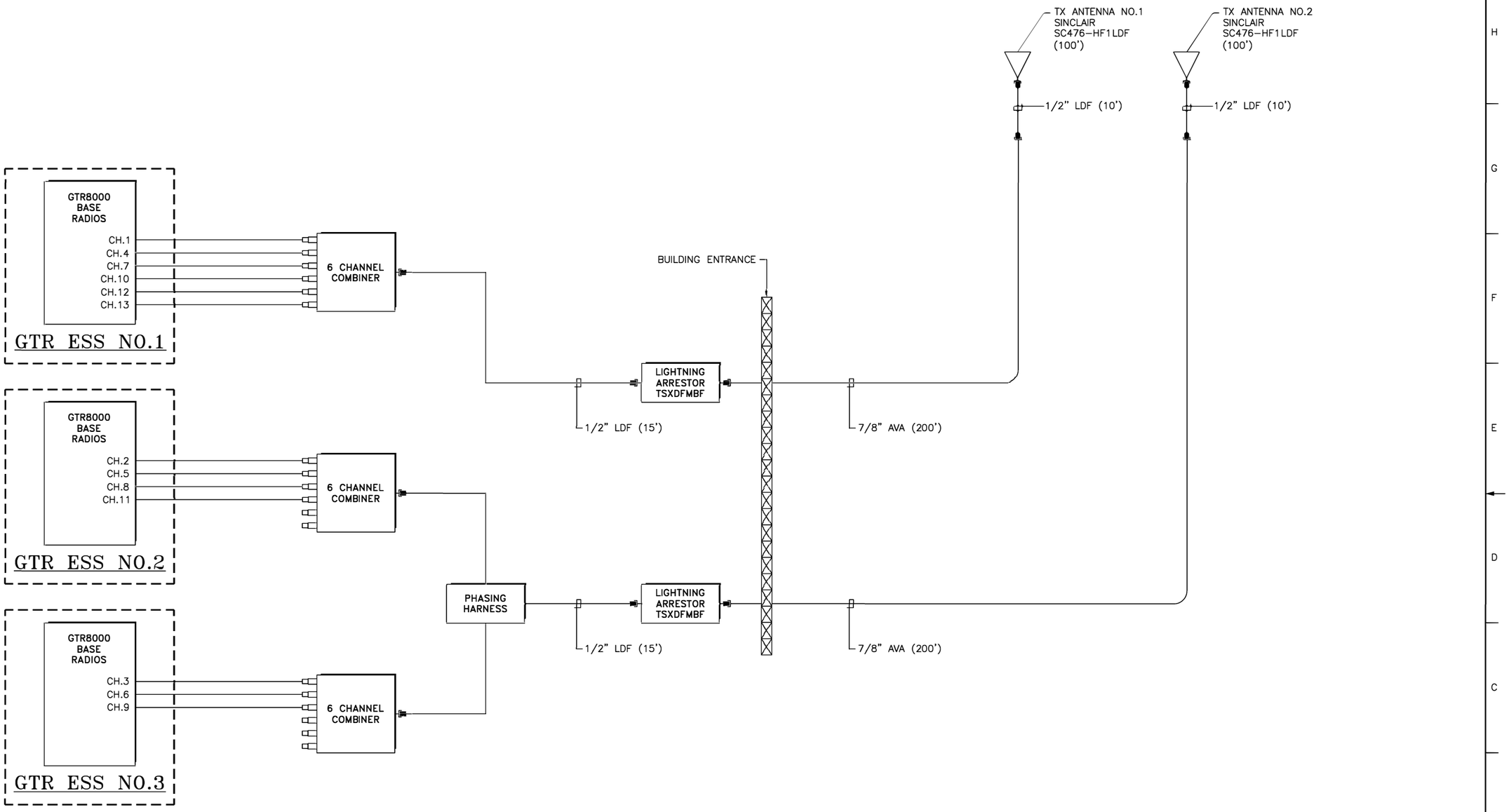
REV NO:	DATE:	ENGR:	DESCRIPTION:
O	5-17-17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: DENVER HOUSING AUTHORITY SITE
TX ANTENNA INTERCONNECT DIAGRAM

CONTRACT:	ENGINEER:	PROJECT MANAGER:	SCALE:	SIZE:
	J. LYNCH		NONE	D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_DHA_11_02	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	



CONNECTOR/SYMBOL LEGEND

FEMALE "N" TYPE	BNC MALE	7/16 DIN FEMALE
MALE "N" TYPE	BNC FEMALE	7/16 DIN MALE
UHF MALE	MINI UHF MALE	RT	RIGHT ANGLE "N" TYPE
UHF FEMALE	MINI UHF FEMALE	RT	RIGHT ANGLE ADAPTOR
RJ45 MALE	UNKNOWN	50 OHM LOAD

*CONNECTORS AND CORRESPONDING CABLES ARE EQUAL IN SIZE UNLESS OTHERWISE SPECIFIED.

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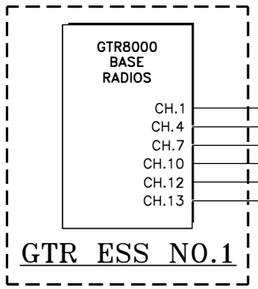
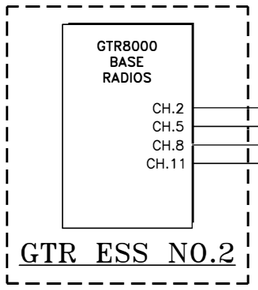
MOTOROLA SOLUTIONS

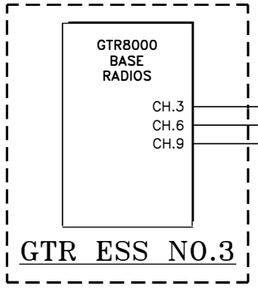
PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

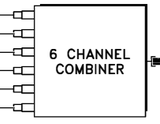
TITLE: DENVER FIRE DEPARTMENT STATION NO.2 SITE
TX ANTENNA INTERCONNECT DIAGRAM

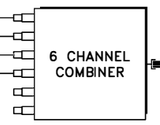
CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: D_DENV_DFD2_11_02	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

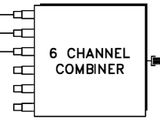


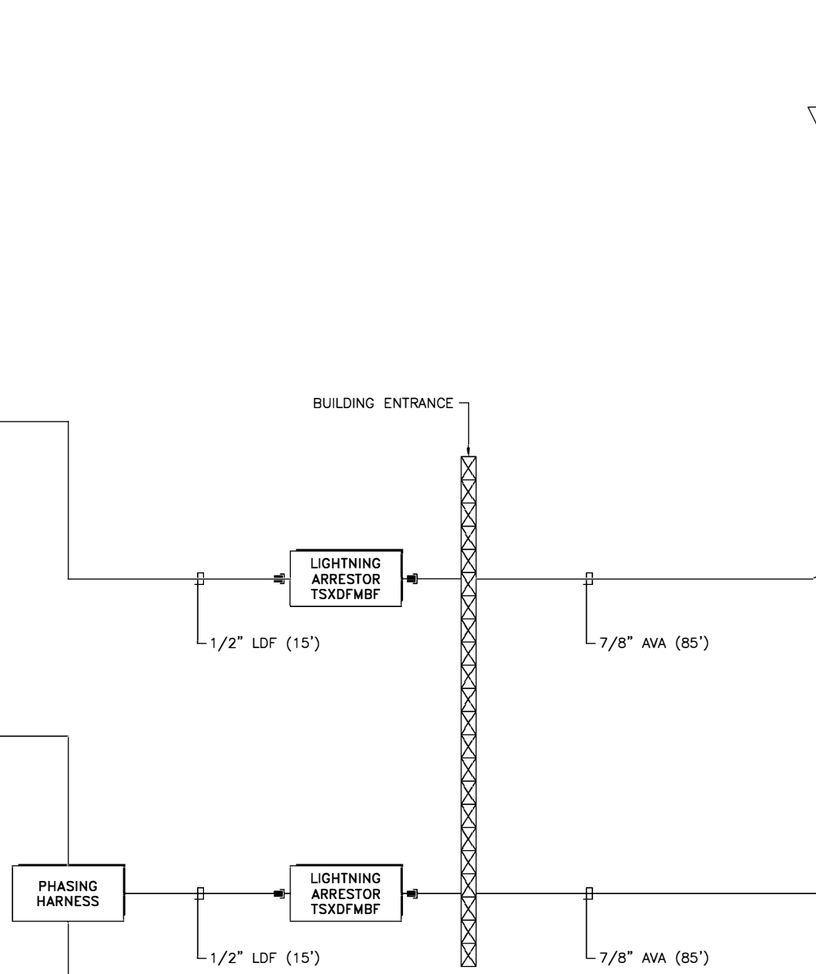


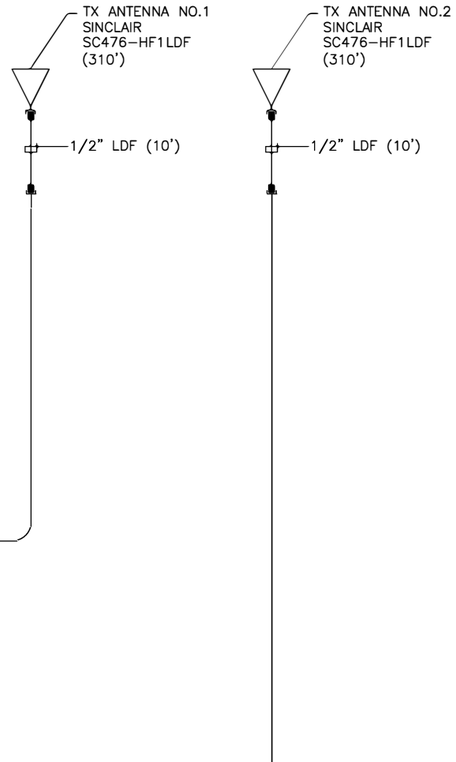












CONNECTOR/SYMBOL LEGEND

FEMALE "N" TYPE	BNC MALE	7/16 DIN FEMALE
MALE "N" TYPE	BNC FEMALE	7/16 DIN MALE
UHF MALE	MINI UHF MALE	RT	RIGHT ANGLE "N" TYPE
UHF FEMALE	MINI UHF FEMALE	RT	RIGHT ANGLE ADAPTOR
RJ45 MALE	UNKNOWN	50 OHM LOAD

*CONNECTORS AND CORRESPONDING CABLES ARE EQUAL IN SIZE UNLESS OTHERWISE SPECIFIED.

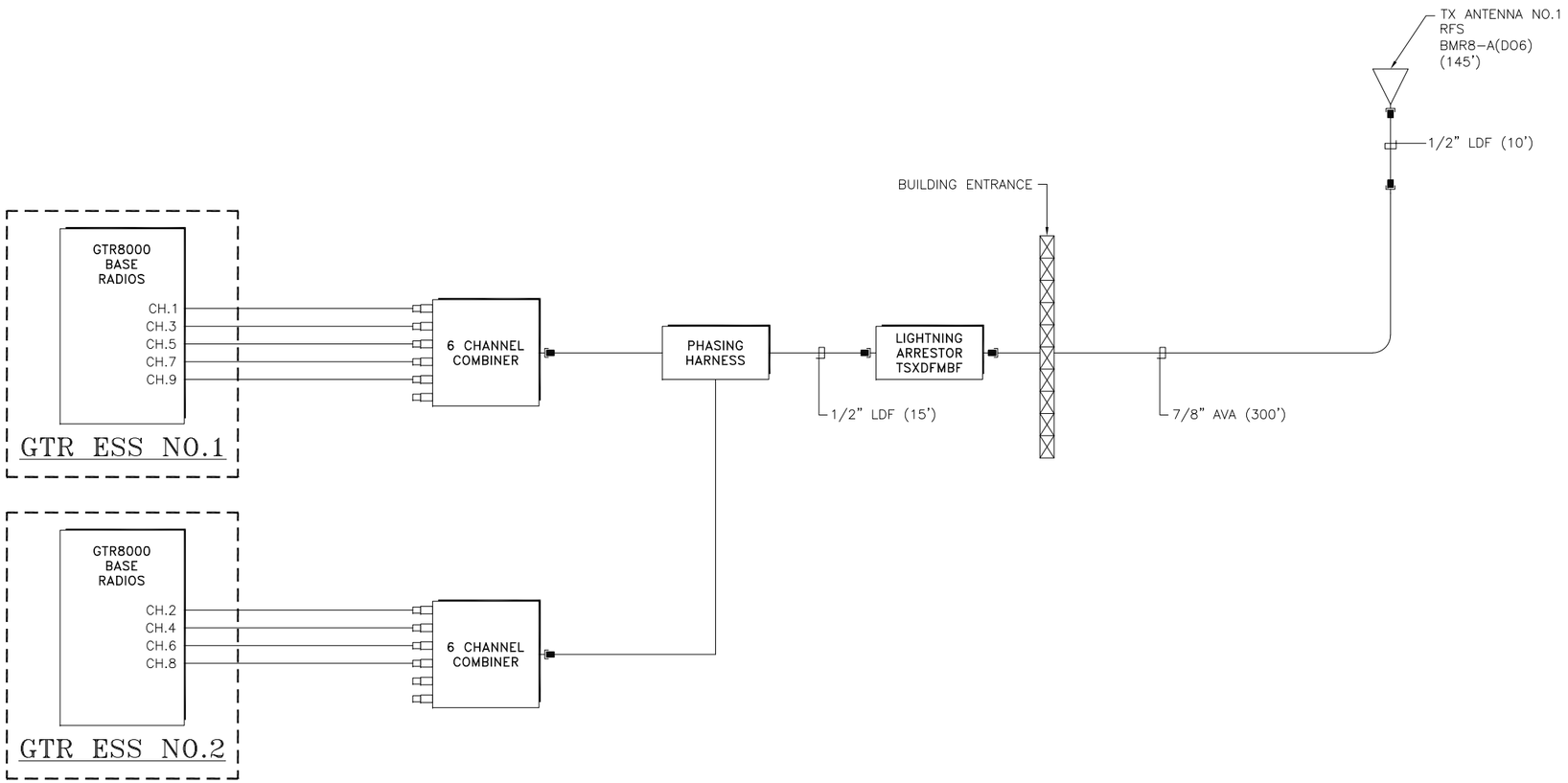
REV NO:	DATE:	ENGR:	DESCRIPTION:
O	5-17-17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: MOUNTAIN TOWERS SITE
TX ANTENNA INTERCONNECT DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_MT_11_02	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	



CONNECTOR/SYMBOL LEGEND

—≺	FEMALE "N" TYPE	—□	BNC MALE	—[	7/16 DIN FEMALE
←—	MALE "N" TYPE	□	BNC FEMALE	■—	7/16 DIN MALE
—●	UHF MALE	←—	MINI UHF MALE	RT	RIGHT ANGLE "N" TYPE
—(	UHF FEMALE	—▷	MINI UHF FEMALE	RT	RIGHT ANGLE ADAPTOR
—◁	RJ45 MALE	▯	UNKNOWN	∿∿	50 OHM LOAD

*CONNECTORS AND CORRESPONDING CABLES ARE EQUAL IN SIZE UNLESS OTHERWISE SPECIFIED.

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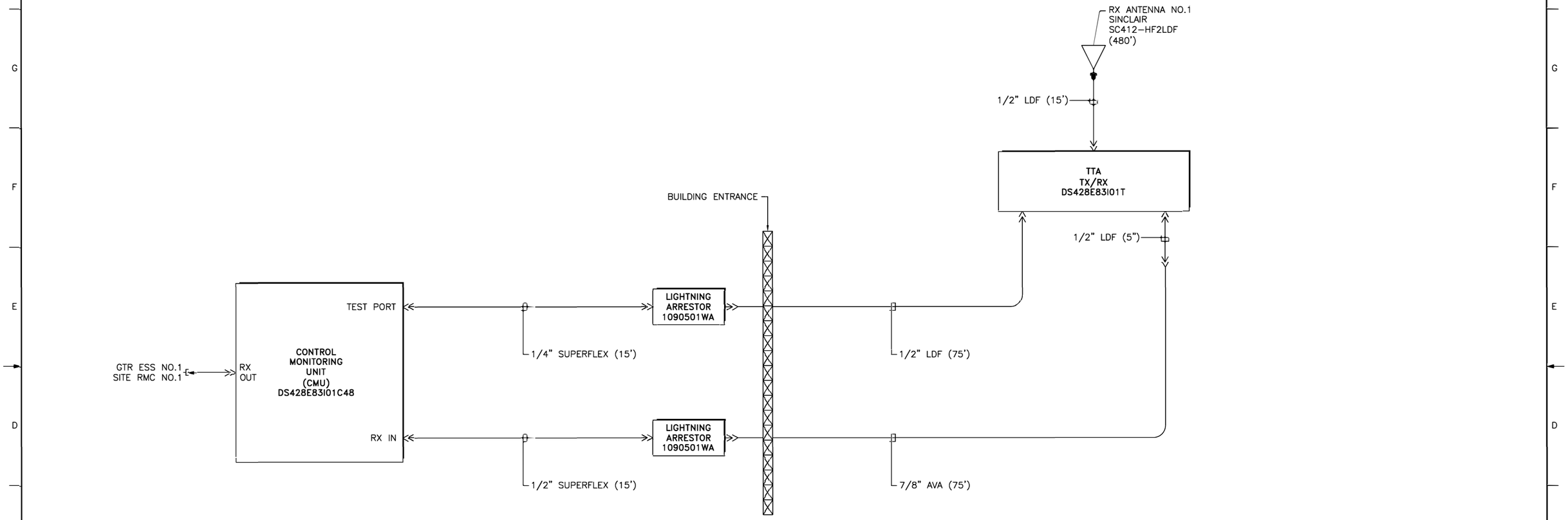
MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: MT. MORRISON (ASR) SITE
TX ANTENNA INTERCONNECT DIAGRAM

CONTRACT:	ENGINEER:	PROJECT MANAGER:	SCALE:	SIZE:
	J. LYNCH		NONE	D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_MTMR_11_02	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	



CONNECTOR/SYMBOL LEGEND

FEMALE "N" TYPE	BNC MALE	7/16 DIN FEMALE
MALE "N" TYPE	BNC FEMALE	7/16 DIN MALE
UHF MALE	MINI UHF MALE	RT	RIGHT ANGLE "N" TYPE
UHF FEMALE	MINI UHF FEMALE	RT	RIGHT ANGLE ADAPTOR
RJ45 MALE	UNKNOWN	50 OHM LOAD

*CONNECTORS AND CORRESPONDING CABLES ARE EQUAL IN SIZE UNLESS OTHERWISE SPECIFIED.

REV NO:	DATE:	ENGR:	DESCRIPTION:
O	5–17–17	J.L.	ORIGINAL RELEASE

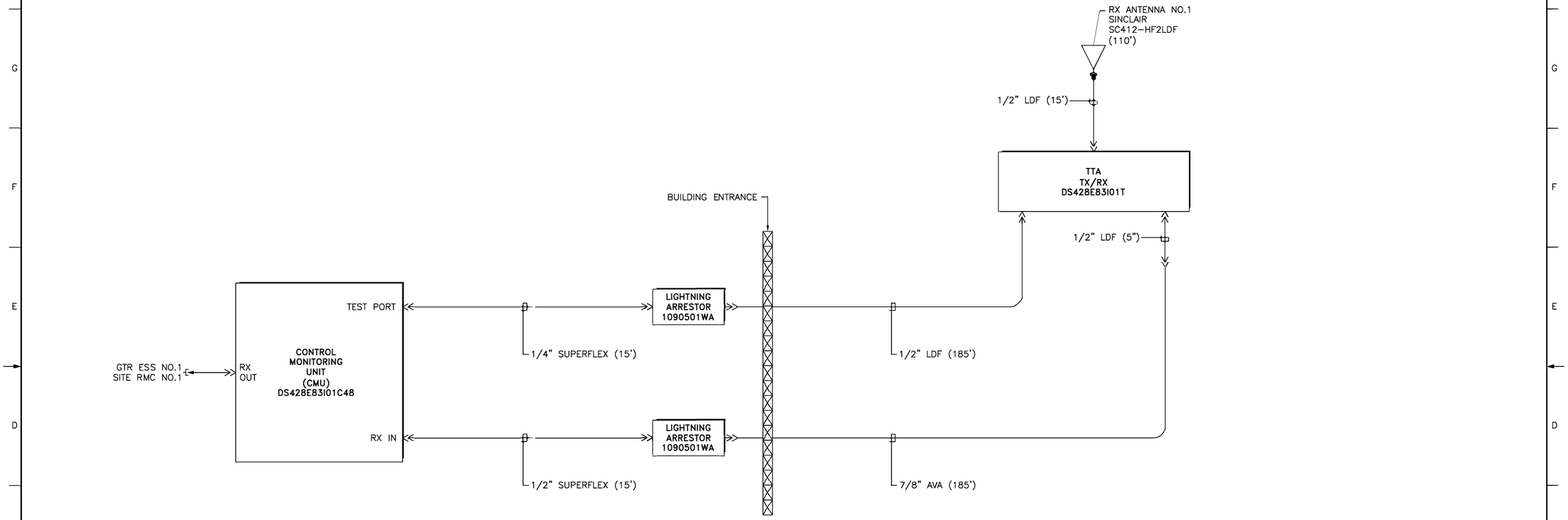
MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: 1670 BROADWAY REMOTE SITE
RX ANTENNA INTERCONNECT DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: D_DENV_BRW_11_01	DATE: 5–17–17	PROJECT NUMBER: CO–16P148A	DRAWING NO:	

ORIGINAL DOCUMENT SIZE IS 22X34, CORRECT SCALE IS NOT GUARANTEED IF REDUCED OR ENLARGED



CONNECTOR/SYMBOL LEGEND

FEMALE "N" TYPE	BNC MALE	7/16 DIN FEMALE
MALE "N" TYPE	BNC FEMALE	7/16 DIN MALE
UHF MALE	MINI UHF MALE	RT	RIGHT ANGLE "N" TYPE
UHF FEMALE	MINI UHF FEMALE	RT	RIGHT ANGLE ADAPTOR
RJ45 MALE	UNKNOWN	50 OHM LOAD

*CONNECTORS AND CORRESPONDING CABLES ARE EQUAL IN SIZE UNLESS OTHERWISE SPECIFIED.

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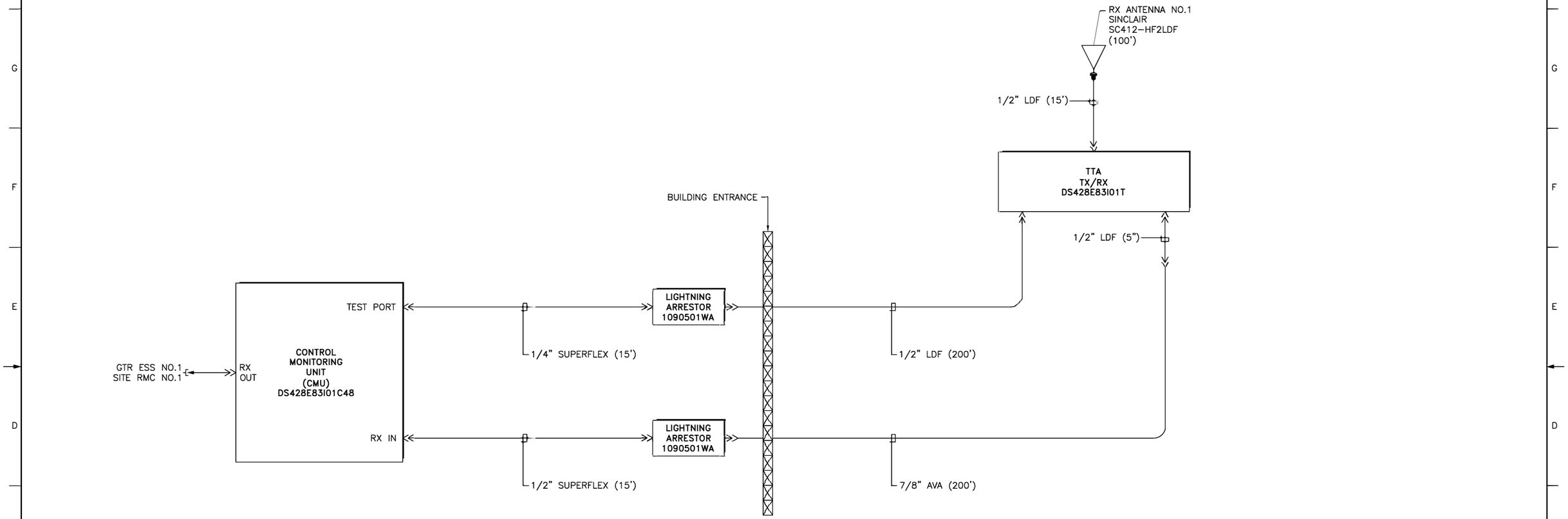
MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: DENVER HOUSING AUTHORITY SITE
RX ANTENNA INTERCONNECT DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: D_DENV_DHA_11_01	DATE: 5–17–17	PROJECT NUMBER: CO–16P148A	DRAWING NO:	

ORIGINAL DOCUMENT SIZE IS 22X34, CORRECT SCALE IS NOT GUARANTEED IF REDUCED OR ENLARGED



CONNECTOR/SYMBOL LEGEND

FEMALE "N" TYPE	BNC MALE	7/16 DIN FEMALE
MALE "N" TYPE	BNC FEMALE	7/16 DIN MALE
UHF MALE	MINI UHF MALE	RT	RIGHT ANGLE "N" TYPE
UHF FEMALE	MINI UHF FEMALE	RT	RIGHT ANGLE ADAPTOR
RJ45 MALE	UNKNOWN	50 OHM LOAD

*CONNECTORS AND CORRESPONDING CABLES ARE EQUAL IN SIZE UNLESS OTHERWISE SPECIFIED.

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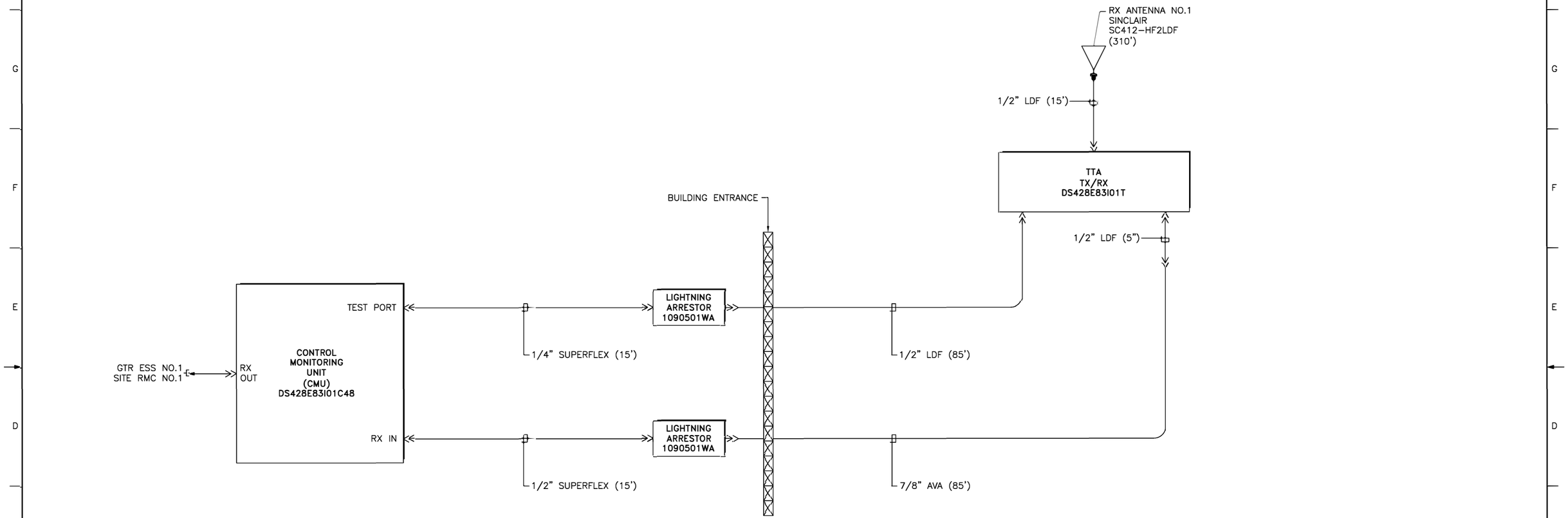
MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: DENVER FIRE DEPARTMENT STATION NO.2 SITE
RX ANTENNA INTERCONNECT DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: D_DENV_DFD2_11_01	DATE: 5–17–17	PROJECT NUMBER: CO–16P148A	DRAWING NO:	

ORIGINAL DOCUMENT SIZE IS 22X34, CORRECT SCALE IS NOT GUARANTEED IF REDUCED OR ENLARGED



CONNECTOR/SYMBOL LEGEND

FEMALE "N" TYPE	BNC MALE	7/16 DIN FEMALE
MALE "N" TYPE	BNC FEMALE	7/16 DIN MALE
UHF MALE	MINI UHF MALE	RT	RIGHT ANGLE "N" TYPE
UHF FEMALE	MINI UHF FEMALE	RT	RIGHT ANGLE ADAPTOR
RJ45 MALE	UNKNOWN	50 OHM LOAD

*CONNECTORS AND CORRESPONDING CABLES ARE EQUAL IN SIZE UNLESS OTHERWISE SPECIFIED.

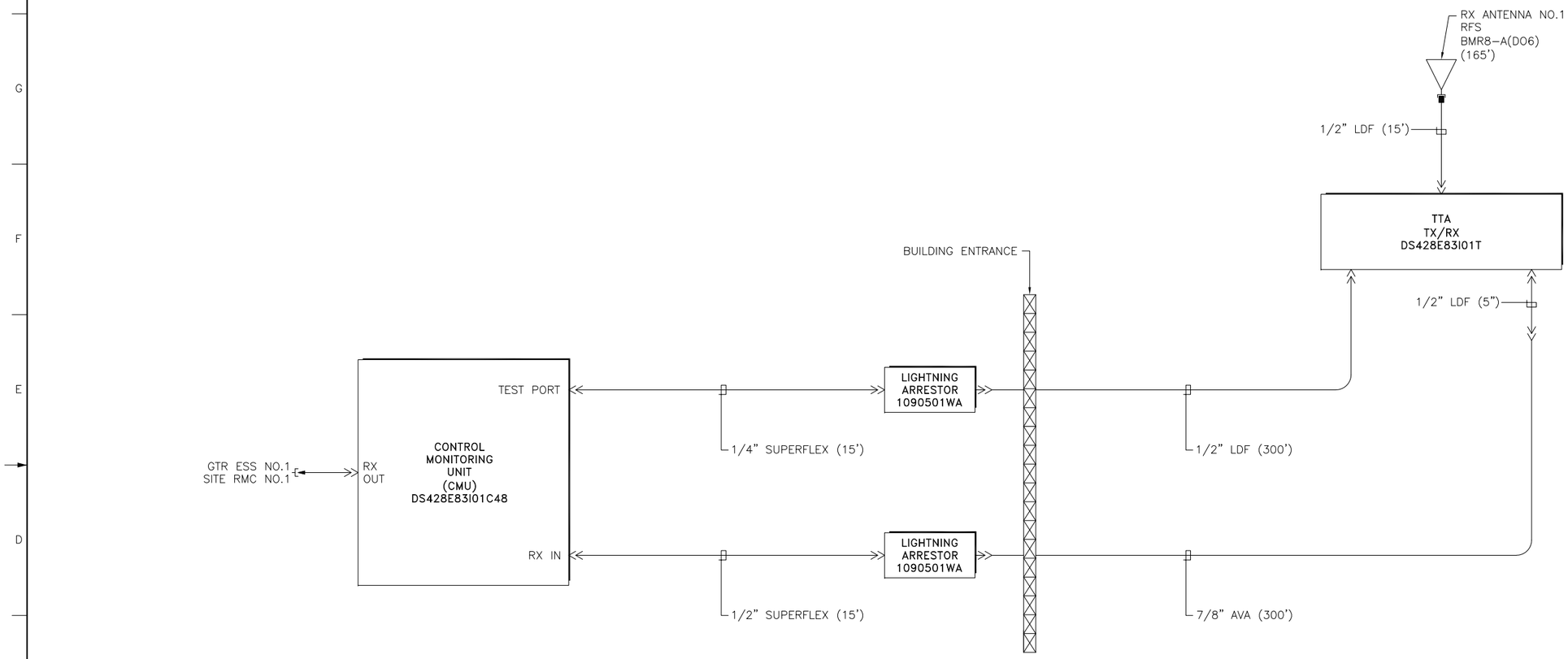
REV NO:	DATE:	ENGR:	DESCRIPTION:
O	5–17–17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: MOUNTAIN TOWERS SITE
RX ANTENNA INTERCONNECT DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: J. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: D_DENV_MT_11_01	DATE: 5–17–17	PROJECT NUMBER: CO–16P148A	DRAWING NO:	



CONNECTOR/SYMBOL LEGEND

FEMALE "N" TYPE	BNC MALE	7/16 DIN FEMALE
MALE "N" TYPE	BNC FEMALE	7/16 DIN MALE
UHF MALE	MINI UHF MALE	RT	RIGHT ANGLE "N" TYPE
UHF FEMALE	MINI UHF FEMALE	RT	RIGHT ANGLE ADAPTOR
RJ45 MALE	UNKNOWN	50 OHM LOAD

*CONNECTORS AND CORRESPONDING CABLES ARE EQUAL IN SIZE UNLESS OTHERWISE SPECIFIED.

REV NO:	DATE:	ENGR:	DESCRIPTION:
O	5-23-17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

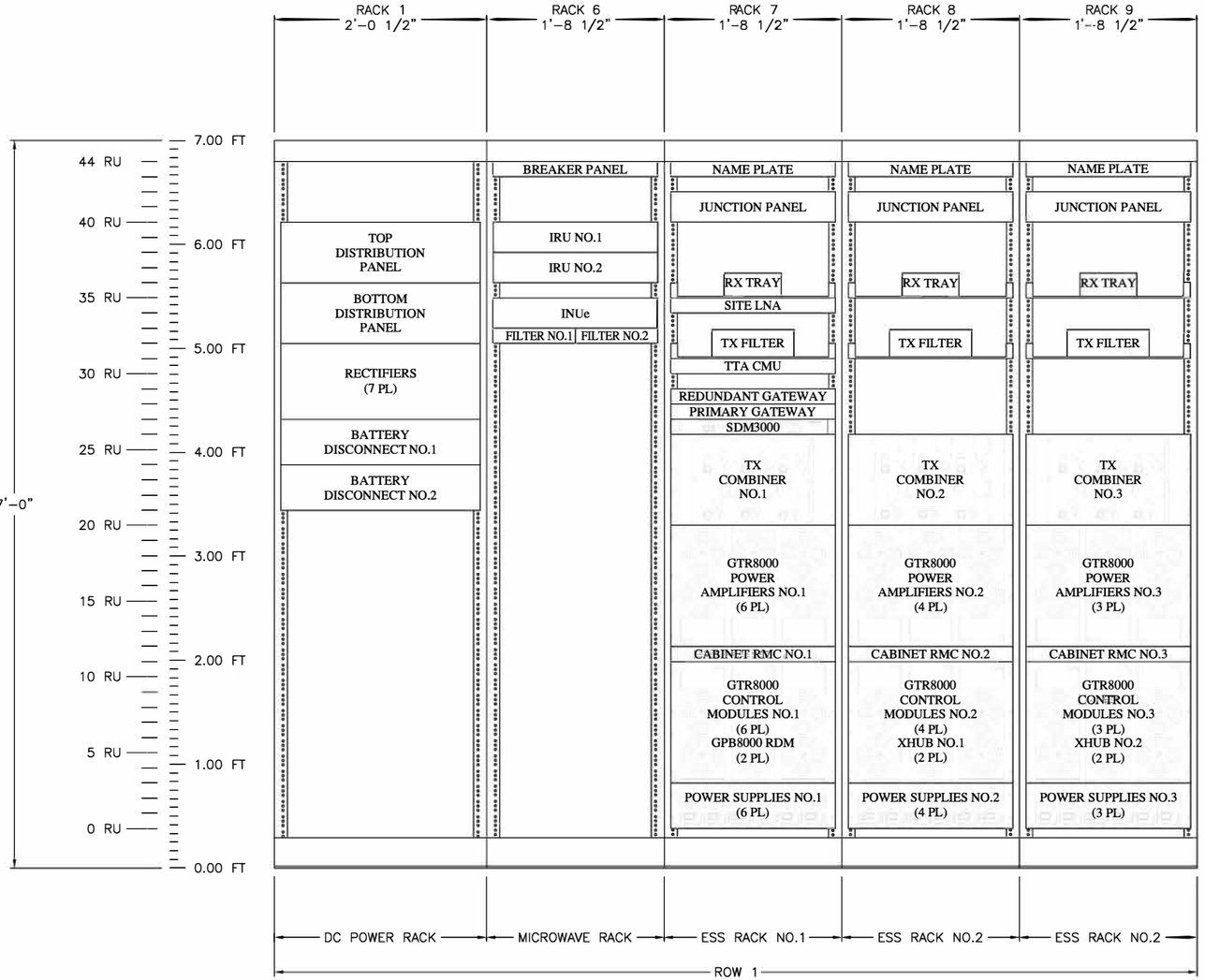
TITLE: MT. MORRISON (ASR) SITE
RX ANTENNA INTERCONNECT DIAGRAM

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: O_DENV_MTMR_11_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

ORIGINAL DOCUMENT SIZE IS 22X34, CORRECT SCALE IS NOT GUARANTEED IF REDUCED OR ENLARGED

NOTES:

1. REAR OF RACKS EQUIVALENT TO RACK FACE.



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MOTOROLA SOLUTIONS

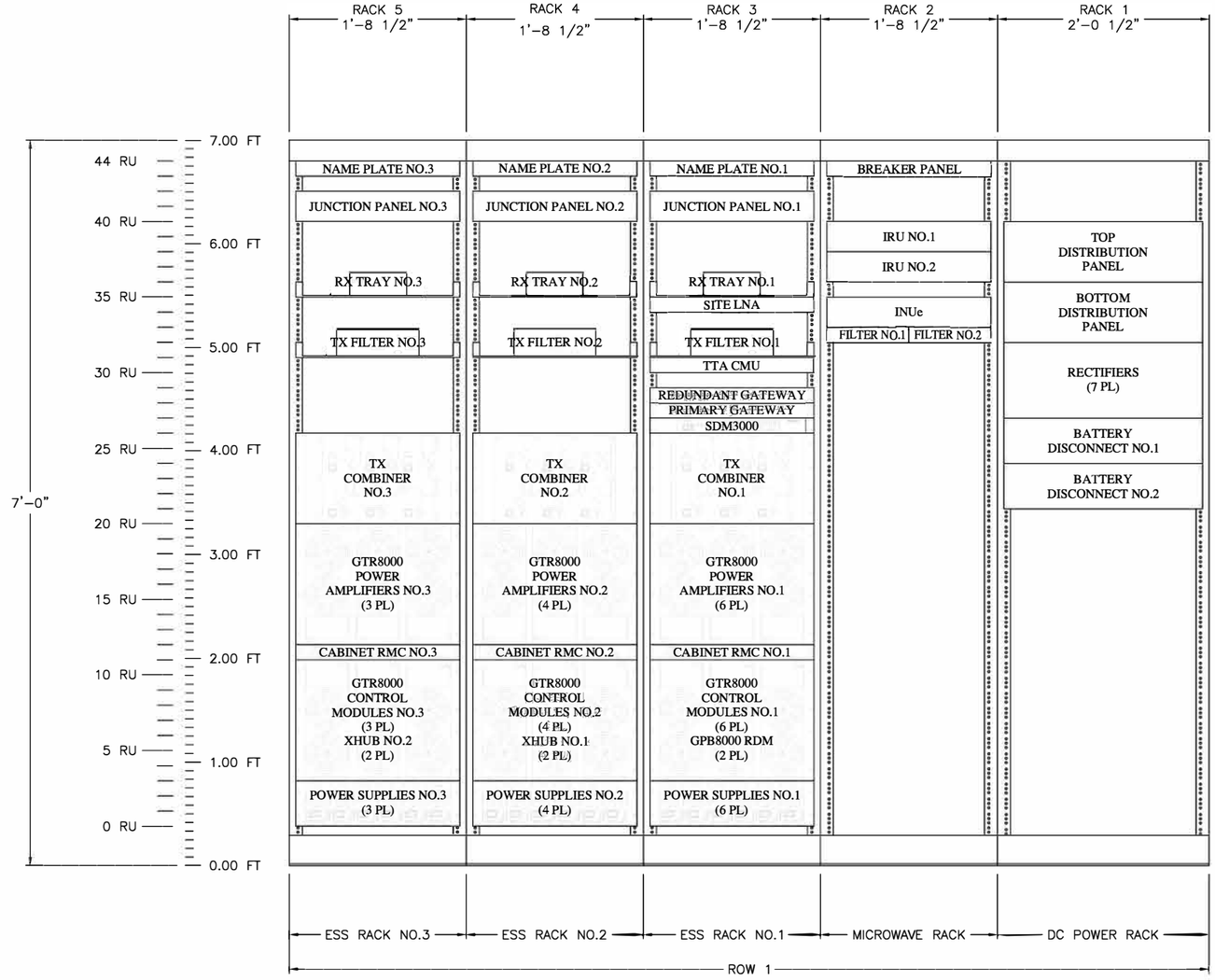
PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: 1670 BROADWAY REMOTE SITE
EQUIPMENT RACK FACE LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1-1/2"=1'	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_BRW_09_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

NOTES:

1. REAR OF RACKS EQUIVALENT TO RACK FACE.



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MOTOROLA SOLUTIONS

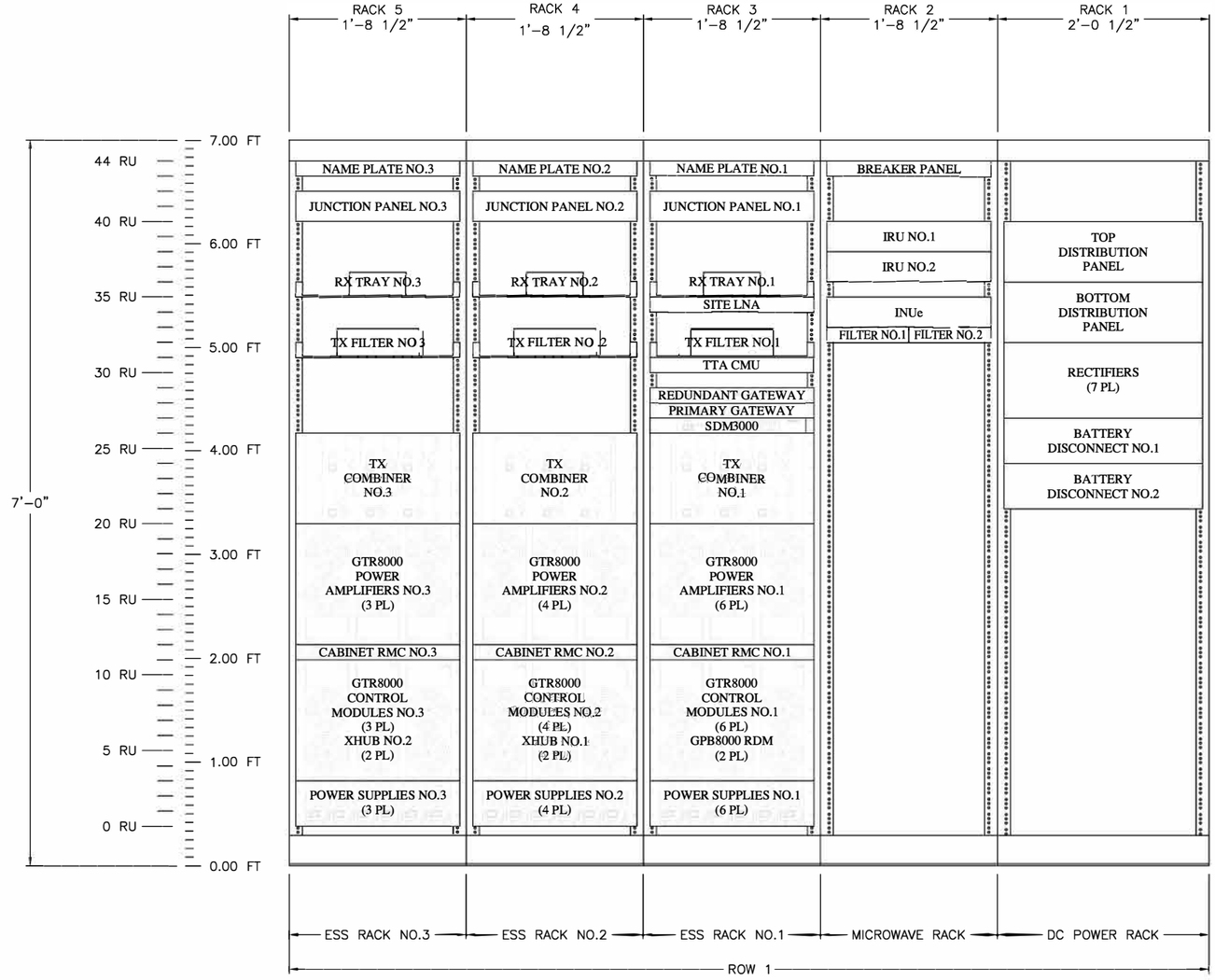
PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: DENVER HOUSING AUTHORITY SITE
EQUIPMENT RACK FACE LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1-1/2"=1'	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: D_DENV_DHA_09_01	DATE: 5-12-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

NOTES:

1. REAR OF RACKS EQUIVALENT TO RACK FACE.



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MOTOROLA SOLUTIONS

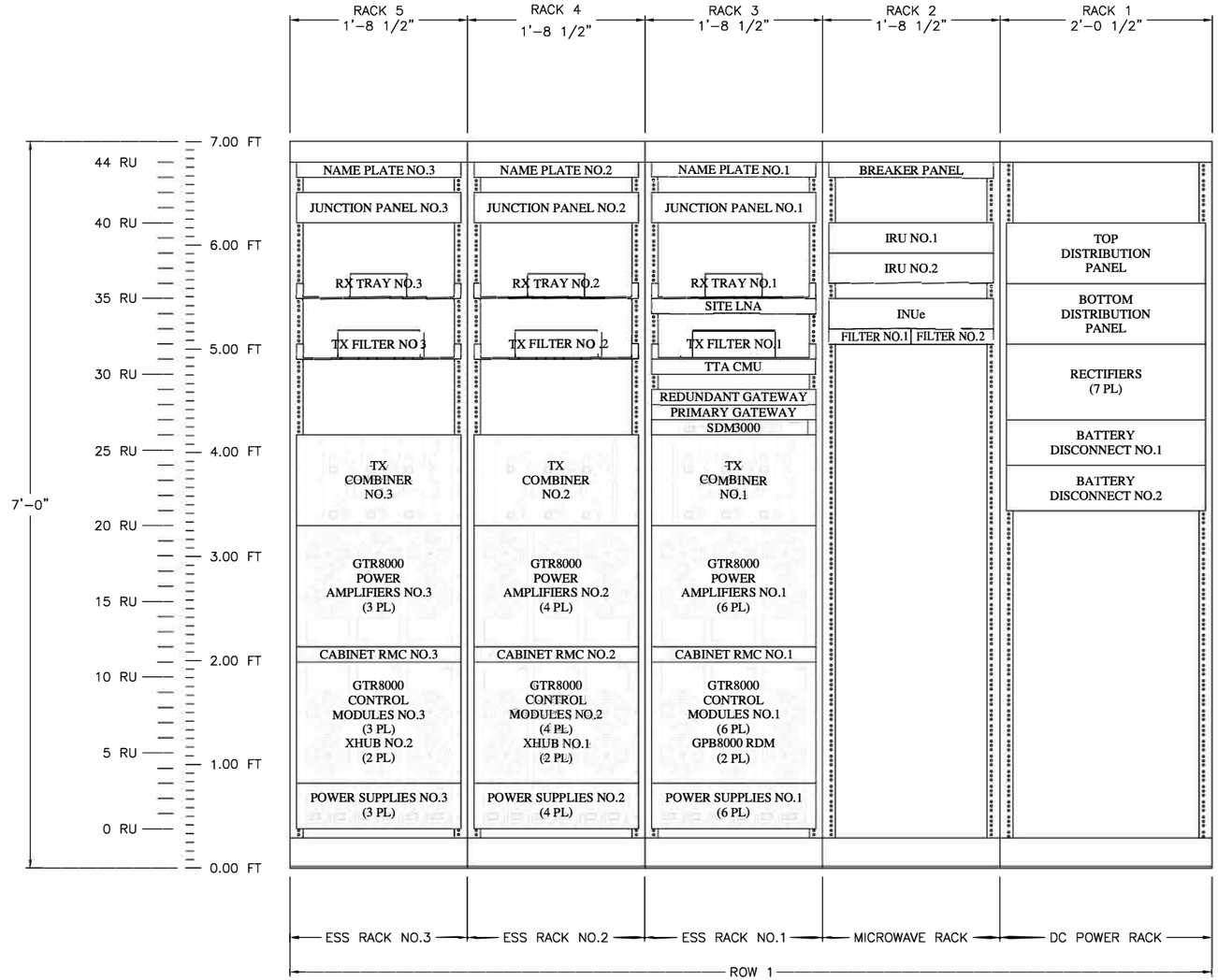
PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: DENVER FIRE DEPARTMENT STATION NO.2 SITE EQUIPMENT RACK FACE LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1-1/2"=1' / SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1 / REV:
FILE NAME: 0_DENV_DFD2_09_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:

NOTES:

1. REAR OF RACKS EQUIVALENT TO RACK FACE.



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MOTOROLA SOLUTIONS

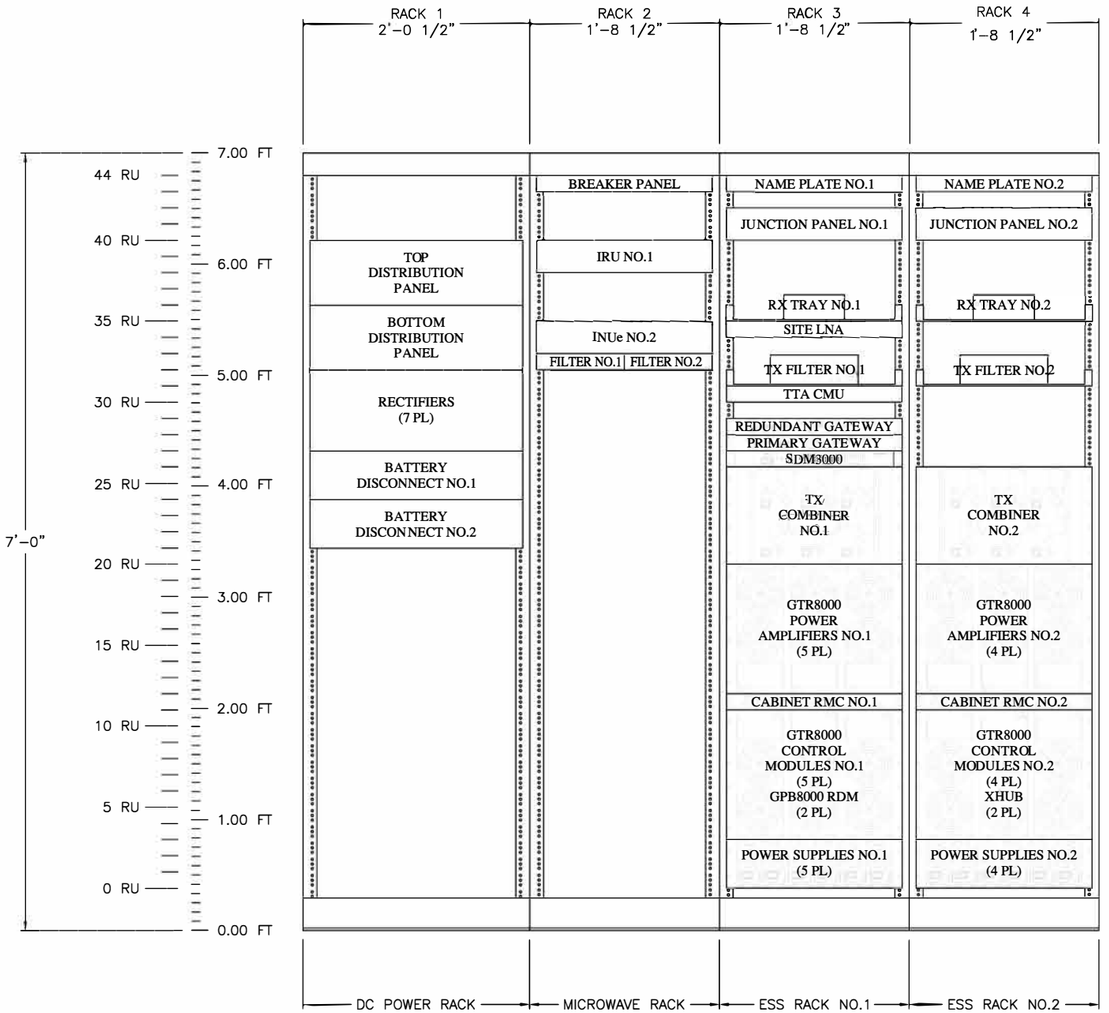
PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: MOUNTAIN TOWERS SITE
EQUIPMENT RACK FACE LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1-1/2"=1'	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: D_DENV_MT_09_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

NOTES:

1. REAR OF RACKS EQUIVALENT TO RACK FACE.



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MOTOROLA SOLUTIONS

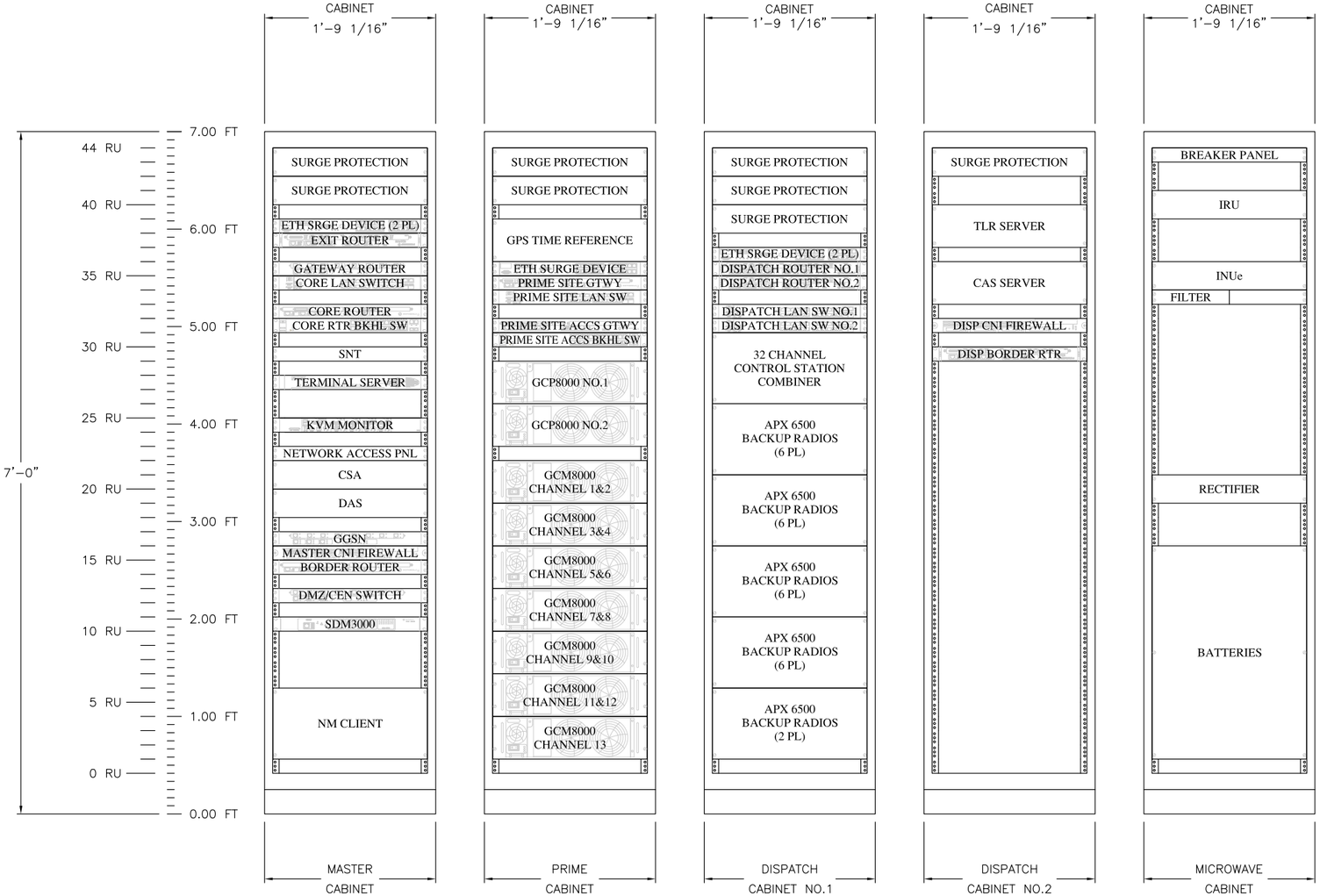
PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: MT. MORRISON (ASR) SITE
EQUIPMENT RACK FACE LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1-1/2"=1'	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_MTMR_09_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

NOTES:

1. REAR OF RACKS EQUIVALENT TO RACK FACE.



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MOTOROLA SOLUTIONS

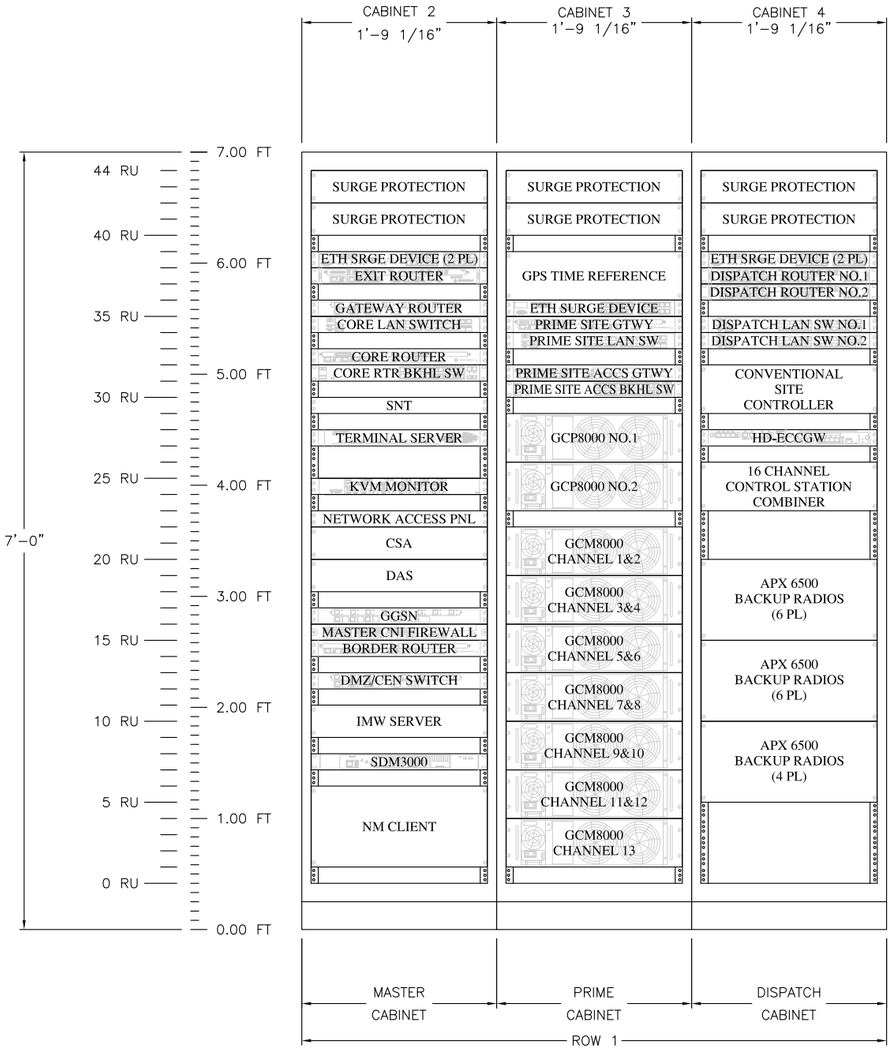
PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: PRIMARY DISPATCH SITE
EQUIPMENT RACK FACE LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1-1/2"=1'	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_PRI_09_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

NOTES:

1. REAR OF RACKS EQUIVALENT TO RACK FACE.



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MOTOROLA SOLUTIONS

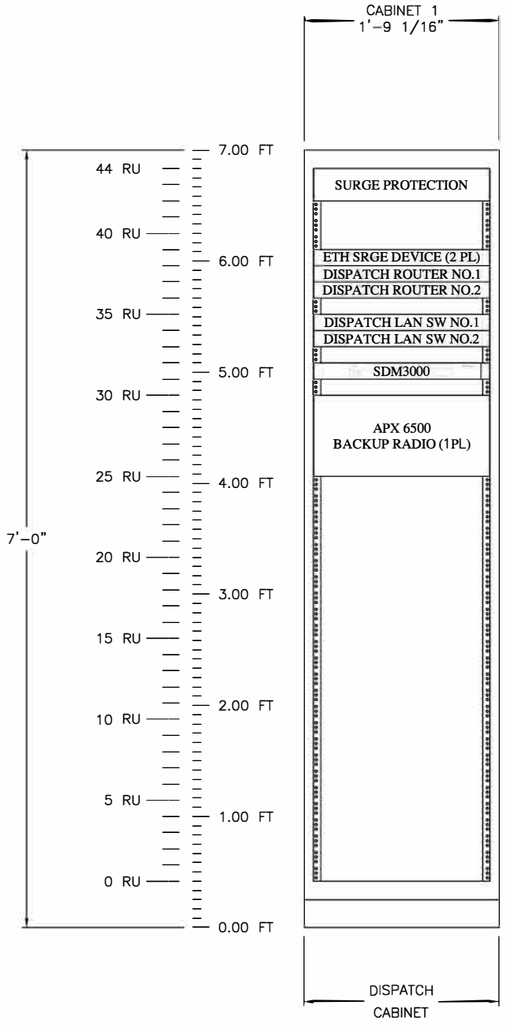
PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: 950 JOSEPHINE PRIME SITE
EQUIPMENT RACK FACE LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1-1/2"=1'	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_JOS_09_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

NOTES:

1. REAR OF RACKS EQUIVALENT TO RACK FACE.



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O	5-17-17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

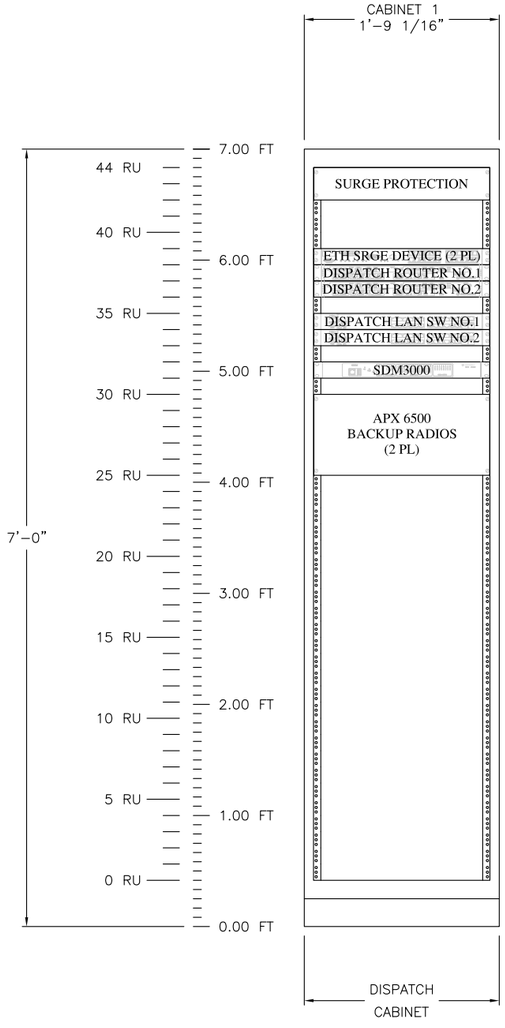
PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: DENVER CRIMINAL COURTS DISPATCH
EQUIPMENT RACK FACE LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1-1/2"=1'	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_DCC_09_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

NOTES:

1. REAR OF RACKS EQUIVALENT TO RACK FACE.



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MOTOROLA SOLUTIONS

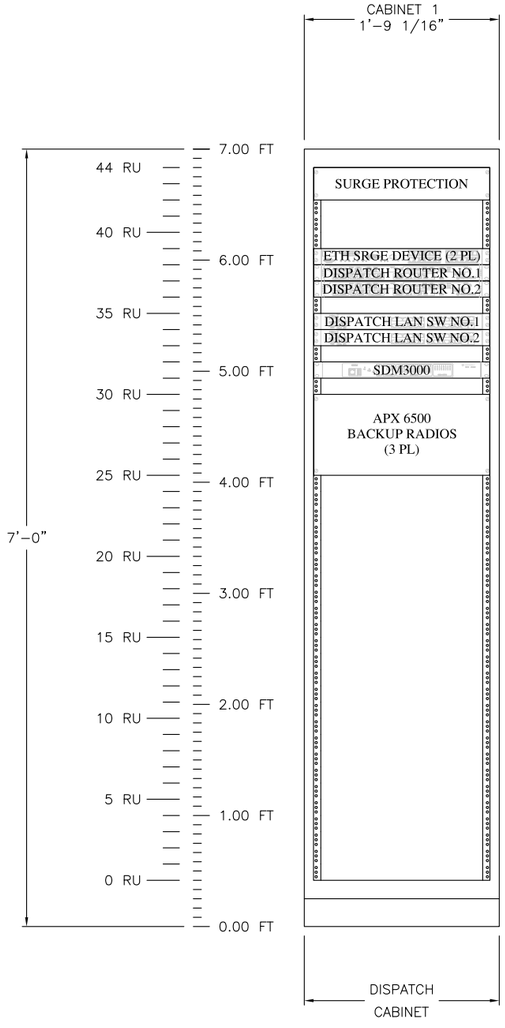
PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: SHERIFF'S DEPT. DETENTION DISPATCH CENTER SITE EQUIPMENT RACK FACE LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1-1/2"=1'	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_SDDC_09_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

NOTES:

1. REAR OF RACKS EQUIVALENT TO RACK FACE.



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MOTOROLA SOLUTIONS

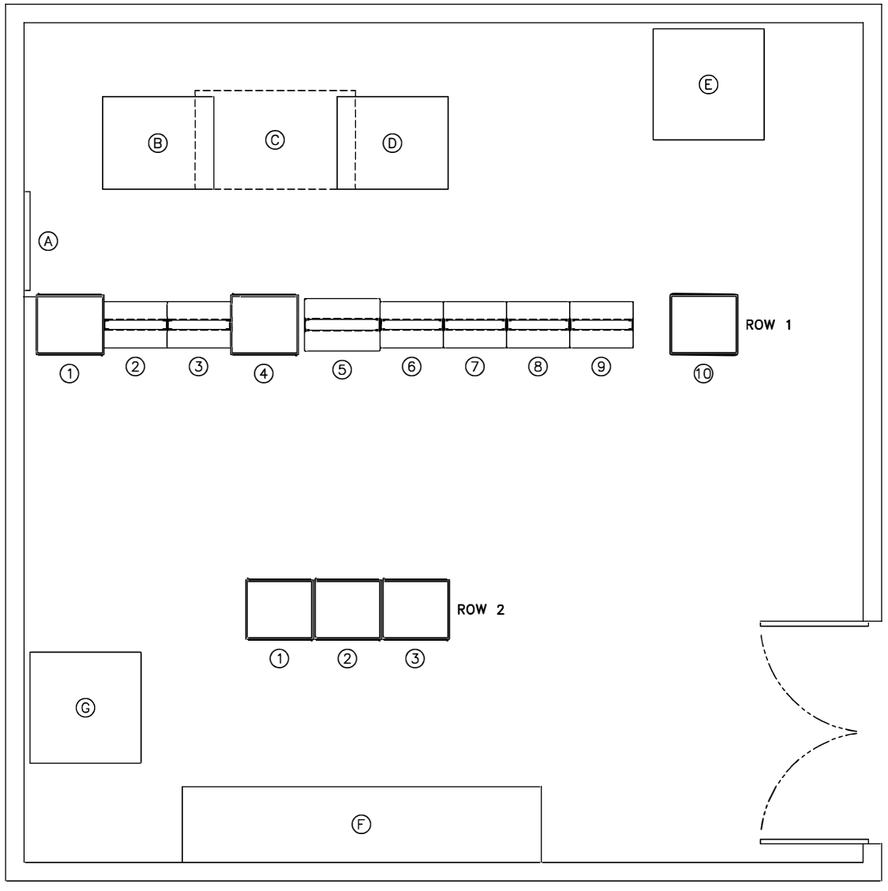
PROJECT:
CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE:
DENVER RIGHT OF WAY SERVICES DISPATCH CENTER SITE
EQUIPMENT RACK FACE LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1-1/2"=1'	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_DRWS_09_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

NOTES:

1. EQUIPMENT RACK NUMBERS ARE LOCATED ON THE FRONT SIDE OF EQUIPMENT.
2. NEW EQUIPMENT LOCATION REPRESENTS PLACEMENT AFTER DECOMMISION OF EXISTING.



EQUIPMENT ROOM EQUIPMENT LAYOUT – PLAN VIEW

SPACE ASSIGNMENTS

ROW	EQUIP SPACE	DESCRIPTION
1	1	EXISTING EQUIPMENT
	2	EXISTING EQUIPMENT
	3	EXISTING EQUIPMENT
	4	EXISTING EQUIPMENT
	5	DC RACK (NOTE 2)
	6	MICROWAVE RACK (NOTE 2)
	7	ESS RACK NO.1 (NOTE 2)
	8	ESS RACK NO.2 (NOTE 2)
	9	ESS RACK NO.3 (NOTE 2)
	10	EXISTING EQUIPMENT
2	1	EXISTING EQUIPMENT
	2	EXISTING EQUIPMENT
	3	EXISTING EQUIPMENT

LIST OF EQUIPMENT

ITEM	DESCRIPTION
A	TELCO BOARD
B	EXISTING BATTERIES
C	NEW BATTERIES
D	EXISTING BATTERIES
E	HVAC
F	ELECTRICAL
G	HVAC

REV NO:	DATE:	ENGR:	DESCRIPTION:
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MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: 1670 BROADWAY REMOTE SITE
EQUIPMENT ROOM EQUIPMENT LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1/2"=1'	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_BRW_06_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

NOTES:

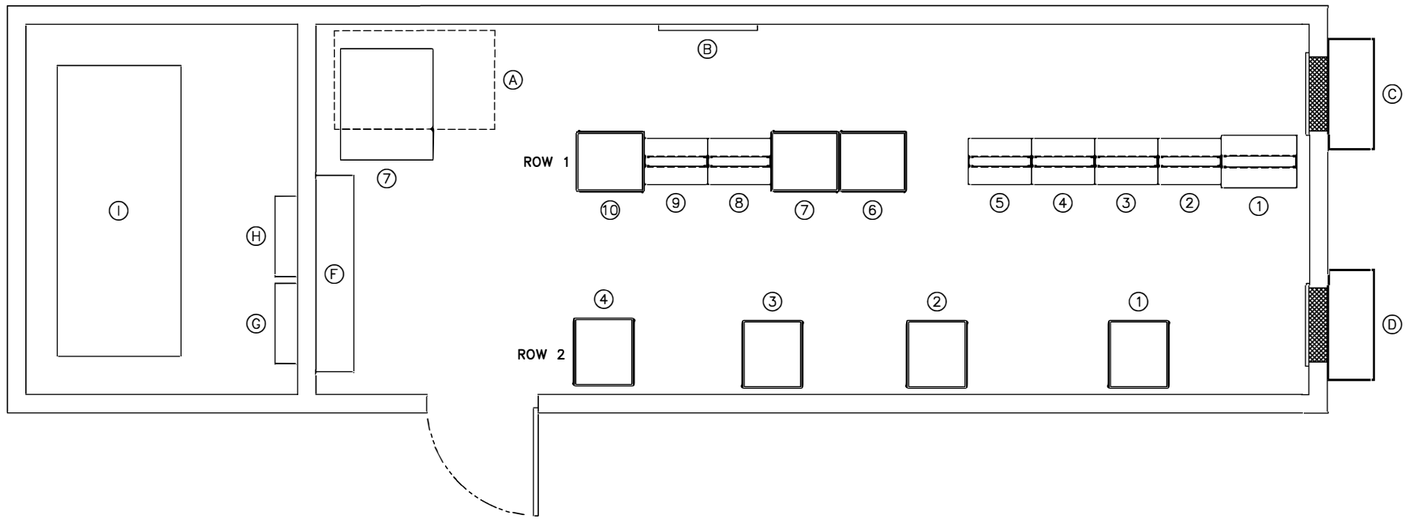
1. EQUIPMENT RACK NUMBERS ARE LOCATED ON THE FRONT SIDE OF EQUIPMENT.
2. NEW EQUIPMENT LOCATION REPRESENTS PLACEMENT AFTER DECOMMISION OF EXISTING.

SPACE ASSIGNMENTS

ROW	EQUIP SPACE	AGENCY/OCCUPANT
1	1	DC RACK (NOTE 2)
	2	MICROWAVE RACK (NOTE 2)
	3	ESS RACK NO.1 (NOTE 2)
	4	ESS RACK NO.2 (NOTE 2)
	5	ESS RACK NO.3 (NOTE 2)
	6	EXISTING EQUIPMENT
	7	EXISTING EQUIPMENT
	8	EXISTING EQUIPMENT
	9	EXISTING EQUIPMENT
	10	EXISTING EQUIPMENT
2	1	EXISTING EQUIPMENT
	2	EXISTING EQUIPMENT
	3	EXISTING EQUIPMENT
	4	EXISTING EQUIPMENT

LIST OF EQUIPMENT

ITEM	DESCRIPTION
A	NEW BATTERIES
B	TELCO BOARD
C	HVAC NO.1
D	HVAC NO.2
E	DESK
F	ELECTRICAL
G	MAIN
H	ATS
I	GENERATOR
J	EXISTING BATTERIES



EQUIPMENT ROOM EQUIPMENT LAYOUT – PLAN VIEW

REV NO:	DATE:	ENGR:	DESCRIPTION:
O	5-17-17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: DENVER HOUSING AUTHORITY SITE
EQUIPMENT ROOM EQUIPMENT LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1/2"=1'	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_DHA_06_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

NOTES:

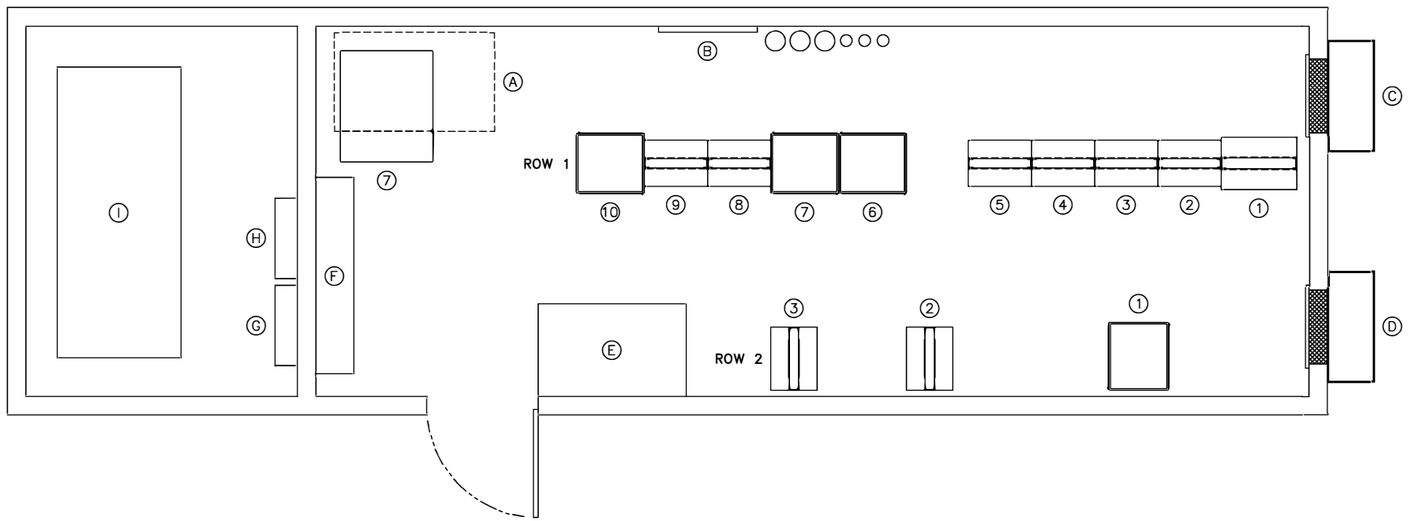
1. EQUIPMENT RACK NUMBERS ARE LOCATED ON THE FRONT SIDE OF EQUIPMENT.
2. NEW EQUIPMENT LOCATION REPRESENTS PLACEMENT AFTER DECOMMISION OF EXISTING.

SPACE ASSIGNMENTS

ROW	EQUIP SPACE	AGENCY/OCCUPANT
1	1	DC RACK (NOTE 2)
	2	MICROWAVE RACK (NOTE 2)
	3	ESS RACK NO.1 (NOTE 2)
	4	ESS RACK NO.2 (NOTE 2)
	5	ESS RACK NO.3 (NOTE 2)
	6	EXISTING EQUIPMENT
	7	EXISTING EQUIPMENT
	8	EXISTING EQUIPMENT
	9	EXISTING EQUIPMENT
	10	EXISTING EQUIPMENT
2	1	EXISTING EQUIPMENT
	2	EXISTING EQUIPMENT
	3	EXISTING EQUIPMENT

LIST OF EQUIPMENT

ITEM	DESCRIPTION
A	NEW BATTERIES
B	TELCO BOARD
C	HVAC NO.1
D	HVAC NO.2
E	DESK
F	ELECTRICAL
G	MAIN
H	ATS
I	GENERATOR
J	EXISTING BATTERIES



EQUIPMENT ROOM EQUIPMENT LAYOUT – PLAN VIEW

REV NO:	DATE:	ENGR:	DESCRIPTION:
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0	5-17-17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: DENVER FIRE DEPARTMENT STATION NO.2 SITE
EQUIPMENT ROOM EQUIPMENT LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1/2"=1'	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_DFD2_06_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

NOTES:

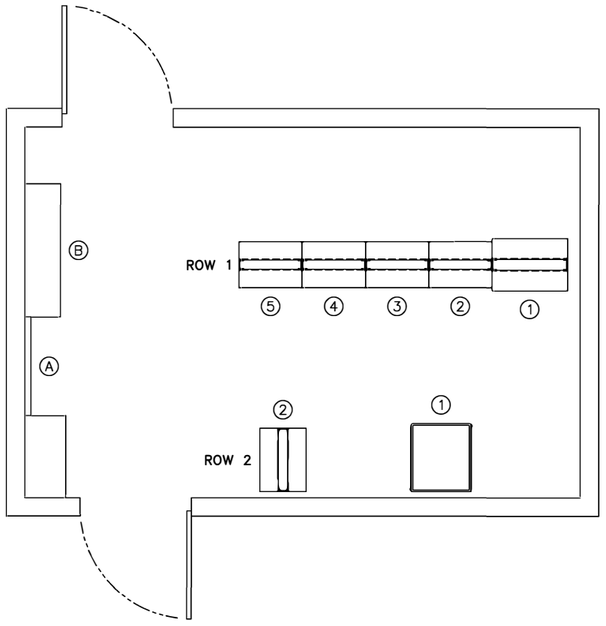
1. EQUIPMENT RACK NUMBERS ARE LOCATED ON THE FRONT SIDE OF EQUIPMENT.
2. NEW EQUIPMENT LOCATION REPRESENTS PLACEMENT AFTER DECOMMISION OF EXISTING.

SPACE ASSIGNMENTS

ROW	EQUIP SPACE	AGENCY/OCCUPANT
1	1	DC RACK (NOTE 2)
	2	MICROWAVE RACK (NOTE 2)
	3	ESS RACK NO.1
	4	ESS RACK NO.2
	5	ESS RACK NO.3
2	1	EXISTING EQUIPMENT
	2	EXISTING EQUIPMENT

LIST OF EQUIPMENT

ITEM	DESCRIPTION
A	TELCO BOARD
B	ELECTRICAL



EQUIPMENT ROOM EQUIPMENT LAYOUT – PLAN VIEW

REV NO:	DATE:	ENGR:	DESCRIPTION:
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MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: MOUNTAIN TOWERS SITE
EQUIPMENT ROOM EQUIPMENT LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1/2"=1'	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_MT_06_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

NOTES:

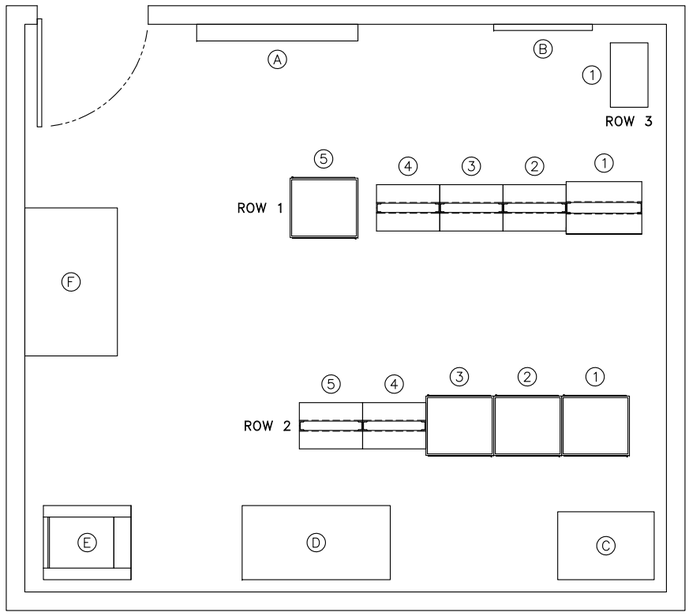
1. EQUIPMENT RACK NUMBERS ARE LOCATED ON THE FRONT SIDE OF EQUIPMENT.
2. NEW EQUIPMENT LOCATION REPRESENTS PLACEMENT AFTER DECOMMISION OF EXISTING.

SPACE ASSIGNMENTS

ROW	EQUIP SPACE	DESCRIPTION
1	1	DC RACK (NOTE 2)
	2	MICROWAVE RACK (NOTE 2)
	3	ESS RACK NO.1 (NOTE 2)
	4	ESS RACK NO.2 (NOTE 2)
	5	EXISTING EQUIPMENT
2	1	EXISTING EQUIPMENT
	2	EXISTING EQUIPMENT
	3	EXISTING EQUIPMENT
	4	EXISTING EQUIPMENT
	5	EXISTING EQUIPMENT
3	1	EXISTING EQUIPMENT

LIST OF EQUIPMENT

ITEM	DESCRIPTION
A	ELECTRICAL
B	TELCO BOARD
C	CABINET
D	BATTERIES
E	UPS
F	DESK



EQUIPMENT ROOM EQUIPMENT LAYOUT – PLAN VIEW

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0	5–17–17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: MT. MORRISON (ASR) SITE
EQUIPMENT ROOM EQUIPMENT LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1/2"=1'	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_MTMR_06_01	DATE: 5–17–17	PROJECT NUMBER: CO–16P148A	DRAWING NO:	

NOTES:

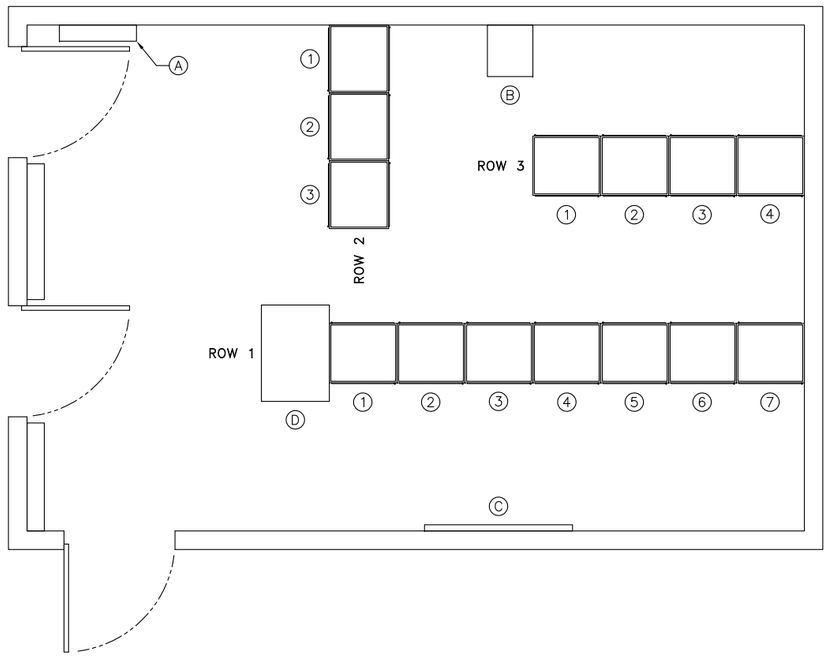
1. EQUIPMENT RACK NUMBERS ARE LOCATED ON THE FRONT SIDE OF EQUIPMENT.
2. NEW EQUIPMENT LOCATION REPRESENTS PLACEMENT AFTER DECOMMISION OF EXISTING.

SPACE ASSIGNMENTS

ROW	EQUIP SPACE	DESCRIPTION
1	1	EXISTING EQUIPMENT
	2	MASTER CABINET (NOTE 2)
	3	PRIME CABINET (NOTE 2)
	4	DISPATCH CABINET (NOTE 2)
	5	EXISTING EQUIPMENT
	6	EXISTING EQUIPMENT
	7	EXISTING EQUIPMENT
2	1	EXISTING EQUIPMENT
	2	EXISTING EQUIPMENT
	3	EXISTING EQUIPMENT
3	1	EXISTING EQUIPMENT
	2	EXISTING EQUIPMENT
	3	EXISTING EQUIPMENT
	4	EXISTING EQUIPMENT

LIST OF EQUIPMENT

ITEM	DESCRIPTION
A	AC PANEL
B	HVAC
C	TELCO BOARD
D	CABINET



EQUIPMENT ROOM EQUIPMENT LAYOUT – PLAN VIEW

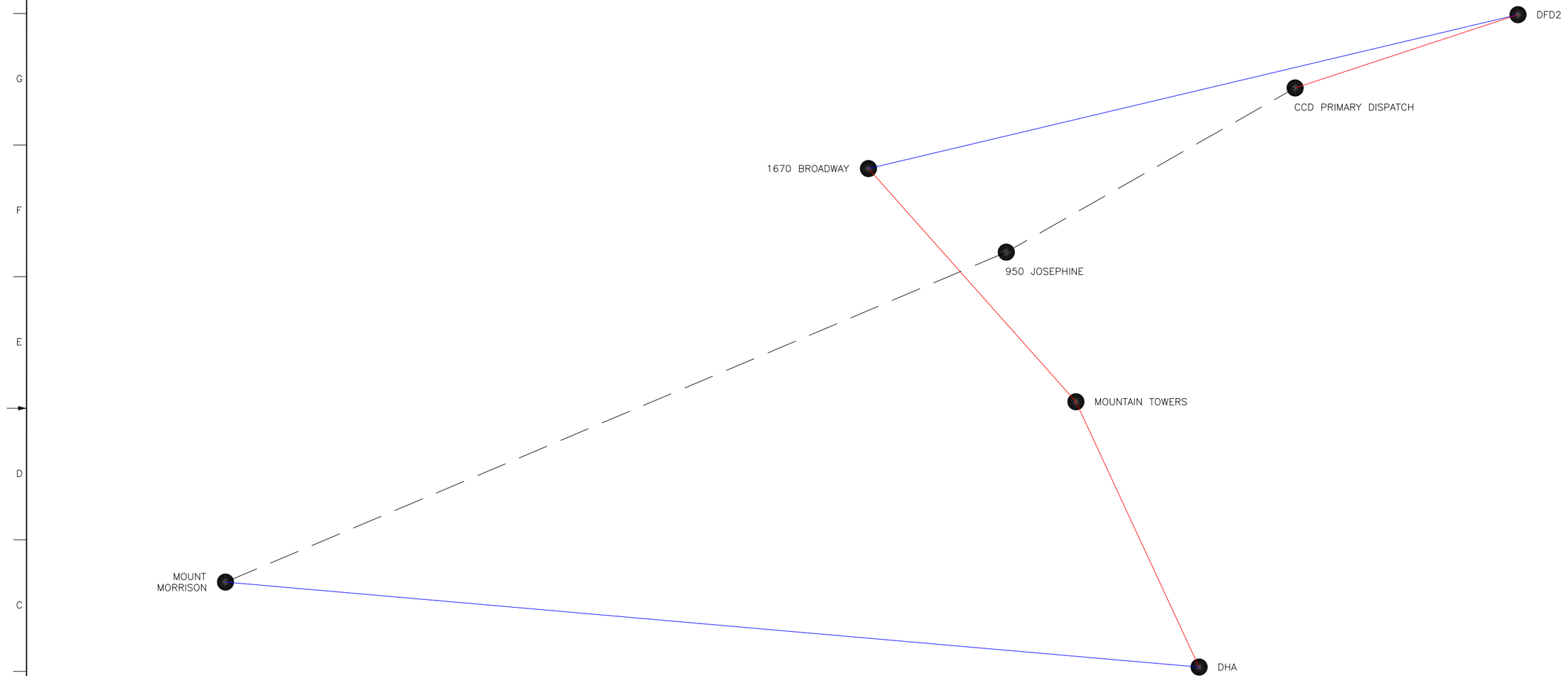
REV NO:	DATE:	ENGR:	DESCRIPTION:
O	5-17-17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

PROJECT: CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE: 950 JOSEPHINE PRIME SITE
EQUIPMENT ROOM EQUIPMENT LAYOUT

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: 1/2"=1'	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: I. CAMACHO	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
	FILE NAME: 0_DENV_JOS_06_01	DATE: 5-17-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:



LEGEND

- 6GHz
- 11GHz
- EXISTING

REV NO:	DATE:	ENGR:	DESCRIPTION:
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O	5-23-17	J.L.	ORIGINAL RELEASE

MOTOROLA SOLUTIONS

PROJECT:
CITY AND COUNTY OF DENVER RFP
ASTRO 25 RADIO SYSTEM

TITLE:
DENVER MICROWAVE SYSTEM MAP

CONTRACT:	ENGINEER: J. LYNCH	PROJECT MANAGER:	SCALE: NONE	SIZE: D
PROGRAM: AUTOCAD 2006	DRAWN: R. SALDARRIAGA	CHECKED: J. LYNCH	SHEET: 1 OF 1	REV:
FILE NAME: 0_DENV_SYS_16_01	DATE: 5-23-17	PROJECT NUMBER: CO-16P148A	DRAWING NO:	

2.1.2 RADIO COVERAGE ANALYSES AND RADIO COVERAGE MAPS

2.1.2.1 Introduction

The coverage solution described herein will provide a signal budget for penetration into 15dB, 18dB and 21dB buildings throughout the geography as depicted by the shaded areas in the figure below. Radio coverage inside will be at 95percent reliability for a Delivered Audio Quality of 3.4 using portable radios with a ½ or ¼ wave antenna operated at hip level using a belt clip. The channel modulation will primarily be APCO Phase II with Phase I operation also supported. All voice radio channels will switch between Phase I and Phase II operation dynamically without operator involvement. There will be seventeen voice channels (17) and one (1) control channel at each of five (5) simulcast remote sites within the simulcast cell. There will be eight voice channels (8) and one (1) control channel at the ASR site. The system will support thirty-two (32) simultaneous voice calls within the simulcast cell and sixteen (16) simultaneous voice calls within the ASR site when all calls occur in the TDMA mode. All voice channels in the system are equipped to process FDMA calls.

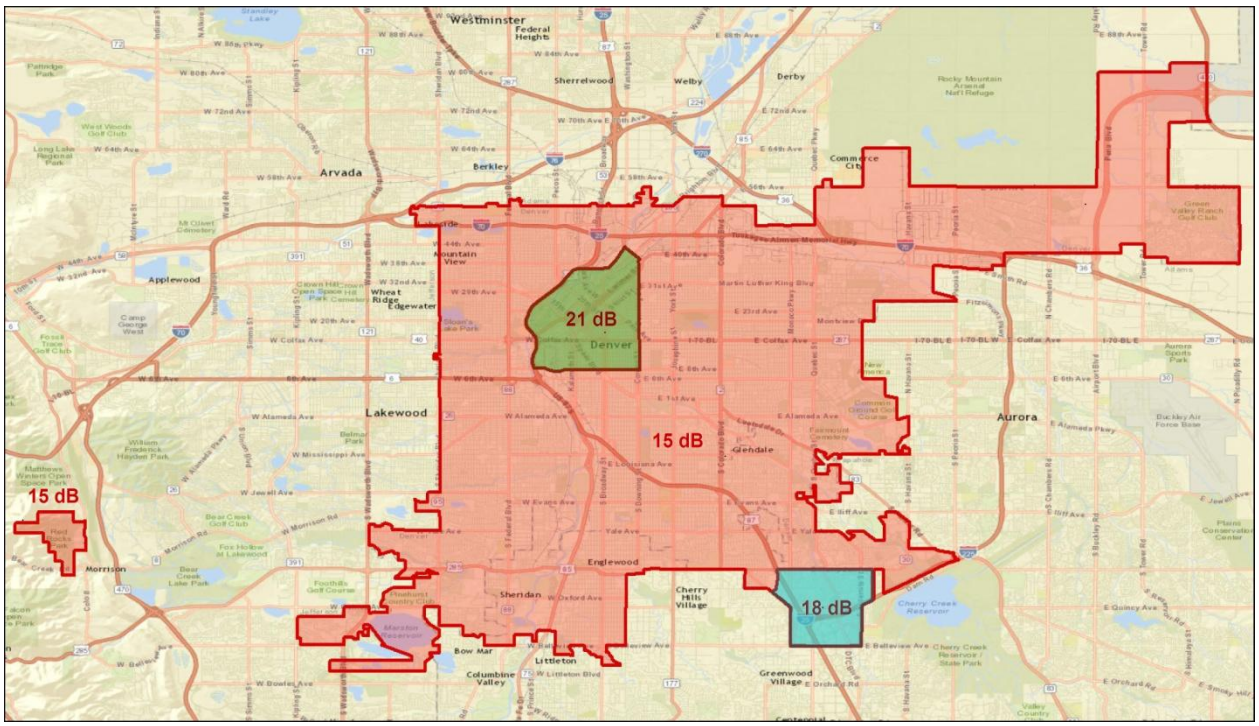


Figure 2-36: Building Losses

2.1.2.2 Coverage Solution Design

CCD has created a thorough and demanding specification. This RFP requires the chosen vendor to verify radio communications to a Delivered Audio Quality of 3.4 in 15dB buildings within the General Service Area, in 18dB buildings within the Tech Center area and in 21dB buildings within the Downtown area. Radio coverage is clearly of chief concern to CCD. Motorola has decades of experience in engineering and deployment of Public Safety radio systems of this critical nature. This work is our purpose, it is in our DNA. In short, it is what we do and we are happy to rise to this challenge.

Motorola understands that CCD has already made substantial investments in eight RF sites and would prefer to reuse these existing sites if possible. For this reason, coverage was modeled using the existing eight RF sites to determine a baseline. From the original baseline, it was determined that using all eight existing sites resulted in several sites providing a low contributing factor to the overall coverage. Through extensive modeling of site selection and antenna designs, Motorola has determined that we can meet and exceed CCD's coverage needs through the use of five of the existing eight sites; four configured as a simulcast cell to provide coverage to the CCD, City of Sheridan and City of Englewood geographic boundaries and a single ASR site to provide coverage for the Red Rocks Mountain Park area.

2.1.2.3 Hydra Description

In the development of any system design, the number of sites predicted to achieve the required coverage is dependent on the accuracy of the tool used to predict and guarantee coverage, and the assumptions made in the operation of those tools. Motorola's proprietary coverage design and prediction tool, Hydra, has been tested and proven in thousands of implemented systems.

To make guaranteed predictions regarding our design, Motorola used a modified propagation prediction model based on the Okumura prediction model. We have incorporated this model into Hydra, which we use to model coverage and voice traffic. Hydra is also used to analyze interference and plane channel re-use, and to perform other design tasks for Motorola's diverse and customized portfolio of radio networks.

2.1.2.3.1 Variables in Coverage Modeling

Hydra takes into account the many elements that must be considered to create an accurate picture of predicted radio coverage. System factors affecting coverage include: operating frequency, transmitter power, receiver sensitivity, antenna height, and antenna gain. Environmental factors vary according to the path taken by the radio signal and the area surrounding the receiver. These may include terrain variations, obstructions, vegetation, buildings, ambient noise, and interference.

All coverage prediction methods try to account for both system and environmental factors and incorporate them into a computational model. Currently accepted propagation models, such as Okumura, Longley-Rice, and TIA, provide excellent portrayals of radio coverage when used within their respective ranges of applicability.

This level of analysis was adequate for the radio systems available in the past. However, today's complex technologies, such as digital voice, packet data systems, and simulcast, require a much deeper analysis. It is necessary to select the appropriate coverage model, accurately represent the environmental factors throughout the service area, and then apply the coverage analysis method to a very high number of locations within the service area. The Hydra prediction tool does this.

2.1.2.3.2 Computational Techniques

Built on the knowledge gained from Motorola's many years of practical experience and coverage testing, Hydra provides a superior means for predicting system coverage. This program employs a technique of computing coverage on tiles throughout a service area rather than on points along radials. Coverage calculations computed on a tile-by-tile basis show a more accurate prediction of coverage than a prediction using the radial method. This is due to the fact that a program using radials results in data points that get further and further apart as distance from the transmitter increases.

Motorola is constantly searching to improve our coverage model predictions. An important step in this process is the incorporation of empirical data into the Hydra model. This process starts with lab

and real-world measurements of the performance of our subscribers and systems, along with the accessories available to the user. This constant improvement and testing is continued with each Coverage Acceptance Test Procedure (CATP) performed by our field teams for our customers. These CATP results are brought back to our coverage design team and analyzed against the predicted coverage from the Hydra tool. Leveraging the results of CATP test runs conducted each year allows Motorola to continue to assess and improve the accuracy of our predicted coverage models and guard against variances between predicted and measured coverage levels.

Inputs and Outputs

Inputs to Hydra's simulations include system architecture, equipment characteristics, service area boundaries, areas of various building losses, subscriber unit distribution density for Traffic analysis, etc. Hydra's coverage map outputs are created and displayed using ESRI's shapefiles, an industry-standard GIS file format. Shapefiles from many sources (GIS vendors, the Internet, your own GIS department, etc.) can be loaded, displayed, and used in Hydra to enhance mapping, and to define service area polygons. Hydra's coverage analyses can be limited to specified service area polygons (e.g., a county, a city, or a dispatch territory), so coverage reliability can be analyzed exclusively within the boundaries of your operating area. In addition to showing coverage reliability, Hydra maps can display terrain, land cover, roads and boundaries, signal field strength, and interference predictions.

Tile Method

Hydra uniformly divides the entire geographical area to be analyzed into small, distinct areas called tiles. The resolution (size) of the tiles can be as fine as one arc-second (approximately 100 feet at U.S. latitudes). At each tile, Hydra models propagation from each site in the system. The tile method is of particular importance in the calculation of simulcast coverage and interference analysis.

Radial methods determine performance only at the locations where radials from all sites cross, leaving many areas where coverage performance is not calculated. With the tile method, the information from every site and all datasets is available in every tile; this provides the most accurate results for Multi-site analyses (simulcast, voting, interference, best server, etc.).

Datasets

For propagation prediction, Hydra uses two types of geophysical datasets:

- Hypsographic (terrain elevations)—To determine shadow loss and elevation
- Morphological (land use)—For environmental clutter loss.

With the proper datasets, Hydra produces accurate results. Because propagation prediction accuracy is directly dependent on the quality of the digitized datasets, Motorola uses high-quality datasets for its analysis. These datasets originate from commercial or government sources such as the U.S. Geological Survey in the United States and equivalent geodata providers worldwide.

Even the best datasets contain a certain amount of errors, caused by a number of factors that are difficult to completely overcome due to the massive amount of data involved. Dataset errors can originate in the source information or in the dataset development process. Old datasets can also contribute to errors due to physical changes that have taken place since the development of the dataset.

Hydra, like all terrain-based propagation tools, provides coverage predictions that are only as accurate as the available datasets permit. In the U.S., Motorola uses high-quality terrain and land cover data derived from USGS 30-meter DEM and NLCD 2011 sources. Other datasets which Hydra can use include the following:

- Planimetric (Mapping)—Roads, water features, political boundaries, feature names, etc.
- U.S. Radio Site Locations—Coordinates of existing radio sites, including FCC Wireless Licenses, FCC Antenna Site Registry, and some commercial site providers.
- U.S. Frequencies—Potentially available channels in geographic areas, per FCC Wireless Licenses.

Coverage Reliability

Hydra predicts area reliability, defined as the probability of achieving a specified performance criterion within a geographical area of interest. The area of interest is either the covered area (the painted area on a Hydra coverage map), or the entire service area. Possible criteria include voice Delivered Audio Quality (DAQ), data throughput or data Message Success Rate (MSR).

Since system coverage can never be one-hundred percent reliable, there will always be particular times and locations where the signal strength or BER does not meet that needed to reach the performance criterion. These locations of unsatisfactory performance are often predictable in a coverage study. However, there are also areas of unsatisfactory coverage that cannot be predicted due to unknown circumstances such as unusual structures, tree density, ambient noise, atmospheric conditions, dataset errors, and interference from co-channel or adjacent channel units operating outside their normal service area. Because these conditions exist and signals fade due to these environmental and terrain factors, coverage must be described statistically in terms of a percentage of locations that exhibit the minimum acceptable criterion.

To provide radio systems with acceptably few communications failures throughout the Covered Area, Motorola designs coverage at high area reliabilities. It is also important to note that locations outside of a Hydra covered area map may still provide useable communications, even though such locations do not achieve the minimum acceptable reliability.

Voice Systems

Hydra's coverage models use proven Okumura-based prediction methods and Monte Carlo simulation techniques to provide coverage reliability maps. Voice coverage models in an ASTRO 25 system provide system wide coverage maps, as well as subsystem maps when applicable, (e.g., for simulcast cells and receiver voting), and individual site maps.

Simulcast Coverage Performance

For a simulcast system, merely providing coverage maps of individual sites (separately or on the same map) does not accurately represent the total system performance, which depends upon differential delays and aggregate signal levels. Therefore, Motorola has developed Hydra's simulcast model, which uses the delay spread methodology to simulate aggregate signal strength and audio phase angle (delay) throughout the entire predicted coverage area. All locations within the predicted coverage area are analyzed for the combined effect of signal strengths and differential delays from the simulcast transmitters in the system. Hydra's simulcast coverage maps will show any areas predicted to have coverage problems caused by out-of-phase signals and/or inadequate signal strengths. Hydra allows modeling with varied transmitter launch delays to predict optimized simulcast coverage within the area being evaluated.

2.1.2.4 Licensing Interference Compliance

During the coverage and frequency selection process, Motorola analyzed the existing licensing at the proposed sites and surrounding areas. Frequencies were analyzed based on adjacent and co-channel interference possibilities along with interference through intermodulation.

Motorola utilizes high performance RF distribution equipment in order to limit the possibilities and effects of interference. Provided filtering on the transmit and receive sides of the GTR8000 radios will limit the possibilities of the radios creating interference while transmitting and receiving interference during reception. PIM rated antenna system components limit intermodulation production. During implementation, if it is determined that the provided equipment is the cause of interference, Motorola will determine a resolution and rectify the situation.

Though not included within the proposal pricing, during implementation, Motorola can perform a paper EME study and include all proposed equipment for an additional charge. The paper EME study would calculate the RF exposure limits for a site based on proposed equipment.

2.1.2.5 Licensing Regulatory Compliance

Motorola's design meets tower height restrictions, as well as output and Effective Radiated Power (ERP) levels permitted by the Regional Planning Committee – Region 7 and FCC rules and regulations.

2.1.2.6 Coverage Failure Scenarios

During the process of developing our coverage design, our coverage engineers conducted various scenarios in order to identify the effect that each site has on the total coverage provided by the system. The proposed system delivers greater than 97.7percent coverage for portables using a ½ wave antenna and greater than 95.3percent coverage for portables using a ¼ wave antenna in buildings (building loss based on the designated geographical area) even if any one of the sites in the system is completely disabled for a portable radio operating at head level. In addition, users operating on the street will continue to transmit and receive at minimum 98.5percent service area reliability while continuing to utilize the radio on the hip, regardless of portable antenna type used.

In extreme situations, such as when an RF site is completely disabled, portable radio users can still achieve highly reliable in-building radio communications on the proposed system by simply removing the radio from their belt clip to transmit and receive. Likewise, highly reliable on street communications is maintained without any adjustments by the user. Motorola's robust design and superior simulcast technology provides this enhanced coverage in a site failure condition.

In order to show the robustness of the design under these failure scenarios, Motorola is providing the composite service area reliability for each scenario with a different RF site eliminated (for informational purposes). In each of these scenarios only five of the total six proposed sites are operating (four operational sites in the case of an outage at the Mount Morrison site as this site houses both the ASR site and simulcast receive only site). The composite service area reliability for each failure scenario is at least 97.7percent for a portable utilizing a ½ wave antenna and 95.3 for a portable utilizing a ¼ wave antenna within structures having a penetration loss based on the designated loss value for the geographic area in which the portable is located, as well as at least 98.5percent for a portable utilizing wither a ½ wave or ¼ wave antenna operating at the hip level while in use on the street.

The table below provides a list of the five scenarios and their corresponding composite service area reliability for a portable utilizing a ½ wave or ¼ wave antenna operating at head level within structures having a penetration loss of up to 21/18/15 dB and composite service area reliability for a portable utilizing a ½ wave or ¼ wave antenna transmitting at hip level while in use on the street. Direction indicated is worse case direction for each scenario.

Table 2-24: Failure Scenarios Showing the Loss of a Single Site and Corresponding Service Area Reliability

Site Turned Off	In Building Composite Service Area Reliability Percent Head Level		On Street Reliability Percent Hip Level	
	½ Wave	¼ Wave	½ Wave	¼ Wave
1670 Broadway	98.5percent Outbound	96.9percent Outbound	99.2percent Outbound	99.1percent Outbound
Denver Housing Authority	98.9percent Outbound	98.2percent Outbound	99.2percent Outbound	99.1percent Outbound
DFD Station 2	97.8percent Inbound	95.3percent Inbound	99.1percent Inbound	98.6percent Inbound
Mountain Towers	98.9percent Outbound	98.1percent Outbound	99.2percent Outbound	99.1percent Outbound
Mount Morrison	97.7percent Inbound	96.1percent Inbound	98.7percent Outbound	98.5percent Outbound

2.1.2.7 Coverage Maps Provided as Part of Our Proposal

CCD's RFP requires vendors to provide several different types of maps. This section describes the reliability and signal field strength maps that Motorola has provided to satisfy the RFP's requirement.

Coverage Maps

As per the RFP, maps have been included for both talk out and talk in. Each map displays the coverage footprint, coverage areas (the Coverage Area, the Downtown Coverage Area and the Denver Tech Center Coverage Area), major roads, bodies of water and other relevant landmarks as requested. Each of the portable maps was modeled with the portable radio (radio and antenna) at belt level at 3.3 feet AGL using a belt clip and a ½ wave antenna. The maps were generated using a tile resolution of one arc-second.

The following coverage maps have been provided for the overall system as a whole:

- Inbound portable coverage with portable at hip level in a belt clip using a RSM, DAQ 3.4.
- Outbound portable coverage with portable at hip level in a belt clip using a RSM, DAQ 3.4.
- Inbound mobile coverage, DAQ 3.4.
- Outbound mobile coverage, DAQ 3.4.
- 40 dBu regulatory contours.

Coverage Parameters Used in the Preparation of Included Maps

In any coverage design, the parameters used in the coverage model are crucial to the accuracy of the predicted radio system coverage. Motorola's coverage engineers modeled our solution's coverage on the performance characteristics of the proposed equipment, along with the proposed equipment

settings. The coverage model parameters for power, gains and losses are provided in the following tables.

Table 2-25: System Transmit Coverage Parameters

Site	TX Power Including Combiner Loss	TX Line Loss	TX Antenna Model	TX Antenna Gain	ERP	TX Antenna Height	TX Antenna Azimuth	Number of TX Antennas
1670 Broadway	40 W	2.0 dB	Sinclair: SC476-HF1LDF	6.5 dBd	113 W	480 ft	0	2
Denver Housing Authority	40 W	3.1 dB	Sinclair: SC476-HF1LDF	6.5 dBd	88 W	110 ft	0	2
DFD Station 2	40 W	2.7 dB	Sinclair: SC476-HF1LDF	6.5 dBd	96 W	100 ft	0	2
Mountain Towers	40 W	2.1 dB	Sinclair: SC476-HF1LDF	6.5 dBd	111 W	310 ft	0	2
Mount Morrison	40 W	4.3 dB	RFS: BMR8-A (6DT)	7.7 dBd	88 W	145 ft	130	1

Table 2-26: System Receive Coverage Parameters

Site	Receiver Sensitivity	TTA Gain	Total TTA Attenuation Including Line Loss	RX Antenna Model	RX Antenna Gain	RX Antenna Height	RX Antenna Azimuth	Number of RX Antennas
1670 Broadway	-116.5 dBm	23 dB	8 dB	Sinclair: SC412-HF2LDF	11.5 dBd	480 ft	0	2
Denver Housing Authority	-116.5 dBm	23 dB	8 dB	Sinclair: SC412-HF2LDF	11.5 dBd	110 ft	0	2
DFD Station 2	-116.5 dBm	23 dB	8 dB	Sinclair: SC412-HF2LDF	11.5 dBd	100 ft	0	2
Mountain Towers	-116.5 dBm	23 dB	8 dB	Sinclair: SC412-HF2LDF	11.5 dBd	310 ft	0	2
Mount Morrison	-116.5 dBm	23 dB	13 dB	RFS: BMR8-A (6DT)	7.7 dBd	165 ft	130	2

Table 2-27: Fielded Unit System Parameters

800 MHz, 4 Site Linear Simulcast and 1 ASR, TDMA	Portable Coverage Design
Coverage Prediction Model	Hydra

800 MHz, 4 Site Linear Simulcast and 1 ASR, TDMA	Portable Coverage Design
Propagation Model	Okumura 1.0
Reliability Goal	95percent Service Area Reliability
Environmental Database	NLCD—National Land Cover dataset 2011, 30m
Terrain Database	Ultra Hi Res-WGS84
Map Data	TIGERS 2015 and GIS Data from ESRI, Inc
Map Tile Resolution	1-arc second
Audio Quality	DAQ 3.4
Modulation	Digital—Project 25 Phase II TDMA
Frequency Band	800 MHz
Field Unit	**Portable**
Portable Transmit Power	3 Watts
Portable Antenna Type	¼ - wave
Portable Antenna Gain	-14.3 dB
Portable Antenna Height	On-Hip (3.3 ft AGL)
Portable ERP	0.11 W
Antenna and Body Loss	14.3 dB
Portable Receiver Sensitivity	-109.85 dBm
Field Unit	**Mobile**
Mobile Transmit Power	15 Watts
Mobile Antenna Type	¼ - wave
Mobile Antenna Gain	-1.0 dB
Mobile Antenna Height	Roof Center (4.92 ft AGL)
Mobile Line Loss	2.2 dB
Mobile ERP	7.2 W
Mobile Receiver Sensitivity	-112.36 dBm

The tables below provide further detail pertaining to the parameters used for each RF site included within the simulcast design.

Table 2-28: Detailed Site Parameters

Site Name	1670 Broadway	Group Name	CCD Simul	Simulcast/Voting	TRUE
General		Transmit		Receive	
Latitude	39°44’34.4” N	ERP	50.52 dBm	Antenna	SC412-HF2LDF(D00)
Longitude	104°59’12.2” W	Antenna	SC476-HF1LDF(D00)	Antenna Gain	11.5 dBm
Elevation Used	5239.5 feet	Antenna Gain	6.5 dBm	Antenna Height	480 feet

Site Name	1670 Broadway	Group Name	CCD Simul	Simulcast/Voting	TRUE
HAAT	315.97 feet	Antenna Height	480 feet	Antenna Azimuth	0 deg
		Antenna Azimuth	0 deg	Antenna Mech Downtilt	0 deg
		Antenna Mech Downtilt	0 deg	Use Tower Top Amp (TTA)	YES
		Total Tx to Ant Loss	2 dB	Antenna to TTA Loss	1.1 dB
		RF Power	46.02 dBm	TTA Gain	23 dB
		Launch Delay	40 usec	TTA Noise Figure	2.7 dB
				Modulation	ASTRO_H-CPM_AMBE+2_EHR
				Radio Faded Sensitivity	-106.8 dBm
				Radio Reference Sensitivity	-116.5 dBm
				Sensitivity Degradation	2 dBm

Site Name	DHA	Group Name	CCD Simul	Simulcast/Voting	TRUE
General		Transmit		Receive	
Latitude	39°38’18” N	ERP	49.42 dBm	Antenna	SC412-HF2LDF(D00)
Longitude	104°53’59.9” W	Antenna	SC476-HF1LDF(D00)	Antenna Gain	11.5 dBm
Elevation Used	5587.27 feet	Antenna Gain	6.5 dBm	Antenna Height	110 feet
HAAT	228.11 feet	Antenna Height	110 feet	Antenna Azimuth	0 deg
		Antenna Azimuth	0 deg	Antenna Mech Downtilt	0 deg
		Antenna Mech Downtilt	0 deg	Use Tower Top Amp (TTA)	YES
		Total Tx to Ant Loss	3.1 dB	Antenna to TTA Loss	1.1 dB
		RF Power	46.02 dBm	TTA Gain	23 dB
		Launch Delay	35 usec	TTA Noise Figure	2.7 dB
				Modulation	ASTRO_H-CPM_AMBE+2_EHR

Site Name	DHA	Group Name	CCD Simul	Simulcast/Voting	TRUE
				Radio Faded Sensitivity	-106.8 dBm
				Radio Reference Sensitivity	-116.5 dBm
				Sensitivity Degradation	0 dBm

Site Name	DFD Station 2	Group Name	CCD Simul	Simulcast/Voting	TRUE
General		Transmit		Receive	
Latitude	39°47’29.7” N	ERP	49.82 dBm	Antenna	SC412-HF2LDF(D00)
Longitude	104°47’42.8” W	Antenna	SC476-HF1LDF(D00)	Antenna Gain	11.5 dBm
Elevation Used	5337.92 feet	Antenna Gain	6.5 dBm	Antenna Height	100 feet
HAAT	63.91 feet	Antenna Height	100 feet	Antenna Azimuth	0 deg
		Antenna Azimuth	0 deg	Antenna Mech Downtilt	0 deg
		Antenna Mech Downtilt	0 deg	Use Tower Top Amp (TTA)	YES
		Total Tx to Ant Loss	2.7 dB	Antenna to TTA Loss	1.1 dB
		RF Power	46.02 dBm	TTA Gain	23 dB
		Launch Delay	65 usec	TTA Noise Figure	2.7 dB
				Modulation	ASTRO_H-CPM_AMBE+2_EHR
				Radio Faded Sensitivity	-106.8 dBm
				Radio Reference Sensitivity	-116.5 dBm
				Sensitivity Degradation	0 dBm

Site Name	Mountain Towers	Group Name	CCD Simul	Simulcast/Voting	TRUE
General		Transmit		Receive	
Latitude	39°41’45.07” N	ERP	50.42 dBm	Antenna	SC412-HF2LDF(D00)

Site Name	Mountain Towers	Group Name	CCD Simul	Simulcast/Voting	TRUE
Longitude	104°56’20.01” W	Antenna	SC476-HF1LDF(D00)	Antenna Gain	11.5 dBm
Elevation Used	5413.38 feet	Antenna Gain	6.5 dBm	Antenna Height	310 feet
HAAT	313.28 feet	Antenna Height	310 feet	Antenna Azimuth	0 deg
		Antenna Azimuth	0 deg	Antenna Mech Downtilt	0 deg
		Antenna Mech Downtilt	0 deg	Use Tower Top Amp (TTA)	YES
		Total Tx to Ant Loss	2.1 dB	Antenna to TTA Loss	1.1 dB
		RF Power	46.02 dBm	TTA Gain	23 dB
		Launch Delay	35 usec	TTA Noise Figure	2.7 dB
				Modulation	ASTRO_H-CPM_AMBE+2_EHR
				Radio Faded Sensitivity	-106.8 dBm
				Radio Reference Sensitivity	-116.5 dBm
				Sensitivity Degradation	2 dBm

Site Name	Mount Morrison	Group Name	ASR	Simulcast/Voting	FALSE
General		Transmit		Receive	
Latitude	39°40’17.51” N	ERP	49.42 dBm	Antenna	bmr8-a_t6_bmr8-a
Longitude	105°13’7.81” W	Antenna	bmr8-a_t6_bmr8-a	Antenna Gain	7.7 dBm
Elevation Used	7683.72 feet	Antenna Gain	7.7 dBm	Antenna Height	165 feet
HAAT	2021.65 feet	Antenna Height	145 feet	Antenna Azimuth	130 deg
		Antenna Azimuth	130 deg	Antenna Mech Downtilt	0 deg
		Antenna Mech Downtilt	0 deg	Use Tower Top Amp (TTA)	YES
		Total Tx to Ant Loss	4.3 dB	Antenna to TTA Loss	1.1 dB

Site Name	Mount Morrison	Group Name	ASR	Simulcast/Voting	FALSE
		RF Power	46.02 dBm	TTA Gain	23 dB
		Launch Delay	0 usec	TTA Noise Figure	2.7 dB
				Modulation	ASTRO_H-CPM_AMBE+2_EHR
				Radio Faded Sensitivity	-106.8 dBm
				Radio Reference Sensitivity	-116.5 dBm
				Sensitivity Degradation	0 dBm

Coverage Map Summary

An index of the maps provided in our proposal is located in the table below. The map number corresponds to the first two numbers in the map file name.

Table 2-29: List of Coverage Maps Provided with Motorola's Proposal

Map #	Map Description
1	System Wide: Outbound portable coverage reliability, portable at hip level, DAQ 3.4.
2	System Wide: Inbound portable coverage reliability, portable at hip level, DAQ 3.4.
3	System Wide: Outbound mobile coverage reliability, DAQ 3.4.
4	System Wide: Inbound mobile coverage reliability, DAQ 3.4.
5	1670 Broadway Simulcast Remote Site: 40dBu regulatory contour.
6	Denver Housing Authority Simulcast Remote Site: 40dBu regulatory contour.
7	DFD Station 2 Simulcast Remote Site: 40dBu regulatory contour.
8	Mountain Towers Simulcast Remote Site: 40dBu regulatory contour.
9	Mount Morrison ASR Site: 40dBu regulatory contour.

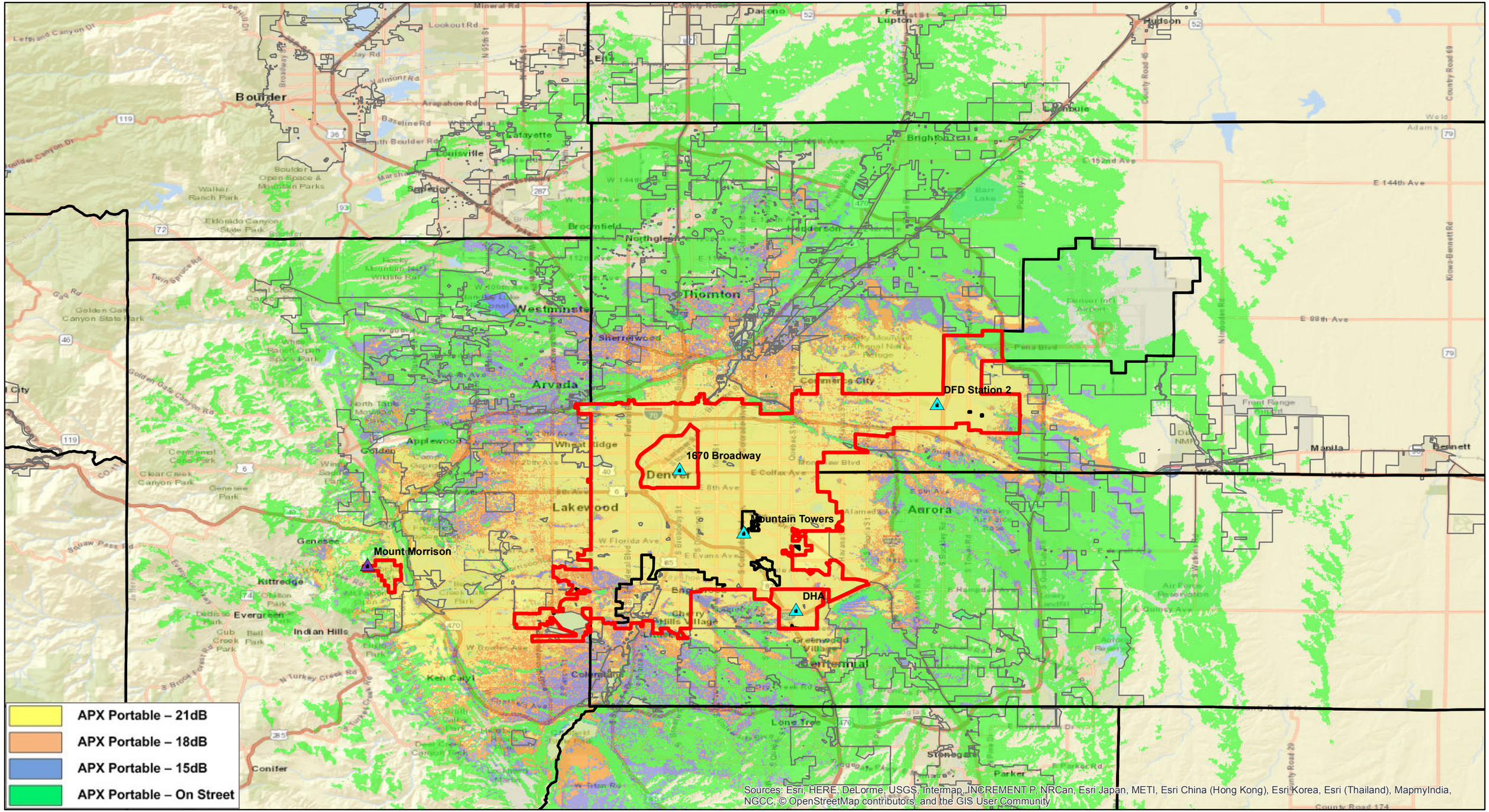
2.1.2.7.1 Coverage Maps

Coverage Maps are included on the pages that follow.

City and County of Denver, Colorado

MOTOROLA

Project 25 Phase 2 Trunked 800MHz Communications System
Portable with 1/4 Wave Antenna Outbound Reliability at DAQ 3.4



APX Portable – 21dB
APX Portable – 18dB
APX Portable – 15dB
APX Portable – On Street

0 2.75 5.5 11 Miles

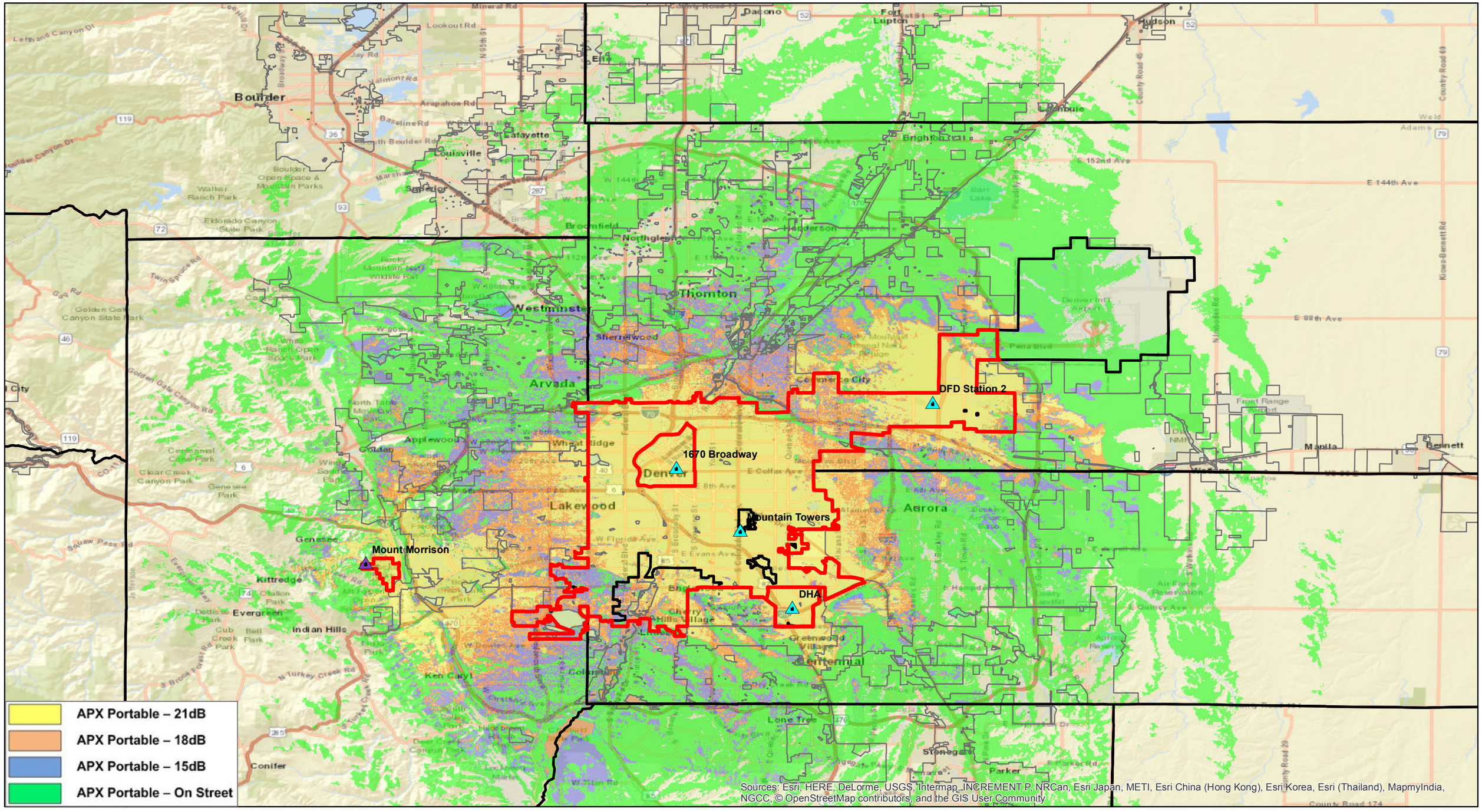
1 inch = 4.61 miles

APX Portable, 3W, Worn at Hip (3.3ft) using Belt Clip and RSM
Diversity Receive All Sites

City and County of Denver, Colorado

MOTOROLA

Project 25 Phase 2 Trunked 800MHz Communications System
Portable with 1/4 Wave Antenna Inbound Reliability at DAQ 3.4



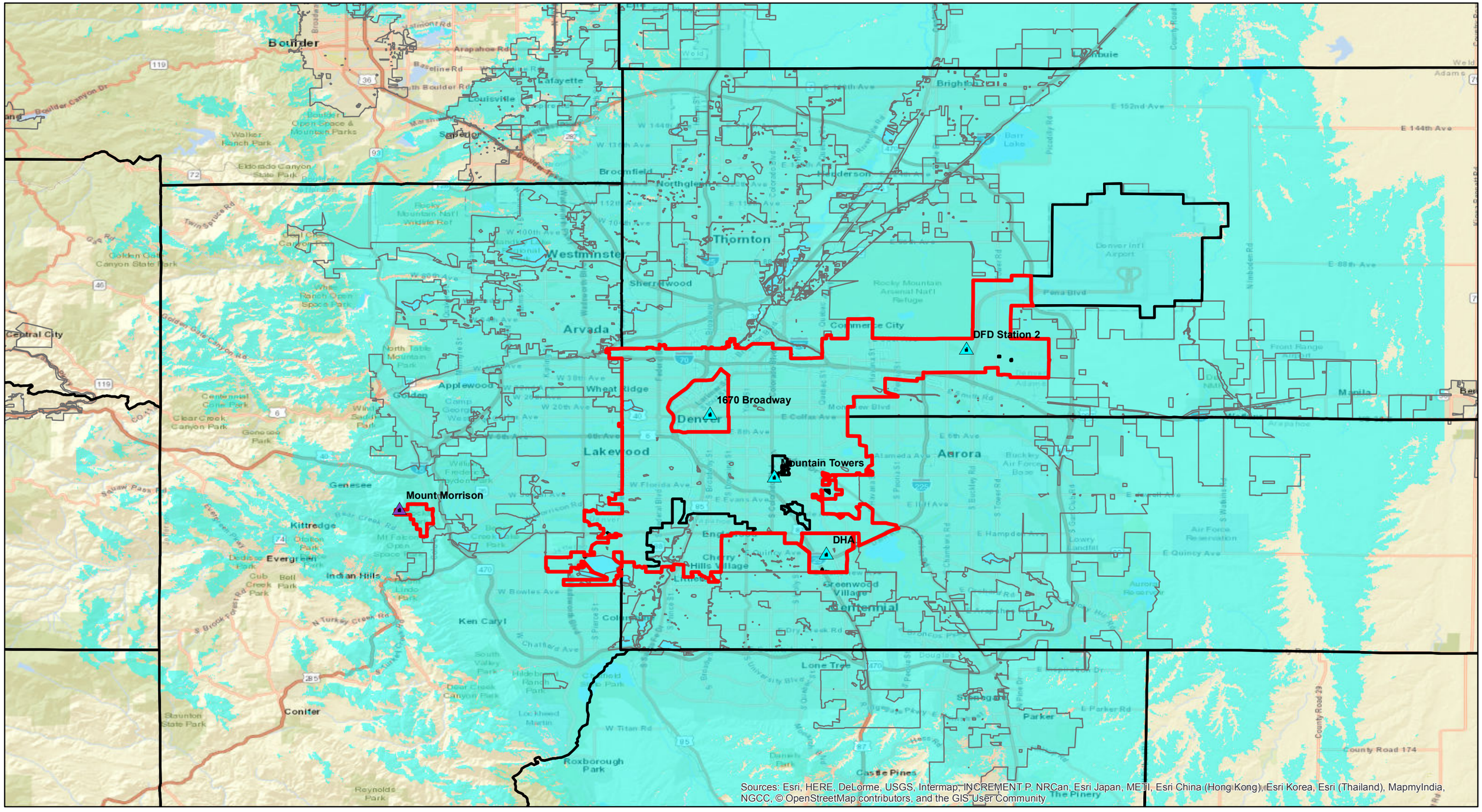
0 2.75 5.5 11 Miles

1 inch = 4.61 miles

APX Portable, 3W, Worn at Hip (3.3ft) using Belt Clip and RSM
Diversity Receive All Sites

City and County of Denver, Colorado

Project 25 Phase 2 Trunked 800MHz Communications System
Mobile Outbound Reliability at DAQ 3.4



0 2.75 5.5 11 Miles

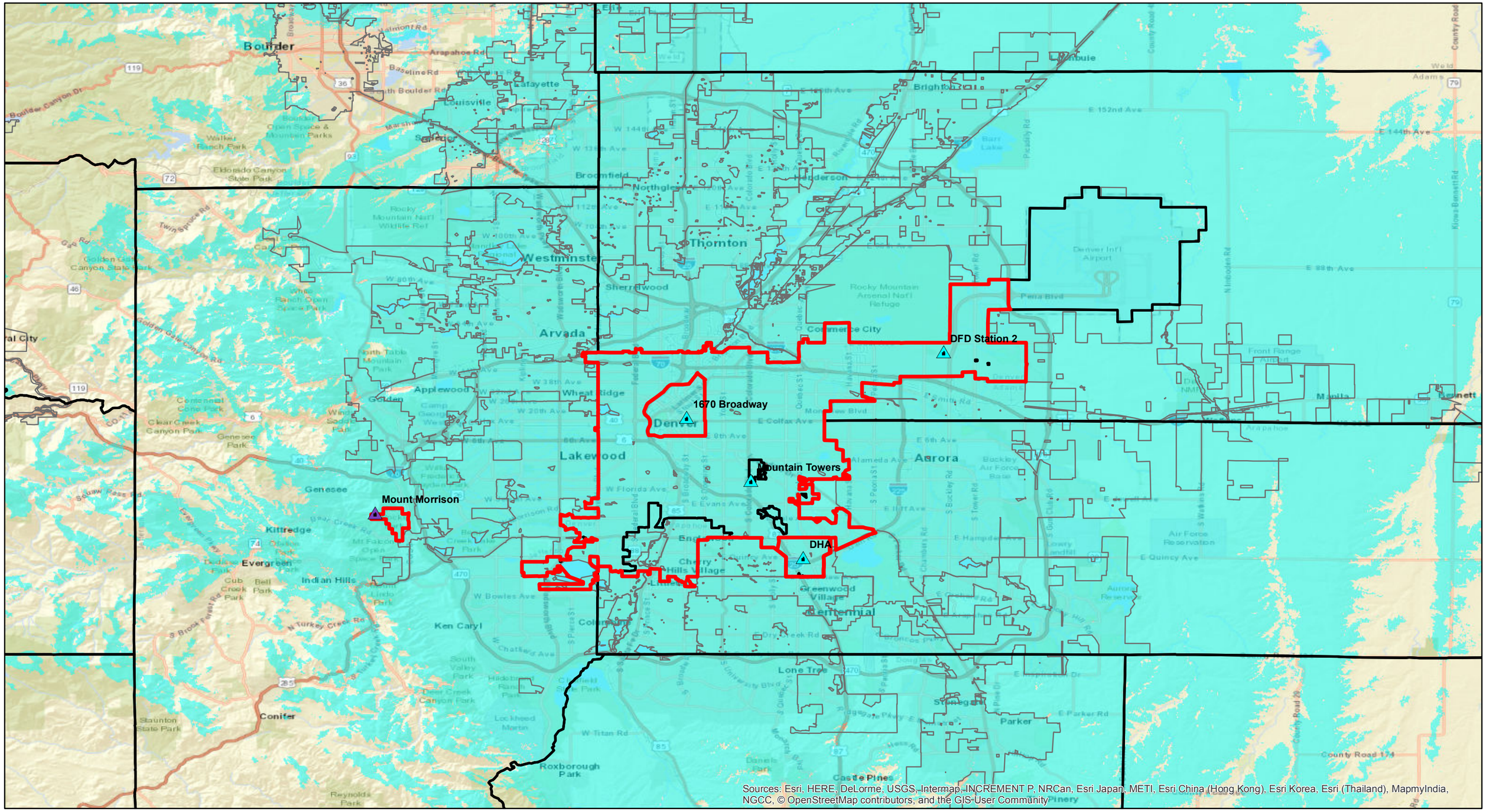
1 inch = 4.61 miles

APX Mobile, 15W, 1/4 Center Roof Mount Antenna

City and County of Denver, Colorado

MOTOROLA

Project 25 Phase 2 Trunked 800MHz Communications System
Mobile Inbound Reliability at DAQ 3.4



0 2.75 5.5 11 Miles

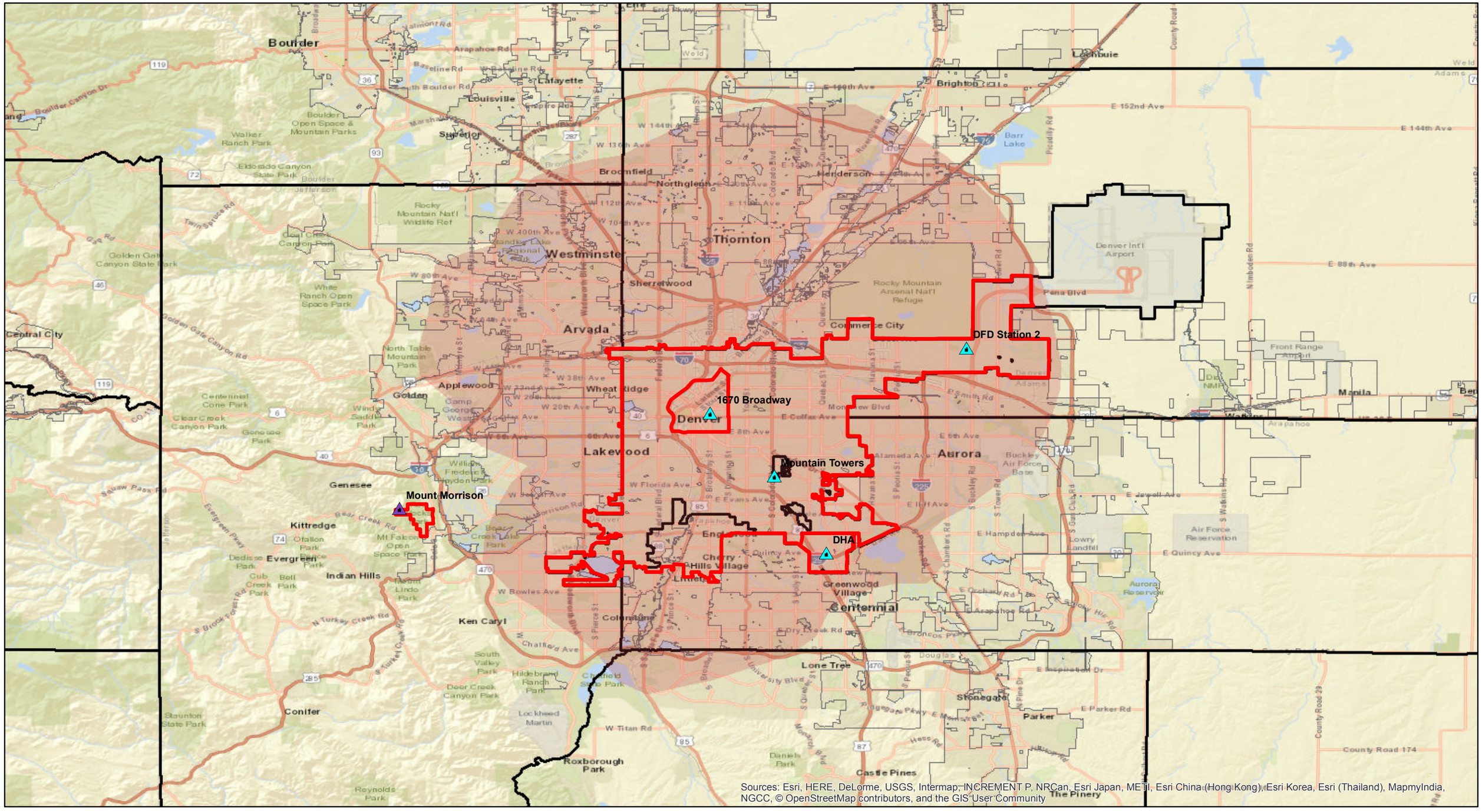
1 inch = 4.61 miles

APX Mobile, 15W, 1/4 Wave Center Mount Antenna
Diversity Receive All Sites

MOTOROLA

City and County of Denver, Colorado

Project 25 Phase 2 Trunked 800MHz Communications System
40dBu Regulatory Contour



0 2.75 5.5 11 Miles

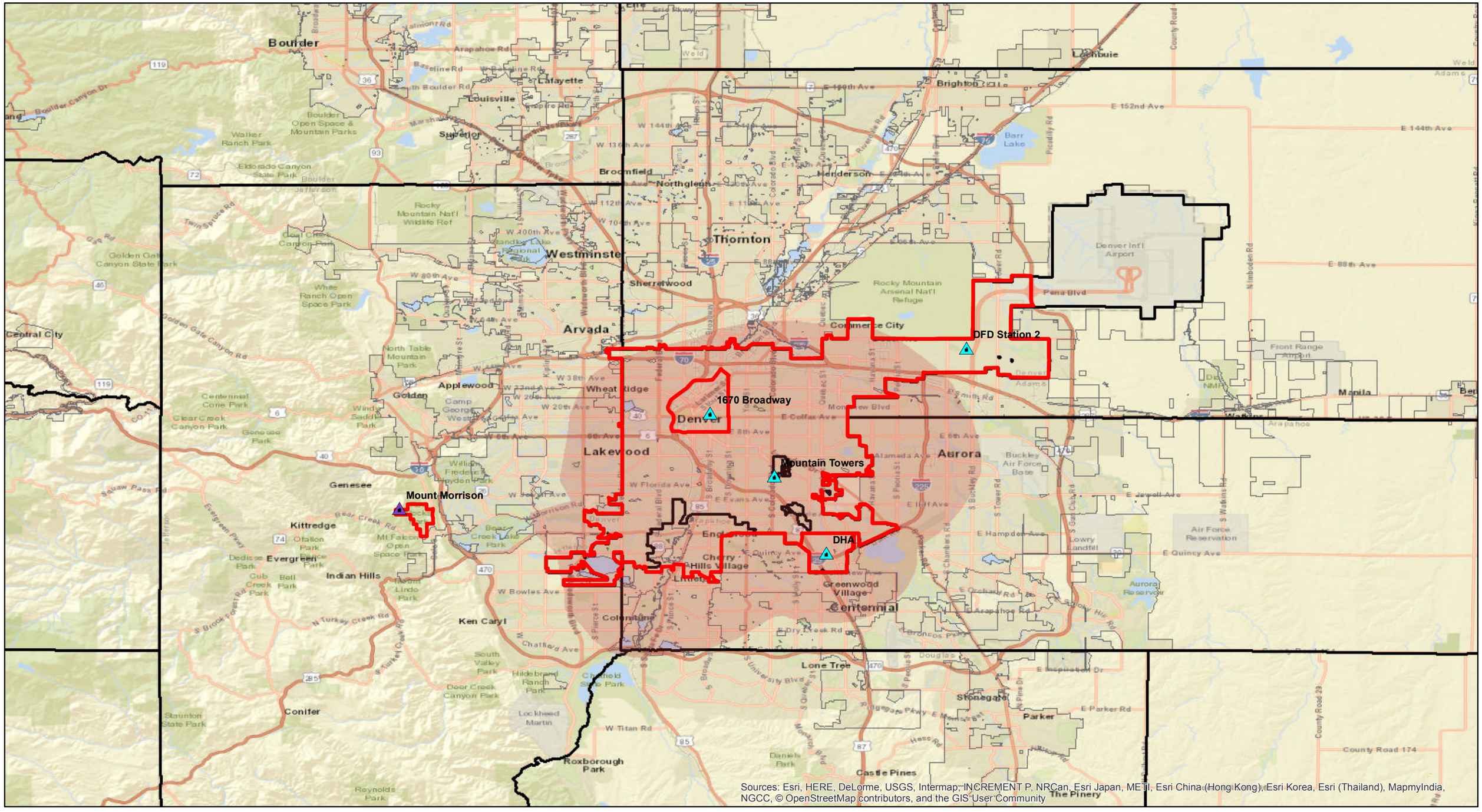
1 inch = 4.61 miles

1670 Broadway Simulcast Remote Site

MOTOROLA

City and County of Denver, Colorado

Project 25 Phase 2 Trunked 800MHz Communications System
40dBu Regulatory Contour



0 2.75 5.5 11 Miles

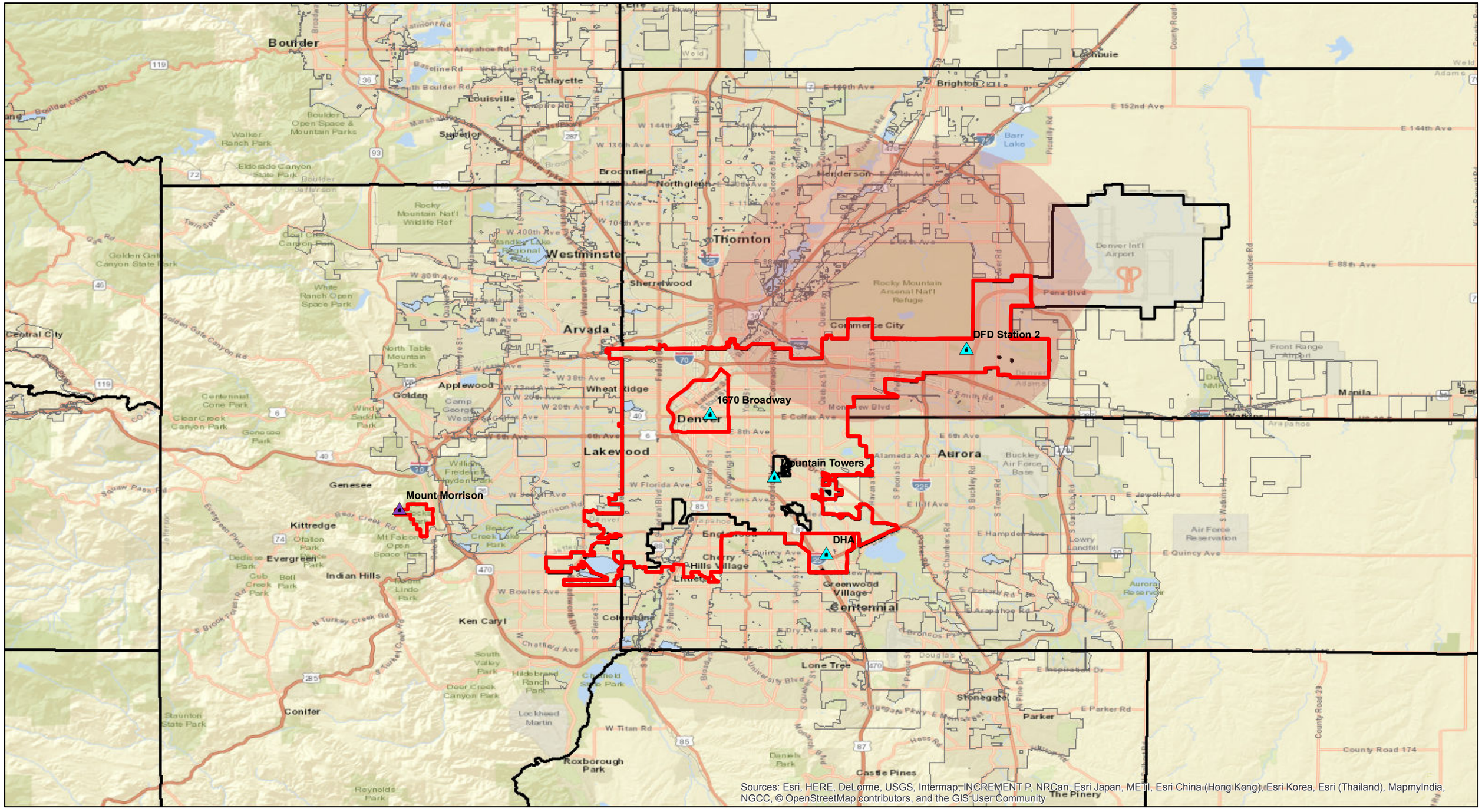
1 inch = 4.61 miles

Denver Housing Authority Simulcast Remote Site

MOTOROLA

City and County of Denver, Colorado

Project 25 Phase 2 Trunked 800MHz Communications System
40dBu Regulatory Contour



0 2.75 5.5 11 Miles

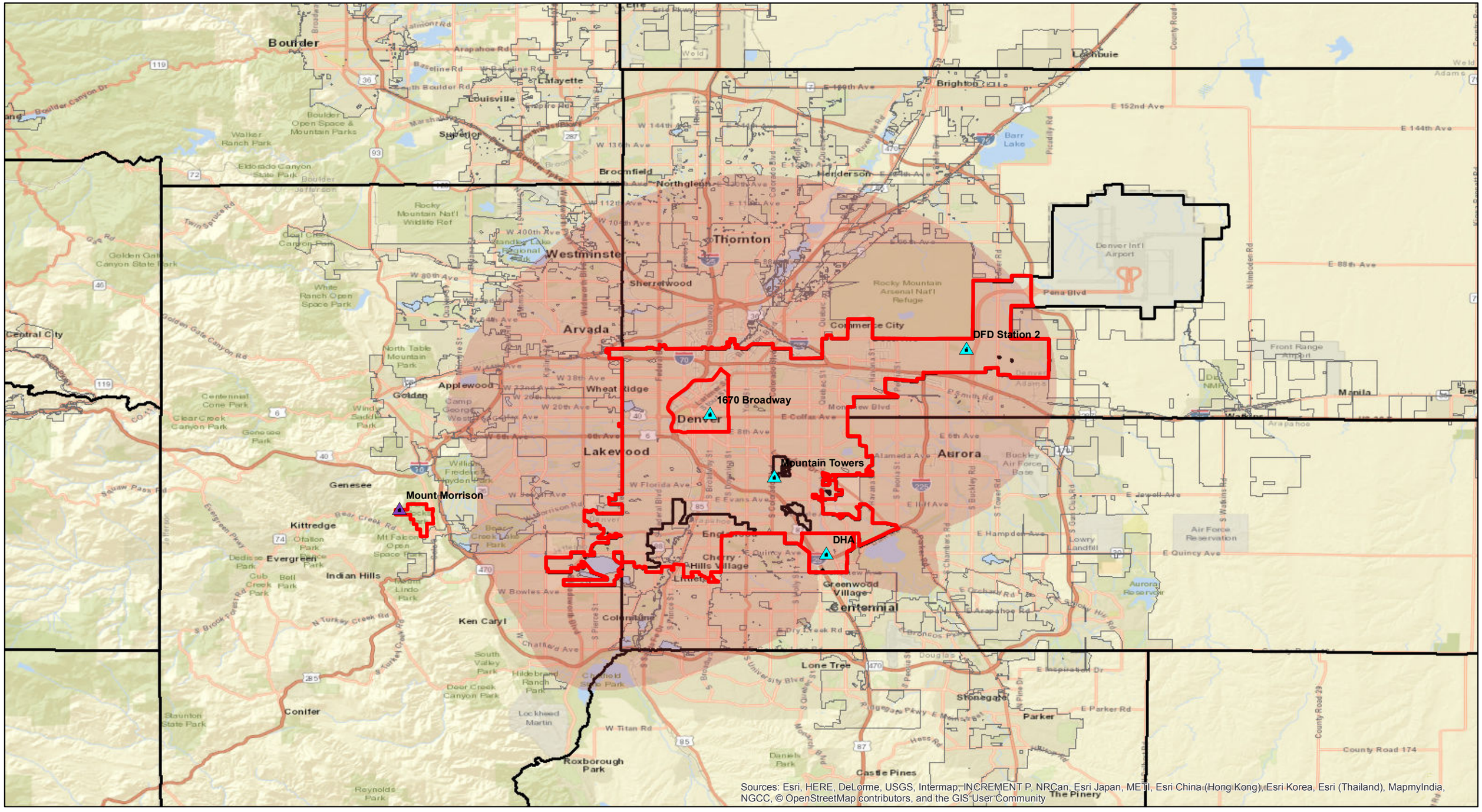
1 inch = 4.61 miles

DFD Station 2 Simulcast Remote Site

MOTOROLA

City and County of Denver, Colorado

Project 25 Phase 2 Trunked 800MHz Communications System
40dBu Regulatory Contour



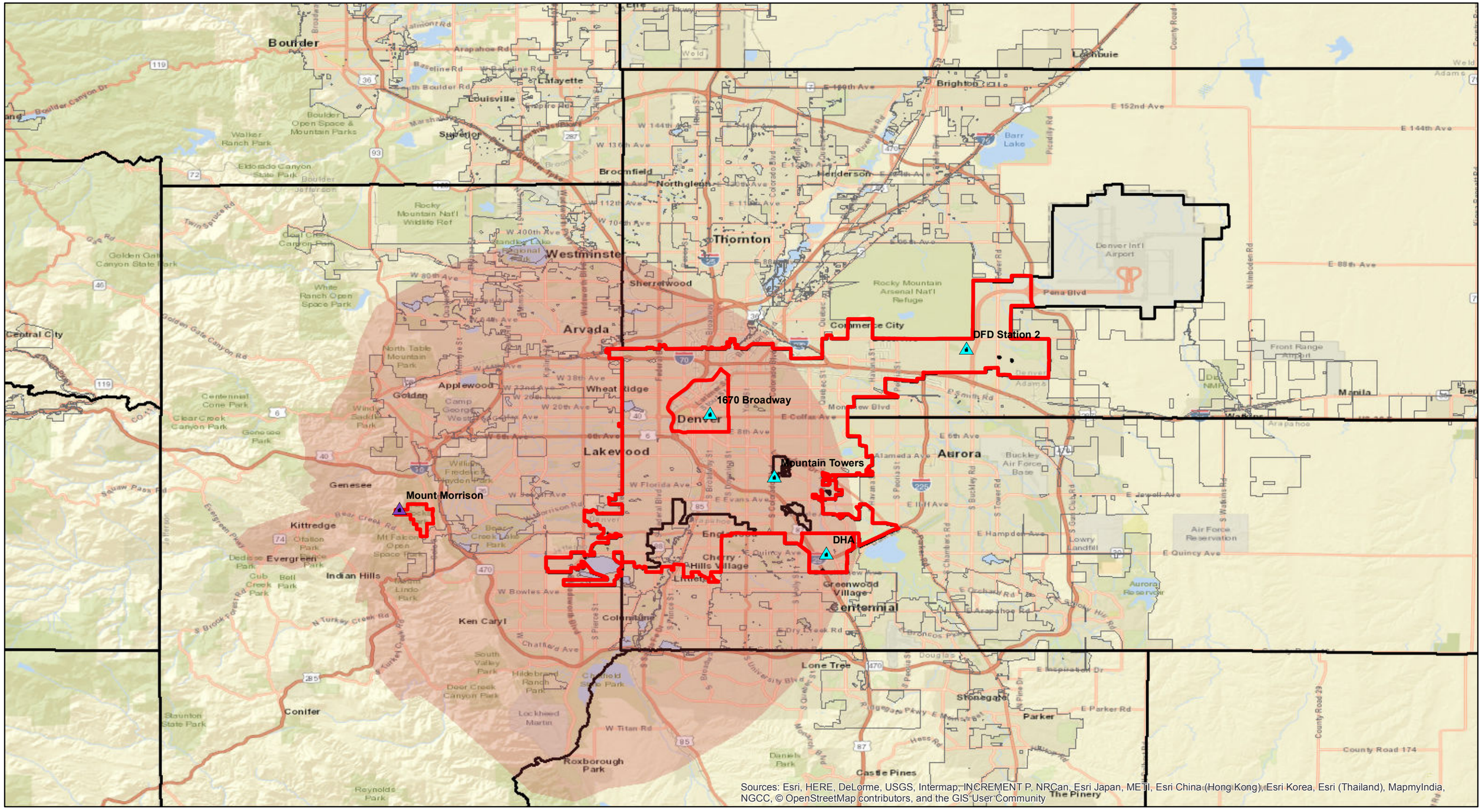
0 2.75 5.5 11 Miles

1 inch = 4.61 miles

Mountain Towers Simulcast Remote Site

City and County of Denver, Colorado

Project 25 Phase 2 Trunked 800MHz Communications System
40dBu Regulatory Contour



0 2.75 5.5 11 Miles

1 inch = 4.61 miles

Mount Morrison ASR Site

2.1.3 BILL OF MATERIALS

The following equipment has been included as part of this proposal. All software and hardware included below are required for proper operation and maintenance of the proposed system.

Table 2-30: Bill of Materials

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
JOSEPHINE	MASTER	1	SQM01SUM0273	MASTER SITE CONFIGURATION		Row 3
JOSEPHINE	MASTER	1	CA02830AB	ADD: M1 NON REDUNDANT ZONE (24 SITES OR LESS)		Row 3
JOSEPHINE	MASTER	1	CA03116AA	ADD: M1 - NON REDUNDANT HW		Row 3
JOSEPHINE	MASTER	1	CA02839AA	ADD: NM/ZC CABINET		Row 3
JOSEPHINE	MASTER	1	CA02113AA	ADD: ASTRO 25 FDMA TRKG OPERATION		Row 3
JOSEPHINE	MASTER	1	UA00158AA	ADD: PHASE 2 TDMA TRKG OP ZONE LIC		Row 3
JOSEPHINE	MASTER	1	CA01723AF	ADD: BASELINE BACK UP 7.17		Row 3
JOSEPHINE	MASTER	1	CA02835AB	ADD:WINDOW SUPPLEMENTAL TRANS CONFIG 7.17		Row 3
JOSEPHINE	MASTER	1	CA01499AA	ADD: DSR SYSTEM NOTIFICATION		Row 3
JOSEPHINE	MASTER	10	UA00156AA	ADD: MCC7500 CONSOLE LICENSES (QTY 5)		Row 3
JOSEPHINE	MASTER	4	CA01316AA	ADD: UNC ADDTL DEVICE LIC (QTY 10)		Row 3
JOSEPHINE	MASTER	5	UA00153AA	ADD: ASTRO 25 FDMA SITE LICENSE		Row 3
JOSEPHINE	MASTER	5	UA00159AA	ADD: P25 PHASE 2 TDMA TRKNG OP SITE LIC		Row 3
JOSEPHINE	MASTER	5	UA00407AA	ADD: CLASSIC DATA-P25 TRNK SITE		Row 3
JOSEPHINE	MASTER	5	UA00160AA	ADD: PHASE 2 DYNAMIC TG ASGNMT SITE LIC		Row 3
JOSEPHINE	MASTER	56	UA00161AA	ADD: P25 PHASE 2 TDMA SW BASE RADIO LIC		Row 3
JOSEPHINE	MASTER	56	UA00162AA	ADD: PHASE 2 DYNAMIC CH BASE RADIO LIC		Row 3
JOSEPHINE	MASTER	15	UA00152AA	ADD:500 RADIO USER LICENSES		Row 3
JOSEPHINE	MASTER	1	UA00136AA	ADD: UNIFIED NETWORK CONFIGURATOR (UNC)		Row 3
JOSEPHINE	MASTER	1	UA00147AA	ADD: PROVISIONING MANAGER		Row 6
JOSEPHINE	MASTER	1	UA00146AA	ADD: UNIFIED EVENT MANAGER (UEM)		Row 6
JOSEPHINE	MASTER	1	UA00225AA	ADD: UEM ENHANCED NAVIGATION		Row 6
JOSEPHINE	MASTER	1	UA00226AA	ADD: MICROWAVE MAP AND SEGMENT VIEW		Row 6
JOSEPHINE	MASTER	3	UA00227AA	ADD: UEM SNMP ELEMENT MANAGEMENT TOOLKIT (QTY 10)		Row 6
JOSEPHINE	MASTER	1	UA00137AA	ADD: EMAIL ALARM NOTIFICATIONS		Row 6
JOSEPHINE	MASTER	1	UA00143AA	ADD: SECURITY PARTITIONING		Row 6

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
JOSEPHINE	MASTER	1	UA00141AA	ADD: ZONEWATCH GRID & CTRL		Row 6
JOSEPHINE	MASTER	1	UA00144AA	ADD: ZONE HISTORICAL RPTS		Row 6
JOSEPHINE	MASTER	1	UA00151AA	ADD: AFFLIATION USER RPTS		Row 6
JOSEPHINE	MASTER	1	UA00149AA	ADD: RADIO CONTROL MANAGER		Row 6
JOSEPHINE	MASTER	1	UA00150AA	ADD: DYNAMIC REPORTS		Row 6
JOSEPHINE	MASTER	23	CA02193AA	ADD: ANTI-MALWARE DEF UPDATE LIC		Row 6
JOSEPHINE	MASTER	1	UA00237AA	ADD: INCREASED CAPACITY		Row 3
JOSEPHINE	MASTER	1	UA00521AA	ADD: INTERFERENCE LOCATOR UNC SYSTEM LICENSE		Row 3
JOSEPHINE	MASTER	1	DSQNAP4BAYW4HDDS	QNAP TS-453A 4-BAY WITH 4 SEAGATE 2TB NAS HDD	X	Row 6
JOSEPHINE	MASTER	1	F4544	SITE MANAGER ADVANCED		Row 6
JOSEPHINE	MASTER	1	VA00873	ADD: SDM SNT FW CURR ASTRO REL		Row 6
JOSEPHINE	MASTER	1	T8363	ASTRO 7.17 CLIENT		Row 6
JOSEPHINE	MASTER	1	T8364	ASTRO 25 RADIO AUTHENTICATION CLIENT SOFTWARE		Row 6
JOSEPHINE	MASTER	1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	X	Row 6
JOSEPHINE	MASTER	1	DSCL5808NCKIT	8 PORT LCD KVM 8 USB-PS 2 COMBO CABLES	X	Row 6
JOSEPHINE	MASTER	1	DDN9657	CRYSTAL REPORTS	X	Row 6
JOSEPHINE	MASTER	1	T8363	ASTRO 7.17 CLIENT		Row 6
JOSEPHINE	MASTER	1	T8364	ASTRO 25 RADIO AUTHENTICATION CLIENT SOFTWARE		Row 6
JOSEPHINE	MASTER	1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	X	Row 6
JOSEPHINE	MASTER	1	DSTG191	TECH GLOBAL EVOLUTION SERIES 19INCH NON TOUCH	X	Row 6
JOSEPHINE	MASTER	1	DDN9657	CRYSTAL REPORTS	X	Row 6
JOSEPHINE	MASTER	2	SQM01SUM0205	GGM 8000 GATEWAY		Row 6
JOSEPHINE	MASTER	2	CA01616AA	ADD: AC POWER		Row 6
JOSEPHINE	MASTER	1	CLN1856	2620-24 ETHERNET SWITCH		Row 6
JOSEPHINE	MASTER	21	T7885	MCAFEE WINDOWS AV CLIENT		Row 6
JOSEPHINE	MASTER	1	DDN1933	PURCHASED SOFTWARE,FORTITOKEN PACK	X	Row 6
JOSEPHINE	MASTER	44	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG		Row 6
JOSEPHINE	MASTER	1	SQM01SUM0238	SRC7500 SWITCHING ROUTING CENTER (7.13 AND BEYOND)		Row 9
JOSEPHINE	MASTER	1	CA03130AA	ADD: SRC 7500 FOR 7.17		Row 9

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
JOSEPHINE	MASTER	1	CA02153AA	SINGLE CORE LAN SWITCH (HP3800-48 PORT)		Row 9
JOSEPHINE	MASTER	1	CA01421AA	ADD: SINGLE GATEWAY ROUTER STANDARD		Row 9
JOSEPHINE	MASTER	1	CA01423AA	ADD: SINGLE CORE ROUTER ETH		Row 9
JOSEPHINE	MASTER	1	CA02654AA	ADD: SINGLE CORE MASTER SITE CONNECTIVITY (ETHERNET)		Row 9
JOSEPHINE	MASTER	1	CA01424AA	ADD: CORE BACKHAUL SWITCH		Row 9
JOSEPHINE	MASTER	1	DSF1DC108H	BELKIN 19" WIDESCREEN LCD RACK CONSOLE (ONLY USB CABLE COMPATIBILITY)	X	Row 9
JOSEPHINE	MASTER	5	DSF1D940106	BELKIN OMNIVIEW ENTERPRISE SERIES - USB KVM CABLE	X	Row 9
JOSEPHINE	KVL	3	T7537B	KVL 4000 KEYLOADER		Row 40
JOSEPHINE	KVL	3	U239AD	ADD: ASTRO 25 MODE		Row 40
JOSEPHINE	KVL	3	QA01767AA	ADD: KVL RADIO AUTHENTICATION		Row 40
JOSEPHINE	KVL	3	X795AJ	ADD: ASN MODE		Row 40
JOSEPHINE	KVL	3	CA01598AA	ADD: AC LINE CORD US		Row 40
JOSEPHINE	KVL	3	CA00182AP	ADD: AES ENCRYPTION SOFTWARE		Row 40
JOSEPHINE	KVL	3	C543	ADD: CABLE FOR RNC, DIU, MGEG		Row 40
JOSEPHINE	KVL	3	CA01603AA	ADD: USB COMM/CHARGE CABLE W/ CUP		Row 40
JOSEPHINE	KVL	3	CA02187	ADD: KEYLOADING CABLE ADAPTER (GCAI)		Row 40
JOSEPHINE	KVL	3	C725AA	ADD: KEYLOAD CABLE FOR APX PORTABLE		Row 40
JOSEPHINE	MASTER	1	DVN4046B	MASTER SYSTEM KEY STARTER KIT		Row 3
JOSEPHINE	MASTER	2	DS11011188	PDU, 120/240 SPLIT PH OR N+1 REDUNDANT, 60A MAX PER PHASE, SIX DEDICAT	X	Row 3
JOSEPHINE	MASTER	24	DS3750297	BREAKER, 15 AMP, CB UL 489 LISTED FOR AC EDGE II (1101-1188)	X	Row 3
JOSEPHINE	MASTER	4	DS1101990	SPD, SHIELDED RJ-45 JACK, SINGLE LINE GBE (1000MBPS) R56 COMPLIANT	X	Row 3
JOSEPHINE	MASTER	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	X	Row 3
JOSEPHINE	ISSI	1	T7776	ISSI 8000 / CSSI 8000 UPGRAGE Software Licenses		Row 3
JOSEPHINE	ISSI	1	UA00005AA	ADD: ISSI Automatic Roaming License (for first system)		Row 3
JOSEPHINE	ISSI	4	UA00184AA	ADD:ISSI AUTOMATIC ROAMING LICENSE (FOR SYSTEMS 2-5)		Row 3
JOSEPHINE	ISSI	5	UA00006AA	ADD: ISSI +10 Addition simultaneous Talk Group Capacity License		Row 3

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DSR_MASTER	DSR_MASTER	1	SQM01SUM0231	DYNAMIC SYSTEM RESILIENCE		Row 3
DSR_MASTER	DSR_MASTER	1	CA01511AA	DSR VOICE		Row 3
DSR_MASTER	DSR_MASTER	1	CA01512AA	DSR DATA		Row 3
DSR_MASTER	DSR_MASTER	1	CA02845AB	ADD: DSR - NON-REDUNDANT M1(UP TO 24 SITES		Row 3
DSR_MASTER	DSR_MASTER	1	CA03141AA	ADD: DSR HW - NON-REDUNDANT M1		Row 3
DSR_MASTER	DSR_MASTER	1	CA01723AF	ADD: BASELINE BACK UP 7.17		Row 3
DSR_MASTER	DSR_MASTER	1	CA02835AB	ADD:WINDOW SUPPLEMENTAL TRANS CONFIG 7.17		Row 3
DSR_MASTER	DSR_MASTER	1	CA02839AA	ADD: NM/ZC CABINET		Row 3
DSR_MASTER	DSR_MASTER	1	VA00873	ADD: SDM SNT FW CURR ASTRO REL		Row 6
DSR_MASTER	DSR_MASTER	1	F4544	SITE MANAGER ADVANCED		Row 6
DSR_MASTER	DSR_MASTER	1	T8363	ASTRO 7.17 CLIENT		Row 6
DSR_MASTER	DSR_MASTER	1	T8364	ASTRO 25 RADIO AUTHENTICATION CLIENT SOFTWARE		Row 6
DSR_MASTER	DSR_MASTER	1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	X	Row 6
DSR_MASTER	DSR_MASTER	1	DSCL5808NCKIT	8 PORT LCD KVM 8 USB-PS 2 COMBO CABLES	X	Row 6
DSR_MASTER	DSR_MASTER	1	DDN9657	CRYSTAL REPORTS	X	Row 6
DSR_MASTER	DSR_MASTER	41	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG		Row 6
DSR_MASTER	DSR_MASTER	1	SQM01SUM0238	SRC7500 SWITCHING ROUTING CENTER (7.13 AND BEYOND)		Row 9
DSR_MASTER	DSR_MASTER	1	CA03130AA	ADD: SRC 7500 FOR 7.17		Row 9
DSR_MASTER	DSR_MASTER	1	CA02153AA	SINGLE CORE LAN SWITCH (HP3800-48 PORT)		Row 9
DSR_MASTER	DSR_MASTER	1	CA01421AA	ADD: SINGLE GATEWAY ROUTER STANDARD		Row 9
DSR_MASTER	DSR_MASTER	1	CA01423AA	ADD: SINGLE CORE ROUTER ETH		Row 9
DSR_MASTER	DSR_MASTER	1	CA02654AA	ADD: SINGLE CORE MASTER SITE CONNECTIVITY (ETHERNET)		Row 9

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DSR_MASTER	DSR_MASTER	1	CA01424AA	ADD: CORE BACKHAUL SWITCH		Row 9
DSR_MASTER	DSR_MASTER	1	DSF1DC108H	BELKIN 19" WIDESCREEN LCD RACK CONSOLE (ONLY USB CABLE COMPATIBILITY)	X	Row 9
DSR_MASTER	DSR_MASTER	5	DSF1D940106	BELKIN OMNIVIEW ENTERPRISE SERIES - USB KVM CABLE	X	Row 9
DSR_MASTER	DSR_MASTER	1	DSTG2A120CB	CHATSWORTH GLOBAL FRAME CABINET 24IN W 84IN H 35IN D BLACK	X	Row 9
DSR_MASTER	DSR_MASTER	2	DS11011188	PDU, 120/240 SPLIT PH OR N+1 REDUNDANT, 60A MAX PER PHASE, SIX DEDICAT	X	Row 9
DSR_MASTER	DSR_MASTER	24	DS3750297	BREAKER, 15 AMP, CB UL 489 LISTED FOR AC EDGE II (1101-1188)	X	Row 9
DSR_MASTER	DSR_MASTER	4	DS1101990	SPD, SHIELDED RJ-45 JACK, SINGLE LINE GBE (1000MBPS) R56 COMPLIANT	X	Row 9
DSR_MASTER	DSR_MASTER	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	X	Row 9
DSR_MASTER	ISSI	1	T7776	ISSI 8000 / CSSI 8000 UPGRAGE Software Licenses		Row 3
DSR_MASTER	ISSI	1	UA00042AA	ADD: ISSI 8000 / CSSI 8000 Redundancy Software License		Row 3
JOSEPHINE	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 3
JOSEPHINE	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 3
JOSEPHINE	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 3
JOSEPHINE	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 3
JOSEPHINE	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
JOSEPHINE	GCM8000	2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW		Row 3
JOSEPHINE	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 3
JOSEPHINE	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 3
JOSEPHINE	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 3
JOSEPHINE	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 3
JOSEPHINE	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
JOSEPHINE	GCM8000	2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW		Row 3
JOSEPHINE	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 3
JOSEPHINE	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 3
JOSEPHINE	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 3
JOSEPHINE	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 3
JOSEPHINE	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
JOSEPHINE	GCM8000	2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW		Row 3
JOSEPHINE	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 3
JOSEPHINE	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 3
JOSEPHINE	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 3
JOSEPHINE	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 3
JOSEPHINE	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
JOSEPHINE	GCM8000	2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW		Row 3
JOSEPHINE	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 3
JOSEPHINE	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 3
JOSEPHINE	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 3
JOSEPHINE	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 3
JOSEPHINE	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
JOSEPHINE	GCM8000	2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW		Row 3
JOSEPHINE	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 3
JOSEPHINE	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 3
JOSEPHINE	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 3
JOSEPHINE	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 3
JOSEPHINE	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
JOSEPHINE	GCM8000	2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW		Row 3
JOSEPHINE	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 3
JOSEPHINE	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 3
JOSEPHINE	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 3
JOSEPHINE	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 3
JOSEPHINE	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
JOSEPHINE	GCM8000	2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW		Row 3
JOSEPHINE	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 34
JOSEPHINE	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 34
JOSEPHINE	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 34
JOSEPHINE	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 34
JOSEPHINE	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 34
JOSEPHINE	GCM8000	2	CA01974AA	ADD: TRUNKING REDUNDANT COMPRTR SW		Row 34
JOSEPHINE	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 34
JOSEPHINE	GCM8000	1	CA01183AA	GCM 8000 COMPARATOR		Row 34

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
JOSEPHINE	GCM8000	1	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 34
JOSEPHINE	GCM8000	1	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 34
JOSEPHINE	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 34
JOSEPHINE	GCM8000	1	CA01974AA	ADD: TRUNKING REDUNDANT COMPRTR SW		Row 34
JOSEPHINE	GCP8000	1	T7038	GCP 8000 SITE CONTROLLER		Row 3
JOSEPHINE	GCP8000	1	CA00303AA	ADD: QTY (1) SITE CONTROLLER		Row 3
JOSEPHINE	GCP8000	1	CA01194AA	IP BASED MULTISITE SITE CONTROLLER SOFTWARE		Row 3
JOSEPHINE	GCP8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
JOSEPHINE	GCP8000	1	T7038	GCP 8000 SITE CONTROLLER		Row 3
JOSEPHINE	GCP8000	1	CA00303AA	ADD: QTY (1) SITE CONTROLLER		Row 3
JOSEPHINE	GCP8000	1	CA01194AA	IP BASED MULTISITE SITE CONTROLLER SOFTWARE		Row 3
JOSEPHINE	GCP8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
JOSEPHINE	GPS	1	DSTRAK91009E	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM AC	X	Row 3
JOSEPHINE	GPS	4	DSTRAK91061	FOUR PORT DDM	X	Row 3
JOSEPHINE	GPS	50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 3
JOSEPHINE	GPS	4	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 3
JOSEPHINE	NETWORK	1	CLN1859	2620-48 ETHERNET SWITCH		Row 9
JOSEPHINE	NETWORK	1	CLN1856	2620-24 ETHERNET SWITCH		Row 9
JOSEPHINE	NETWORK	1	SQM01SUM0205	GGM 8000 GATEWAY		Row 9
JOSEPHINE	NETWORK	1	CA01616AA	ADD: AC POWER		Row 9
JOSEPHINE	NETWORK	1	SQM01SUM0205	GGM 8000 GATEWAY		Row 9
JOSEPHINE	NETWORK	1	CA01616AA	ADD: AC POWER		Row 9
JOSEPHINE	RACK	1	DSTG2A120CB	CHATSWORTH GLOBAL FRAME CABINET 24IN W 84IN H 35IN D BLACK	X	Row 3
JOSEPHINE	SURGE	2	DS11011188	PDU, 120/240 SPLIT PH OR N+1 REDUNDANT, 60A MAX PER PHASE, SIX DEDICAT	X	Row 3
JOSEPHINE	SURGE	24	DS3750297	BREAKER, 15 AMP, CB UL 489 LISTED FOR AC EDGE II (1101-1188)	X	Row 3
JOSEPHINE	SURGE	3	DS1101990	SPD, SHIELDED RJ-45 JACK, SINGLE LINE GBE (1000MBPS) R56 COMPLIANT	X	Row 3
JOSEPHINE	SURGE	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	X	Row 3
PRIME2	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 3

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
PRIME2	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 3
PRIME2	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 3
PRIME2	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 3
PRIME2	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
PRIME2	GCM8000	2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW		Row 3
PRIME2	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 3
PRIME2	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 3
PRIME2	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 3
PRIME2	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 3
PRIME2	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
PRIME2	GCM8000	2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW		Row 3
PRIME2	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 3
PRIME2	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 3
PRIME2	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 3
PRIME2	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 3
PRIME2	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
PRIME2	GCM8000	2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW		Row 3
PRIME2	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 3
PRIME2	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 3
PRIME2	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 3
PRIME2	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 3
PRIME2	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
PRIME2	GCM8000	2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW		Row 3
PRIME2	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 3
PRIME2	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 3
PRIME2	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 3
PRIME2	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 3
PRIME2	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
PRIME2	GCM8000	2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW		Row 3
PRIME2	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 3
PRIME2	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 3
PRIME2	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 3
PRIME2	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 3

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
PRIME2	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
PRIME2	GCM8000	2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW		Row 3
PRIME2	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 3
PRIME2	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 3
PRIME2	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 3
PRIME2	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 3
PRIME2	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
PRIME2	GCM8000	2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW		Row 3
PRIME2	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 34
PRIME2	GCM8000	2	CA01183AA	GCM 8000 COMPARATOR		Row 34
PRIME2	GCM8000	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 34
PRIME2	GCM8000	2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 34
PRIME2	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 34
PRIME2	GCM8000	2	CA01974AA	ADD: TRUNKING REDUNDANT COMPRTR SW		Row 34
PRIME2	GCM8000	1	T7321	GCM 8000 COMPARATOR		Row 34
PRIME2	GCM8000	1	CA01183AA	GCM 8000 COMPARATOR		Row 34
PRIME2	GCM8000	1	CA01185AA	ADD: IP BASED MULTISITE OPERATION		Row 34
PRIME2	GCM8000	1	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE		Row 34
PRIME2	GCM8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 34
PRIME2	GCM8000	1	CA01974AA	ADD: TRUNKING REDUNDANT COMPRTR SW		Row 34
PRIME2	GCP8000	1	T7038	GCP 8000 SITE CONTROLLER		Row 3
PRIME2	GCP8000	1	CA00303AA	ADD: QTY (1) SITE CONTROLLER		Row 3
PRIME2	GCP8000	1	CA02474AA	ADD:GEO-REDUN BACK-UP SC LIC		Row 3
PRIME2	GCP8000	1	CA01194AA	IP BASED MULTISITE SITE CONTROLLER SOFTWARE		Row 3
PRIME2	GCP8000	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 3
PRIME2	GPS	1	DSTRAK91009E	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM AC	X	Row 3
PRIME2	GPS	4	DSTRAK91061	FOUR PORT DDM	X	Row 3
PRIME2	GPS	50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 3
PRIME2	GPS	4	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 3
PRIME2	NETWORK	1	SQM01SUM0205	GGM 8000 GATEWAY		Row 9
PRIME2	NETWORK	1	CA01616AA	ADD: AC POWER		Row 9

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
PRIME2	NETWORK	1	CLN1856	2620-24 ETHERNET SWITCH		Row 9
PRIME2	NETWORK	1	CLN1859	2620-48 ETHERNET SWITCH		Row 9
PRIME2	NETWORK	1	SQM01SUM0205	GGM 8000 GATEWAY		Row 9
PRIME2	NETWORK	1	CA01616AA	ADD: AC POWER		Row 9
PRIME2	RACK	1	DSTG2A120CB	CHATSWORTH GLOBAL FRAME CABINET 24IN W 84IN H 35IN D BLACK	X	Row 3
PRIME2	SURGE	2	DS11011188	PDU, 120/240 SPLIT PH OR N+1 REDUNDANT, 60A MAX PER PHASE, SIX DEDICAT	X	Row 3
PRIME2	SURGE	24	DS3750297	BREAKER, 15 AMP, CB UL 489 LISTED FOR AC EDGE II (1101-1188)	X	Row 3
PRIME2	SURGE	3	DS1101990	SPD, SHIELDED RJ-45 JACK, SINGLE LINE GBE (1000MBPS) R56 COMPLIANT	X	Row 3
PRIME2	SURGE	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	X	Row 3
BROADWAY	REMOTE_1	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM		Row 7
BROADWAY	REMOTE_1	1	CA00855AA	ADD: 700/800 MHZ		Row 7
BROADWAY	REMOTE_1	5	CA01842AA	ADD: P25 TDMA SOFTWARE		Row 7
BROADWAY	REMOTE_1	5	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE		Row 7
BROADWAY	REMOTE_1	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS		Row 7
BROADWAY	REMOTE_1	6	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE		Row 7
BROADWAY	REMOTE_1	2	CA01706AA	ADD: ADD: GGM 8000 GATEWAY		Row 7
BROADWAY	REMOTE_1	1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILITY OF 7-24 BRS		Row 7
BROADWAY	REMOTE_1	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER		Row 7
BROADWAY	REMOTE_1	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU		Row 7
BROADWAY	REMOTE_1	2	CA01536AA	GPB 8000 REFERENCE DISTRIBUTION MODULE		Row 7
BROADWAY	REMOTE_1	2	CA01537AA	ADD: REFERENCE DISTRIBUTION SOFTWARE		Row 7
BROADWAY	REMOTE_1	1	CA01402AA	ADD: 7.0 FT OPEN RACK		Row 7
BROADWAY	REMOTE_1	1	CA02686AA	ADD: AC DC POWER DISTRIBUTION		Row 7
BROADWAY	REMOTE_1	2	PMUG1017A	GNSS REMOTE RECEIVER ASSY		Row 7
BROADWAY	REMOTE_1	2	DSP04268	ALUMINUM 6061-T6. PIPE 1 INCH SCHED 40	X	Row 7
BROADWAY	REMOTE_1	2	DSIX2L1M1DC48IG	SPD, HPD GPS DATA LINE, 48VDC, HARD WIRE WITH ISOLATED GROUNDING	X	Row 7
BROADWAY	REMOTE_1	2	DS30C87465CO1	125FT OUTDOOR UV PROTECTED CABLE 6 PR, 22AWG DB15 CABLE	X	Row 7
BROADWAY	REMOTE_1	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM		Row 7

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
BROADWAY	REMOTE_1	1	CA00855AA	ADD: 700/800 MHZ		Row 7
BROADWAY	REMOTE_1	6	CA01842AA	ADD: P25 TDMA SOFTWARE		Row 7
BROADWAY	REMOTE_1	6	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE		Row 7
BROADWAY	REMOTE_1	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS		Row 7
BROADWAY	REMOTE_1	6	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE		Row 7
BROADWAY	REMOTE_1	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK		Row 7
BROADWAY	REMOTE_1	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER		Row 7
BROADWAY	REMOTE_1	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU		Row 7
BROADWAY	REMOTE_1	2	CA00885AA	ADD: HIGH AVAILABILITY XHUB		Row 7
BROADWAY	REMOTE_1	1	CA01402AA	ADD: 7.0 FT OPEN RACK		Row 7
BROADWAY	REMOTE_1	1	CA02686AA	ADD: AC DC POWER DISTRIBUTION		Row 7
BROADWAY	REMOTE_1	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM		Row 7
BROADWAY	REMOTE_1	1	CA00855AA	ADD: 700/800 MHZ		Row 7
BROADWAY	REMOTE_1	5	CA01842AA	ADD: P25 TDMA SOFTWARE		Row 7
BROADWAY	REMOTE_1	5	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE		Row 7
BROADWAY	REMOTE_1	1	X305AC	ADD: QTY (5) GTR 8000 BASE RADIOS		Row 7
BROADWAY	REMOTE_1	5	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE		Row 7
BROADWAY	REMOTE_1	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK		Row 7
BROADWAY	REMOTE_1	1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBINER		Row 7
BROADWAY	REMOTE_1	1	CA01058AA	ADD: 700/800 PHASING HARNESS		Row 7
BROADWAY	REMOTE_1	2	CA00885AA	ADD: HIGH AVAILABILITY XHUB		Row 7
BROADWAY	REMOTE_1	1	CA01402AA	ADD: 7.0 FT OPEN RACK		Row 7
BROADWAY	REMOTE_1	1	CA02686AA	ADD: AC DC POWER DISTRIBUTION		Row 7
BROADWAY	REMOTE_1	2	DS1101990	SPD, SHIELDED RJ-45 JACK, SINGLE LINE GBE (1000MBPS) R56 COMPLIANT	X	Row 7
BROADWAY	REMOTE_1	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	X	Row 7
BROADWAY	REMOTE_1	1	THN1012	RACK 7' OPEN		Row 7
BROADWAY	REMOTE_1	1	DS43783I01T	TTA, 796-824MHZ, SINGLE / DUAL NETWORK, TEST PORT	X	Row 7
BROADWAY	REMOTE_1	1	DS43783I01C48	CONTROL MONITORING UNIT, 796-824MHZ,DUAL DIVERSITY,ETHERNET,48VDC	X	Row 7
BROADWAY	REMOTE_1	1	F4544	SITE MANAGER ADVANCED		Row 7

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
BROADWAY	REMOTE_1	1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL		Row 7
BROADWAY	REMOTE_1	3	V592	AAD TERM BLCK & CONN WI		Row 7
BROADWAY	REMOTE_1	1	VA00905	ADD:24/48 VDC PS TO SM		Row 7
DHA	REMOTE_2	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM		Row 7
DHA	REMOTE_2	1	CA00855AA	ADD: 700/800 MHZ		Row 7
DHA	REMOTE_2	5	CA01842AA	ADD: P25 TDMA SOFTWARE		Row 7
DHA	REMOTE_2	5	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE		Row 7
DHA	REMOTE_2	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS		Row 7
DHA	REMOTE_2	6	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE		Row 7
DHA	REMOTE_2	2	CA01706AA	ADD: ADD: GGM 8000 GATEWAY		Row 7
DHA	REMOTE_2	1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILITY OF 7-24 BRS		Row 7
DHA	REMOTE_2	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER		Row 7
DHA	REMOTE_2	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU		Row 7
DHA	REMOTE_2	2	CA01536AA	GPB 8000 REFERENCE DISTRIBUTION MODULE		Row 7
DHA	REMOTE_2	2	CA01537AA	ADD: REFERENCE DISTRIBUTION SOFTWARE		Row 7
DHA	REMOTE_2	1	CA01402AA	ADD: 7.0 FT OPEN RACK		Row 7
DHA	REMOTE_2	1	CA02686AA	ADD: AC DC POWER DISTRIBUTION		Row 7
DHA	REMOTE_2	2	PMUG1017A	GNSS REMOTE RECEIVER ASSY		Row 7
DHA	REMOTE_2	2	DSP04268	ALUMINUM 6061-T6. PIPE 1 INCH SCHED 40	X	Row 7
DHA	REMOTE_2	2	DSIX2L1M1DC48IG	SPD, HPD GPS DATA LINE, 48VDC, HARD WIRE WITH ISOLATED GROUNDING	X	Row 7
DHA	REMOTE_2	2	DS30C87465CO1	125FT OUTDOOR UV PROTECTED CABLE 6 PR, 22AWG DB15 CABLE	X	Row 7
DHA	REMOTE_2	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM		Row 7
DHA	REMOTE_2	1	CA00855AA	ADD: 700/800 MHZ		Row 7
DHA	REMOTE_2	6	CA01842AA	ADD: P25 TDMA SOFTWARE		Row 7
DHA	REMOTE_2	6	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE		Row 7
DHA	REMOTE_2	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS		Row 7
DHA	REMOTE_2	6	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE		Row 7
DHA	REMOTE_2	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK		Row 7
DHA	REMOTE_2	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER		Row 7

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DHA	REMOTE_2	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU		Row 7
DHA	REMOTE_2	2	CA00885AA	ADD: HIGH AVAILABILITY XHUB		Row 7
DHA	REMOTE_2	1	CA01402AA	ADD: 7.0 FT OPEN RACK		Row 7
DHA	REMOTE_2	1	CA02686AA	ADD: AC DC POWER DISTRIBUTION		Row 7
DHA	REMOTE_2	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM		Row 7
DHA	REMOTE_2	1	CA00855AA	ADD: 700/800 MHZ		Row 7
DHA	REMOTE_2	5	CA01842AA	ADD: P25 TDMA SOFTWARE		Row 7
DHA	REMOTE_2	5	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE		Row 7
DHA	REMOTE_2	1	X305AC	ADD: QTY (5) GTR 8000 BASE RADIOS		Row 7
DHA	REMOTE_2	5	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE		Row 7
DHA	REMOTE_2	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK		Row 7
DHA	REMOTE_2	1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBINER		Row 7
DHA	REMOTE_2	1	CA01058AA	ADD: 700/800 PHASING HARNESS		Row 7
DHA	REMOTE_2	2	CA00885AA	ADD: HIGH AVAILABILITY XHUB		Row 7
DHA	REMOTE_2	1	CA01402AA	ADD: 7.0 FT OPEN RACK		Row 7
DHA	REMOTE_2	1	CA02686AA	ADD: AC DC POWER DISTRIBUTION		Row 7
DHA	REMOTE_2	2	DS1101990	SPD, SHIELDED RJ-45 JACK, SINGLE LINE GBE (1000MBPS) R56 COMPLIANT	X	Row 7
DHA	REMOTE_2	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	X	Row 7
DHA	REMOTE_2	1	THN1012	RACK 7' OPEN		Row 7
DHA	REMOTE_2	1	DS43783I01T	TTA, 796-824MHZ, SINGLE / DUAL NETWORK, TEST PORT	X	Row 7
DHA	REMOTE_2	1	DS43783I01C48	CONTROL MONITORING UNIT, 796-824MHZ,DUAL DIVERSITY,ETHERNET,48VDC	X	Row 7
DHA	REMOTE_2	1	F4544	SITE MANAGER ADVANCED		Row 7
DHA	REMOTE_2	1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL		Row 7
DHA	REMOTE_2	3	V592	AAD TERM BLCK & CONN WI		Row 7
DHA	REMOTE_2	1	VA00905	ADD:24/48 VDC PS TO SM		Row 7
DFD2	REMOTE_3	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM		Row 7
DFD2	REMOTE_3	1	CA00855AA	ADD: 700/800 MHZ		Row 7
DFD2	REMOTE_3	5	CA01842AA	ADD: P25 TDMA SOFTWARE		Row 7
DFD2	REMOTE_3	5	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE		Row 7
DFD2	REMOTE_3	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS		Row 7

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DFD2	REMOTE_3	6	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE		Row 7
DFD2	REMOTE_3	2	CA01706AA	ADD: ADD: GGM 8000 GATEWAY		Row 7
DFD2	REMOTE_3	1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILITY OF 7-24 BRS		Row 7
DFD2	REMOTE_3	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER		Row 7
DFD2	REMOTE_3	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU		Row 7
DFD2	REMOTE_3	2	CA01536AA	GPB 8000 REFERENCE DISTRIBUTION MODULE		Row 7
DFD2	REMOTE_3	2	CA01537AA	ADD: REFERENCE DISTRIBUTION SOFTWARE		Row 7
DFD2	REMOTE_3	1	CA01402AA	ADD: 7.0 FT OPEN RACK		Row 7
DFD2	REMOTE_3	1	CA02686AA	ADD: AC DC POWER DISTRIBUTION		Row 7
DFD2	REMOTE_3	2	PMUG1017A	GNSS REMOTE RECEIVER ASSY		Row 7
DFD2	REMOTE_3	2	DSP04268	ALUMINUM 6061-T6. PIPE 1 INCH SCHED 40	X	Row 7
DFD2	REMOTE_3	2	DSIX2L1M1DC48IG	SPD, HPD GPS DATA LINE, 48VDC, HARD WIRE WITH ISOLATED GROUNDING	X	Row 7
DFD2	REMOTE_3	2	DS30C87465CO1	125FT OUTDOOR UV PROTECTED CABLE 6 PR, 22AWG DB15 CABLE	X	Row 7
DFD2	REMOTE_3	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM		Row 7
DFD2	REMOTE_3	1	CA00855AA	ADD: 700/800 MHZ		Row 7
DFD2	REMOTE_3	6	CA01842AA	ADD: P25 TDMA SOFTWARE		Row 7
DFD2	REMOTE_3	6	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE		Row 7
DFD2	REMOTE_3	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS		Row 7
DFD2	REMOTE_3	6	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE		Row 7
DFD2	REMOTE_3	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK		Row 7
DFD2	REMOTE_3	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER		Row 7
DFD2	REMOTE_3	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU		Row 7
DFD2	REMOTE_3	2	CA00885AA	ADD: HIGH AVAILABILITY XHUB		Row 7
DFD2	REMOTE_3	1	CA01402AA	ADD: 7.0 FT OPEN RACK		Row 7
DFD2	REMOTE_3	1	CA02686AA	ADD: AC DC POWER DISTRIBUTION		Row 7
DFD2	REMOTE_3	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM		Row 7
DFD2	REMOTE_3	1	CA00855AA	ADD: 700/800 MHZ		Row 7
DFD2	REMOTE_3	5	CA01842AA	ADD: P25 TDMA SOFTWARE		Row 7
DFD2	REMOTE_3	5	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE		Row 7
DFD2	REMOTE_3	1	X305AC	ADD: QTY (5) GTR 8000 BASE RADIOS		Row 7

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DFD2	REMOTE_3	5	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE		Row 7
DFD2	REMOTE_3	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK		Row 7
DFD2	REMOTE_3	1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBINER		Row 7
DFD2	REMOTE_3	1	CA01058AA	ADD: 700/800 PHASING HARNESS		Row 7
DFD2	REMOTE_3	2	CA00885AA	ADD: HIGH AVAILABILITY XHUB		Row 7
DFD2	REMOTE_3	1	CA01402AA	ADD: 7.0 FT OPEN RACK		Row 7
DFD2	REMOTE_3	1	CA02686AA	ADD: AC DC POWER DISTRIBUTION		Row 7
DFD2	REMOTE_3	2	DS1101990	SPD, SHIELDED RJ-45 JACK, SINGLE LINE GBE (1000MBPS) R56 COMPLIANT	X	Row 7
DFD2	REMOTE_3	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	X	Row 7
DFD2	REMOTE_3	1	THN1012	RACK 7' OPEN		Row 7
DFD2	REMOTE_3	1	DS43783I01T	TTA, 796-824MHZ, SINGLE / DUAL NETWORK, TEST PORT	X	Row 7
DFD2	REMOTE_3	1	DS43783I01C48	CONTROL MONITORING UNIT, 796-824MHZ,DUAL DIVERSITY,ETHERNET,48VDC	X	Row 7
DFD2	REMOTE_3	1	F4544	SITE MANAGER ADVANCED		Row 7
DFD2	REMOTE_3	1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL		Row 7
DFD2	REMOTE_3	3	V592	AAD TERM BLCK & CONN WI		Row 7
DFD2	REMOTE_3	1	VA00905	ADD:24/48 VDC PS TO SM		Row 7
MNTN_TWRS	REMOTE_4	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM		Row 7
MNTN_TWRS	REMOTE_4	1	CA00855AA	ADD: 700/800 MHZ		Row 7
MNTN_TWRS	REMOTE_4	5	CA01842AA	ADD: P25 TDMA SOFTWARE		Row 7
MNTN_TWRS	REMOTE_4	5	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE		Row 7
MNTN_TWRS	REMOTE_4	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS		Row 7
MNTN_TWRS	REMOTE_4	6	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE		Row 7
MNTN_TWRS	REMOTE_4	2	CA01706AA	ADD: ADD: GGM 8000 GATEWAY		Row 7
MNTN_TWRS	REMOTE_4	1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILITY OF 7-24 BRS		Row 7
MNTN_TWRS	REMOTE_4	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER		Row 7
MNTN_TWRS	REMOTE_4	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU		Row 7
MNTN_TWRS	REMOTE_4	2	CA01536AA	GPB 8000 REFERENCE DISTRIBUTION MODULE		Row 7
MNTN_TWRS	REMOTE_4	2	CA01537AA	ADD: REFERENCE DISTRIBUTION SOFTWARE		Row 7

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
MNTN_TWRS	REMOTE_4	1	CA01402AA	ADD: 7.0 FT OPEN RACK		Row 7
MNTN_TWRS	REMOTE_4	1	CA02686AA	ADD: AC DC POWER DISTRIBUTION		Row 7
MNTN_TWRS	REMOTE_4	2	PMUG1017A	GNSS REMOTE RECEIVER ASSY		Row 7
MNTN_TWRS	REMOTE_4	2	DSP04268	ALUMINUM 6061-T6. PIPE 1 INCH SCHED 40	X	Row 7
MNTN_TWRS	REMOTE_4	2	DSIX2L1M1DC48IG	SPD, HPD GPS DATA LINE, 48VDC, HARD WIRE WITH ISOLATED GROUNDING	X	Row 7
MNTN_TWRS	REMOTE_4	2	DS30C87465CO1	125FT OUTDOOR UV PROTECTED CABLE 6 PR, 22AWG DB15 CABLE	X	Row 7
MNTN_TWRS	REMOTE_4	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM		Row 7
MNTN_TWRS	REMOTE_4	1	CA00855AA	ADD: 700/800 MHZ		Row 7
MNTN_TWRS	REMOTE_4	6	CA01842AA	ADD: P25 TDMA SOFTWARE		Row 7
MNTN_TWRS	REMOTE_4	6	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE		Row 7
MNTN_TWRS	REMOTE_4	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS		Row 7
MNTN_TWRS	REMOTE_4	6	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE		Row 7
MNTN_TWRS	REMOTE_4	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK		Row 7
MNTN_TWRS	REMOTE_4	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER		Row 7
MNTN_TWRS	REMOTE_4	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU		Row 7
MNTN_TWRS	REMOTE_4	2	CA00885AA	ADD: HIGH AVAILABILITY XHUB		Row 7
MNTN_TWRS	REMOTE_4	1	CA01402AA	ADD: 7.0 FT OPEN RACK		Row 7
MNTN_TWRS	REMOTE_4	1	CA02686AA	ADD: AC DC POWER DISTRIBUTION		Row 7
MNTN_TWRS	REMOTE_4	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM		Row 7
MNTN_TWRS	REMOTE_4	1	CA00855AA	ADD: 700/800 MHZ		Row 7
MNTN_TWRS	REMOTE_4	5	CA01842AA	ADD: P25 TDMA SOFTWARE		Row 7
MNTN_TWRS	REMOTE_4	5	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE		Row 7
MNTN_TWRS	REMOTE_4	1	X305AC	ADD: QTY (5) GTR 8000 BASE RADIOS		Row 7
MNTN_TWRS	REMOTE_4	5	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE		Row 7
MNTN_TWRS	REMOTE_4	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK		Row 7
MNTN_TWRS	REMOTE_4	1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBINER		Row 7
MNTN_TWRS	REMOTE_4	1	CA01058AA	ADD: 700/800 PHASING HARNESS		Row 7
MNTN_TWRS	REMOTE_4	2	CA00885AA	ADD: HIGH AVAILABILITY XHUB		Row 7
MNTN_TWRS	REMOTE_4	1	CA01402AA	ADD: 7.0 FT OPEN RACK		Row 7
MNTN_TWRS	REMOTE_4	1	CA02686AA	ADD: AC DC POWER DISTRIBUTION		Row 7

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
MNTN_TWRS	REMOTE_4	2	DS1101990	SPD, SHIELDED RJ-45 JACK, SINGLE LINE GBE (1000MBPS) R56 COMPLIANT	X	Row 7
MNTN_TWRS	REMOTE_4	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	X	Row 7
MNTN_TWRS	REMOTE_4	1	THN1012	RACK 7' OPEN		Row 7
MNTN_TWRS	REMOTE_4	1	DS43783I01T	TTA, 796-824MHZ, SINGLE / DUAL NETWORK, TEST PORT	X	Row 7
MNTN_TWRS	REMOTE_4	1	DS43783I01C48	CONTROL MONITORING UNIT, 796-824MHZ,DUAL DIVERSITY,ETHERNET,48VDC	X	Row 7
MNTN_TWRS	REMOTE_4	1	F4544	SITE MANAGER ADVANCED		Row 7
MNTN_TWRS	REMOTE_4	1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL		Row 7
MNTN_TWRS	REMOTE_4	3	V592	AAD TERM BLCK & CONN WI		Row 7
MNTN_TWRS	REMOTE_4	1	VA00905	ADD:24/48 VDC PS TO SM		Row 7
MT_MORSN	ASR	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM		Row 7
MT_MORSN	ASR	1	CA00855AA	ADD: 700/800 MHZ		Row 7
MT_MORSN	ASR	1	X305AC	ADD: QTY (5) GTR 8000 BASE RADIOS		Row 7
MT_MORSN	ASR	4	CA01842AA	ADD: P25 TDMA SOFTWARE		Row 7
MT_MORSN	ASR	4	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE		Row 7
MT_MORSN	ASR	5	X591AE	ENH: ASTRO 25 SITE REPEATER SW		Row 7
MT_MORSN	ASR	2	CA01706AA	ADD: ADD: GGM 8000 GATEWAY		Row 7
MT_MORSN	ASR	1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILITY OF 7-24 BRS		Row 7
MT_MORSN	ASR	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER		Row 7
MT_MORSN	ASR	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU		Row 7
MT_MORSN	ASR	2	CA00303AA	ADD: QTY (1) SITE CONTROLLER		Row 7
MT_MORSN	ASR	2	CA03177AA	ADD: ASTRO SITE REPEATER SC SW		Row 7
MT_MORSN	ASR	1	CA01402AA	ADD: 7.0 FT OPEN RACK		Row 7
MT_MORSN	ASR	1	CA02686AA	ADD: AC DC POWER DISTRIBUTION		Row 7
MT_MORSN	ASR	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM		Row 7
MT_MORSN	ASR	1	CA00855AA	ADD: 700/800 MHZ		Row 7
MT_MORSN	ASR	1	X304AE	ADD: QTY (4) GTR 8000 BASE RADIOS		Row 7
MT_MORSN	ASR	4	CA01842AA	ADD: P25 TDMA SOFTWARE		Row 7
MT_MORSN	ASR	4	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE		Row 7
MT_MORSN	ASR	4	X591AE	ENH: ASTRO 25 SITE REPEATER SW		Row 7
MT_MORSN	ASR	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK		Row 7

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
MT_MORSN	ASR	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER		Row 7
MT_MORSN	ASR	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU		Row 7
MT_MORSN	ASR	2	CA00884AA	ADD: QTY (1) XHUB		Row 7
MT_MORSN	ASR	1	CA01402AA	ADD: 7.0 FT OPEN RACK		Row 7
MT_MORSN	ASR	1	CA02686AA	ADD: AC DC POWER DISTRIBUTION		Row 7
MT_MORSN	ASR	2	DS1101990	SPD, SHIELDED RJ-45 JACK, SINGLE LINE GBE (1000MBPS) R56 COMPLIANT	X	Row 7
MT_MORSN	ASR	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	X	Row 7
MT_MORSN	ASR	1	DS43783I01T	TTA, 796-824MHZ, SINGLE / DUAL NETWORK, TEST PORT	X	Row 7
MT_MORSN	ASR	1	DS43783I01M48	MULTICOUPLER UNIT, 796-824MHZ,DUAL DIVERSITY,ETHERNET,48VDC	X	Row 7
MT_MORSN	ASR	1	F4544	SITE MANAGER ADVANCED		Row 7
MT_MORSN	ASR	1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL		Row 7
MT_MORSN	ASR	3	V592	AAD TERM BLCK & CONN WI		Row 7
MT_MORSN	ASR	1	VA00905	ADD:24/48 VDC PS TO SM		Row 7
BROADWAY	TX_1	1	DSSC476HF1LDFE5749	COLLINEAR OMNI ANTENNA, 6 DBD, LOW PIM, HD, 746-869 MHZ, PIP RATED	X	Row 8
BROADWAY	TX_1	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
BROADWAY	TX_1	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
BROADWAY	TX_1	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
BROADWAY	TX_1	75	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
BROADWAY	TX_1	2	DSA5DFD	D-CLASS 7-16 DIN FEMALE FOR AVA5-50 CABLE	X	Row 8
BROADWAY	TX_1	3	DSSG7812B2U	SG78-12B2U SUREGROUND GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
BROADWAY	TX_1	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
BROADWAY	TX_1	1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, DIN FEM/MALE BI-DIR W/ BRACKET	X	Row 8
BROADWAY	TX_1	1	DSGSAKITD	GROUND STRAP KIT - DIN	X	Row 8
BROADWAY	TX_1	25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
BROADWAY	TX_1	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
BROADWAY	TX_2	1	DSSC476HF1LDFE5749	COLLINEAR OMNI ANTENNA, 6 DBD, LOW PIM, HD, 746-869 MHZ, PIP RATED	X	Row 8

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
BROADWAY	TX_2	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
BROADWAY	TX_2	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
BROADWAY	TX_2	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
BROADWAY	TX_2	75	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
BROADWAY	TX_2	2	DSA5DFD	D-CLASS 7-16 DIN FEMALE FOR AVA5-50 CABLE	X	Row 8
BROADWAY	TX_2	3	DSSG7812B2U	SG78-12B2U SUREGROUND GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
BROADWAY	TX_2	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
BROADWAY	TX_2	1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, DIN FEM/MALE BI-DIR W/ BRACKET	X	Row 8
BROADWAY	TX_2	1	DSGSAKITD	GROUND STRAP KIT - DIN	X	Row 8
BROADWAY	TX_2	25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
BROADWAY	TX_2	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
BROADWAY	RX_1	1	DSSC412HF2LDFE5765	COLLINEAR OMNI, 11.5DBD HD NULL FILL, PIP RATED LOW PIM 746-869 MHZ	X	Row 8
BROADWAY	RX_1	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
BROADWAY	RX_1	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
BROADWAY	RX_1	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
BROADWAY	RX_1	5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
BROADWAY	RX_1	5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
BROADWAY	RX_1	2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
BROADWAY	RX_1	75	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
BROADWAY	RX_1	2	DSA5NFS	N FEMALE FOR AVA5-50 CABLE	X	Row 8
BROADWAY	RX_1	3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
BROADWAY	RX_1	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
BROADWAY	RX_1	75	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
BROADWAY	RX_1	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
BROADWAY	RX_1	1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	X	Row 8
BROADWAY	RX_1	3	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	X	Row 8
BROADWAY	RX_1	1	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	X	Row 8
BROADWAY	RX_1	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 8
BROADWAY	RX_1	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 8
BROADWAY	RX_1	25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 8
BROADWAY	RX_1	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 8
BROADWAY	RX_1	25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	X	Row 8
BROADWAY	RX_1	2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	X	Row 8
BROADWAY	RX_2	1	DSSC412HF2LDF E5765	COLLINEAR OMNI, 11.5DBD HD NULL FILL, PIP RATED LOW PIM 746-869 MHZ	X	Row 8
BROADWAY	RX_2	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
BROADWAY	RX_2	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
BROADWAY	RX_2	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
BROADWAY	RX_2	4	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
BROADWAY	RX_2	5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
BROADWAY	RX_2	2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
BROADWAY	RX_2	75	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
BROADWAY	RX_2	2	DSA5NFS	N FEMALE FOR AVA5-50 CABLE	X	Row 8
BROADWAY	RX_2	3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
BROADWAY	RX_2	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
BROADWAY	RX_2	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 8
BROADWAY	RX_2	25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	X	Row 8
BROADWAY	RX_2	2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	X	Row 8
DHA	TX_1	1	DSSC476HF1LDF E5749	COLLINEAR OMNI ANTENNA, 6 DBD, LOW PIM, HD, 746-869 MHZ, PIP RATED	X	Row 8

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DHA	TX_1	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DHA	TX_1	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
DHA	TX_1	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
DHA	TX_1	185	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
DHA	TX_1	2	DSA5DFD	D-CLASS 7-16 DIN FEMALE FOR AVA5-50 CABLE	X	Row 8
DHA	TX_1	5	DSSG7812B2U	SG78-12B2U SUREGROUND GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
DHA	TX_1	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
DHA	TX_1	1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, DIN FEM/MALE BI-DIR W/ BRACKET	X	Row 8
DHA	TX_1	1	DSGSAKITD	GROUND STRAP KIT - DIN	X	Row 8
DHA	TX_1	25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DHA	TX_1	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
DHA	TX_2	1	DSSC476HF1LDFE5749	COLLINEAR OMNI ANTENNA, 6 DBD, LOW PIM, HD, 746-869 MHZ, PIP RATED	X	Row 8
DHA	TX_2	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DHA	TX_2	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
DHA	TX_2	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
DHA	TX_2	185	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
DHA	TX_2	2	DSA5DFD	D-CLASS 7-16 DIN FEMALE FOR AVA5-50 CABLE	X	Row 8
DHA	TX_2	5	DSSG7812B2U	SG78-12B2U SUREGROUND GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
DHA	TX_2	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
DHA	TX_2	1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, DIN FEM/MALE BI-DIR W/ BRACKET	X	Row 8
DHA	TX_2	1	DSGSAKITD	GROUND STRAP KIT - DIN	X	Row 8
DHA	TX_2	25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DHA	TX_2	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
DHA	RX_1	1	DSSC412HF2LDFE5765	COLLINEAR OMNI, 11.5DBD HD NULL FILL, PIP RATED LOW PIM 746-869 MHZ	X	Row 8

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DHA	RX_1	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DHA	RX_1	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
DHA	RX_1	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
DHA	RX_1	5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
DHA	RX_1	5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DHA	RX_1	2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
DHA	RX_1	185	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
DHA	RX_1	2	DSA5NFS	N FEMALE FOR AVA5-50 CABLE	X	Row 8
DHA	RX_1	5	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
DHA	RX_1	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
DHA	RX_1	185	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DHA	RX_1	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
DHA	RX_1	1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	X	Row 8
DHA	RX_1	5	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	X	Row 8
DHA	RX_1	1	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	X	Row 8
DHA	RX_1	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 8
DHA	RX_1	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 8
DHA	RX_1	25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 8
DHA	RX_1	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 8
DHA	RX_1	25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	X	Row 8
DHA	RX_1	2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	X	Row 8
DHA	RX_2	1	DSSC412HF2LDF E5765	COLLINEAR OMNI, 11.5DBD HD NULL FILL, PIP RATED LOW PIM 746-869 MHZ	X	Row 8
DHA	RX_2	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DHA	RX_2	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DHA	RX_2	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
DHA	RX_2	4	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
DHA	RX_2	5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DHA	RX_2	2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
DHA	RX_2	185	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
DHA	RX_2	2	DSA5NFS	N FEMALE FOR AVA5-50 CABLE	X	Row 8
DHA	RX_2	5	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
DHA	RX_2	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
DHA	RX_2	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 8
DHA	RX_2	25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	X	Row 8
DHA	RX_2	2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	X	Row 8
DFD2	TX_1	1	DSSC476HF1LDFE5749	COLLINEAR OMNI ANTENNA, 6 DBD, LOW PIM, HD, 746-869 MHZ, PIP RATED	X	Row 8
DFD2	TX_1	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DFD2	TX_1	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
DFD2	TX_1	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
DFD2	TX_1	200	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
DFD2	TX_1	2	DSA5DFD	D-CLASS 7-16 DIN FEMALE FOR AVA5-50 CABLE	X	Row 8
DFD2	TX_1	5	DSSG7812B2U	SG78-12B2U SUREGROUND GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
DFD2	TX_1	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
DFD2	TX_1	1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, DIN FEM/MALE BI-DIR W/ BRACKET	X	Row 8
DFD2	TX_1	1	DSGSAKITD	GROUND STRAP KIT - DIN	X	Row 8
DFD2	TX_1	25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DFD2	TX_1	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
DFD2	TX_2	1	DSSC476HF1LDFE5749	COLLINEAR OMNI ANTENNA, 6 DBD, LOW PIM, HD, 746-869 MHZ, PIP RATED	X	Row 8

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DFD2	TX_2	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DFD2	TX_2	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
DFD2	TX_2	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
DFD2	TX_2	200	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
DFD2	TX_2	2	DSA5DFD	D-CLASS 7-16 DIN FEMALE FOR AVA5-50 CABLE	X	Row 8
DFD2	TX_2	5	DSSG7812B2U	SG78-12B2U SUREGROUND GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
DFD2	TX_2	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
DFD2	TX_2	1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, DIN FEM/MALE BI-DIR W/ BRACKET	X	Row 8
DFD2	TX_2	1	DSGSAKITD	GROUND STRAP KIT - DIN	X	Row 8
DFD2	TX_2	25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DFD2	TX_2	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
DFD2	RX_1	1	DSSC412HF2LDFE5765	COLLINEAR OMNI, 11.5DBD HD NULL FILL, PIP RATED LOW PIM 746-869 MHZ	X	Row 8
DFD2	RX_1	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DFD2	RX_1	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
DFD2	RX_1	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
DFD2	RX_1	5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
DFD2	RX_1	5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DFD2	RX_1	2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
DFD2	RX_1	200	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
DFD2	RX_1	2	DSA5NFS	N FEMALE FOR AVA5-50 CABLE	X	Row 8
DFD2	RX_1	5	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
DFD2	RX_1	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
DFD2	RX_1	200	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DFD2	RX_1	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DFD2	RX_1	1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	X	Row 8
DFD2	RX_1	5	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	X	Row 8
DFD2	RX_1	1	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	X	Row 8
DFD2	RX_1	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 8
DFD2	RX_1	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 8
DFD2	RX_1	25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 8
DFD2	RX_1	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 8
DFD2	RX_1	25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	X	Row 8
DFD2	RX_1	2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	X	Row 8
DFD2	RX_2	1	DSSC412HF2LDF E5765	COLLINEAR OMNI, 11.5DBD HD NULL FILL, PIP RATED LOW PIM 746-869 MHZ	X	Row 8
DFD2	RX_2	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DFD2	RX_2	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
DFD2	RX_2	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
DFD2	RX_2	4	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
DFD2	RX_2	5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
DFD2	RX_2	2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
DFD2	RX_2	200	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
DFD2	RX_2	2	DSA5NFS	N FEMALE FOR AVA5-50 CABLE	X	Row 8
DFD2	RX_2	5	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
DFD2	RX_2	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
DFD2	RX_2	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 8
DFD2	RX_2	25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	X	Row 8
DFD2	RX_2	2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	X	Row 8
MNTN_TWRS	TX_1	1	DSSC476HF1LDF E5749	COLLINEAR OMNI ANTENNA, 6 DBD, LOW PIM, HD, 746-869 MHZ, PIP RATED	X	Row 8

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
MNTN_TWRS	TX_1	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MNTN_TWRS	TX_1	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
MNTN_TWRS	TX_1	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
MNTN_TWRS	TX_1	85	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
MNTN_TWRS	TX_1	2	DSA5DFD	D-CLASS 7-16 DIN FEMALE FOR AVA5-50 CABLE	X	Row 8
MNTN_TWRS	TX_1	4	DSSG7812B2U	SG78-12B2U SUREGROUND GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
MNTN_TWRS	TX_1	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
MNTN_TWRS	TX_1	1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, DIN FEM/MALE BI-DIR W/ BRACKET	X	Row 8
MNTN_TWRS	TX_1	1	DSGSAKITD	GROUND STRAP KIT - DIN	X	Row 8
MNTN_TWRS	TX_1	25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MNTN_TWRS	TX_1	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
MNTN_TWRS	TX_2	1	DSSC476HF1LDFE5749	COLLINEAR OMNI ANTENNA, 6 DBD, LOW PIM, HD, 746-869 MHZ, PIP RATED	X	Row 8
MNTN_TWRS	TX_2	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MNTN_TWRS	TX_2	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
MNTN_TWRS	TX_2	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
MNTN_TWRS	TX_2	85	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
MNTN_TWRS	TX_2	2	DSA5DFD	D-CLASS 7-16 DIN FEMALE FOR AVA5-50 CABLE	X	Row 8
MNTN_TWRS	TX_2	4	DSSG7812B2U	SG78-12B2U SUREGROUND GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
MNTN_TWRS	TX_2	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
MNTN_TWRS	TX_2	1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, DIN FEM/MALE BI-DIR W/ BRACKET	X	Row 8
MNTN_TWRS	TX_2	1	DSGSAKITD	GROUND STRAP KIT - DIN	X	Row 8
MNTN_TWRS	TX_2	25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MNTN_TWRS	TX_2	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
MNTN_TWRS	RX_1	1	DSSC412HF2LDFE5765	COLLINEAR OMNI, 11.5DBD HD NULL FILL, PIP RATED LOW PIM 746-869 MHZ	X	Row 8

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
MNTN_TWRS	RX_1	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MNTN_TWRS	RX_1	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
MNTN_TWRS	RX_1	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
MNTN_TWRS	RX_1	5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
MNTN_TWRS	RX_1	5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MNTN_TWRS	RX_1	2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
MNTN_TWRS	RX_1	85	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
MNTN_TWRS	RX_1	2	DSA5NFS	N FEMALE FOR AVA5-50 CABLE	X	Row 8
MNTN_TWRS	RX_1	4	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
MNTN_TWRS	RX_1	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
MNTN_TWRS	RX_1	85	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MNTN_TWRS	RX_1	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
MNTN_TWRS	RX_1	1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	X	Row 8
MNTN_TWRS	RX_1	4	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	X	Row 8
MNTN_TWRS	RX_1	1	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	X	Row 8
MNTN_TWRS	RX_1	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 8
MNTN_TWRS	RX_1	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 8
MNTN_TWRS	RX_1	25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 8
MNTN_TWRS	RX_1	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 8
MNTN_TWRS	RX_1	25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	X	Row 8
MNTN_TWRS	RX_1	2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	X	Row 8
MNTN_TWRS	RX_2	1	DSSC412HF2LDF E5765	COLLINEAR OMNI, 11.5DBD HD NULL FILL, PIP RATED LOW PIM 746-869 MHZ	X	Row 8
MNTN_TWRS	RX_2	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MNTN_TWRS	RX_2	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
MNTN_TWRS	RX_2	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
MNTN_TWRS	RX_2	4	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
MNTN_TWRS	RX_2	5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MNTN_TWRS	RX_2	2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
MNTN_TWRS	RX_2	85	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
MNTN_TWRS	RX_2	2	DSA5NFS	N FEMALE FOR AVA5-50 CABLE	X	Row 8
MNTN_TWRS	RX_2	4	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
MNTN_TWRS	RX_2	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
MNTN_TWRS	RX_2	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 8
MNTN_TWRS	RX_2	25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	X	Row 8
MNTN_TWRS	RX_2	2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	X	Row 8
MT_MORSN	TX_1	1	DQBMR8AB1DT6	10.3 DB 220 DEG SEC 806-869 MHZ ANTENNA WITH 6 DEG. DOWNTILT	X	Row 8
MT_MORSN	TX_1	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MT_MORSN	TX_1	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
MT_MORSN	TX_1	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
MT_MORSN	TX_1	300	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
MT_MORSN	TX_1	2	DSA5DFD	D-CLASS 7-16 DIN FEMALE FOR AVA5-50 CABLE	X	Row 8
MT_MORSN	TX_1	6	DSSG7812B2U	SG78-12B2U SUREGROUND GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
MT_MORSN	TX_1	2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
MT_MORSN	TX_1	1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, DIN FEM/MALE BI-DIR W/ BRACKET	X	Row 8
MT_MORSN	TX_1	1	DSGSAKITD	GROUND STRAP KIT - DIN	X	Row 8
MT_MORSN	TX_1	25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MT_MORSN	TX_1	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
MT_MORSN	RX_1	1	DQBMR8AB1DT6	10.3 DB 220 DEG SEC 806-869 MHZ ANTENNA WITH 6 DEG. DOWNTILT	X	Row 8

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
MT_MORSN	RX_1	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MT_MORSN	RX_1	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
MT_MORSN	RX_1	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
MT_MORSN	RX_1	5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
MT_MORSN	RX_1	5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MT_MORSN	RX_1	2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
MT_MORSN	RX_1	300	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
MT_MORSN	RX_1	2	DSA5NFS	N FEMALE FOR AVA5-50 CABLE	X	Row 8
MT_MORSN	RX_1	6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
MT_MORSN	RX_1	2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
MT_MORSN	RX_1	300	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MT_MORSN	RX_1	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
MT_MORSN	RX_1	1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	X	Row 8
MT_MORSN	RX_1	6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	X	Row 8
MT_MORSN	RX_1	2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	X	Row 8
MT_MORSN	RX_1	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 8
MT_MORSN	RX_1	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 8
MT_MORSN	RX_1	25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 8
MT_MORSN	RX_1	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 8
MT_MORSN	RX_1	25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	X	Row 8
MT_MORSN	RX_1	2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	X	Row 8
MT_MORSN	RX_2	1	DSSC412HF2LDFE5765	COLLINEAR OMNI, 11.5DBD HD NULL FILL, PIP RATED LOW PIM 746-869 MHZ	X	Row 8
MT_MORSN	RX_2	15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MT_MORSN	RX_2	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
MT_MORSN	RX_2	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 8
MT_MORSN	RX_2	4	TDN9289	221213 CABLE WRAP WEATHERPROOFING	X	Row 8
MT_MORSN	RX_2	5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 8
MT_MORSN	RX_2	2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	X	Row 8
MT_MORSN	RX_2	300	DSAVA550	AVA5-50, COAXIAL CABLE, CORRUGATED COPPER,7/8 IN, BLACK PE JACKET	X	Row 8
MT_MORSN	RX_2	2	DSA5NFS	N FEMALE FOR AVA5-50 CABLE	X	Row 8
MT_MORSN	RX_2	6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	X	Row 8
MT_MORSN	RX_2	2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	X	Row 8
MT_MORSN	RX_2	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 8
MT_MORSN	RX_2	25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	X	Row 8
MT_MORSN	RX_2	2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	X	Row 8
BROADWAY	APM	10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 39
BROADWAY	APM	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 39
BROADWAY	APM	1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	X	Row 39
BROADWAY	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
BROADWAY	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
BROADWAY	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
BROADWAY	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
BROADWAY	APM	1	DSSP74964440DF F1RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	X	Row 39
BROADWAY	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
BROADWAY	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
BROADWAY	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
BROADWAY	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DHA	APM	10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 39
DHA	APM	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 39
DHA	APM	1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	X	Row 39
DHA	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
DHA	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
DHA	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
DHA	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
DHA	APM	1	DSSP74964440DF F1RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	X	Row 39
DHA	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
DHA	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
DHA	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
DHA	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
DFD2	APM	10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 39
DFD2	APM	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 39
DFD2	APM	1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	X	Row 39
DFD2	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
DFD2	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
DFD2	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
DFD2	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
DFD2	APM	1	DSSP74964440DF F1RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	X	Row 39
DFD2	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
DFD2	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DFD2	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
DFD2	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
MNTN_TWRS	APM	10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 39
MNTN_TWRS	APM	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 39
MNTN_TWRS	APM	1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	X	Row 39
MNTN_TWRS	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
MNTN_TWRS	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
MNTN_TWRS	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
MNTN_TWRS	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
MNTN_TWRS	APM	1	DSSP74964440DFF1RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	X	Row 39
MNTN_TWRS	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
MNTN_TWRS	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
MNTN_TWRS	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
MNTN_TWRS	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
MT_MORSN	APM	10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	X	Row 39
MT_MORSN	APM	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	X	Row 39
MT_MORSN	APM	1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	X	Row 39
MT_MORSN	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
MT_MORSN	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
MT_MORSN	APM	10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	X	Row 39
MT_MORSN	APM	2	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	X	Row 39
MAIN_DIS	OP_POSIT	1	B1949	MCC 7500E SOFTWARE DVD		Row 5
MAIN_DIS	OP_POSIT	26	B1948	MCC 7500E DISPATCH POSITION LICENSES		Row 5

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
MAIN_DIS	OP_POSIT	26	UA00653AA	ADD: BASIC CONSOLE OPERATION		Row 5
MAIN_DIS	OP_POSIT	26	UA00654AA	ADD: ASTRO 25 TRUNKING OPERATION		Row 5
MAIN_DIS	OP_POSIT	26	UA00658AA	ADD: SECURE OPERATION		Row 5
MAIN_DIS	OP_POSIT	26	UA00659AA	ADD: ADP/AES/DES-OFB ENCRYPTION		Row 5
MAIN_DIS	OP_POSIT	26	UA00251AA	ADD: 15 CHANNEL SW LICENSE		Row 5
MAIN_DIS	OP_POSIT	26	UA00661AA	ADD: ENHANCED IRR		Row 5
MAIN_DIS	OP_POSIT	26	TT3225	Z2 MINI WORKSTATION 258G 8G NON RET	X	Row 5
MAIN_DIS	OP_POSIT	26	DSY7B61AA	HP Z2 MINI ARM WALL VESA MOUNT	X	Row 5
MAIN_DIS	OP_POSIT	26	DSUSB31000S	STARTECH USB 3.0 TO GIGABIT ETHERNET ADAPTER	X	Row 5
MAIN_DIS	OP_POSIT	26	T7885	MCAFEE WINDOWS AV CLIENT		Row 5
MAIN_DIS	OP_POSIT	26	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG		Row 5
MAIN_DIS	OP_POSIT	26	DSST7300U3M	STARTECH 7 PORT USB 3.0 HUB	X	Row 5
MAIN_DIS	OP_POSIT	26	B1941	USB AUDIO INTERFACE MODULE		Row 5
MAIN_DIS	OP_POSIT	26	CDN6673	CREATIVE LABS INSPIRE A60	X	Row 5
MAIN_DIS	OP_POSIT	10	DSM1ACT520USB	ALESIS 3IN ACTIVE USB SPEAKER PAIR	X	Row 5
MAIN_DIS	OP_POSIT	26	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE		Row 5
MAIN_DIS	OP_POSIT	52	B1913	MCC SERIES HEADSET JACK		Row 5
MAIN_DIS	OP_POSIT	26	RMN5077B	SUPRAPLUS SINGLE MUFF HEADSET		Row 5
MAIN_DIS	OP_POSIT	26	RLN6098	HDST MODULE BASE W/PTT, 15' CBL		Row 5
MAIN_DIS	OP_POSIT	26	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH FOR USE WITH MOTOROLA MCC 7500 DISP	X	Row 5
MAIN_DIS	OP_POSIT	26	DSSHI29274809	GENOVATION CP24		Row 5
MAIN_DIS	OP_POSIT	26	DSTXBUTTON	DESKTOP TX BUTTON		Row 45
MAIN_DIS	NETWORK	2	CLN1859	2620-48 ETHERNET SWITCH		Row 9
MAIN_DIS	NETWORK	2	SQM01SUM0205	GGM 8000 GATEWAY		Row 9
MAIN_DIS	NETWORK	2	CA01616AA	ADD: AC POWER		Row 9
MAIN_DIS	AFM	1	F4544	SITE MANAGER ADVANCED		Row 5
MAIN_DIS	AFM	1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL		Row 5
MAIN_DIS	AFM	3	V592	AAD TERM BLCK & CONN WI		Row 5
MAIN_DIS	AFM	1	VA00905	ADD:24/48 VDC PS TO SM		Row 5
MAIN_DIS	CONVENTIONAL	1	SQM01SUM0205	GGM 8000 GATEWAY		Row 5
MAIN_DIS	CONVENTIONAL	1	CA01616AA	ADD: AC POWER		Row 5
MAIN_DIS	CONVENTIONAL	1	CA02086AA	ADD: HIGH DENSITY ENH CONV GATEWAY		Row 5
MAIN_DIS	CONVENTIONAL	1	T7038	GCP 8000 SITE CONTROLLER		Row 5

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
MAIN_DIS	CONVENTIONAL	1	CA00303AA	ADD: QTY (1) SITE CONTROLLER		Row 5
MAIN_DIS	CONVENTIONAL	1	CA01136AA	MCC 7500 CONVEN SITE OPER		Row 5
MAIN_DIS	CONVENTIONAL	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 5
MAIN_DIS	SURGE	4	DS11011188	PDU, 120/240 SPLIT PH OR N+1 REDUNDANT, 60A MAX PER PHASE, SIX DEDICAT	X	Row 5
MAIN_DIS	SURGE	48	DS3750297	BREAKER, 15 AMP, CB UL 489 LISTED FOR AC EDGE II (1101-1188)	X	Row 5
MAIN_DIS	SURGE	2	DS1101990	SPD, SHIELDED RJ-45 JACK, SINGLE LINE GBE (1000MBPS) R56 COMPLIANT	X	Row 5
MAIN_DIS	SURGE	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	X	Row 5
MAIN_DIS	CABINET	2	DSTG2A120CB	CHATSWORTH GLOBAL FRAME CABINET 24IN W 84IN H 35IN D BLACK	X	Row 5
MAIN_DIS	DISP_CNI	1	SQM01SUM0205	GGM 8000 GATEWAY		Row 9
MAIN_DIS	DISP_CNI	1	CA01616AA	ADD: AC POWER		Row 9
MAIN_DIS	DISP_CNI	1	T8126	FORTINET FIREWALL APPLIANCE		Row 9
JOSEPHINE	OP_POSIT	16	B1948	MCC 7500E DISPATCH POSITION LICENSES		Row 5
JOSEPHINE	OP_POSIT	16	UA00653AA	ADD: BASIC CONSOLE OPERATION		Row 5
JOSEPHINE	OP_POSIT	16	UA00654AA	ADD: ASTRO 25 TRUNKING OPERATION		Row 5
JOSEPHINE	OP_POSIT	16	UA00658AA	ADD: SECURE OPERATION		Row 5
JOSEPHINE	OP_POSIT	16	UA00659AA	ADD: ADP/AES/DES-OFB ENCRYPTION		Row 5
JOSEPHINE	OP_POSIT	16	UA00251AA	ADD: 15 CHANNEL SW LICENSE		Row 5
JOSEPHINE	OP_POSIT	16	UA00661AA	ADD: ENHANCED IRR		Row 5
JOSEPHINE	OP_POSIT	16	TT3225	Z2 MINI WORKSTATION 258G 8G NON RET	X	Row 5
JOSEPHINE	OP_POSIT	16	DSY7B61AA	HP Z2 MINI ARM WALL VESA MOUNT	X	Row 5
JOSEPHINE	OP_POSIT	16	DSUSB31000S	STARTECH USB 3.0 TO GIGABIT ETHERNET ADAPTER	X	Row 5
JOSEPHINE	OP_POSIT	16	T7885	MCAFEE WINDOWS AV CLIENT		Row 5
JOSEPHINE	OP_POSIT	16	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG		Row 5
JOSEPHINE	OP_POSIT	16	DSST7300U3M	STARTECH 7 PORT USB 3.0 HUB	X	Row 5
JOSEPHINE	OP_POSIT	16	B1941	USB AUDIO INTERFACE MODULE		Row 5
JOSEPHINE	OP_POSIT	16	CDN6673	CREATIVE LABS INSPIRE A60	X	Row 5
JOSEPHINE	OP_POSIT	8	DSM1ACT520USB	ALESIS 3IN ACTIVE USB SPEAKER PAIR	X	Row 5
JOSEPHINE	OP_POSIT	16	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE		Row 5
JOSEPHINE	OP_POSIT	32	B1913	MCC SERIES HEADSET JACK		Row 5
JOSEPHINE	OP_POSIT	16	RMN5077B	SUPRAPLUS SINGLE MUFF HEADSET		Row 5

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
JOSEPHINE	OP_POSIT	16	RLN6098	HDST MODULE BASE W/PTT, 15' CBL		Row 5
JOSEPHINE	OP_POSIT	16	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH FOR USE WITH MOTOROLA MCC 7500 DISP	X	Row 5
JOSEPHINE	OP_POSIT	16	DSSHI29274809	GENOVATION CP24		Row 5
JOSEPHINE	OP_POSIT	16	DSTXBUTTON	DESKTOP TX BUTTON		Row 45
JOSEPHINE	NETWORK	2	CLN1859	2620-48 ETHERNET SWITCH		Row 9
JOSEPHINE	NETWORK	2	SQM01SUM0205	GGM 8000 GATEWAY		Row 9
JOSEPHINE	NETWORK	2	CA01616AA	ADD: AC POWER		Row 9
JOSEPHINE	AFM	1	F4544	SITE MANAGER ADVANCED		Row 5
JOSEPHINE	AFM	1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL		Row 5
JOSEPHINE	AFM	3	V592	AAD TERM BLCK & CONN WI		Row 5
JOSEPHINE	AFM	1	VA00905	ADD:24/48 VDC PS TO SM		Row 5
JOSEPHINE	SURGE	2	DS11011188	PDU, 120/240 SPLIT PH OR N+1 REDUNDANT, 60A MAX PER PHASE, SIX DEDICAT	X	Row 5
JOSEPHINE	SURGE	24	DS3750297	BREAKER, 15 AMP, CB UL 489 LISTED FOR AC EDGE II (1101-1188)	X	Row 5
JOSEPHINE	SURGE	2	DS1101990	SPD, SHIELDED RJ-45 JACK, SINGLE LINE GBE (1000MBPS) R56 COMPLIANT	X	Row 5
JOSEPHINE	SURGE	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	X	Row 5
JOSEPHINE	CABINET	1	DSTG2A120CB	CHATSWORTH GLOBAL FRAME CABINET 24IN W 84IN H 35IN D BLACK	X	Row 5
DCC	OP_POSIT	1	B1948	MCC 7500E DISPATCH POSITION LICENSES		Row 5
DCC	OP_POSIT	1	UA00653AA	ADD: BASIC CONSOLE OPERATION		Row 5
DCC	OP_POSIT	1	UA00654AA	ADD: ASTRO 25 TRUNKING OPERATION		Row 5
DCC	OP_POSIT	1	UA00658AA	ADD: SECURE OPERATION		Row 5
DCC	OP_POSIT	1	UA00659AA	ADD: ADP/AES/DES-OFB ENCRYPTION		Row 5
DCC	OP_POSIT	1	UA00251AA	ADD: 15 CHANNEL SW LICENSE		Row 5
DCC	OP_POSIT	1	UA00661AA	ADD: ENHANCED IRR		Row 5
DCC	OP_POSIT	1	TT3225	Z2 MINI WORKSTATION 258G 8G NON RET	X	Row 5
DCC	OP_POSIT	1	DSY7B61AA	HP Z2 MINI ARM WALL VESA MOUNT	X	Row 5
DCC	OP_POSIT	1	DSUSB31000S	STARTECH USB 3.0 TO GIGABIT ETHERNET ADAPTER	X	Row 5
DCC	OP_POSIT	1	T7885	MCAFEE WINDOWS AV CLIENT		Row 5
DCC	OP_POSIT	1	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG		Row 5
DCC	OP_POSIT	1	DSST7300U3M	STARTECH 7 PORT USB 3.0 HUB	X	Row 5

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DCC	OP_POSIT	1	B1941	USB AUDIO INTERFACE MODULE		Row 5
DCC	OP_POSIT	1	CDN6673	CREATIVE LABS INSPIRE A60	X	Row 5
DCC	OP_POSIT	1	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE		Row 5
DCC	OP_POSIT	2	B1913	MCC SERIES HEADSET JACK		Row 5
DCC	OP_POSIT	1	RMN5077B	SUPRAPLUS SINGLE MUFF HEADSET		Row 5
DCC	OP_POSIT	1	RLN6098	HDST MODULE BASE W/PTT, 15' CBL		Row 5
DCC	OP_POSIT	1	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH FOR USE WITH MOTOROLA MCC 7500 DISP	X	Row 5
DCC	OP_POSIT	1	DSSHI29274809	GENOVATION CP24		Row 5
DCC	OP_POSIT	1	DSTXBUTTON	DESKTOP TX BUTTON		Row 45
DCC	NETWORK	2	CLN1856	2620-24 ETHERNET SWITCH		Row 9
DCC	NETWORK	2	SQM01SUM0205	GGM 8000 GATEWAY		Row 9
DCC	NETWORK	2	CA01616AA	ADD: AC POWER		Row 9
DCC	AFM	1	F4544	SITE MANAGER ADVANCED		Row 5
DCC	AFM	1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL		Row 5
DCC	AFM	3	V592	AAD TERM BLCK & CONN WI		Row 5
DCC	AFM	1	VA00905	ADD:24/48 VDC PS TO SM		Row 5
DCC	SURGE	1	DS11011188	PDU, 120/240 SPLIT PH OR N+1 REDUNDANT, 60A MAX PER PHASE, SIX DEDICAT	X	Row 5
DCC	SURGE	12	DS3750297	BREAKER, 15 AMP, CB UL 489 LISTED FOR AC EDGE II (1101-1188)	X	Row 5
DCC	SURGE	2	DS1101990	SPD, SHIELDED RJ-45 JACK, SINGLE LINE GBE (1000MBPS) R56 COMPLIANT	X	Row 5
DCC	SURGE	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	X	Row 5
DCC	CABINET	1	DSTG2A120CB	CHATSWORTH GLOBAL FRAME CABINET 24IN W 84IN H 35IN D BLACK	X	Row 5
SDDC	OP_POSIT	2	B1948	MCC 7500E DISPATCH POSITION LICENSES		Row 5
SDDC	OP_POSIT	2	UA00653AA	ADD: BASIC CONSOLE OPERATION		Row 5
SDDC	OP_POSIT	2	UA00654AA	ADD: ASTRO 25 TRUNKING OPERATION		Row 5
SDDC	OP_POSIT	2	UA00658AA	ADD: SECURE OPERATION		Row 5
SDDC	OP_POSIT	2	UA00659AA	ADD: ADP/AES/DES-OFB ENCRYPTION		Row 5
SDDC	OP_POSIT	2	UA00251AA	ADD: 15 CHANNEL SW LICENSE		Row 5
SDDC	OP_POSIT	2	UA00661AA	ADD: ENHANCED IRR		Row 5
SDDC	OP_POSIT	2	TT3225	Z2 MINI WORKSTATION 258G 8G NON RET	X	Row 5
SDDC	OP_POSIT	2	DSY7B61AA	HP Z2 MINI ARM WALL VESA MOUNT	X	Row 5

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
SDDC	OP_POSIT	2	DSUSB31000S	STARTECH USB 3.0 TO GIGABIT ETHERNET ADAPTER	X	Row 5
SDDC	OP_POSIT	2	T7885	MCAFEE WINDOWS AV CLIENT		Row 5
SDDC	OP_POSIT	2	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG		Row 5
SDDC	OP_POSIT	2	DSST7300U3M	STARTECH 7 PORT USB 3.0 HUB	X	Row 5
SDDC	OP_POSIT	2	B1941	USB AUDIO INTERFACE MODULE		Row 5
SDDC	OP_POSIT	2	CDN6673	CREATIVE LABS INSPIRE A60	X	Row 5
SDDC	OP_POSIT	2	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE		Row 5
SDDC	OP_POSIT	4	B1913	MCC SERIES HEADSET JACK		Row 5
SDDC	OP_POSIT	2	RMN5077B	SUPRAPLUS SINGLE MUFF HEADSET		Row 5
SDDC	OP_POSIT	2	RLN6098	HDST MODULE BASE W/PTT, 15' CBL		Row 5
SDDC	OP_POSIT	2	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH FOR USE WITH MOTOROLA MCC 7500 DISP	X	Row 5
SDDC	OP_POSIT	2	DSSHI29274809	GENOVATION CP24		Row 5
SDDC	OP_POSIT	2	DSTXBUTTON	DESKTOP TX BUTTON		Row 45
SDDC	NETWORK	2	CLN1856	2620-24 ETHERNET SWITCH		Row 9
SDDC	NETWORK	2	SQM01SUM0205	GGM 8000 GATEWAY		Row 9
SDDC	NETWORK	2	CA01616AA	ADD: AC POWER		Row 9
SDDC	AFM	1	F4544	SITE MANAGER ADVANCED		Row 5
SDDC	AFM	1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL		Row 5
SDDC	AFM	3	V592	AAD TERM BLCK & CONN WI		Row 5
SDDC	AFM	1	VA00905	ADD:24/48 VDC PS TO SM		Row 5
SDDC	SURGE	1	DS11011188	PDU, 120/240 SPLIT PH OR N+1 REDUNDANT, 60A MAX PER PHASE, SIX DEDICAT	X	Row 5
SDDC	SURGE	12	DS3750297	BREAKER, 15 AMP, CB UL 489 LISTED FOR AC EDGE II (1101-1188)	X	Row 5
SDDC	SURGE	2	DS1101990	SPD, SHIELDED RJ-45 JACK, SINGLE LINE GBE (1000MBPS) R56 COMPLIANT	X	Row 5
SDDC	SURGE	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	X	Row 5
SDDC	CABINET	1	DSTG2A120CB	CHATSWORTH GLOBAL FRAME CABINET 24IN W 84IN H 35IN D BLACK	X	Row 5
DRWS	OP_POSIT	3	B1948	MCC 7500E DISPATCH POSITION LICENSES		Row 5
DRWS	OP_POSIT	3	UA00653AA	ADD: BASIC CONSOLE OPERATION		Row 5
DRWS	OP_POSIT	3	UA00654AA	ADD: ASTRO 25 TRUNKING OPERATION		Row 5

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DRWS	OP_POSIT	3	UA00658AA	ADD: SECURE OPERATION		Row 5
DRWS	OP_POSIT	3	UA00659AA	ADD: ADP/AES/DES-OFB ENCRYPTION		Row 5
DRWS	OP_POSIT	3	UA00251AA	ADD: 15 CHANNEL SW LICENSE		Row 5
DRWS	OP_POSIT	3	UA00661AA	ADD: ENHANCED IRR		Row 5
DRWS	OP_POSIT	3	TT3225	Z2 MINI WORKSTATION 258G 8G NON RET	X	Row 5
DRWS	OP_POSIT	3	DSY7B61AA	HP Z2 MINI ARM WALL VESA MOUNT	X	Row 5
DRWS	OP_POSIT	3	DSUSB31000S	STARTECH USB 3.0 TO GIGABIT ETHERNET ADAPTER	X	Row 5
DRWS	OP_POSIT	3	T7885	MCAFEE WINDOWS AV CLIENT		Row 5
DRWS	OP_POSIT	3	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG		Row 5
DRWS	OP_POSIT	3	DSST7300U3M	STARTECH 7 PORT USB 3.0 HUB	X	Row 5
DRWS	OP_POSIT	3	B1941	USB AUDIO INTERFACE MODULE		Row 5
DRWS	OP_POSIT	3	CDN6673	CREATIVE LABS INSPIRE A60	X	Row 5
DRWS	OP_POSIT	3	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE		Row 5
DRWS	OP_POSIT	6	B1913	MCC SERIES HEADSET JACK		Row 5
DRWS	OP_POSIT	3	RMN5077B	SUPRAPLUS SINGLE MUFF HEADSET		Row 5
DRWS	OP_POSIT	3	RLN6098	HDST MODULE BASE W/PTT, 15' CBL		Row 5
DRWS	OP_POSIT	3	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH FOR USE WITH MOTOROLA MCC 7500 DISP	X	Row 5
DRWS	OP_POSIT	3	DSSHI29274809	GENOVATION CP24		Row 5
DRWS	OP_POSIT	3	DSTXBUTTON	DESKTOP TX BUTTON		Row 45
DRWS	NETWORK	2	CLN1856	2620-24 ETHERNET SWITCH		Row 9
DRWS	NETWORK	2	SQM01SUM0205	GGM 8000 GATEWAY		Row 9
DRWS	NETWORK	2	CA01616AA	ADD: AC POWER		Row 9
DRWS	AFM	1	F4544	SITE MANAGER ADVANCED		Row 5
DRWS	AFM	1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL		Row 5
DRWS	AFM	3	V592	AAD TERM BLCK & CONN WI		Row 5
DRWS	AFM	1	VA00905	ADD:24/48 VDC PS TO SM		Row 5
DRWS	SURGE	1	DS11011188	PDU, 120/240 SPLIT PH OR N+1 REDUNDANT, 60A MAX PER PHASE, SIX DEDICAT	X	Row 5
DRWS	SURGE	12	DS3750297	BREAKER, 15 AMP, CB UL 489 LISTED FOR AC EDGE II (1101-1188)	X	Row 5
DRWS	SURGE	2	DS1101990	SPD, SHIELDED RJ-45 JACK, SINGLE LINE GBE (1000MBPS) R56 COMPLIANT	X	Row 5
DRWS	SURGE	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	X	Row 5

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DRWS	CABINET	1	DSTG2A120CB	CHATSWORTH GLOBAL FRAME CABINET 24IN W 84IN H 35IN D BLACK	X	Row 5
JOSEPHINE	MASTER	1	SQM01SUM0273	MASTER SITE CONFIGURATION		Row 3
JOSEPHINE	MASTER	1	CA02629AC	ADD: EXPAND 7.17 M CORE		Row 3
JOSEPHINE	MASTER	1	UA00237AA	ADD: INCREASED CAPACITY		Row 3
JOSEPHINE	MASTER	1	UA00156AA	ADD: MCC7500 CONSOLE LICENSES (QTY 5)		Row 3
NOC	OP_POSIT	1	B1949	MCC 7500E SOFTWARE DVD		Row 37
NOC	OP_POSIT	1	B1948	MCC 7500E DISPATCH POSITION LICENSES		Row 37
NOC	OP_POSIT	1	UA00653AA	ADD: BASIC CONSOLE OPERATION		Row 37
NOC	OP_POSIT	1	UA00654AA	ADD: ASTRO 25 TRUNKING OPERATION		Row 37
NOC	OP_POSIT	1	UA00658AA	ADD: SECURE OPERATION		Row 37
NOC	OP_POSIT	1	UA00659AA	ADD: ADP/AES/DES-OFB ENCRYPTION		Row 37
NOC	OP_POSIT	1	UA00251AA	ADD: 15 CHANNEL SW LICENSE		Row 37
NOC	OP_POSIT	1	UA00661AA	ADD: ENHANCED IRR		Row 37
NOC	OP_POSIT	1	TT3225	Z2 MINI WORKSTATION 258G 8G NON RET	X	Row 37
NOC	OP_POSIT	1	DSY7B61AA	HP Z2 MINI ARM WALL VESA MOUNT	X	Row 37
NOC	OP_POSIT	1	DSUSB31000S	STARTECH USB 3.0 TO GIGABIT ETHERNET ADAPTER	X	Row 37
NOC	OP_POSIT	1	T7885	MCAFEE WINDOWS AV CLIENT		Row 37
NOC	OP_POSIT	1	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG		Row 37
NOC	OP_POSIT	1	DSST7300U3M	STARTECH 7 PORT USB 3.0 HUB	X	Row 37
NOC	OP_POSIT	1	B1941	USB AUDIO INTERFACE MODULE		Row 37
NOC	OP_POSIT	1	CDN6673	CREATIVE LABS INSPIRE A60	X	Row 37
NOC	OP_POSIT	1	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE		Row 37
NOC	OP_POSIT	2	B1913	MCC SERIES HEADSET JACK		Row 37
NOC	OP_POSIT	1	RMN5077B	SUPRAPLUS SINGLE MUFF HEADSET		Row 37
NOC	OP_POSIT	1	RLN6098	HDST MODULE BASE W/PTT, 15' CBL		Row 37
NOC	OP_POSIT	1	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH FOR USE WITH MOTOROLA MCC 7500 DISP	X	Row 37
NOC	OP_POSIT	1	DSSHI29274809	GENOVATION CP24		Row 37
NOC	OP_POSIT	1	DSTXBUTTON	DESKTOP TX BUTTON		Row 45
NOC	NETWORK	1	CLN1856	2620-24 ETHERNET SWITCH		Row 37
MAIN_DISP	DISP1	26	M25URS9PW1 N	APX6500 7/800 MHZ MID POWER MOBILE		Row 5
MAIN_DISP	DISP1	26	G806	ADD: ASTRO DIGITAL CAI OPERATION		Row 5
MAIN_DISP	DISP1	26	G51	ENH: SMARTZONE OPERATION APX6500		Row 5

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
MAIN_DISP	DISP1	26	G361	ADD: P25 TRUNKING SOFTWARE		Row 5
MAIN_DISP	DISP1	26	GA00580	ADD: TDMA OPERATION		Row 5
MAIN_DISP	DISP1	26	QA01648	ADD: ADVANCED SYSTEM KEY - HARDWARE KEY		Row 5
MAIN_DISP	DISP1	26	G442	ADD: O5 CONTROL HEAD		Row 5
MAIN_DISP	DISP1	26	G444	ADD: APX CONTROL HEAD SOFTWARE		Row 5
MAIN_DISP	DISP1	26	G67	ADD: REMOTE MOUNT O2 WWM		Row 5
MAIN_DISP	DISP1	26	G89	ADD: NO RF ANTENNA NEEDED		Row 5
MAIN_DISP	DISP1	26	G90	ADD: NO MICROPHONE NEEDED		Row 5
MAIN_DISP	DISP1	26	B18	ADD: AUXILARY SPKR 7.5 WATT		Row 5
MAIN_DISP	DISP1	26	G582	ADD: REMOTE MOUNT CABLE 131 FT		Row 5
MAIN_DISP	DISP1	26	GA00235	ADD: NO GPS ANTENNA NEEDED		Row 5
MAIN_DISP	DISP1	26	G24	INT: 3 YEAR SERVICE FROM THE START LITE		Row 5
MAIN_DISP	DISP1	26	G843	ADD: AES ENCRYPTION APX		Row 5
MAIN_DISP	DISP1	26	G298	ENH: ASTRO 25 OTAR W/ MULTIKEY		Row 5
MAIN_DISP	DISP1	26	RMN5070A	AS. SPECTRA & XTL5000 DESKTOP MIC		Row 5
MAIN_DISP	DISP1	26	HPN4007D	POWER SUPPLY 14V 15A UNI 117/240 VAC		Row 5
MAIN_DISP	DISP1	2	DSSMD783U	SIDE MOUNTED EXPOSED DIPOLE, 0 DBD, 190 DEG BW, 746-870 MHZ, PIM RATED	X	Row 8
MAIN_DISP	DISP1	300	L3570	FSJ4RK-50B CABLE: 1/2" SUPERFLEX FOAM COAX BLCK FIRE RETARDANT JCKT,	X	Row 8
MAIN_DISP	DISP1	4	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	X	Row 8
MAIN_DISP	DISP1	4	TDN8810	F4PNF-C 1/2" TYPE N FEMALE CONNECTOR	X	Row 8
MAIN_DISP	DISP1	2	DSTSXNFMPBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, NF/MALE BIDIRECTIONAL PIM W/BF	X	Row 8
MAIN_DISP	DISP1	2	DQBFN	MOUNTING KIT FOR SUPPRESSORS	X	Row 8
MAIN_DISP	DISP1	1	DSCS74863205SN	HYBRID CONTROL STATION COMBINER, 746-869 MHZ 32 CH.	X	Row 8
MAIN_DISP	DISP1	130	L1700	RG142B/U PLENUM CABLE PRICED PER FOOT BELDEN 83242 0011000	X	Row 8
MAIN_DISP	DISP1	26	DDN9769	N MALE CONNECTOR FOR RG55, RG223, RG142, BELDEN 8219 & 9907 CBL	X	Row 8
MAIN_DISP	DISP1	26	DSF1MU	F1MU 1/4" MINI UHF MALE S FLEX CONNECTOR	X	Row 8
JOSEPHINE	DISP2	16	M25URS9PW1N	APX6500 7/800 MHZ MID POWER MOBILE		Row 5
JOSEPHINE	DISP2	16	G806	ADD: ASTRO DIGITAL CAI OPERATION		Row 5
JOSEPHINE	DISP2	16	G51	ENH: SMARTZONE OPERATION APX6500		Row 5

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
JOSEPHINE	DISP2	16	G361	ADD: P25 TRUNKING SOFTWARE		Row 5
JOSEPHINE	DISP2	16	GA00580	ADD: TDMA OPERATION		Row 5
JOSEPHINE	DISP2	16	QA01648	ADD: ADVANCED SYSTEM KEY - HARDWARE KEY		Row 5
JOSEPHINE	DISP2	16	G442	ADD: O5 CONTROL HEAD		Row 5
JOSEPHINE	DISP2	16	G444	ADD: APX CONTROL HEAD SOFTWARE		Row 5
JOSEPHINE	DISP2	16	G67	ADD: REMOTE MOUNT O2 WWM		Row 5
JOSEPHINE	DISP2	16	G89	ADD: NO RF ANTENNA NEEDED		Row 5
JOSEPHINE	DISP2	16	G90	ADD: NO MICROPHONE NEEDED		Row 5
JOSEPHINE	DISP2	16	B18	ADD: AUXILARY SPKR 7.5 WATT		Row 5
JOSEPHINE	DISP2	16	G582	ADD: REMOTE MOUNT CABLE 131 FT		Row 5
JOSEPHINE	DISP2	16	GA00235	ADD: NO GPS ANTENNA NEEDED		Row 5
JOSEPHINE	DISP2	16	G24	INT: 3 YEAR SERVICE FROM THE START LITE		Row 5
JOSEPHINE	DISP2	16	G843	ADD: AES ENCRYPTION APX		Row 5
JOSEPHINE	DISP2	16	G298	ENH: ASTRO 25 OTAR W/ MULTIKEY		Row 5
JOSEPHINE	DISP2	16	RMN5070A	AS. SPECTRA & XTL5000 DESKTOP MIC		Row 5
JOSEPHINE	DISP2	16	HPN4007D	POWER SUPPLY 14V 15A UNI 117/240 VAC		Row 5
JOSEPHINE	DISP2	2	DSSMD783U	SIDE MOUNTED EXPOSED DIPOLE, 0 DBD, 190 DEG BW, 746-870 MHZ, PIM RATED	X	Row 8
JOSEPHINE	DISP2	300	L3570	FSJ4RK-50B CABLE: 1/2" SUPERFLEX FOAM COAX BLCK FIRE RETARDANT JCKT,	X	Row 8
JOSEPHINE	DISP2	4	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	X	Row 8
JOSEPHINE	DISP2	4	TDN8810	F4PNF-C 1/2" TYPE N FEMALE CONNECTOR	X	Row 8
JOSEPHINE	DISP2	2	DSTSXNFMPBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, NF/MALE BIDIRECTIONAL PIM W/BF	X	Row 8
JOSEPHINE	DISP2	2	DQBFN	MOUNTING KIT FOR SUPPRESSORS	X	Row 8
JOSEPHINE	DISP2	1	DSCS74861605SN	HYBRID CONTROL STATION COMBINER, 746-869 MHZ 16 CH.	X	Row 8
JOSEPHINE	DISP2	80	L1700	RG142B/U PLENUM CABLE PRICED PER FOOT BELDEN 83242 0011000	X	Row 8
JOSEPHINE	DISP2	16	DDN9769	N MALE CONNECTOR FOR RG55, RG223, RG142, BELDEN 8219 & 9907 CBL	X	Row 8
JOSEPHINE	DISP2	16	DSF1MU	F1MU 1/4" MINI UHF MALE S FLEX CONNECTOR	X	Row 8
DCC	DISP3	1	M25URS9PW1N	APX6500 7/800 MHZ MID POWER MOBILE		Row 8
DCC	DISP3	1	G806	ADD: ASTRO DIGITAL CAI OPERATION		Row 8
DCC	DISP3	1	G51	ENH: SMARTZONE OPERATION APX6500		Row 8

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DCC	DISP3	1	G361	ADD: P25 TRUNKING SOFTWARE		Row 5
DCC	DISP3	1	GA00580	ADD: TDMA OPERATION		Row 5
DCC	DISP3	1	QA01648	ADD: ADVANCED SYSTEM KEY - HARDWARE KEY		Row 5
DCC	DISP3	1	G442	ADD: O5 CONTROL HEAD		Row 5
DCC	DISP3	1	G444	ADD: APX CONTROL HEAD SOFTWARE		Row 5
DCC	DISP3	1	G67	ADD: REMOTE MOUNT O2 WWM		Row 5
DCC	DISP3	1	G89	ADD: NO RF ANTENNA NEEDED		Row 5
DCC	DISP3	1	G90	ADD: NO MICROPHONE NEEDED		Row 5
DCC	DISP3	1	B18	ADD: AUXILARY SPKR 7.5 WATT		Row 5
DCC	DISP3	1	G582	ADD: REMOTE MOUNT CABLE 131 FT		Row 5
DCC	DISP3	1	GA00235	ADD: NO GPS ANTENNA NEEDED		Row 5
DCC	DISP3	1	G24	INT: 3 YEAR SERVICE FROM THE START LITE		Row 5
DCC	DISP3	1	G843	ADD: AES ENCRYPTION APX		Row 5
DCC	DISP3	1	G298	ENH: ASTRO 25 OTAR W/ MULTIKEY		Row 5
DCC	DISP3	1	RMN5070A	AS. SPECTRA & XTL5000 DESKTOP MIC		Row 5
DCC	DISP3	1	HPN4007D	POWER SUPPLY 14V 15A UNI 117/240 VAC		Row 5
DCC	DISP3	1	DSSMD783U	SIDE MOUNTED EXPOSED DIPOLE, 0 DBD, 190 DEG BW, 746-870 MHZ, PIM RATED	X	Row 8
DCC	DISP3	150	L3570	FSJ4RK-50B CABLE: 1/2" SUPERFLEX FOAM COAX BLCK FIRE RETARDANT JCKT,	X	Row 8
DCC	DISP3	2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	X	Row 8
DCC	DISP3	2	TDN8810	F4PNF-C 1/2" TYPE N FEMALE CONNECTOR	X	Row 8
DCC	DISP3	1	DSTSXNFMPBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, NF/MALE BIDIRECTIONAL PIM W/BF	X	Row 8
DCC	DISP3	1	DQBFN	MOUNTING KIT FOR SUPPRESSORS	X	Row 8
DCC	DISP3	15	L1700	RG142B/U PLENUM CABLE PRICED PER FOOT BELDEN 83242 0011000	X	Row 8
DCC	DISP3	1	DDN9769	N MALE CONNECTOR FOR RG55, RG223, RG142, BELDEN 8219 & 9907 CBL	X	Row 8
DCC	DISP3	1	DSF1MU	F1MU 1/4" MINI UHF MALE S FLEX CONNECTOR	X	Row 8
SDDC	DISP4	2	M25URS9PW1 N	APX6500 7/800 MHZ MID POWER MOBILE		Row 5
SDDC	DISP4	2	G806	ADD: ASTRO DIGITAL CAI OPERATION		Row 5
SDDC	DISP4	2	G51	ENH: SMARTZONE OPERATION APX6500		Row 5
SDDC	DISP4	2	G361	ADD: P25 TRUNKING SOFTWARE		Row 5
SDDC	DISP4	2	GA00580	ADD: TDMA OPERATION		Row 5

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
SDDC	DISP4	2	QA01648	ADD: ADVANCED SYSTEM KEY - HARDWARE KEY		Row 5
SDDC	DISP4	2	G442	ADD: O5 CONTROL HEAD		Row 5
SDDC	DISP4	2	G444	ADD: APX CONTROL HEAD SOFTWARE		Row 5
SDDC	DISP4	2	G67	ADD: REMOTE MOUNT O2 WWM		Row 5
SDDC	DISP4	2	G89	ADD: NO RF ANTENNA NEEDED		Row 5
SDDC	DISP4	2	G90	ADD: NO MICROPHONE NEEDED		Row 5
SDDC	DISP4	2	B18	ADD: AUXILARY SPKR 7.5 WATT		Row 5
SDDC	DISP4	2	G582	ADD: REMOTE MOUNT CABLE 131 FT		Row 5
SDDC	DISP4	2	GA00235	ADD: NO GPS ANTENNA NEEDED		Row 5
SDDC	DISP4	2	G24	INT: 3 YEAR SERVICE FROM THE START LITE		Row 5
SDDC	DISP4	2	G843	ADD: AES ENCRYPTION APX		Row 5
SDDC	DISP4	2	G298	ENH: ASTRO 25 OTAR W/ MULTIKEY		Row 5
SDDC	DISP4	2	RMN5070A	AS. SPECTRA & XTL5000 DESKTOP MIC		Row 5
SDDC	DISP4	2	HPN4007D	POWER SUPPLY 14V 15A UNI 117/240 VAC		Row 5
SDDC	DISP4	2	DSSMD783U	SIDE MOUNTED EXPOSED DIPOLE, 0 DBD, 190 DEG BW, 746-870 MHZ, PIM RATED	X	Row 8
SDDC	DISP4	300	L3570	FSJ4RK-50B CABLE: 1/2" SUPERFLEX FOAM COAX BLCK FIRE RETARDANT JCKT,	X	Row 8
SDDC	DISP4	4	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	X	Row 8
SDDC	DISP4	4	TDN8810	F4PNF-C 1/2" TYPE N FEMALE CONNECTOR	X	Row 8
SDDC	DISP4	2	DSTSXNFMPBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, NF/MALE BIDIRECTIONAL PIM W/BF	X	Row 8
SDDC	DISP4	2	DQBFN	MOUNTING KIT FOR SUPPRESSORS	X	Row 8
SDDC	DISP4	30	L1700	RG142B/U PLENUM CABLE PRICED PER FOOT BELDEN 83242 0011000	X	Row 8
SDDC	DISP4	2	DDN9769	N MALE CONNECTOR FOR RG55, RG223, RG142, BELDEN 8219 & 9907 CBL	X	Row 8
SDDC	DISP4	2	DSF1MU	F1MU 1/4" MINI UHF MALE S FLEX CONNECTOR	X	Row 8
DRWS	DISP5	3	M25URS9PW1 N	APX6500 7/800 MHZ MID POWER MOBILE		Row 5
DRWS	DISP5	3	G806	ADD: ASTRO DIGITAL CAI OPERATION		Row 5
DRWS	DISP5	3	G51	ENH: SMARTZONE OPERATION APX6500		Row 5
DRWS	DISP5	3	G361	ADD: P25 TRUNKING SOFTWARE		Row 5
DRWS	DISP5	3	GA00580	ADD: TDMA OPERATION		Row 5
DRWS	DISP5	3	QA01648	ADD: ADVANCED SYSTEM KEY - HARDWARE KEY		Row 5

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DRWS	DISP5	3	G442	ADD: O5 CONTROL HEAD		Row 5
DRWS	DISP5	3	G444	ADD: APX CONTROL HEAD SOFTWARE		Row 5
DRWS	DISP5	3	G67	ADD: REMOTE MOUNT O2 WWM		Row 5
DRWS	DISP5	3	G89	ADD: NO RF ANTENNA NEEDED		Row 5
DRWS	DISP5	3	G90	ADD: NO MICROPHONE NEEDED		Row 5
DRWS	DISP5	3	B18	ADD: AUXILARY SPKR 7.5 WATT		Row 5
DRWS	DISP5	3	G582	ADD: REMOTE MOUNT CABLE 131 FT		Row 5
DRWS	DISP5	3	GA00235	ADD: NO GPS ANTENNA NEEDED		Row 5
DRWS	DISP5	3	G24	INT: 3 YEAR SERVICE FROM THE START LITE		Row 5
DRWS	DISP5	3	G843	ADD: AES ENCRYPTION APX		Row 5
DRWS	DISP5	3	G298	ENH: ASTRO 25 OTAR W/ MULTIKEY		Row 5
DRWS	DISP5	3	RMN5070A	AS. SPECTRA & XTL5000 DESKTOP MIC		Row 5
DRWS	DISP5	3	HPN4007D	POWER SUPPLY 14V 15A UNI 117/240 VAC		Row 5
DRWS	DISP5	3	DSSMD783U	SIDE MOUNTED EXPOSED DIPOLE, 0 DBD, 190 DEG BW, 746-870 MHZ, PIM RATED	X	Row 8
DRWS	DISP5	450	L3570	FSJ4RK-50B CABLE: 1/2" SUPERFLEX FOAM COAX BLCK FIRE RETARDANT JCKT,	X	Row 8
DRWS	DISP5	6	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	X	Row 8
DRWS	DISP5	6	TDN8810	F4PNF-C 1/2" TYPE N FEMALE CONNECTOR	X	Row 8
DRWS	DISP5	3	DSTSXNFMPBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, NF/MALE BIDIRECTIONAL PIM W/BF	X	Row 8
DRWS	DISP5	3	DQBFN	MOUNTING KIT FOR SUPPRESSORS	X	Row 8
DRWS	DISP5	45	L1700	RG142B/U PLENUM CABLE PRICED PER FOOT BELDEN 83242 0011000	X	Row 8
DRWS	DISP5	3	DDN9769	N MALE CONNECTOR FOR RG55, RG223, RG142, BELDEN 8219 & 9907 CBL	X	Row 8
DRWS	DISP5	3	DSF1MU	F1MU 1/4" MINI UHF MALE S FLEX CONNECTOR	X	Row 8
MAIN_DISP	LOGGING	1	B1905	MCC 7500 ASTRO 25 SOFTWARE		Row 4
MAIN_DISP	LOGGING	1	B1933	MOTOROLA VOICE PROCESSOR MODULE		Row 4
MAIN_DISP	LOGGING	1	CA00288AB	ADD: MCC 7500 ARCHIVING INTERFACE SERVER SOFTWARE LICENSE		Row 4
MAIN_DISP	LOGGING	1	CA00147AF	ADD: MCC 7500 SECURE OPERATION		Row 4
MAIN_DISP	LOGGING	1	CA00182AB	ADD: AES ALGORITHM		Row 4
MAIN_DISP	LOGGING	1	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN		Row 4
MAIN_DISP	LOGGING	1	T7885	MCAFEE WINDOWS AV CLIENT		Row 4

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
MAIN_DISP	LOGGING	1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	X	Row 4
MAIN_DISP	LOGGING	1	TT2812	TRUNKED LOGGING RECORDER BUNDLE	X	Row 4
MAIN_DISP	LOGGING	1	TT06079AA	ADD: TLR FOR USE ON 7.17 SYSTEMS	X	Row 4
MAIN_DISP	LOGGING	96	TT05973AA	ADD: TRUNKED RADIO TALKGROUP (1 PER TG)	X	Row 4
MAIN_DISP	LOGGING	1	T7885	MCAFEE WINDOWS AV CLIENT		Row 4
MAIN_DISP	LOGGING	1	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG		Row 4
MAIN_DISP	LOGGING	1	TT2811	CENTRAL ARCHIVE SERVER BUNDLE	X	Row 4
MAIN_DISP	LOGGING	1	T7885	MCAFEE WINDOWS AV CLIENT		Row 4
MAIN_DISP	LOGGING	1	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG		Row 4
JOSEPHINE	LOGGING	1	B1905	MCC 7500 ASTRO 25 SOFTWARE		Row 4
JOSEPHINE	LOGGING	1	B1933	MOTOROLA VOICE PROCESSOR MODULE		Row 4
JOSEPHINE	LOGGING	1	CA00288AB	ADD: MCC 7500 ARCHIVING INTERFACE SERVER SOFTWARE LICENSE		Row 4
JOSEPHINE	LOGGING	1	CA00147AF	ADD: MCC 7500 SECURE OPERATION		Row 4
JOSEPHINE	LOGGING	1	CA00182AB	ADD: AES ALGORITHM		Row 4
JOSEPHINE	LOGGING	1	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN		Row 4
JOSEPHINE	LOGGING	1	T7885	MCAFEE WINDOWS AV CLIENT		Row 4
JOSEPHINE	LOGGING	1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	X	Row 4
JOSEPHINE	LOGGING	1	SQM01SUM0205	GGM 8000 GATEWAY		Row 4
JOSEPHINE	LOGGING	1	CA01616AA	ADD: AC POWER		Row 4
JOSEPHINE	LOGGING	1	T8126	FORTINET FIREWALL APPLIANCE		Row 4
BROADWAY	DC_POWER	1	DS320477SYS1	DC POWER SYSTEM, FP2-48/600- 2BD450A SPW/WEB	X	Row 7
BROADWAY	DC_POWER	7	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	X	Row 7
BROADWAY	DC_POWER	9	DS236408	BLIND PANEL FP2 HE BLACK G1	X	Row 7
BROADWAY	DC_POWER	1	DS222707	48V 2000AH BATTERY SET #DDM125-33	X	Row 7
BROADWAY	DC_POWER	1	DS502666	100 AMP CIRCUIT BREAKER	X	Row 7
BROADWAY	DC_POWER	13	DS502655	BREAKER 20A 1P AUX 5/16 BULLET	X	Row 7
BROADWAY	DC_POWER	2	DS502651	3 AMP CIRCUIT BREAKER	X	Row 7
DHA	DC_POWER	1	DS320477SYS1	DC POWER SYSTEM, FP2-48/600- 2BD450A SPW/WEB	X	Row 7
DHA	DC_POWER	7	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	X	Row 7
DHA	DC_POWER	9	DS236408	BLIND PANEL FP2 HE BLACK G1	X	Row 7
DHA	DC_POWER	1	DS222707	48V 2000AH BATTERY SET #DDM125-33	X	Row 7
DHA	DC_POWER	1	DS502666	100 AMP CIRCUIT BREAKER	X	Row 7

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DHA	DC_POWER	13	DS502655	BREAKER 20A 1P AUX 5/16 BULLET	X	Row 7
DHA	DC_POWER	2	DS502651	3 AMP CIRCUIT BREAKER	X	Row 7
DFD2	DC_POWER	1	DS320477SYS1	DC POWER SYSTEM, FP2-48/600- 2BD450A SPW/WEB	X	Row 7
DFD2	DC_POWER	7	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	X	Row 7
DFD2	DC_POWER	9	DS236408	BLIND PANEL FP2 HE BLACK G1	X	Row 7
DFD2	DC_POWER	1	DS222707	48V 2000AH BATTERY SET #DDM125-33	X	Row 7
DFD2	DC_POWER	1	DS502666	100 AMP CIRCUIT BREAKER	X	Row 7
DFD2	DC_POWER	13	DS502655	BREAKER 20A 1P AUX 5/16 BULLET	X	Row 7
DFD2	DC_POWER	2	DS502651	3 AMP CIRCUIT BREAKER	X	Row 7
DFD2	TOWER	1	DS125SST-TBD	125-foot self-supported tower		Row 10
DFD2	ICE BRIDGE	1	DS20FTICEBRDG	20 foot ice bridge		Row 46
MNTN_TWRS	DC_POWER	1	DS320477SYS1	DC POWER SYSTEM, FP2-48/600- 2BD450A SPW/WEB	X	Row 7
MNTN_TWRS	DC_POWER	7	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	X	Row 7
MNTN_TWRS	DC_POWER	9	DS236408	BLIND PANEL FP2 HE BLACK G1	X	Row 7
MNTN_TWRS	DC_POWER	1	DS222707	48V 2000AH BATTERY SET #DDM125-33	X	Row 7
MNTN_TWRS	DC_POWER	1	DS502666	100 AMP CIRCUIT BREAKER	X	Row 7
MNTN_TWRS	DC_POWER	13	DS502655	BREAKER 20A 1P AUX 5/16 BULLET	X	Row 7
MNTN_TWRS	DC_POWER	2	DS502651	3 AMP CIRCUIT BREAKER	X	Row 7
MT_MORSN	DC_POWER	1	DS320477SYS1	DC POWER SYSTEM, FP2-48/600- 2BD450A SPW/WEB	X	Row 7
MT_MORSN	DC_POWER	7	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	X	Row 7
MT_MORSN	DC_POWER	9	DS236408	BLIND PANEL FP2 HE BLACK G1	X	Row 7
MT_MORSN	DC_POWER	1	DS222707	48V 2000AH BATTERY SET #DDM125-33	X	Row 7
MT_MORSN	DC_POWER	1	DS502666	100 AMP CIRCUIT BREAKER	X	Row 7
MT_MORSN	DC_POWER	13	DS502655	BREAKER 20A 1P AUX 5/16 BULLET	X	Row 7
MT_MORSN	DC_POWER	2	DS502651	3 AMP CIRCUIT BREAKER	X	Row 7
DENVER	PROGRAMMING	12	RVN5224AH	PURCHASED SOFTWARE,CPS R15.00.02 GLOBAL APX DVD		Row 3
DENVER	PROGRAMMING	12	HKN6184C	CABLE, CH PROGRAMMING (USB)		Row 3
DENVER	PROGRAMMING	12	PMKN4012B	PORTABLE PROGRAMMING CABLE		Row 3
DENVER	PROGRAMMING	7	DVN4050	ADV'D SYSTEM KEY READER REPLACMENT		Row 3
DENVER	PROGRAMMING	2	DVN4316	I-BUTTONS ASK REPLACEMENT DS1996		Row 3
CCD_DISP	UWAVE	1	DQMWPDISP_R5	NOKIA MICROWAVE EQUIPMENT AT CCD PRIMARY DISPATCH		Row 11
BROADWAY	UWAVE	1	DQMWBRDY_R5	NOKIA MICROWAVE EQUIPMENT AT 1670 BROADWAY		Row 11

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DHA	UWAVE	1	DQMWDHA_R5	NOKIA MICROWAVE EQUIPMENT AT DHA		Row 11
DFD2	UWAVE	1	DQMWDFD2_R5	NOKIA MICROWAVE EQUIPMENT AT DFD STATION 2		Row 11
MNTN_TWRS	UWAVE	1	DQMWMT_R5	NOKIA MICROWAVE EQUIPMENT AT MOUNTAIN TOWERS		Row 11
MT_MORSN	UWAVE	1	DQMWMM_R5	NOKIA MICROWAVE EQUIPMENT AT MOUNT MORRISON		Row 11
JOSEPHINE	UWAVE	1	DQMWMM_R5	NOKIA MICROWAVE EQUIPMENT AT MOUNT MORRISON		Row 11
DENVER	UWAVE	1	DQMWSAM_R5	NOKIA 5620 SAM		Row 11
JOSEPHINE	MASTER	1	SQM01SUM0273	MASTER SITE CONFIGURATION		Row 33
JOSEPHINE	MASTER	1	CA02629AC	ADD: EXPAND 7.17 M CORE		Row 33
JOSEPHINE	MASTER	1	UA00153AA	ADD: ASTRO 25 FDMA SITE LICENSE		Row 33
JOSEPHINE	MASTER	1	UA00407AA	ADD: CLASSIC DATA-P25 TRNK SITE		Row 33
JOSEPHINE	MASTER	1	UA00159AA	ADD: P25 PHASE 2 TDMA TRKNG OP SITE LIC		Row 33
JOSEPHINE	MASTER	1	UA00160AA	ADD: PHASE 2 DYNAMIC TG ASGNMT SITE LIC		Row 33
JOSEPHINE	MASTER	17	UA00161AA	ADD: P25 PHASE 2 TDMA SW BASE RADIO LIC		Row 33
JOSEPHINE	MASTER	17	UA00162AA	ADD: PHASE 2 DYNAMIC CH BASE RADIO LIC		Row 33
MT_MORSN	REMOTE_RX	2	SQM01SUM0205	GGM 8000 GATEWAY		Row 9
MT_MORSN	REMOTE_RX	2	CA01619AA	ADD: DC POWER		Row 9
MT_MORSN	REMOTE_RX	1	T7038	GCP 8000 SITE CONTROLLER		Row 33
MT_MORSN	REMOTE_RX	2	CA01536AA	ADD: GPB 8000 REFERENCE DISTRIBUTION MODULE		Row 33
MT_MORSN	REMOTE_RX	2	CA01537AC	ADD: RDM SW FOR RX ONLY		Row 33
MT_MORSN	REMOTE_RX	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 33
MT_MORSN	REMOTE_RX	1	T7038	GCP 8000 SITE CONTROLLER		Row 33
MT_MORSN	REMOTE_RX	2	CA00884AB	ADD : XHUB STANDALONE		Row 33
MT_MORSN	REMOTE_RX	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 33
MT_MORSN	REMOTE_RX	1	T7038	GCP 8000 SITE CONTROLLER		Row 33
MT_MORSN	REMOTE_RX	2	CA00884AB	ADD : XHUB STANDALONE		Row 33
MT_MORSN	REMOTE_RX	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 33
MT_MORSN	REMOTE_RX	1	T7540	GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	1	X302AR	ADD: QTY 2 GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	2	CA00855AB	ADD: 700/800 MHZ		Row 33
MT_MORSN	REMOTE_RX	2	CA01193AB	ADD: IP BASED MULTISITE (SIMULCAST/VOTING) RCVR SW		Row 33

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
MT_MORSN	REMOTE_RX	1	CA01842AB	ADD : P25 TDMA RCVR SOFTWARE		Row 33
MT_MORSN	REMOTE_RX	1	CA01902AB	ADD:DYNAMIC CHNL ASSIGNMENT RCVR SW		Row 33
MT_MORSN	REMOTE_RX	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 33
MT_MORSN	REMOTE_RX	1	T7540	GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	1	X302AR	ADD: QTY 2 GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	2	CA00855AB	ADD: 700/800 MHZ		Row 33
MT_MORSN	REMOTE_RX	2	CA01193AB	ADD: IP BASED MULTISITE (SIMULCAST/VOTING) RCVR SW		Row 33
MT_MORSN	REMOTE_RX	2	CA01842AB	ADD : P25 TDMA RCVR SOFTWARE		Row 33
MT_MORSN	REMOTE_RX	2	CA01902AB	ADD:DYNAMIC CHNL ASSIGNMENT RCVR SW		Row 33
MT_MORSN	REMOTE_RX	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 33
MT_MORSN	REMOTE_RX	1	T7540	GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	1	X302AR	ADD: QTY 2 GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	2	CA00855AB	ADD: 700/800 MHZ		Row 33
MT_MORSN	REMOTE_RX	2	CA01193AB	ADD: IP BASED MULTISITE (SIMULCAST/VOTING) RCVR SW		Row 33
MT_MORSN	REMOTE_RX	2	CA01842AB	ADD : P25 TDMA RCVR SOFTWARE		Row 33
MT_MORSN	REMOTE_RX	2	CA01902AB	ADD:DYNAMIC CHNL ASSIGNMENT RCVR SW		Row 33
MT_MORSN	REMOTE_RX	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 33
MT_MORSN	REMOTE_RX	1	T7540	GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	1	X302AR	ADD: QTY 2 GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	2	CA00855AB	ADD: 700/800 MHZ		Row 33
MT_MORSN	REMOTE_RX	2	CA01193AB	ADD: IP BASED MULTISITE (SIMULCAST/VOTING) RCVR SW		Row 33
MT_MORSN	REMOTE_RX	2	CA01842AB	ADD : P25 TDMA RCVR SOFTWARE		Row 33
MT_MORSN	REMOTE_RX	2	CA01902AB	ADD:DYNAMIC CHNL ASSIGNMENT RCVR SW		Row 33
MT_MORSN	REMOTE_RX	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 33
MT_MORSN	REMOTE_RX	1	T7540	GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	1	X302AR	ADD: QTY 2 GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	2	CA00855AB	ADD: 700/800 MHZ		Row 33
MT_MORSN	REMOTE_RX	2	CA01193AB	ADD: IP BASED MULTISITE (SIMULCAST/VOTING) RCVR SW		Row 33
MT_MORSN	REMOTE_RX	2	CA01842AB	ADD : P25 TDMA RCVR SOFTWARE		Row 33
MT_MORSN	REMOTE_RX	2	CA01902AB	ADD:DYNAMIC CHNL ASSIGNMENT RCVR SW		Row 33
MT_MORSN	REMOTE_RX	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 33

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
MT_MORSN	REMOTE_RX	1	T7540	GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	1	X302AR	ADD: QTY 2 GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	2	CA00855AB	ADD: 700/800 MHZ		Row 33
MT_MORSN	REMOTE_RX	2	CA01193AB	ADD: IP BASED MULTISITE (SIMULCAST/VOTING) RCVR SW		Row 33
MT_MORSN	REMOTE_RX	2	CA01842AB	ADD : P25 TDMA RCVR SOFTWARE		Row 33
MT_MORSN	REMOTE_RX	2	CA01902AB	ADD:DYNAMIC CHNL ASSIGNMENT RCVR SW		Row 33
MT_MORSN	REMOTE_RX	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 33
MT_MORSN	REMOTE_RX	1	T7540	GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	1	X302AR	ADD: QTY 2 GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	2	CA00855AB	ADD: 700/800 MHZ		Row 33
MT_MORSN	REMOTE_RX	2	CA01193AB	ADD: IP BASED MULTISITE (SIMULCAST/VOTING) RCVR SW		Row 33
MT_MORSN	REMOTE_RX	2	CA01842AB	ADD : P25 TDMA RCVR SOFTWARE		Row 33
MT_MORSN	REMOTE_RX	2	CA01902AB	ADD:DYNAMIC CHNL ASSIGNMENT RCVR SW		Row 33
MT_MORSN	REMOTE_RX	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 33
MT_MORSN	REMOTE_RX	1	T7540	GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	1	X302AR	ADD: QTY 2 GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	2	CA00855AB	ADD: 700/800 MHZ		Row 33
MT_MORSN	REMOTE_RX	2	CA01193AB	ADD: IP BASED MULTISITE (SIMULCAST/VOTING) RCVR SW		Row 33
MT_MORSN	REMOTE_RX	2	CA01842AB	ADD : P25 TDMA RCVR SOFTWARE		Row 33
MT_MORSN	REMOTE_RX	2	CA01902AB	ADD:DYNAMIC CHNL ASSIGNMENT RCVR SW		Row 33
MT_MORSN	REMOTE_RX	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 33
MT_MORSN	REMOTE_RX	1	T7540	GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	1	X301AR	ADD: QTY 1 GPW 8000 RECEIVER		Row 33
MT_MORSN	REMOTE_RX	1	CA00855AB	ADD: 700/800 MHZ		Row 33
MT_MORSN	REMOTE_RX	1	CA01193AB	ADD: IP BASED MULTISITE (SIMULCAST/VOTING) RCVR SW		Row 33
MT_MORSN	REMOTE_RX	1	CA01842AB	ADD : P25 TDMA RCVR SOFTWARE		Row 33
MT_MORSN	REMOTE_RX	1	CA01902AB	ADD:DYNAMIC CHNL ASSIGNMENT RCVR SW		Row 33
MT_MORSN	REMOTE_RX	1	X153AW	ADD: RACK MOUNT HARDWARE		Row 33
MT_MORSN	REMOTE_RX	1	DS7583K04	EXPANSION KIT, 16-32 PORT,792-902MHZ, DUAL	X	Row 33
MT_MORSN	REMOTE_RX	2	PMUG1017A	GNSS REMOTE RECEIVER ASSY		Row 33

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
MT_MORSN	REMOTE_RX	2	DSP04268	ALUMINUM 6061-T6. PIPE 1 INCH SCHED 40	X	Row 33
MT_MORSN	REMOTE_RX	2	DSIX2L1M1DC48IG	SPD, HPD GPS DATA LINE, 48VDC, HARD WIRE WITH ISOLATED GROUNDING	X	Row 33
MT_MORSN	REMOTE_RX	2	DS30C87465CO1	125FT OUTDOOR UV PROTECTED CABLE 6 PR, 22AWG DB15 CABLE	X	Row 33
MT_MORSN	REMOTE_RX	15	DS502651	3 AMP CIRCUIT BREAKER	X	Row 33
MT_MORSN	REMOTE_RX	1	THN1012	RACK 7' OPEN		Row 33
MT_MORSN	REMOTE_RX	1	T8343	GSERIES SOFTWARE LICENSING		Row 33
MT_MORSN	REMOTE_RX	2	UA00409AA	ADD: GSERIES RDM		Row 33
MT_MORSN	REMOTE_RX	17	UA00411AA	ADD: GSERIES RX-P25 TRNK MS IP		Row 33
DENVER	OTAR	1	T7688	KEY MANAGEMENT FACILITY		Row 51
DENVER	OTAR	1	ZA00860AA	ADD: KMF SERVER AND CLIENT SOFTWARE		Row 51
DENVER	OTAR	1	ZA00861AA	ADD: MORE THAN 1000 RADIO USERS		Row 51
DENVER	OTAR	1	ZA00975AA	64 AGENCY PARTITIONING		Row 51
DENVER	OTAR	1	TT3125	KMF DL380 G9 SERVER WITH WINDOWS SERVER 2008	X	Row 51
DENVER	OTAR	1	SQM01SUM0222	KMF CRYPTR		Row 51
DENVER	OTAR	1	CA00147AG	ADD: BASIC SOFTWARE OPTION		Row 51
DENVER	OTAR	1	CA00182AV	ADD: AES 256 ENCRYPTION KIT		Row 51
DENVER	OTAR	1	CA02066AA	AC Line Cord, North America		Row 51
DENVER	OTAR	1	TKN9285	RACK MOUNT KIT FOR CRYPTR II		Row 51
DENVER	OTAR	1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	X	Row 51
DENVER	OTAR	1	DSTG191	TECH GLOBAL EVOLUTION SERIES 19INCH NON TOUCH	X	Row 51
DENVER	SPARES	1	DLN7009	FRE: DL380 G9 900GB DISK WD2		Row 12
DENVER	SPARES	1	DLN6972	FRU: DL380 G9 POWER SUPPLY		Row 12
DENVER	SPARES	1	DLN6970	FRU: DL380 G9 HARD DRIVE		Row 12
DENVER	SPARES	1	DLN6973	FRU: DL380 G9 FAN		Row 12
DENVER	SPARES	1	DLN6971	FRU: DL380 G9 DVD DRIVE		Row 12
DENVER	SPARES	1	DLN6880	DAS - CHASSIS ONLY		Row 12
DENVER	SPARES	1	DLN6878	DAS - 600 GB SAS HARD DRIVE		Row 12
DENVER	SPARES	1	DLN6978	FRU: DOTHILL 4524 RAID I/O CONTROLLER MODULE		Row 12
DENVER	SPARES	1	DLN7006	FRU:HP DL380/DL360 G9 SERVER'S SMART STORAGE BATTERY		Row 12
DENVER	SPARES	1	DLN6867	DAS POWER SUPPLY		Row 12

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DENVER	SPARES	1	CKN6975	CABLE, DATA,CABLE, MINI-SAS HD TO MINI-SAS HD CABLE, AWG30, LENGTH 1M"		Row 12
DENVER	SPARES	1	SQM01SUM0205	GGM 8000 GATEWAY		Row 12
DENVER	SPARES	1	CA01616AA	ADD: AC POWER		Row 12
DENVER	SPARES	1	CLN1856	2620-24 ETHERNET SWITCH		Row 12
DENVER	SPARES	1	CLN1858	3800-48 ETHERNET SWITCH		Row 12
DENVER	SPARES	1	DLN6940	460W POWER SUPPLY FOR DL380P		Row 12
DENVER	SPARES	1	DLN6967	FRU: 500 GB SATA DRIVE		Row 12
DENVER	SPARES	1	T8126	FORTINET FIREWALL APPLIANCE		Row 12
DENVER	SPARES	1	DLN6742	460 WATT POWER SUPPLY		Row 12
DENVER	SPARES	1	DSTRAK91061	FOUR PORT DDM	X	Row 12
DENVER	SPARES	1	CLN1859	2620-48 ETHERNET SWITCH		Row 12
DENVER	SPARES	1	DLN6966	FRU: GCP 8000/GCM 8000/GPB 8000		Row 12
DENVER	SPARES	1	DLN6781	FRU: POWER SUPPLY		Row 12
DENVER	SPARES	1	DLN6898	FRU: FAN MODULE		Row 12
DENVER	SPARES	1	DLN6885	FRU: XCVR 7/800 MHZ V2		Row 12
DENVER	SPARES	1	DLN6895	FRU: PA 7/800 MHz		Row 12
DENVER	SPARES	1	DLN6677	FRU: G-SERIES XHUB		Row 12
DENVER	SPARES	1	SQM01SUM0205	GGM 8000 GATEWAY		Row 12
DENVER	SPARES	1	CA01619AA	ADD: DC POWER		Row 12
DENVER	SPARES	2	TT3225	Z2 MINI WORKSTATION 258G 8G NON RET	X	Row 12
DENVER	SPARES	2	DSUSB31000S	STARTECH USB 3.0 TO GIGABIT ETHERNET ADAPTER	X	Row 12
DENVER	SPARES	2	DSST7300U3M	STARTECH 7 PORT USB 3.0 HUB	X	Row 12
DENVER	SPARES	2	B1941	USB AUDIO INTERFACE MODULE		Row 12
DENVER	SPARES	2	CDN6673	CREATIVE LABS INSPIRE A60	X	Row 12
DENVER	SPARES	2	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE		Row 12
DENVER	SPARES	2	B1913	MCC SERIES HEADSET JACK		Row 12
DENVER	SPARES	1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	X	Row 12
DENVER	SPARES	1	B1934	MCC 7500 VOICE PROCESSOR MODULE FRU		Row 12
DENVER	SPARES	1	CA00147AF	ADD: MCC 7500 SECURE OPERATION		Row 12
DENVER	SPARES	1	CA00182AB	ADD: AES ALGORITHM		Row 12
DENVER	SPARES	1	DDN2022	SPARE PARTS KIT - 5000 SERIES MAX-PRO QUADCORE FOR VOIP AND TLR	X	Row 12
DENVER	SPARES	1	DQMWMPRSPARES	MW MPR SPARES		Row 12

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DENVER	SPARES	1	DQMWRTRSSPARES_R5	MW RTR SPARES		Row 12
DENVER	SPARES	1	DSSC476HF1LDFE5749	COLLINEAR OMNI ANTENNA, 6 DBD, LOW PIM, HD, 746-869 MHZ, PIP RATED	X	Row 38
DENVER	SPARES	1	DSSC412HF2LDFE5765	COLLINEAR OMNI, 11.5DBD HD NULL FILL, PIP RATED LOW PIM 746-869 MHZ	X	Row 38
DENVER	SPARES	1	DQBMR8AB1DT6	10.3 DB 220 DEG SEC 806-869 MHZ ANTENNA WITH 6 DEG. DOWNTILT	X	Row 38
DENVER	SPARES	1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH PWR, DIN FEM/MALE BI-DIR W/ BRACKET	X	Row 38
DENVER	SPARES	1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 15 VDC PASS NM ANT, NF EQUIP PIP, ASIG	X	Row 38
DENVER	SPARES	1	DS43783I01T	TTA, 796-824MHZ, SINGLE / DUAL NETWORK, TEST PORT	X	Row 38
DENVER	SPARES	1	DS43783I01C48	CONTROL MONITORING UNIT, 796-824MHZ,DUAL DIVERSITY,ETHERNET,48VDC	X	Row 38
DENVER	SPARES	1	DS43783I01M48	MULTICOUPLER UNIT, 796-824MHZ,DUAL DIVERSITY,ETHERNET,48VDC	X	Row 38
DENVER	SPARES	1	DLN6634	FRU: 700/800 MHZ SITE LNA		Row 38
DENVER	SPARES	1	DLN1306	FRU: 700/800 MHZ CABINET RMC MODULE		Row 38
DENVER	SPARES	1	DSPCD013V6	6 CHANNEL COMBINER KIT, STANDARD ISOLATION, 851-870 MHZ	X	Row 38
DENVER	SPARES	1	DSSP74964440DFF1RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	X	Row 38
JOSEPHINE	RM	1	DSSUBSERVER4	RACK MOUNT WINDOWS SERVER	X	Row 53
JOSEPHINE	RM	1	DSSUBSERVER1	RACK MOUNT WINDOWS SERVER	X	Row 53
JOSEPHINE	RM	1	DSF1DC108H	BELKIN 19" WIDESCREEN LCD RACK CONSOLE (ONLY USB CABLE COMPATIBILITY)	X	Row 53
JOSEPHINE	RM	2	DSF1D940106	BELKIN OMNIVIEW ENTERPRISE SERIES - USB KVM CABLE	X	Row 53
JOSEPHINE	RM	1	T7914	RADIO MANAGEMENT ONLINE		Row 53
JOSEPHINE	RM	4000	UA00049AA	ADD: RADIO MANAGEMENT LICENSES ONLINE		Row 53
DENVER	FLASH	2	T7907	9600 OR 3600 SINGLE SYSTEM DIGITAL TRUNKING		Row 40
DENVER	FLASH	2	QA00580AE	ENH: TDMA OPERATION		Row 40
DENVER	FLASH	2	T7553	DIGITAL SMARTZONE		Row 40
DENVER	FLASH	2	QA00580AB	ENH: TDMA OPERATION		Row 40
JOSEPHINE	MASTER	1	SQM01SUM0273	MASTER SITE CONFIGURATION		Row 49
JOSEPHINE	MASTER	1	CA02629AC	ADD: EXPAND 7.17 M CORE		Row 49
JOSEPHINE	MASTER	2	UA00147AA	ADD: PROVISIONING MANAGER		Row 49

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
JOSEPHINE	MASTER	1	UA00146AA	ADD: UNIFIED EVENT MANAGER (UEM)		Row 49
JOSEPHINE	MASTER	1	UA00149AA	ADD: RADIO CONTROL MANAGER		Row 49
JOSEPHINE	MASTER	1	SQM01SUM0273	MASTER SITE CONFIGURATION		Row 48
JOSEPHINE	MASTER	1	CA02629AC	ADD: EXPAND 7.17 M CORE		Row 48
JOSEPHINE	MASTER	2	UA00156AA	ADD: MCC7500 CONSOLE LICENSES (QTY 5)		Row 48
JOSEPHINE	OP_POSIT	10	B1948	MCC 7500E DISPATCH POSITION LICENSES		Row 48
JOSEPHINE	OP_POSIT	10	UA00653AA	ADD: BASIC CONSOLE OPERATION		Row 48
JOSEPHINE	OP_POSIT	10	UA00654AA	ADD: ASTRO 25 TRUNKING OPERATION		Row 48
JOSEPHINE	OP_POSIT	10	UA00658AA	ADD: SECURE OPERATION		Row 48
JOSEPHINE	OP_POSIT	10	UA00659AA	ADD: ADP/AES/DES-OFB ENCRYPTION		Row 48
JOSEPHINE	OP_POSIT	10	UA00251AA	ADD: 45 CHANNEL SW LICENSE		Row 48
JOSEPHINE	OP_POSIT	10	UA00661AA	ADD: ENHANCED IRR		Row 48
JOSEPHINE	OP_POSIT	10	TT3225	Z2 MINI WORKSTATION 258G 8G NON RET	X	Row 48
JOSEPHINE	OP_POSIT	10	DSY7B61AA	HP Z2 MINI ARM WALL VESA MOUNT	X	Row 48
JOSEPHINE	OP_POSIT	10	DSUSB31000S	STARTECH USB 3.0 TO GIGABIT ETHERNET ADAPTER	X	Row 48
JOSEPHINE	OP_POSIT	10	T7885	MCAFEE WINDOWS AV CLIENT		Row 48
JOSEPHINE	OP_POSIT	10	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG		Row 48
JOSEPHINE	OP_POSIT	10	DSST7300U3M	STARTECH 7 PORT USB 3.0 HUB	X	Row 48
JOSEPHINE	OP_POSIT	10	B1941	USB AUDIO INTERFACE MODULE		Row 48
JOSEPHINE	OP_POSIT	10	CDN6673	CREATIVE LABS INSPIRE A60	X	Row 48
JOSEPHINE	OP_POSIT	10	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE		Row 48
JOSEPHINE	OP_POSIT	20	B1913	MCC SERIES HEADSET JACK		Row 48
JOSEPHINE	OP_POSIT	10	RMN5077B	SUPRAPLUS SINGLE MUFF HEADSET		Row 48
JOSEPHINE	OP_POSIT	10	RLN6098	HDST MODULE BASE W/PTT, 15' CBL		Row 48
JOSEPHINE	OP_POSIT	10	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH FOR USE WITH MOTOROLA MCC 7500 DISP	X	Row 48
JOSEPHINE	OP_POSIT	10	DSSHI29274809	GENOVATION CP24		Row 48
JOSEPHINE	BU_CS	10	M25URS9PW1 N	APX6500 7/800 MHZ MID POWER MOBILE		Row 48
JOSEPHINE	BU_CS	10	G806	ADD: ASTRO DIGITAL CAI OPERATION		Row 48
JOSEPHINE	BU_CS	10	G51	ENH: SMARTZONE OPERATION APX6500		Row 48
JOSEPHINE	BU_CS	10	G361	ADD: P25 TRUNKING SOFTWARE		Row 48

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
JOSEPHINE	BU_CS	10	GA00580	ADD: TDMA OPERATION		Row 48
JOSEPHINE	BU_CS	10	QA01648	ADD: ADVANCED SYSTEM KEY - HARDWARE KEY		Row 48
JOSEPHINE	BU_CS	10	G442	ADD: O5 CONTROL HEAD		Row 48
JOSEPHINE	BU_CS	10	G444	ADD: APX CONTROL HEAD SOFTWARE		Row 48
JOSEPHINE	BU_CS	10	G67	ADD: REMOTE MOUNT O2 WWM		Row 48
JOSEPHINE	BU_CS	10	G89	ADD: NO RF ANTENNA NEEDED		Row 48
JOSEPHINE	BU_CS	10	G90	ADD: NO MICROPHONE NEEDED		Row 48
JOSEPHINE	BU_CS	10	B18	ADD: AUXILARY SPKR 7.5 WATT		Row 48
JOSEPHINE	BU_CS	10	G582	ADD: REMOTE MOUNT CABLE 131 FT		Row 48
JOSEPHINE	BU_CS	10	GA00235	ADD: NO GPS ANTENNA NEEDED		Row 48
JOSEPHINE	BU_CS	10	G24	INT: 3 YEAR SERVICE FROM THE START LITE		Row 48
JOSEPHINE	BU_CS	10	G843	ADD: AES ENCRYPTION APX		Row 48
JOSEPHINE	BU_CS	10	G298	ENH: ASTRO 25 OTAR W/ MULTIKEY		Row 48
JOSEPHINE	BU_CS	10	RMN5070A	AS. SPECTRA & XTL5000 DESKTOP MIC		Row 48
JOSEPHINE	BU_CS	10	HPN4007D	POWER SUPPLY 14V 15A UNI 117/240 VAC		Row 48
JOSEPHINE	BU_CS	1	DSCS74861605SN	HYBRID CONTROL STATION COMBINER, 746-869 MHZ 16 CH.	X	Row 48
DENVER	SUB MAINT	1	66009256001	BIT, SPANNER, VOL POT OUTER		Row 47
DENVER	SUB MAINT	1	66009258001	BIT, SPANNER ANTENNA		Row 47
DENVER	SUB MAINT	1	66009255001	GRILLE ELIMINATOR		Row 47
DENVER	SUB MAINT	1	66009259001	VACUUM RADIO TEST ADAPTOR		Row 47
DENVER	SUB MAINT	1	NTN4265A	PRESSURE PUMP TEST		Row 47
DENVER	SUB MAINT	1	0180706J23	CHASSIS ELIMINATOR (MID POWER)		Row 47
DENVER	SUB MAINT	1	0180706J24	CHASSIS ELIMINATOR (HIGH POWER)		Row 47
DENVER	SUB MAINT	1	0180320B16	MAG SCRDVR SET		Row 47
DENVER	SUB MAINT	1	3085651A01	CBL RF MIMI-UHF TO N/TYP MALE		Row 47
DENVER	SUB MAINT	1	6686119B01	DISMANTLING TOOL		Row 47
DENVER	SUB MAINT	1	6680163F01	TOOL INSERTION & EXTRACTION		Row 47
DENVER	SUB MAINT	1	RSX4043A	SCR DVR		Row 47
DENVER	SUB MAINT	1	NLN9839	VACUUM PUMP KIT		Row 47
DENVER	SUB MAINT	1	180386A82	ANTI-STATIC GROUNDING KIT		Row 47
DENVER	WAVE	1	TT3142	NEW WAVE SYSTEM		Row 44
DENVER	WAVE	1	TT06266AA	SOFTWARE,WAVE SERVER LICIENSING		Row 44

Site	Sub-System	Qty	Model	Description	COTS	Table B1 Reference
DENVER	WAVE	25	TT06183AA	WAVE COMMUNICATION CHANNEL-WITH RADIO SYSTEM INTEGRATION		Row 44
DENVER	WAVE	1	TT06189AA	WAVE DESKTOP COMMUNICATOR-INCLUDES PLUG-IN-PANEL		Row 44
DENVER	WAVE	291	TT06207AA	WAVE MOBILE COMMUNICATOR ANDROID & IOS		Row 44
DENVER	WAVE	1	TT06244AA	SOFTWARE,WAVE RADIO GATEWAY SOFTWAR		Row 44
DENVER	WAVE	1	SQM01SUM0292	CRYPTR		Row 44
DENVER	WAVE	1	CA02066AA	AC Line Cord, North America		Row 44
DENVER	WAVE	1	CA02933AA	ADD: ASTRO AES 256, DES-OFB, ADP ENCRYPTION KIT		Row 44
DENVER	WAVE	1	CA02954AA	ADD: SECURE OPERATION		Row 44
DENVER	WAVE	1	CA02934AA	ADD: OTEK		Row 44
DENVER	WAVE	1	DLN6988	FRU ASTRO AES,DES-OFB,ADP WAVE 5000 CRYPTR		Row 44
DENVER	WAVE	1	CVN7053	ASTRO 25 TO WAVE INTERFACE		Row 44

CITY AND COUNTY OF DENVER

SECTION 2.2

DISPATCH AND LOGGING SUBSYSTEM

P25 PUBLIC SAFETY RADIO SYSTEM REPLACEMENT PROJECT NOVEMBER 20, 2017

REQUEST FOR PROPOSAL NO. 28435Q

MOTOROLA SOLUTIONS

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Section 2.2

SECTION 2.2

DISPATCH AND LOGGING SUBSYSTEM

2.2.1 MCC 7500E DISPATCH CONSOLE SYSTEM

Motorola's proposed dispatch console solution for CCD consists of 59 MCC 7500E dispatch console operator positions across six dispatch locations. The MCC-series console offers IP-based seamless connectivity between CCD's dispatch operators and field personnel, as well as interoperability with outside trunked and conventional systems. The MCC 7500E meets the latest applicable standards of the FCC, EIA, NEC, IEEE, APCO Project 16B, and APCO Project 25.

2.2.1.1 Dispatch Console Sites

CCD has specified six locations for which dispatch operations shall be supported. At each of these locations, Motorola's MCC 7500E Dispatch Console system will be deployed to provide the required dispatch operations. This section provides detailed information on the proposed system pertinent to the console requirements prescribed by CCD for each dispatch location.

The following table provides a list of the proposed dispatch centers and the associated number of proposed console positions.

Table 2-1: Proposed Dispatch Centers

Dispatch Center Name	MCC 7500E Wirelined Consoles
CCD Primary Dispatch	26
950 Josephine Dispatch	26
Denver Criminal Court	1
Sheriff's Department Detention Center	2
Denver Right of Way Services	3
EEB	1
Total	**59**

Each proposed dispatch center includes dual site links to the ASTRO 25 master network site to maintain a high level of redundancy. In the event of primary wire-lined link failure, the secondary wire-lined link will seamlessly take over backhaul control with no impact to dispatch operations.

The following sections detail the dispatch equipment configuration at each of the six sites.

2.2.1.1.1 CCD Primary Dispatch

CCD will be implementing a new 9-1-1 main dispatch center at 12025 E 45th Ave. CCD has requested a total of 26 positions to be located at this location.

Equipment List

The following equipment is included for the dispatch location:

- Two HP 2620- 48 port dispatch LAN Switches.
- Two GGM 8000 Site Gateways.
- Two 7’ Cabinets.
- Four Type 3 AC EDGE Devices with breakers.
- Two Ethernet Surge Protectors.
- 26 MCC 7500E Console Positions each of which includes:
  - One Motorola-certified workstation hosting the MCC 7500E Graphical User Interface.
  - One 24” Diagonal LCD Touch Screen Monitor.
  - Two Desktop Speakers (three speakers included at ten positions).
  - Two Headset Jacks.
  - One Gooseneck Microphone.
  - One Dual Pedal Footswitch.
  - One Instant Recall Recorder.
  - One RMP615A Surge Suppressor.
  - One Genovation CP24 Keypad.
  - One Desktop PTT Button.
  - One Mouse and Keyboard.
- 26 APX6500 Mobile Radios with radio mounted in equipment room and control head at the operator position (distance between radio and control head not to exceed 300’)

2.2.1.1.2 950 Josephine Dispatch

CCD currently operates their primary dispatch operations from their current main 9-1-1 dispatch center at 950 Josephine. When CCD’s new 9-1-1 dispatch center opens, the 950 Josephine Dispatch center will serve as the backup dispatch center. Motorola has proposed the replacement of the existing consoles with a total of 26 new MCC 7500E consoles.

Equipment List

The following equipment is included for the dispatch location:

- Two HP 2620- 48 port dispatch LAN Switches.
- Two GGM 8000 Site Gateways.
- One 7’ Cabinet.
- Two Type 3 AC EDGE Devices with breakers.
- Two Ethernet Surge Protectors.
- 26 MCC 7500E Console Positions each of which includes:
  - One Motorola-certified workstation hosting the MCC 7500E Graphical User Interface.
  - One 24” Diagonal LCD Touch Screen Monitor.
  - Two Desktop Speakers (three speakers included at eight positions).
  - Two Headset Jacks.
  - One Gooseneck Microphone.
  - One Dual Pedal Footswitch.
  - One Instant Recall Recorder.
  - One RMP615A Surge Suppressor.
  - One Genovation CP24 Keypad.
  - One Desktop PTT Button.
  - One Mouse and Keyboard.
- 26 APX6500 Mobile Radios with radio mounted in equipment room and control head at the operator position (distance between radio and control head not to exceed 300’)
- One GCP8000 Conventional Site Controller

- One 8 port HD-ECCGW

2.2.1.1.3 Denver Criminal Courts

CCD has requested a single console position for use at the Denver Criminal Courts building. Motorola has included one MCC7500E console for this location.

Equipment List

The following equipment is included for the dispatch location:

- Two HP 2620- 24 port dispatch LAN Switches.
- Two GGM 8000 Site Gateways.
- One 7’ Cabinet.
- One Type 3 AC EDGE Device with breakers.
- Two Ethernet Surge Protectors.
- One MCC 7500E Console Position including the following:
  - One Motorola-certified workstation hosting the MCC 7500E Graphical User Interface.
  - One 24” Diagonal LCD Touch Screen Monitor.
  - Two Desktop Speakers.
  - Two Headset Jacks.
  - One Gooseneck Microphone.
  - One Dual Pedal Footswitch.
  - One Instant Recall Recorder.
  - One RMP615A Surge Suppressor.
  - One Genovation CP24 Keypad.
  - One Desktop PTT Button.
  - One Mouse and Keyboard
- One APX6500 Mobile Radio with radio mounted in equipment room and control head at the operator position (distance between radio and control head not to exceed 300’)

2.2.1.1.4 Sheriff’s Department Detention Center

CCD has requested a two console positions for use at the Sheriff’s Department Detention Center. Motorola has included two MCC7500E consoles for this location.

Equipment List

The following equipment is included for the dispatch location:

- Two HP 2620- 24 port dispatch LAN Switches.
- Two GGM 8000 Site Gateways.
- One 7’ Cabinet.
- One Type 3 AC EDGE Device with breakers.
- Two Ethernet Surge Protectors.
- Two MCC 7500E Console Positions each of which includes:
  - One Motorola-certified workstation hosting the MCC 7500E Graphical User Interface.
  - One 24” Diagonal LCD Touch Screen Monitor.
  - Two Desktop Speakers.
  - Two Headset Jacks.
  - One Gooseneck Microphone.
  - One Dual Pedal Footswitch.

  - One Instant Recall Recorder.
  - One RMP615A Surge Suppressor.
  - One Genovation CP24 Keypad.
  - One Desktop PTT Button.
  - One Mouse and Keyboard
- Two APX6500 Mobile Radios with radio mounted in equipment room and control head at the operator position (distance between radio and control head not to exceed 300')

2.2.1.1.5 Denver Right of Way Services

CCD has requested a three console positions for use at the Denver Right of Way Services in the Wellington E. Webb Municipal Office Building. Motorola has included three MCC7500E consoles for this location.

Equipment List

The following equipment is included for the dispatch location:

- Two HP 2620- 24 port dispatch LAN Switches.
- Two GGM 8000 Site Gateways.
- One 7' Cabinet.
- One Type 3 AC EDGE Device with breakers.
- Two Ethernet Surge Protectors.
- Three MCC 7500E Console Positions each of which includes:
  - One Motorola-certified workstation hosting the MCC 7500E Graphical User Interface.
  - One 24" Diagonal LCD Touch Screen Monitor.
  - Two Desktop Speakers.
  - Two Headset Jacks.
  - One Gooseneck Microphone.
  - One Dual Pedal Footswitch.
  - One Instant Recall Recorder.
  - One RMP615A Surge Suppressor.
  - One Genovation CP24 Keypad.
  - One Desktop PTT Button.
  - One Mouse and Keyboard
- Three APX6500 Mobile Radios with radio mounted in equipment room and control head at the operator position (distance between radio and control head not to exceed 300')

2.2.1.1.6 Denver EEB

CCD has requested a single console position for use at the Denver EEB. Motorola has included one MCC7500E console for this location.

Equipment List

The following equipment is included for the dispatch location:

- Two HP 2620- 24 port dispatch LAN Switches.
- Two GGM 8000 Site Gateways.
- One MCC 7500E Console Positions including the following:
  - One Motorola-certified workstation hosting the MCC 7500E Graphical User Interface.
  - One 24" Diagonal LCD Touch Screen Monitor.

- Two Desktop Speakers.
- Two Headset Jacks.
- One Gooseneck Microphone.
- One Dual Pedal Footswitch.
- One Instant Recall Recorder.
- One RMP615A Surge Suppressor.
- One Genovation CP24 Keypad.
- One Desktop PTT Button.
- One Mouse and Keyboard

2.2.1.2 MCC 7500E Console Platform

The MCC 7500E IP Dispatch Console is seamlessly integrated into the ASTRO 25 IP Network. The console connects directly to the Master Site via an IP backbone. This modular IP approach eliminates the need for space-consuming backroom electronics. All dispatch activity is performed over IP. The physical space needed to accommodate the MCC 7500E console position is no more than required for a HP Z2 Mini personal computer. Both trunked talkgroups and conventional radio channels can be accessed and controlled from one MCC 7500E IP Dispatch Console over the same network, thus reducing overall transport costs. All conventional resources become shared resources within the ASTRO 25 network, reducing the need for duplicate fixed network equipment.

Inherent integration with the ASTRO 25 network means:

- Emergency calls are prioritized to get through no matter how busy the network.
- Voice quality is optimized, eliminating the potential for audio degradation.
- Quality of service is maintained, regardless of the size of the system.
- IP network redundancy ensures call traffic delivery.
- Rapid call setup times that remain constant, regardless of the size of the system.
- Improved bandwidth efficiencies reduce transport costs.
- Flexibility in usage of the operator configuration–any operator can do their job from any position in the network.
- True end-to-end encryption from the radio user to the console operator position, enhancing operational security.
- Inherent access to all system resources within the network by eliminating equipment and coverage constraints, providing dispatch priority to reach any user when needed.

2.2.1.2.1 Plan View of the Dispatch Console

A plan view of the dispatch console system and its relationship to the rest of the proposed solution is included in the following figure.

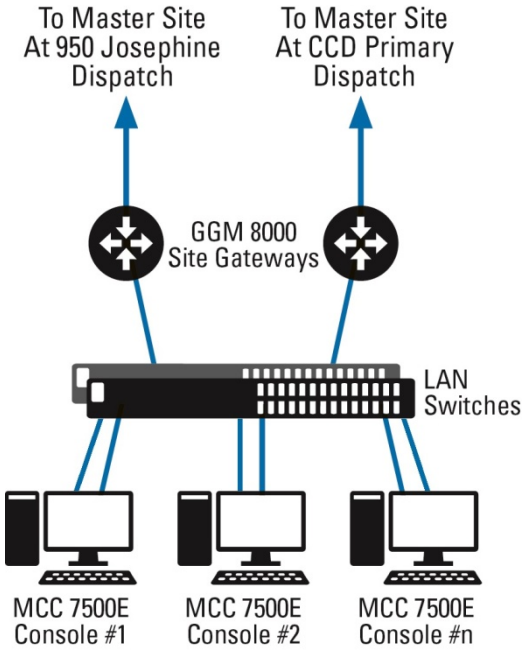

Figure 2-1: Plan View of the Dispatch Console

2.2.1.2.2 A Detailed Drawing of each Control Panel with All Controls Identified

The MCC 7500E's intuitive graphical user interface (GUI) optimizes user efficiency. The MCC 7500E user interface is an enhanced version of Motorola's proven dispatch GUI. The graphical icons and unsurpassed flexibility make the MCC 7500E IP console GUI easy to learn and operate. The MCC 7500E GUI is highly configurable and customizable by agency or user to meet dynamic needs and requirements. The MCC 7500E GUI makes the most use of monitor space, maximizing the number of resources a dispatcher is able to easily view and control. Features include:

- Twenty screen configurations (folders) for added resource capacity, for shift changes, or for differing dispatch scenarios and/or responsibilities.
- 16 different radio patch configurations per MCC 7500E Console.
- Call history log for up 1000 calls.
- Elite Admin Application–The manner in which resources and audio are presented to the dispatch console user on the MCC 7500E dispatch console is managed by the Elite Admin application. The look and feel of the Elite Dispatch GUI, as well as how received audio is routed on the dispatch console, can be optimized to meet your needs.

The MCC 7500E's graphical user interface (GUI) optimizes user efficiency. It is designed to display the maximum number of resources a dispatch operator is able to easily view and control. Each dispatch center can customize the MCC 7500E's GUI by agency or by individual user to meet their dynamic needs and requirements.

The figures below show the MCC 7500E dispatch position GUI control panel where dispatchers do the large majority of their work. This screen is completely configurable and highly customizable. Motorola will work with each individual dispatch center to create a control panel that fits their needs.

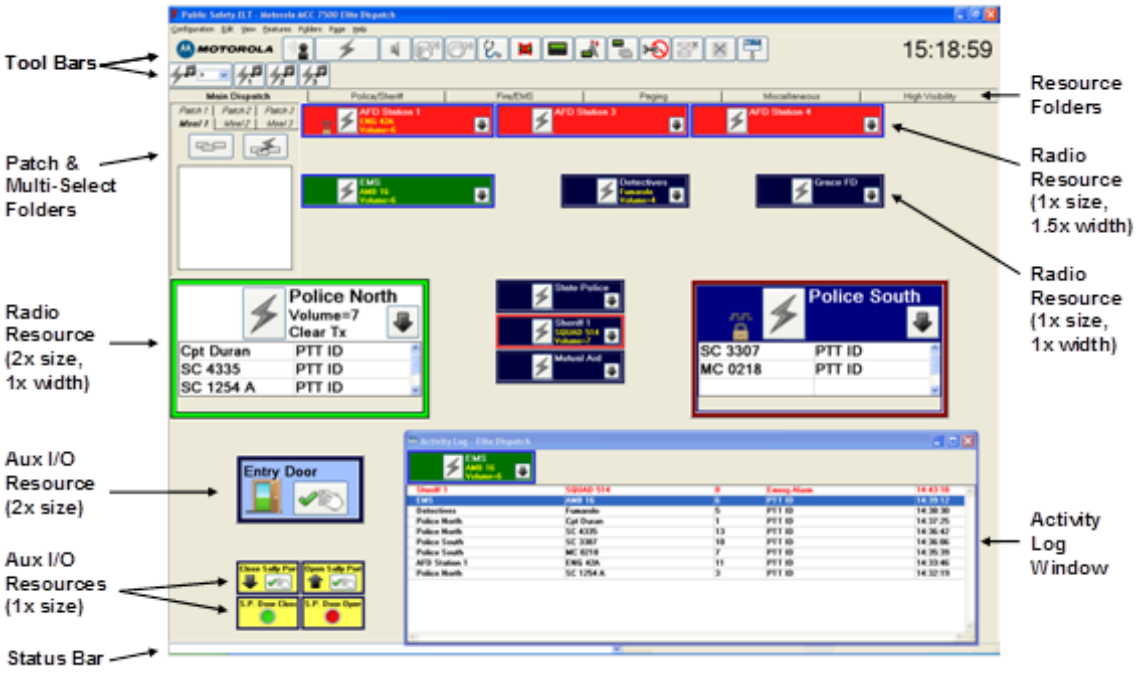

Figure 2-2: Detailed Image of MCC 7500E Control Panel

A.1.1 **Figure 2-3: MCC 7500E GUI Custimization**

Based on operator preference, the MCC 7500E GUI can be customized to show details of trunked and conventional channels on a per-channel basis. Various controls can be highlighted, such as patch status, frequency select, coded/clear select, and individual volume control. Per-channel controls can be fully or partially shown, or hidden to save space on the screen. Busy dispatch operators 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 MCC 7500E provides both a select and un-select speaker configuration. The routing of audio to the select speaker is user controlled by selecting the channel control module (CCM). Each CCM has an individual volume control.

2.2.1.2.3 Console Feature Descriptions

The MCC 7500E IP console is designed to provide mission-critical audio between the dispatch console and users in the field. It is capable of providing communication over trunked talkgroups, conventional channels, and other console positions, i.e. intercom. Additional information on the MCC 7500E call processing capabilities is included below.

The MCC 7500E dispatch console is optimized for real-time audio, prioritizing emergency calls over other traffic, minimizing voice queuing, and transmitting calls in 450 milliseconds or less. It uses error mitigation to maintain call quality even when the system is heavily loaded, reducing communication errors that force dispatch console operators to repeat their transmissions.

Network Connectivity

IP network equipment is used to route audio and control signals between the dispatch operators and the P25 trunked system. Redundant switches and gateways will negate a single point of failure within the common electronics equipment at each dispatch center.

The MCC 7500E console site is remote from the master site and is provided with redundant site routers 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 all of the IP Network Management traffic between the MCC 7500E console center and the master site. The site gateways fragment large IP packets according to industry standards, prioritize packets, and convert Ethernet data to the desired transport medium.

The site LAN switches provide LAN interfaces for dispatch site equipment and gateway to the master site. The MCC 7500E console also uses dual network connections on dispatch positions to prevent a console site LAN switch failure or individual Network Interface Card failure from rendering a dispatch position unusable.

Standard Radio Transmission and Reception

The MCC 7500E consoles have two speakers, one for selected audio, and the second for unselected audio. Additional speakers can also be added to the console, allowing dispatch operators to choose a specific speaker for a set of designated audio sources. This simplifies multitasking between multiple audio sources, allowing flexibility in the way the audio is presented to the dispatch operator.

Receiving Calls from the Field and Other Dispatch Operators

Dispatch operators have great flexibility as to how to hear calls from field radio users and other dispatch operators. Each console dispatch operator can define his or her own audio reception profile. They can select a single audio source, whether conventional or talkgroup, to be heard on a selected speaker (“Single Select). They can also define groups of radio resources that can all be heard on a selected speaker (“Multi-Select”).

Initiating Calls to the Field and Other Dispatch Operators

The dispatch operator has several different ways of initiating a call. In most circumstances, a “General Transmit” is appropriate; the dispatch operator selects a resource on the console and activates the transmission through a footswitch, headset transmit button, microphone transmit button, the desktop transmit button or General Transmit API function.

If the dispatch operator needs to quickly transmit on a resource, they use the “Instant Transmit” function, which activates the resource regardless of whether it is selected. To prevent accidental activation of “Instant Transmit,” it can be limited through an “Instant Transmit Safety Switch,” which must be pressed prior to activation of “Instant Transmit.”

Making Calls to the Field and Other Dispatch Operators

The dispatch operator can transmit audio in different ways, depending on who they need to speak with and how important that communication is. Most basically, they can make conventional PTT calls to all users listening to a specific conventional radio resource. They can also speak to all users on a specific talkgroup (the “Trunking Talkgroup” feature, and they can define groups of talkgroups or conventional channels to transmit to multiple resources at once.

The MCC 7500E system enables dispatch operators to make calls to individual field radio users or dispatch operators on a trunking resource (the “Trunking Individual Call” feature). Once this private call is established on a resource, it can be patched in with another resource at the dispatch operator’s discretion. When either party on an individual call ends the call, the individual call resource automatically hangs up (the “Cancel Service – Individual Call” feature).

Controlling Console Audio

The MCC 7500E console offers the operator several different ways of controlling or muting the audio on their console. The operator can change the audio volume of any specific resource routed to a selected speaker and, if they desire, can mute and un-mute all non-selected resources on the console (the “All Mute” feature). The console also has built-in functionality that makes the console operator’s job easier; it enables the dispatch operator to transmit on a resource while receiving audio from other resources, and prevents acoustic feedback from nearby consoles by muting parallel operator audio on all common radio resources.

Controlling Network Audio

Dispatch operators can control the audio on the ASTRO 25 network. Using the console, the operator can enable or disable radio users in a talkgroup from hearing transmissions of other radio users in that talkgroup, 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 console.

Standard Call Indications

The MCC 7500E console indicates the availability of any given trunking resource, whether or not it is being transmitted on at the moment. It will also give an inbound call indication that provides the console operator with a visual cue of audio activity on a radio resource. This functionality makes it easy for an operator to see at a glance what the status of a resource is at any moment.

Dispatcher Call Override

Console operator positions have console priority of transmitted audio on assigned channel/group resources. Console Priority enables dispatchers to gain immediate access to an assigned channel/group so they can override any subscriber’s audio. A console supervisor also may override a dispatch operator or subscriber’s audio.

Multi-Select

A Multi-Select allows a dispatcher to merge several talkgroups together on one voice channel to participate in a single conversation. This can be used for announcements to two or more channels or talkgroups for general broadcast purposes.

Using the Multi-Select feature, the console operator can talk and listen to all of the selected talkgroups grouped; however, the members of the individual talkgroups cannot talk or listen to members of other talkgroups. Multi-selected talkgroups still only communicate with the console dispatcher and other members in the same talkgroup. A predefined multi-select configuration can be saved by the console operator as an All Points Bulletin (APB) for quick broadcast-type transmissions by the dispatcher.

The maximum number of simultaneous multi-select groups that can be simultaneously constructed is three. The maximum number of resources in a multi-select call is 20, and up to 60 members total across all multi-select groups.

Dispatcher Call Override/Console Priority

Console operator positions have console priority of transmitted audio on assigned channel/group resources. Console Priority enables dispatchers to gain immediate access to an assigned channel/group so they can override any subscriber's audio. A console supervisor also may override a dispatch operator or subscriber's audio.

Emergency Alarms

The MCC 7500E IP Dispatch Console is capable of monitoring radio subscribers for user initiated emergency activations. On subscriber radios that are equipped and programmed to transmit an emergency alarm, the MCC 7500E detects that this emergency has occurred and displays the emergency on operator positions that are preprogrammed to receive the emergency notification.

Operator positions can be programmed to either receive the emergency or to completely ignore it. In the event of an emergency condition from a radio user, all programmed consoles will give both an audible and visual indication of the event. The dispatch operator can then silence the emergency leaving the visual indication on the screen indicating information on the initiating radio allowing the call to be handled and dispatched appropriately.

Once an emergency is received all programmed operator positions will give the audible and visual indication of the event. Any one of these operator positions has the ability to silence the emergency at only their position or for all operator positions on the system.

In the event of a system that all channels are busy at the RF site that receives the emergency, that event is automatically given a Priority Level 1. This is the highest priority possible, putting the emergency call at the top of any busy queue. The emergency call will be given the next available voice channel at that site bumping all non-emergency calls in the queue.

Remote Monitor

The Remote Monitor feature allows a MCC 7500E dispatcher to put an ASTRO 25 trunked radio in transmit mode. This allows dispatchers and radio users to hear audio activity occurring at the radio.

When a Remote Monitor command is initiated, the receiving radio is expected to automatically acknowledge it. The MCC 7500E dispatch position always commands the target radio to key up in the "silent" mode (i.e., no visual or audible indications that the radio is keyed up).

The dispatcher can select the trunked talkgroup that the target radio should use for its remote monitor transmission. For example, the dispatcher could command the radio to transmit as follows.

- On a talkgroup only being monitored by the initiating console (a semi-private transmission).
- On a talkgroup which only dispatch positions are monitoring so other radios can't hear the transmission.
- On a talkgroup on which both dispatch positions and radios can hear the transmission

The dispatcher can also command the target radio to use either clear or secure audio for the remote monitor transmission on secure-capable talkgroups/radios. The Remote Monitor feature can be used to allow a MCC 7500E dispatcher to hear what is going on at an ASTRO 25 trunked radio to determine the safety and welfare of a radio user.

In addition, Remote Monitor or Radio Trace can be used to help determine the location of a lost or stolen radio, by providing an RF signal from the radio. This signal can be used to track the location of the radio.

Mission Critical Audio and Tones

MCC 7500E IP console is designed to minimize the impact of any momentary glitches in IP audio packet delivery. It has robust error mitigation methods in place so that call audio is not degraded even when the system is heavily loaded in a crisis, improving dispatcher accuracy to minimize communication errors and repeated transmissions. Special protocols are used in the MCC 7500E software to enhance the quality of Alert Tones and Channel Marker tones used in trunking, which can be subject to distortion from the Project 25 IMBE Vocoder. This optimizes the quality of tones sent to the radio users and improves the accuracy of their interpretation and response.

Radio Status/Message

The Radio Status/Message feature allows a radio user using an ASTRO 25 system to relay the user's present information to MCC 7500E dispatch positions without taking up air time with a voice communication. Radio Status/Message is used to provide a means of tracking the status of radio users. It can help the dispatcher decide how to respond to new incidents by providing an overview of the current disposition of the available field resources. This allows for more efficient use of field resources (people and/or vehicles). An example of a use of Radio Status/Message is as a police application, in which the various patrol persons may be "Out of Service", "Available", "En Route", "On Scene", etc.

Radio Status/Message is a numeric value associated with a predefined state. For example, a status code of 1 could mean "Out to Lunch", a status code of 2 could mean "Available", etc. Aliases can be assigned to the status/message codes to enable the dispatcher to easily understand what information the status is intended to convey. These aliases can be up to 60 characters in length. The dispatch position can be configured to display statuses/messages in the resource tile, the received call stack, the 3-line display and/or the activity log.

Radio Status and Radio Message operate in very similar manners, but differ in one respect. Radio Status is persistent within the radio, in which the radio retains the last status that was sent. This allows for an MCC7500E dispatch position to query the status of the radio. In doing so, the radio will respond with the last transmitted status. Radio Message is not retained, once transmitted, the radio no longer retains what message was sent last.

As part of the MCC 7500E console, an API is included to allow for connection to an outside CAD system. This API allows for the CAD system to receive all Radio Status/Message transmissions received by the MCC 7500E console, as well as for the CAD system to request the MCC 7500E console to send a status query to a specific radio.

Agency Partitioning

Agency Partitioning provides access controls for talkgroups, conventional channels, pre-programmed pages, encryption keys, and configuration data. Agency Partitioning allows departments or agencies to share a radio system for cost savings and interoperability, without compromising the integrity of their dispatch operations. User Login Accounts provide access controls for dispatch positions, logging recorders and replay stations enabling radio system administrators to control which users have access

to specific resources in the system. This helps keep an agency's resources available for its users, while preventing unauthorized people from making any changes.

Centralized Network Configuration and Fault Management

Centralized configuration is a unique MCC 7500E IP Console feature that speeds console setup, enhancement, or expansion efforts and makes the most efficient use of resources.

- Configuration of the MCC 7500E IP Console positions is accomplished via the User Configuration Manager (UCM).
- There is no need to separately maintain or manage configuration databases solely for the dispatch equipment.
- Redundancy and potential errors from entering radio IDs and other data at multiple locations are eliminated.
- Console configuration changes are immediately and automatically distributed to dispatch positions.
- Call traffic and performance reports for each console can be generated from the Network Manager.
- Historical reports can assist in making informed decisions regarding dispatch changes for optimal effectiveness and efficiency.
- Centralized fault management allows reduced service times, and quicker resolution of issues.

MCC 7500E IP console is designed to continuously monitor its application software and important hardware elements (PC) to make sure it is operating efficiently at all times. Network connections and control paths between the consoles and various elements are also monitored to make sure they are operating efficiently. If configuration, fault management, or report generating ability is desired at individual console sites, remote network management clients can be employed. This is beneficial for users who are sharing a system but have limited access to the Network Manager, or for users who desire expanded console management capabilities at console sites.

Reliability and Availability

The MCC 7500E Console and services are optimized for real-time audio, essential for mission critical operations. The MCC 7500E is designed to prioritize emergency calls over other traffic. Queuing of voice is kept to a minimum and calls are transmitted in 450 milliseconds or less.

For added assurance of reliable communications, MCC 7500E console sites support redundant WAN links to the trunking system's master site. A Conventional Site Controller is used to ensure conventional channels remain operational.

Bandwidth Management

The ASTRO 25 Network utilizes protocols that enable the most efficient use of bandwidth. Each trunked resource to the MCC 7500E site requires only 9.4 kbs of bandwidth versus other manufacturers in the industry who require up to 50 kbs per trunked resource to the console site.

Bandwidth management provides the following benefits:

- Ensures emergency calls make it through to the dispatcher.
- Bandwidth is shared between calls. This sharing allows you to use less total bandwidth.
- For systems that include logging, only one copy of a call is sent across the link. The console site LAN switch duplicates the call packets for the MCC 7500E consoles and logging equipment.

Voice Encryption

The MCC 7500E provides true end-to-end encryption from the subscriber to the console operator position, enhancing operational security. This assures that sensitive, private communications will remain secure, from the user in the field to the console dispatch operator. The following encryption is available: DES-OFB, AES, ADP. AES encryption has been included for all operator positions.

Conventional Base Station Interfaces

The MCC 7500E is capable of accessing and controlling CCD system users' analog and digital conventional base stations through the use of conventional channel gateways (CCGW). This capability lowers the CCD system users' cost of ownership in two-ways:

- It uses the same transport network, reducing the requirements for dedicated backhaul.
- It reduces the hardware requirements for interoperability, lowering fixed network equipment costs.

The dispatch 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. Using the high density version of the Enhanced GGM 8000-based CCGW, up to 16 additional conventional channels can be connected to the analog and V.24ports. These 16 channels can be a mixture of analog, MDC 1200, ACIM link, digital, or mixed mode operation.

Enhanced Integrated Instant Recall Recorder

Motorola has included an Enhanced Integrated Instant Recall Recorder (IRR) for each proposed MCC 7500E. It is capable of recording and playing back the audio from five different sources as listed below. The specific sources to be recorded are configured on a per dispatch position basis.

- Source A: Selected receive audio and dispatcher transmit audio
- Source B: Speaker "X" audio
- Source C: Telephony audio
- Source D: Analog Line-in 1
- Source E: Analog Line-in 2

Audio and call data from any of the above sources can be recorded and easily played back. Call data recorded includes PTT IDs, name of resource recorded, start and stop time and date.

The recording is stored on the console PC for "instant" playback. The amount of time recordable depends on available hard drive space. The IRR application is customizable to allow each agency to determine how much call check audio should be backed up at the position, and can record up to two days of playback.

The Instant Recall Recorder keeps a database of all recordings, which allows for convenient "point and click" search and playback of any recordings. Once the software is installed on your PC, the functions are controlled through a Graphical User Interface (GUI) icon.

In addition, the Instant Recall Recorder has numerous special features; such as the ability to attach text documents to recordings, a security system, multiple playback (which allows the user to playback more than one recording at the same time), and real time audio monitor (which allows the user to listen to the last ten minutes of a recording in progress without being required to stop recording to be able to listen).

2.2.1.2.4 Console Network Equipment

Console Site Gateways

The site gateways provide an interface that handles all of the IP network management traffic between the master site and the MCC 7500E Dispatch center. The Site Gateways provide the following:

- Media conversion – the router converts Ethernet to the selected transport medium.
- Traffic prioritization – the router applies a prioritization marking to the packets leaving the site.
- Fragmentation – the router fragments large IP packets per industry standards.
- Redundancy through the utilization of dual site links.

Console Site LAN Switch

The site LAN Switches provides a LAN interface for dispatch site equipment and a LAN port for the site router. Through the switch, the service technicians gain access to service the site, and also access the system's Graphical User Interface.

This proposal includes two dispatch LAN switches at each dispatch center to eliminate single points of failure. Dispatch positions will be connected to both LAN switches through the positions dual NICs. In the event that one dispatch LAN switch fails to operate, dispatch operations will continue with normal operation and remain in wide area trunking. Only access to those auxiliary resources (Enhanced Conventional Channel Gateways) connected to the failed switch will be affected.

High/Low Density Enhanced Conventional Channel Interface (HD/LD-ECCGW)

Conventional channels are much more integrated into ASTRO 25 trunking systems than in previous radio systems. The zone controller manages conventional channels in a manner similar to how it manages trunked talkgroups.

The physical interface to the analog conventional stations also changes from previous radio systems. GGM 8000 Gateways are fitted with 4-wire/V.24 interface cards, which are connected to the conventional resources. This connection allows the conventional audio to use the same transport network as the trunked audio. The portion of the router hardware and software that support the conventional stations is called the Enhanced Conventional Channel Gateway (ECCGW). Up to eight conventional resources may be connected to the High Density ECCGW. If the number of stations at a site exceeds the capacity of the gateway, additional ECCGWs can be added to support those conventional stations.

The Conventional Site Controller allows dispatch console users continued access and control to local conventional channels if connectivity to the radio system's controller is lost. This mode of operation is often called "fallback operation." The conventional site controller, ECCGWs and dispatch consoles must all be on the same console site LAN to take advantage of fallback operation. ECCGWs located at RF sites or other console sites cannot be accessed by the dispatch consoles located at the console site when in fallback operation mode.

Only one conventional site controller is required per console site utilizing ECCGWs. This single conventional site controller is capable of supporting the full set of dispatch consoles and ECCGWs that can be placed in a console site.

All dispatch consoles and ECCGWs continuously monitor their connections to the radio system's controller. If they detect that the connections have failed, they check their configuration data to see if a conventional site controller is present in their console site. If a conventional site controller does exist, they will automatically switch over to it.

During the switchover, the dispatch consoles entering fallback operation will lose any calls in progress on non-local conventional channels and all trunking resources. Calls on local conventional channels will be re-established after the switchover finishes.

When a dispatch console is in fallback operation, it will display a visual indication on the dispatch GUI on every non-local conventional channel and every trunked resource indicating the channel or resource is not available for use. The local conventional channels are shown as being fully available for use.

An indication is also given in the status bar at the bottom of the dispatch GUI that the dispatch console is in fallback operation. While in fallback operation, the dispatch consoles and ECCGWs continuously check to see if connectivity to the radio system's controller has been restored. When they detect that connectivity has been restored, they will automatically switch out of fallback operation and into normal operation.

Included in this proposal is a GCP8000 Conventional Site Controller and one High Density ECCGW (HD-ECCGW) at the 950 Josephine Dispatch. The HD-ECCGW provides up to eight analog interfaces which will be used to provide the connection to the seven resources indicated within the RFP at this location.

2.2.1.2.5 Dispatch Console Hardware

An MCC 7500E dispatch console consists of an operator position computer, logging equipment, network equipment and conventional channel interface equipment. This section discusses the various components that make up the proposed system.

The MCC 7500E's flexible IP architecture enables interfaces and components to be distributed where they are needed. Logging components can be centrally located at the zone core or distributed at console sites. Conventional Channel Gateways (CCGWs) can be located at conventional-only RF Sites, or they can be located at trunking RF sites, the master site, or at console sites.

2.2.1.2.6 Operator Position Components

The MCC 7500E IP dispatch console, shown in the figure below, consists of a computer, an Audio Interface Module (AIM), one select speaker, up to seven unselect speakers, a desktop gooseneck microphone, two headset jack boxes with inline PTT amplifier, dual footswitch, and USB expansion hub. Details on the configurations provided for CCD are included above.

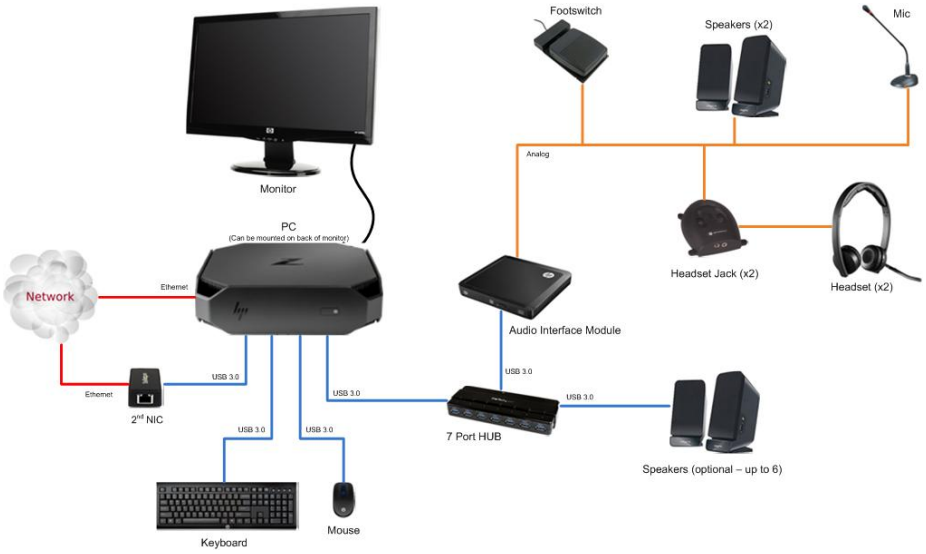

Figure 2-4: MCC 7500E Operator Position

Personal Computer (PC)

The dispatch console uses a Motorola certified HP Z2 Mini PC to provide audio and control processing, user interface through the Elite GUI and network connectivity. The PC is provided in a 8.5” x 8.5” x 2.28” mini PC form factor that can be either placed on the desk surface or mounted on the rear of the associated monitor.

Audio Interface Module (AIM)

The USB Audio Interface Module (AIM) is an external device connected to the MCC 7500E dispatch console. It functions as an interface between analog devices and the console position and as a general-purpose input/output module.

The USB Audio Interface Module supports audio routing between the dispatch operator and Motorola Solutions-standard peripherals. The USB AIM connects to the MCC 7500E Dispatch Console with a USB cable.

Microphone

The desktop gooseneck microphone can be attached to a horizontal surface or left freestanding so that the dispatcher can pick it up. The eighteen-inch long, flexible shaft makes it possible for the dispatcher to position the microphone head within a few inches of their mouth even when the base is placed behind a keyboard or writing area.

If a desk microphone is connected to a dispatch console while no headsets are connected, the desk microphone is active whenever any transmit function is active.

Each MCC 7500E Dispatch Console can support one desktop microphone.

If a desk microphone is connected to a dispatch console while one or two headsets are connected, the desk microphone is only active during a transmit function when the dispatcher presses the transmit button on it. This solution prevents the desk microphone from picking up unwanted background sound when the dispatcher uses a headset to transmit.

Headset Jack

Each dispatch console is capable of supporting up to two headset jacks. A headset jack allows a dispatch console user to use a headset while operating the dispatch console. The headset jack supports headsets which use either PJ7 (6-wire) or PJ327 (4-wire) long-frame connectors (6-wire headsets have a PTT button while 4-wire headsets do not have a PTT button).

The headset jack contains two volume controls: one for adjusting the level of received radio audio and one for adjusting the level of received telephone audio. A small dimple is molded into the headset jack housing near the telephone volume control so the dispatch console user can tell them apart without having to look at them.

The size of the headset jack is 1.6 inches x 5 inches x 6 inches.

Desktop Speaker

The USB AIM supports all the Motorola Solutions-standard peripherals except for the desktop speakers.

Instead of the Motorola Solutions-standard speakers, Motorola Solutions tested COTS (commercial-off-the-shelf) USB speakers or analog stereo speakers are used. The USB speakers connect directly to the console operator position computer USB port (or USB expansion hub) while the analog speakers connect directly to the computer stereo output port.

Footswitch

Each dispatch console can utilize a dual-pedal footswitch.

Telephone/Headset Port

The telephone/headset port allows an external telephone set to be connected to the dispatch console. The dispatch console's headset can then be used to communicate on both the radio system and the telephone set.

When the dispatch console senses a dry closure on the Off Hook input buffer, it removes the selected radio audio from the headset earpiece and puts it back in the appropriate speaker(s). It then routes any audio appearing at the telephone/headset port's audio input to the headset earpiece. It also routes headset microphone audio to the telephone/headset port's audio output. This allows the dispatch console user to communicate hands-free on the telephone set.

When the dispatch console senses a dry closure on the Auxiliary Jack Sense input buffer, it ignores any closures on the Off Hook input buffer. This causes the headset to work with the radio system instead of the external telephone system. This allows the dispatch console headset to be used for radio operations when another person is staffing the telephone set.

If the dispatch console user transmits on any radio resources while the Off Hook signal is active, the headset microphone is re-routed to the radio system for the duration of the transmission. When the transmission ends, the headset microphone is routed back to the telephone headset port's audio output. The headset earpiece audio routing is not changed during the transmission, so the dispatch console user can still hear the telephone's received audio. Also, in the event a dispatcher plays back recorded audio via the Instant Recall Recorder, the playback will occur in the dispatcher's headset and the selected resource's audio will be played on the "select" speaker.

The telephone/headset port allows a dispatch console user to use a single headset to communicate on both the radio system and a telephone system (e.g., a 911 system).

2.2.2 LOGGING SYSTEM

2.2.2.1 Dispatch System Interface with Logging Recorder

The Archiving Interface Server (AIS) provides an interface between the dispatch consoles and the logging recorder system. This allows calls on the radio system to be recorded together with information associated with the calls. The AIS is comprised of a personal computer and Voice Processing Module (VPM). There is a one-to-one relationship between an AIS and IP logging recorder, such that each IP logging recorder in a system requires its own AIS.

The proposed design includes one AIS located at the CCD Primary Dispatch equipment room and one AIS located at the 950 Josephine Dispatch equipment room.

Capacity of Console AIS

The AIS is designed to accommodate 120 simultaneous clear conversations. Encrypted conversations or those on conventional resources will impact the number of simultaneous conversations that can be recorded. Motorola has designed the AIS and logging solution to take these constraints into consideration to ensure all conversations that require recording is recorded.

Date and Time Synchronization

The console sub-system synchronizes its time and date information with the radio system's time source via Network Time Protocol (NTP) on the radio system's IP network. This ensures that the time displays at the dispatch positions and any time stamps on events in log files are accurate.

Adjustments for 12/24 hour format, different time zones and Daylight Savings Time are automatically made if the operating system on the dispatch positions and other console sub-system elements is configured to support them.

2.2.2.2 Verint Logging System

As indicated in the RFP, CCD currently operates a Verint logging recorder. As part of this proposal, Motorola has included a Verint Trunked Logging Recorder (TLR) to interface with the AIS located at the 950 Josephine Dispatch in order to record radio system traffic. As indicated in the RFP, proposed Verint TLR has been configured to record audio from up to 96 P25 talkgroups.

Also included is a Verint Central Archive Server to provide both a centralized location for archived audio along with the server functionality for Verint's Audiolog Insight Center multimedia replay. The existing CCD Verint logging recorder can continue to be utilized for analog and IP based telephony recording capabilities. This recorder will also have connectivity to the CAS. Doing such will allow for incident reconstruction utilizing recordings from both the TLR for P25 communications along with telephony recordings from the existing CCD logging recorder.

CCD will be responsible for supplying the logging recorder and associated licensing for interfacing with the second AIS located at the CCD Primary Dispatch.

CITY AND COUNTY OF DENVER

SECTION 2.3

SUBSCRIBER EQUIPMENT

P25 PUBLIC SAFETY RADIO SYSTEM REPLACEMENT PROJECT NOVEMBER 20, 2017

REQUEST FOR PROPOSAL NO. 28435Q

MOTOROLA SOLUTIONS

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Section 2.3

SECTION 2.3

SUBSCRIBER EQUIPMENT

2.3.1 APX™ SERIES P25 TWO-WAY RADIOS

The APX P25 two-way radio series redefines safety in communication. APX puts the right device into the hands of the right user. Every feature and function is designed with its users in mind – from the rugged, easy to operate design to the loudest, clearest audio. The result is the ability to keep your people and community safer than ever before.

Figure 2-1: APX Series P25 Two-Way Radios.

All radios that Motorola offers to the public safety market have specific features that our customers have indicated are critical for first responders and other public safety field personnel.

For CCD, Motorola's proposed APX radios include options for encryption (AES), as requested in the RFP. For any APX radios that are not ordered with AES encryption, the encryption algorithm can be added at a later date through the FLASHPort software and does not require a return to the factory or any hardware additions.

Motorola's APX P25 multi-band radios deliver exceptional performance by combining advanced voice and data technology driven by the challenges of mission critical users. They enable instant multi-agency interoperability for mission critical first responders, in a form factor that has been designed specifically for Public Safety and Law Enforcement agencies.

The APX radio interfaces with our ASTRO 25 infrastructure technology to provide seamless, high-quality communications that meet and exceed P25 standards.

Motorola's IP-enabled APX radios offer a full array of sophisticated features and progressive technology and are the most sophisticated, interoperable, and rugged radios that Motorola manufactures for public safety professionals.

Trunking Support

All Motorola high-performance mobile and portable radios are compatible with the Project 25 Type II standards for analog and digital trunking. They all support conventional analog and digital operation, as well as trunked digital operation in the same radio. In addition, they support Project 25 features for interoperability with systems from both Motorola and other manufacturers. They are ideally suited to situations in which personnel need instant interoperability on different systems.

Backwards and Forwards Compatibility

Motorola's current P25 radio portfolio is designed with both backwards and forwards compatibility. The radios in our portfolio have been designed to operate on analog conventional, Project 25 conventional, and Project 25 trunking systems and can also operate on systems using Motorola Project 16 analog trunking, SMARTNET, and SmartZone technology. These radios will remain compatible with the technology used on your infrastructure for the foreseeable future.

POP25 Over the Air Programming (OTAP) - Optional

Motorola's Programming Over P25 (POP25) solution allows subscriber radios to be programmed over the air using ASTRO 25 system, while remaining in the field without interruption. POP25 functionality reduces the time, effort, and costs needed to update radio functionality by allowing radios' configuration to be accessed and updated over the air.

Easy Radio Programming

All proposed Motorola radios can be easily programmed using Customer Programming Software (CPS). This easy to use, Windows-based customer programming software enables programmers to use the drag-and-drop, clone wizard, and programming over IP capabilities. This increases your users' speed and efficiency in updating radio programming. As your system changes or expands and your field users' needs change, you can easily add new software or future enhancements.

Superior Audio Quality

Intelligent 2-microphone noise reduction software and the latest AMBE vocoder dynamically adjusts for changing high noise environments. The noise cancellation capability of the APX radio is second to none.

Rugged, Robust Design—Standard with Every Radio

Motorola public safety radios meet applicable Military Specifications 810, C, D, E, and F. Using MacroBlend housing material, they are designed to survive severe shock and vibration, and exposure to damaging environments such as salt fog, UV radiation, dust, and electrostatic discharge.

Motorola radios are tested and exposed to extreme conditions to simulate years of abuse. Typical environmental tests performed on our radios include temperature shock, temperature cycling, drop, display impact, vibration, blowing rain, dust, salt fog, UV exposure and Electro-Static discharge (ESD). We also perform functional and parametric testing to verify that the radios still work after they are exposed to the environment. Our testing standards include:

- Military Specification 810 C, D, E, F
- Motorola Internal 12M spec

Motorola's Internal 12M specifications are more stringent than industry-standard testing. For example, Military specifications for a drop test call for the unit to be dropped onto a plywood surface. Motorola's drop tests use a steel landing surface, which increases the severity of the test.

It is Motorola procedure that each test unit should be subjected to every environmental test, rather than using a different unit for each test. This ensures that our radios perform to specification regardless of the amount and type of abuse they receive.

Interoperability in Multiple Frequency Bands

In mission critical situations, agencies from different jurisdictions sometimes operate on different frequency bands, requiring personnel to carry two radios in order to communicate with one another. With APX portable and mobile radios, agencies can purchase one radio for instant communication over multiple frequency bands. This eliminates the need for field users to carry multiple radios, and reduces the amount of equipment that must be maintained and installed.

Project 25 Phase 1 FDMA and Phase 2 TDMA Operation

The proposed APX radios can operate in both Project 25 Phase 1 FDMA and Project 25 Phase 2 TDMA trunking modes. Using Motorola's unique Dynamic Dual Mode (DDM) capability, APX radios can dynamically switch between FDMA and TDMA without the user having to change channels. This provides interoperability on demand with existing and future networks.

Integrated GPS Capability

The integrated GPS receiver can transmit the outdoor location of an individual or vehicle to map-based location software.

Intelligent Lighting

APX radios use color alerts to indicate radio mode, potential emergencies, or specific events. Intelligent lighting enables users to see critical information at a glance, regardless of the amount of ambient lighting.

Radio Profiles

Radio profiles enable users to customize the radio's interface to their environments and activities, including the radio's default audio level, lighting and tone alerts. For example, a user in bright sunlight or high-noise environments can increase the lighting or audio level—or if the user is conducting ongoing, covert surveillance, they can create a profile that provides lower lighting with subdued alert tones and audio.

Text Messaging

Text messaging offers freeform and canned messaging between field users and dispatch operators. This enables selected field users to not only communicate with one another and with dispatch operators via voice transmission, but also through efficient and discreet texts.

Expandable for Future Applications

One of the prime limiters of radio expansion is memory. Future applications are expected to use significantly more memory than current applications. To accommodate this future need, each APX radio is equipped with 64 MB of industrial grade internal memory and a removable memory MicroSD card slot. The removable memory card allows future expandability for growing technology needs.

Another major limiter is the ability to add functionality using insertable cards—and we've included in each APX an expansion slot. This allows the incorporation of additional functionality, such as Bluetooth, to APX radios.

Intrinsically Safe

Radios ordered with the eXtreme Edition (XE) package include intrinsically safe operation. Factory Mutual (FM) Certification is no longer offered in the industry for portable radios, as of January 1, 2016. The previously used FM part numbers for batteries in these packages have been updated to the new TIA UL standard numbers.

Motorola has transitioned to a new standard: TIA 4950 as of Q1 2016. TIA 4950 is similar to the FM 3610_88 standard. Compliance testing is done by UL (Underwriters' Laboratory). Radios are approved per TIA 4950 standard for use in the following categories:

- Division 1
- Class I: Groups C, D
- Class II: Group E, F, G
- Class III
- Division 2
- Class I Groups A, B, C, D
- Canadian CSA C22.2 NO. 157-92 standards

Group Services - Alias Update (Optional)

ASTRO 25's Group Services use talkgroups to broadcast data, sending information to multiple APX users simultaneously. Group Services allows APX radios to take advantage of Alias Group Download. This function provides simultaneous, mass transmission of alias information to all APX radios in a voice talkgroup, eliminating the need for aliases to be entered manually which improves operational efficiency. Group Services works in the background, giving voice traffic priority on the talkgroup.

Customer Programming Software (Included)

All Motorola radios can be easily programmed using Customer Programming Software (CPS). This Windows-based customer programming software enables programmers to use the drag-and-drop, clone wizard, and Programming over IP capabilities. This increases your users' speed and efficiency in updating their radio's programming. As your system changes or expands and your field users' needs change, you can easily add new software or future enhancements.

Radio Management (Optional)

Motorola has included the APX CPS Radio Management application with 100 subscriber licenses to assist CCD radio shop or technical staff with radio fleet management.

Managing your radio fleet is an important part of day-to-day operations. But it can also be expensive and time consuming. Updates to add or remove channels, upgrade firmware, or add purchased features through FLASHport upgrade, take substantial time and resources because each radio has to be programmed individually. Motorola's APX CPS Radio Management application simplifies APX™ radio configuration and management, allowing for the mentioned radios changes to be performed over the air. This saves you time and money while ensuring your users can accomplish their mission without interruption.

The APX CPS Management application can program up to many radios at one time and track which radios have been successfully programmed, providing a clear view of the entire radio fleet and a codeplug history for each radio.

Access And Share Codeplugs

When codeplug updates occur, the radio codeplug database can be stored on a network server, allowing remote programmers to access and program radios and share a codeplug template across

multiple radios. Changes to codeplug templates can be automatically applied to all affected radios while radio programming jobs can be scheduled ahead of time giving you more flexibility and operational efficiency.

Minimize Downtime

Radios can be programmed either via a USB port on a local or remote PC, over Wi-Fi if the subscriber radio is so equipped, or with the optional Over-the-Air-Programming (OTAP) on a Project 25 system. With USB programming, a Device Programmer application resides on a PC and you can connect up to 16 radios via a USB hub to expedite the programming. To read/write multiple radios through a single computer or USB hub, the radios must be programmed with a unique IP address the first time they are read/written.

No application knowledge or application interaction is necessary by the user to program a radio with the Device Programmer application. The user simply plugs the radio into a USB port and the application automatically reads and writes the updates from the server to the radio.

2.3.2 PROPOSED SUBSCRIBER RADIO MODELS

The features provided for each model are based on the RFP and indicated in the subscriber equipment list located in section 2.1 System Design Proposal. Additional options are also shown in Pricing Sheets, Tab B9 – Optional Accessories. Motorola's proposed radios are shown in the table below:

Table 2-1: Proposed Subscriber Units

Radio Class	Radio Category	Type	Model
Portable	Ultra (Multiband)	APX8000	M3.5
Portable	High	APX6000	M3.5
Portable	High - Fire	APX6000XE	M3.5
Portable	Medium	APX6000	M2.5
Portable	Low	APX4000	M2
Mobile	Ultra (Multiband)	APX8500	O7
Mobile	High	APX6500	O7
Mobile	Mid	APX6500	O5
Mobile	Mid – Fire	APX6500	O2
Mobile	Mid – Motorcycle	APX8500	O5
Mobile	Low	APX4500	O2
Consolette	Mid	APX7500	Consolette
Control Station	Mid	APX6500	O5 (Tray Mounted)

2.3.2.1 APX 4000 Portable Radio

The APX 4000 provides users with a feature-rich portable radio with a unique form factor in a compact and rugged design. The APX 4000 operates on both Project 25 Phase 1 and Phase 2 TDMA trunking systems. The radio also operates on analog and Project 25 conventional systems. The APX 4000 is the smallest and lightest P25 Phase 2 TDMA radio on the market.

The APX 4000 portable can be ordered in two different models; the APX 4000 Model 2 (front display and limited keypad) and a Model 3 (front display with full keypad). The portable can support a variety of software capabilities and feature sets to best meet your users' needs.

Figure 2-2: APX 4000 Model 2

The APX 4000 offers the voice and data capabilities with a color display and speaker in a compact rugged design.

APX 4000 Model 2 Features

- Top-mounted orange display
- Three programmable side buttons for easy access features
- Push-to-talk button designed for easy activation
- Dual function rotary knob for channel selection and volume control
- Rugged GCAI accessory connector for improved audio accessories
- Two-line / 12-character / two icon character alphanumeric display
- 3 x 2 keypad with for navigating through menus
- Cellular style user interface and color display
- Easy access emergency button
- Meets Military Specs 810 (C, D, E, & F).

* Due to its unique design, the APX 4000 portable radio is compatible with existing APX remote speaker microphones (RSM), display RSM, and existing APX customer programming software (CPS) and programming cables. It is not compatible with public safety microphones and supports a unique set of batteries and chargers.

The APX 4000 portable supports the following APX advanced feature sets:

Advanced Data Capabilities

With Integrated Voice & Data (IV&D), the APX 4000 can be utilized for various applications.

- Programming over Project 25 (POP25): Motorola's POP25 solution allows subscriber radios to be programmed over the air via ASTRO 25 systems while remaining in the field.
- Text Messaging: Text messaging offers a freeform or canned messaging solution so that users can efficiently send and receive messages to and from subscribers or dispatch operators.
- Integrated GPS: The Integrated GPS receiver can transmit the outdoor location of the portable to a map-based location application.

Technology Rich

APX 4000 radios are designed with advanced hardware components that allow for the following features:

- Multiple Protocols for Enhanced Interoperability: The APX Series radios support Analog, Digital Conventional, P25 Phase 1 FDMA, and P25 Phase 2 TDMA.
- Seamless Scan: Seamless scanning of multiple protocols including FDMA and TDMA systems.
- Advanced Software Features: The advanced software features listed below allow for easy and efficient usability and configuration of the subscribers.
- Intelligent Lighting: Intelligent lighting uses color to notify the user of the radio mode, potential emergencies, or specific events. Color alerts provide information at a glance.
- Radio Profiles: Radios can be configured with multiple user-selected or automated operating behaviors such as audio level, lighting and tones. Whether on surveillance or working in bright sunlight, the user can customize settings as needed.
- Unified Call List: Consolidates all call lists underneath one unified list. Users can easily access all information associated to a particular contact.
- Adaptive Dual-Microphone Noise Reduction: An intelligent dual-microphone noise cancellation implemented to aggressively reduce background noise source location or microphone used during the transmission.

2.3.2.2 APX 6000 Portable Radio

The APX 6000 is Motorola's fourth-generation P25 portable and was designed with direct input from first responders. Engineered with high-performance technology and using innovative designs, the APX 6000 provides users with an ergonomic and rugged device that delivers superior audio performance with real-time information in a smaller package. The APX 6000 is easy to use, allowing personnel to focus on the job at hand, rather than the technology. In addition, the APX 6000 equips first responders with the loudest, clearest audio of any Motorola portable on the market. The APX6000 is also available in the optional eXtreme Edition (XE) package, which includes larger knobs and control top and extreme noise processing enhancements.

The APX 6000 comes standard with IP67 submersibility (1m/30mins) and is upgradable to Delta T submersibility (2m/2hrs), which comes standard on the XE package. The APX 6000 offers yellow or green color housing options.

The APX 6000 offers voice and data capabilities with a color display, top display, keypad, and best-in-class audio in a compact rugged design. Its unique T-Grip form factor provides secure and easy handling. The APX 6000 portable can support a variety of software capabilities and feature sets to best meet your radio user's needs, and is available in three different models:

- Model 1.5 (top display)
- Model 2.5 (Dual-Display and limited Keypad)
- Model 3.5 (dual-display with full keypad) (Figure 2-3).

Figure 2-3: APX 6000 operational controls.

APX 6000 Model 1.5

The Model 1.5 is equipped with the following features:

- One line, eight characters, with one row for icons; monochrome LCD top-mounted display
- Large Angled Volume On/Off knob and large Channel selector knob for easy gloved operation.
- Top-mounted orange emergency button
- Three programmable side buttons for easy access features
- Large Universal Push-to-talk button backlit for easy activation
- Rugged GCAI accessory connector for improved audio accessories.

APX 6000 Model 2.5

The Model 2.5 has all the features that the Model 1.5 has, with the addition of the following (Figure 2-4).

- Four-line, 14-character, with two rows for icons, alphanumeric display
- 3 x 2 keypad with for navigating through menus
- Cellular style user interface and color display
- Easy Access Emergency Button
- Meets Military Specs 810 (C, D, E, and F).

Figure 2-4: Model 2.5 Front Panel Display.

APX 6000 Model 3.5

The model 3.5 has all the features that the model 2.5 has, with the addition of the following features (Figure 2-5):

- Four-line, 14-character, with two rows for icons, alphanumeric display
- 3 x 6 keypad with up to 24 programmable soft keys

Figure 2-5 Model 3.5

APX 6000 offers various benefits, feature sets, and capabilities. Outlined below is a list of the various features and benefits specific to all APX 6000 portable radios.

System Compatibility and Supported Operation Modes

The mobiles support the following system and operation modes and capabilities:

- Clear or encrypted APCO Project 16 SmartNet/SmartZone systems
- Project 25 Phase 1 FDMA and Phase 2 TDMA trunking systems
- 3600/9600 baud trunking interoperability
- 12.5/30/25 kHz bandwidth receiver – analog systems
- 12.5 kHz bandwidth receiver – digital systems
- 6.25e TDMA.

Operating Modes and Features:

The APX 6000 portables supports up to 870 talkgroups/modes. In addition, the following features and functionality are offered:

- Conventional channels
- Talk-around channels
- Can support up to 50 trunking systems, and 100 personalities
- Scan and Priority Scan available
- Dynamic Regrouping capable
- Call-Alert Paging and Individual Call
  - Transmit or Receive by Unit ID or Alias
  - Features share the Unified Call List
    - Maximum of 1500 aliases.

Unsurpassed Encryption Capabilities:

The APX 6000 supports single encryption algorithm, including both software-based and FIPS approved UCM based solutions:

- Multi-Algorithm / Multi-Key Support
- Tactical OTAR and P25 OTAR capability
- Minimum of 64 Encryption Keys/Radio
- Hardware and Software Encryption
  - 40 kbit RSA Software Encryption (ADP)
  - Type III/IV Hardware UCM Encryption
  - FIPS140 Certification with Encryption Module.

Optional Data Capabilities

With the integrated voice & data (IV&D) option the APX 6000 can support the following data applications:

- Over-the-Air Programming (POP25)
- Integrated GPS for personnel location
- Text Messaging.

APX 6000XE

The APX 6000 is also available in an eXtreme Edition (XE) package, as described below.

APX 6000XE Portable Design Features

The APX 6000XE offers various benefits, feature sets, and capabilities with a large top display, with loud and clear audio in a compact rugged design. Its unique ergonomic form factor provides secure and easy handling. Outlined below is a list of the various features, and benefits specific to the APX 6000XE portable.

Unique Fire-centric Design

Better, More-secure Grip: Minimizing distractions and maximizing control is critical in a fire response. So when firefighters asked us for a better, firmer grip of the device, we added rubber nibs on the back to secure it from slipping. The “grip zone” on the radio’s body improves coordination and control.

Enlarged Top Display

The top display, shown in Figure 2-6, supports one line of text (8 characters) with an additional row for system status icons. Now firefighters can see the radio status and channel/zone information at a glance, without removing the radio from their turnout gear.

Figure 2-6: APX 6000XE Portable Top Display.

X-large Emergency Button

The emergency button is designed at the base of the antenna so firefighters can quickly locate it. The APX 6000XE is designed with the largest emergency button in the market.

Greater Dexterity with Gloves

Because firefighters often operate their radios by touch alone, mentally counting “clicks” while changing channels, the APX ™ 6000XE knobs are designed for improved tactility or touch. Not only is the volume knob angled, it now has a continuous high-resistance “feel” that is different from the feel of the channel knob—making the radios intuitive and easy to use with gloves or in low visibility environments.

Superior Audio Quality

Volume is the most frequently-used control on any radio, and the APX 6000XE honors this fact. It’s 50percent louder than traditional two-way radios without distorting or degrading communication. With a powerful 1-watt speaker, the APX 6000XE won’t wash out from background noise, like the high-pitched alarm on an SCBA or the variety of specialty power saws used on the fireground.

Fire scene profile: Reducing background noise is essential for communications and the APX 6000XE has the latest noise reduction software developed especially for loud environments. With the ability to use dual microphones for noise cancellation and the latest vocoder, our fire scene profile provides an additional layer of noise reduction specifically designed for the fire-market, so that firefighters can transmit clearly and effectively.

2.3.2.3 APX 8000 Portable Radio

Providing unlimited mobility and seamless WiFi connectivity, the APX 8000 multi-band radio places instant interoperability into the hands of mission-critical first responders. The APX8000 features include:

- All-Band to enable communications across multiple agencies
- WiFi for quicker wireless and codeplug updates
- Adaptive Audio Engine to provide better audio experience in any environment .

Figure 2-7: APX 8000 Portable Radio

All Bands, No Boundaries

With four RF bands and multi-mode system access, the APX 8000 knows no limits when it comes to interoperability. Communicate across borders using a single device. Use analog MDC 1200 or digital P25 mode, conventional or trunked operation, SmartNet or SmartZone legacy systems, clear or secure - all across 7/800MHz, VHF and UHF Range 1 and 2 bands.

Hear And Be Heard More Clearly

Whether it's loud or windy, whether you whisper or yell, the APX 8000 adaptive audio engine and ultra-loud speaker bring clarity to every conversation. The radio dynamically changes the level of noise suppression, microphone gain, windporting, and speaker equalization on the fly to consistently produce the loudest, clearest audio in any environment.

Voice And Data, All At Once

With Wi-Fi® access, the APX 8000 can quickly receive new codeplugs, firmware and software features in order to redeploy the radio fleet with ease as users keep talking without interruption. Mission Critical Wireless Bluetooth® connects quickly and securely with remote speaker microphones, surveillance kits and the LEX L10 Mission Critical LTE Handheld for radio remote control.

The APX 8000 is available in three models: Model 1.5 (top display), Model 2.5 (limited keypad and display), and Model 3.5 (top/front display and keypad). These portables can support a variety of software capabilities and feature sets to best meet the user's needs. The APX 8000 is also available in an eXtreme Edition (XE) package, as described for the APX 6000.

2.3.2.4 APX 4500 Mobile Radio

Figure 2-8: APX 4500 (shown with O2 Control Head

The APX 4500 brings together powerful technology in a compact, rugged, mobile radio. Its single control head can be used in dash-mount configurations and offers the following user interface features:

- O2 control head in grey or green. (Single – does not support dual control heads)
- Can be ordered with a 3 x 6 keypad microphone accessory with three programmable soft keys.
- Four programmable soft key buttons and five scroll-through menus with up to 20 programmable soft keys
- Dual function knob that supports both channel selection and volume control
- Recessed orange emergency button
- Meets Military Specs 810 (C, D, E, and F).

Outlined below is a list of the various features and benefits specific to the APX 4500 mobile.

Enhanced Interoperability

The APX 4500 series support the following system and operational modes and capabilities:

- Motorola SmartZone trunking
- Project 25 Phase 1 FDMA trunking
- Project 25 Phase 2 TDMA trunking.
- 12.5/20/25 kHz bandwidth receiver – analog capable
- 12.5 kHz bandwidth receiver – digital capable.

The APX 4500 is a single-band mobile offering that can be programmed supports operation on either Motorola SMARTNET/SmartZone trunking or APCO Project 25 (FDMA and TDMA) Trunked systems. However, it cannot be programmed to concurrently support both system types.

Operating Modes & Features

The APX 4500 series supports a minimum of 512 talkgroups/modes as well as the following features and functionality:

- Conventional channels
- Talk-around channels
- Supports up to 20 trunking systems, and 100 personalities
- Scan and priority scan available
- Dynamic regrouping capable
- Call-alert paging and individual call
  - Transmit or receive by Unit ID or alias

– Features share the unified call list.

Encryption Capabilities

The APX 4500 supports multiple encryption algorithms including software based and FIPS-approved UCM based solutions.

- AES
- Single-algorithm / multi-key support
- Minimum of 48 encryption keys/radio
- Hardware and software encryption
- FIPS 140-2 Level 3 certification with AES encryption module.

Data Capabilities

With the Integrated Voice & Data (IV&D) option the APX 4000 supports the following data applications:

- Over- the-Air Programming (POP25) available option
- Integrated GPS for personnel location available option
- Text Messaging.

2.3.2.5 APX 6500 Mobile Radio

Figure 2-9: APX 6500 Mobile Radio (shown with O2 Control Head)

We've put exceptional flexibility into an advanced mission critical mobile radio that's easy to operate and intuitive to use. The APX 6500 P25 mobile allows users to choose from 4 control heads; mid- and high-power models and multiple installation configurations in an easy-to-install design.

APX 6500 mobiles support multiple configurations to best support installation requirements and user needs.

- Easy and efficient serviceability - The high-power mobile's new trunnion design provides secure engagement, it is also includes a new handle design that allows the radio to be removed without having to remove the cables.
- Enhanced Interoperability - System Compatibility & Supported Operation Modes.

The mobiles support the following system and operation modes and capabilities:

- Clear or encrypted APCO Project 16 SMARTNET/SmartZone systems
- Project 25 Phase 1 FDMA and Phase 2 TDMA trunked systems
- 3600/9600 systems interoperability
- 12.5/20/25 kHz bandwidth receiver – analog capable
- 12.5 kHz bandwidth receiver – digital capable

- 6.25e TDMA.

The APX 6500 supports up to 870 talkgroups/modes, as well as the following features and functionality:

- Conventional channels
- Talk-around channels
- Can support up to 50 trunking systems, and 100 personalities
- Scan and Priority Scan available
- Dynamic Regrouping capable
- Call-Alert Paging and Individual Call
  - Transmit or Receive by Unit ID or Alias
  - Features share the Unified Call List
    - Maximum of 1500 aliases.

The APX 6500 supports multiple encryption algorithm, including software based and FIPS approved UCM based solutions.

- ADP/AES/DES/DES-XL/DES-OFB/DVP-XL
- Multi-Algorithm / Multi-Key Support
- Over the Air Encryption Key Management OTAR
- Tactical OTAR and P25 OTAR capability
- 96 Encryption Keys/Radio
- Hardware and Software Encryption
  - 40 kbit RSA Software Encryption (ADP)
  - Type III/IV Hardware UCM Encryption
  - FIPS140 Certification with UCM Module.

With the integrated voice and data (IV&D) option, the APX 6500 can support the following data applications:

- Over-the-Air Programming (POP25)
- Integrated GPS for personnel location
- Text Messaging.

2.3.2.6 APX 8500 Mobile Radio

Figure 2-10: APX 8500 Mobile

The APX 8500 offers all of the communications features and benefits of our APX line of radios in an easy-to-install design.

Figure 2-11: The APX has hard gold contacts molded into plastic to eliminate loose wires and parts

You want communication to be continuous – especially during a high-speed chase or lifesaving helicopter rescue. You depend upon every word being heard and every message being understood, with sirens blasting, engines blaring and weather howling in the background. You count on controls that are easy to locate and operate when situations get stressful. And you expect a mobile so seamlessly interoperable that your personnel can communicate, no matter how many agencies or how vast the area. Working with public safety personnel around the world, we designed the APX™ 8500 All-band mobile radio with these must-haves in mind. Whether you want instant interoperability, easy ergonomics or loud, clear audio, the APX 8500 delivers it all, everywhere you go.

Talk Together Instantly

Launching a covert operation or military response, you don't want to operate two radios in order to communicate; and you don't have to. The APX 8500 provides interoperability on demand, performing across multiple digital and analog networks and operating in any frequency band (700/800 MHz, VHF, UHF R1 and UHF R2). Now your agency can rely on one cost-effective, all-band mobile, instead of installing and operating multiple radios.

Install It Easily

Since vehicle space is limited and access can be difficult, we designed the APX 8500 mobile to fit into the existing install space of our XTL radios, so you can use, install and remove it easily. You can reuse existing mounting holes and cables on the mid and high-power models. And a new high-power trunion design secures the mobile and makes installing easy— simply remove the radio without removing the cables.

Plan to Expand Now

Every APX 8500 radio is P25 Phase 2-capable for twice the voice capacity. That means you can add more users to your system without adding frequencies or infrastructure. Not only does the APX 8500 meet current P25 standards, it's backwards and forwards compatible and future-ready to support new technology and data applications. So you can upgrade your existing system or design a new one at your own pace.

Reliable Construction

The APX 8500 mobile platform dramatically improves reliability by reducing the number of discrete parts and connectors. Side connectors with hard gold contacts molded into plastic eliminate loose wires and parts, and radial silicone seals protect the internal components. The radio housing is ultrasonically welded to distribute impacts over the entire area of the radio and additional adhesive layers and gaskets prevent water intrusion.

Multiple Control Head Options

Each APX 8500 mobile radio can be controlled by multiple control heads, including the O2, O3, O5, O7, and O9 integrated control head. Up to four control heads can be interfaced to the APX 8500 (excluding O3 and O9 heads).

2.3.2.7 APX 7500 Consolette

Figure 2-12: APX 7500 Consolette.

The APX 7500 has been proposed in a contained unit, consolette configuration with a full featured front panel. The APX 7500 consolette can be rack-mounted or operated from a desk.

The APX 7500 Consolette is a mid-powered RF control station that can also act as a wireless dispatch solution. The Consolette can be used as an emergency backup station for times when standard infrastructure is off-line, or to enable wireless access to different system types for increased interoperability between agencies.

The APX 7500 Consolette is backwards and forwards compatible, developed to meet current P25 standards and future-ready to support new technology and data applications. Its innovative design and skillful engineering make this Consolette a tireless performer. It can readily be serviced or programmed without removing its lid and its robust metal housing ensures durability. The integrated front panel numeric keypad on the APX 7500 Consolette gives fast access to the radio controls. The unit also meets stringent FCC and UL certifications for exceptional safety.

When a power loss occurs, users can count on the Consolette unit's automatic battery revert feature to stay connected. All that is needed is a DC source such as a marine battery, and the Consolette will switch over automatically and keep communications going. Rich in features, the APX 7500 Consolette gives access to contact information with one unified call list and the largest number of interface connections to a wide variety of consoles and desk sets. The ACIM wireless interface can also provide back-up dispatch in the event that consoles lose their link to the master site.

Features include:

- Robust metal housing
- Integrated rack mount
- Battery Revert (immediate external battery backup when AC goes down)
- TRC (16 Mode) and ACIM interface included in all APX Consolette radios
- VU Meter/Clock included in all Consolette radios (Crosspatch, VIP, Over the Air audible TX alert tones, Consolette Status)
- Emergency Alarm acknowledgement sent back to initiator
- EXTERNAL programming and keyloading using GCAI microphone connector on O5 C/H OR via aux connector
- "05" Control Head with "CAN" delivery bus and XCMP (Extended Command & Mgmt Protocol)
- Full feature keypad and speaker available (not included)
- Local and Remote control capability.

2.3.2.8 APX Intermodulation Rejection

The tables below provide the intermodulation rejection for the proposed subscriber units within the 7/800 MHz frequency band.

Table 2-2: Proposed Subscriber Units

Type	Model	TIA/EAI 102 Spec	IM Rejection
Portable	APX8000	-70dB or better	-81dB (700MHz) -82dB (800MHz)
Portable	APX6000	-70dB or better	-80.1dB
Portable	APX6000XE	-70dB or better	-80.1dB
Portable	APX4000	-70dB or better	-75dB
Mobile	APX8500	-75dB or better	-85dB
Mobile	APX7500	-75dB or better	-82dB
Mobile	APX6500	-75dB or better	-82dB
Mobile	APX4500	-75dB or better	-82dB

CITY AND COUNTY OF DENVER

SECTION 2.5

SITE INSTALLATION STATEMENT

P25 PUBLIC SAFETY RADIO SYSTEM REPLACEMENT PROJECT NOVEMBER 20, 2017

REQUEST FOR PROPOSAL NO. 28435Q

MOTOROLA SOLUTIONS

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Section 2.5

SECTION 2.5

SITE INSTALLATION STATEMENT

Motorola has reviewed and will comply with all requirements shown in Section 5, Site Installation Requirements,

City and County of Denver

Requirements Specification for Proposals and Project

RFP 28435Q P25 Public Safety Radio System Replacement Project

Section 5: Site Installation Requirements

FINAL

Prepared by

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Fairfax, VA 22030
703-359-8200

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5. Site Installation Requirements

5.1 CCD Standards and Guidelines

A. In the installation of all equipment at all locations, the Selected Vendor shall comply with all requirements of Appendix G, *CCD Technology Cabling, Infrastructure and Installation Requirements*.

B. Any work at any site will need to be approved, monitored, and completed according to the respective processes of the city/county in which the site is located. This includes all zoning, permitting or any regulatory requirements necessary for the requirements of that city/county. This includes any construction work, electrical work, structural review, antenna installation.

5.2 Other Standards and Guidelines

A. Notwithstanding the CCD standards provided in Appendix G, *CCD Technology Cabling, Infrastructure and Installation Requirements*, the Selected Vendor shall comply with the applicable portions of the following standards, rules, regulations, and industry guidelines (presented here in alphabetical order; not reflective of priority):

1. American National Standards Institute (ANSI)
2. American Society of Testing Materials (ASTM)
3. Federal Aviation Administration (FAA)
4. Federal Communications Commission (FCC)
5. Institute of Electrical and Electronics Engineers (IEEE)
6. National Electrical Code (NEC) (NFPA-70)
7. National Electrical Manufacturer's Association (NEMA)
8. National Fire Protection Association (NFPA) 1221
9. Telecommunications Distribution Methods Manual (TDMM)
10. Telecommunications Industry Associations (TIA)
11. Underwriters Laboratories, Inc. (UL)

B. The Proposer shall comply with industry best practices for system installation, grounding, bonding, and transient voltage surge suppression (TVSS), as outlined in the following standards:

1. Motorola R56 - Standards and Guidelines for Communication Sites (latest revision)
2. Harris Site Grounding and Lightning Protection Guidelines (AE/LZT - 123 4618/1 - latest revision)
3. Other contractor / industry standard - the Proposer shall provide to CCD for review and approval prior to contract award.

C. Equipment mounting (e.g., racks and cabinets) shall conform to full Zone 2A earthquake compliance in accordance with Telcordia (formerly Bellcore) GR-63-CORE Network Equipment Building System (NEBS) requirements. The Selected Vendor shall provide certification that the racks and/or cabinets used meet the Telcordia GR-63-CORE NEBS requirements for Zone 2A in their as-built documentation package.

1. Equipment placement in racks or cabinets shall be such that heavier items are lower in the racks while lighter items are higher in the racks to minimize the effect of centrifugal forces and swaying during an earthquake.

D. Bracing of equipment is required during unattended periods during construction.

E. Governing codes and conflicts: If the requirements of this requirements specification conflict with those of the governing codes and regulations, it is the Proposer's responsibility to bring the conflict to the attention of CCD. Any conflict not identified shall be the responsibility of the vendor to resolve to the satisfaction of CCD without additional cost.

F. If the Proposer cannot meet any of the standards or guidelines listed above, the Proposer shall list all deviations for approval by CCD in their proposal.

5.3 Existing Site Conditions

CCD provides the information in this section to inform Proposer of site conditions that CCD expects each Proposer to address in their proposal. CCD expects Proposers to include costs for equipment and services for all items expressly listed in this section and desires to work with the Selected Vendor to eliminate any costs for any site improvements

from those listed that may ultimately be mutually agreed to as being unnecessary (i.e., CCD expects a 'worst case' cost proposal regarding site improvements with the understanding that it may be reduced by mutual agreement with the Selected Vendor).

A. As described elsewhere, site visits shall occur as part of the pre-proposal process and it is incumbent upon Proposers to gather additional information about each site and each listed site improvement during those visits. During such visits, it is also expected that Proposers shall raise to CCD's attention any site issues they notice that may require repair, upgrade, or replacement. CCD will append this section with additional details, if necessary.

B. Note that space in many existing CCD sites is limited and it is a requirement that Proposers be prepared to locate both the existing and proposed radio system equipment in each site during the period of implementation (and until the existing system is decommissioned).

5.3.1 Mountain Towers

Space at this site is extremely limited; however, Proposers shall assume they will move the equipment of the existing system into nearby, available mechanical space to allow for the installation of the proposed system's equipment.

5.3.2 Denver Housing Authority

No issues to report.

5.3.3 1670 Broadway

A. Proposers shall include equipment and services to replace this site's HVAC system.

B. Proposers shall include equipment and services to upgrade or replace the 20-foot tower sections located on the roof of this building.

5.3.4 Loretto Heights

This site will not be available for the new system.

5.3.5 Qwest-Zuni

No issues to report.

5.3.6 DFD Station 2

A. Proposers shall include equipment and services to replace this site's HVAC system.

B. The existing tower is in good condition but Proposers shall assume it is at loading capacity and is unable to house additional antennas. If a new tower is proposed higher than the current tower height, it must meet CCD's permitting and zoning rights.

5.3.7 DFD Station 26

A. Proposers shall assume the existing power distribution system (electrical panel and wiring) is undersized is in need of analysis and upgrade.

B. The existing tower is in good condition but Proposers shall assume it is at loading capacity and is unable to house additional antennas. A replacement of the tower at this site, if necessary, can be one of a taller height but only pending approval by CCD permitting and zoning processes.

5.3.8 Mt. Morrison

No issues to report. Any changes to antenna placement require approval through Jefferson County's zoning and permitting processes.

5.3.9 950 Josephine Street

A. This site is a building that houses the current 9-1-1 center. It has multiple internal rooms and is the location for the existing system's control equipment. Equipment for the replacement system can be located within the building.

B. The existing tower is in good condition but Proposers shall assume it is near loading capacity (currently approximately 90% loaded).

5.4 Permitting / Zoning

For any and all construction, electrical, structural review, and antenna installation work to be conducted at sites, the Selected Vendor shall be responsible for all necessary zoning approvals and permits including regulatory, building/construction, and utility of the particular city where that site is located. CCD shall pay any necessary permitting fees but the Selected Vendor shall assemble and submit the necessary permitting application and associated documentation and track submitted permits to approval.

5.5 Equipment Shelters

Should a new equipment shelter be required at any site, it shall comply with the requirements of this section.

5.5.1 Shelter Size

The shelter size shall be nominal 11-foot, 6-inch wide exterior X nominal 16-foot long exterior X nominal 9-foot, 2-inch high interior, one room concrete shelter.

5.5.2 Shelter Construction

The shelter construction shall be concrete or concrete composite. Any new shelters must be approved for non-occupancy use according to State of Colorado building code.

5.5.3 Shelter Design and Construction Requirements

A. In addition to all applicable codes and standards, the Selected Vendor shall design the shelter to meet or exceed the following structural requirements:

   1. 200 pounds per square foot distributed floor loading while on foundation
   2. 125 pounds per square foot distributed floor loading while lifting
   3. 200 pounds per square foot minimum roof load and a concentrated load of at least 500 pounds per square foot

B. Walls shall be constructed to a minimum 120 MPH wind loading, including overturning moments

C. Seismic Design Category D

D. Vents and entryways shall be constructed to deter vandalism

E. Waterproof

F. Exterior Finish:

1. The exterior finish of the shelter shall be exposed aggregate.
2. Bullet Resistance: Shelter walls must be capable of stopping 30.06 rifle shot per UL 752 requirements.
3. Fire Rating: Shelter walls must provide a two-hour fire rating.

G. Insulation and Interior Finish:

1. Walls and ceiling must be insulated to a minimum value of R-11.
2. Interior walls and ceiling must be sheathed with ½ inch white Nu-Poly® or similar board.

H. Shelter walls must be reinforced as required to support wall mounted equipment.

I. Floor will be covered with light colored industrial grade vinyl tile floor covering.

J. Exterior Door:

1. The shelter shall be equipped with a 42 inch by 84-inch door.
2. The door shall have a bullet resistance rating that complies with levels 1-4 of UL 752 ballistic standards.
3. Door, frame and frame components shall be painted or otherwise treated to be rust-proof.
4. Each door shall as a minimum be equipped with the following hardware and accessories:
   a. A continuous stainless-steel hinge the entire length of the door
   b. Neoprene weather strip
   c. High security locking cylinder latch set
   d. Mortised dead bolt
   e. Anti-pick plate on strike of door to restrict access to the latch and deadbolt

f. Hydraulic closer

g. An exterior mounted canopy to protect the door entry. This canopy shall be designed to support a load of 100 pounds per square foot

5.5.4 Power Distribution:

A. Power distribution shall include the following:

1. One MOV/SAD only lightning arrestor, Type 1, Transtector Model DSAPEXIMAX808 or equivalent
2. One MOV lightning arrestor, Type 2, Transtector Model DSAPEXIMAX808MM or equivalent
3. One 60 Amp enclosed circuit breaker for safety disconnect of TVSS unit
4. One 200 Amp, 10,000 AIC, 120/240 VAC, single phase, 60 Hz, 30 space main breaker, snap-in utility power distribution panel, in a NEMA 1 surface mount enclosure

B. Circuit breakers for all communications system equipment and customer loads as specified

1. One 200 Amp, 240 VAC, fused, double pole, single throw safety switch
2. One 200 Amp, 240 VAC, non-fused, double pole, double throw manual transfer switch
3. One 200 Amp, four-pin, reversed service exterior power receptacle; Appleton Model: AJA20044-200RS
4. Six 20 Amp specification grade duplex receptacles
5. One 20 Amp specification grade exterior ground fault duplex receptacle
6. Ten 20 Amp ceiling or cable tray mounted NEMA twist-lock receptacles with matching plugs

C. All wiring shall be installed in surface mounted conduit or NEMA wire ways and be in full compliance with ANSI/NFPA-70 - The National Electric Code, latest version.

5.5.5 Lighting

A. Shelter lighting shall include the following:

1. Five 4-foot, two-tube surface mounted fluorescent or LED light fixtures
2. One LED exterior door light with vandal resistant lens and photo cell control

5.5.6 HVAC

A. HVAC shall be redundant wall mount air conditioning units, with low ambient and compressor anti-cycle controls, integral 5 kW resistance heat strips and washable dust filters. Selected Vendor will ensure HVAC is sized correctly with equipment heat loads and include the following features:

1. Redundant lead/lag controls allowing approximately equal operating time on each air conditioning unit
2. Active dehumidification controls that modulate heat and air conditioning operation to control high humidity conditions
3. One 650 cfm (at 0" of H2O static pressure) exhaust fan system, including motorized intake and exhaust louvers, thermostat, fiberglass hoods, permanent expanded metal dust filter and exhaust insect screen

5.5.7 Site Alarms

A. Any change in the state of site equipment shall induce an alarmed state to the system's Network Management System, as described in Section 3.6, above.

B. Equipment monitored shall include, but not be limited to the following:

1. Door Open
2. Door Bypass
3. Temperature High
4. Temperature Low
5. Humidity High
6. AC Fail
7. Rectifier Conditions

8. Generator Run
9. Generator Trouble / Not-In-Auto
10. Generator Fuel Level Low
11. Tower Lights
12. Smoke
13. Fuel level low

C. CCD will provide a final list in the course of implementation of the system. In an effort to reduce false alarms, all alarm contacts shall be normally closed when no alarm is present.

5.5.8 Grounding

A. Shelter grounding shall consist of one interior perimeter ground bus (halo) ground system per Motorola's R-56 or equivalent guidelines, and include the following:

1. Provisions for the connecting of a grounding electrode conductor at the shelter service equipment
2. One IPGB compliant to Motorola's R-56 or equivalent guidelines
3. One ground kit (Harger model EPK-12MOT or equivalent) including interior and exterior ground bars and exterior copper straps

5.5.9 Entry Ports

Cable entry ports shall consist of one - eight-port/waveguide entry panel with 4 inch sleeves and protective blank covers.

5.5.10 Cable Ladder

The Selected Vendor shall supply and install up to 40 feet of 18-inch wide cable ladder/tray.

5.5.11 Telco Board

The Selected Vendor shall supply one 4-foot x 6-foot x ¾ inch Telco board(s).

5.5.12 Accessories

A. The Selected Vendor shall provide the following accessories:

1. One portable 10 pound CO2 fire extinguisher
2. One hand held emergency eye wash station
3. One first aid kit
4. One service manual
5. One smoke detector

5.5.13 Drawings

A. The Selected Vendor shall provide two sets of shelter drawings with each shelter.

B. The Selected Vendor shall also supply typical foundation drawings based on normal soil conditions and support calculations for recommended building tie down locations.

5.6 Site Generator (If required)

Should a new generator be required at any site, it shall comply with the requirements of this section.

5.6.1 Power and Electric Requirements

A. Generator specifications include the following:

1. Fuel: Diesel
2. Output: 25 kW (minimum, and sized for the proposed system)
3. Phase: Single
4. Voltage: 120/240 VAC
5. Frequency: 60 Hz
6. Enclosure: The generator enclosure shall be outdoor weather protective and securely attached to a foundation designed to the generator manufacturer's specifications.

5.6.2 Muffler Type

The generator muffler shall be of residential critical grade including flexible exhaust section.

5.6.3 Control Panel

A. The generator control panel shall be either analog or digital and capable of displaying the following:

1. Oil Pressure
2. Coolant temperature
3. Fuel level (where applicable)
4. DC battery voltage
5. Run time hours
6. Alarm Status

B. The generator shall be capable of providing, at a minimum the following alarm status information:

1. High or low AC voltage
2. High or low battery voltage
3. High or low frequency
4. Low or pre-low oil pressure
5. Low water level
6. Low water temperature
7. High and pre-high engine temperature
8. High, low and critical low fuel levels (where applicable)
9. Over crank
10. Over speed
11. Unit not in "Automatic Mode"

C. Generator will be supplied with block heater, 10 Amp battery charger, and meet NFPA99 and 110 requirements.

5.6.4 Fuel

A. Fuel tanks shall be sized to accommodate a 3-day run time with a minimum size of 200 gallons.

B. The Selected Vendor shall be responsible for generator startup and first fill of all fuel tanks.

C. Fuel tanks shall be equipped with a monitoring device capable of triggering an alarm contact upon low fuel. Low full threshold shall be programmable.

D. Fuel tanks shall be securely attached to a poured concrete foundation.

5.6.5 Automatic Transfer Switch (ATS)

The Selected Vendor shall install the ATS in the shelter prior to shelter shipment. ATS shall include a programmable exerciser capable of automatic starting and shutdown of the generator on a weekly basis. The ATS shall have a 200 Amp rating and enclosed in NEMA 1 enclosure.

5.7 Self-Supporting / Monopole Tower

Should a new self-supporting tower or monopole be required at any site, it shall comply with the requirements of this section.

5.7.1 Design Criteria

The Selected Vendor shall design the towers and foundations to CCD's permitting and zoning codes, and also meet TIA Standard RS-222 Standards Revision G. Each tower and foundation proposal shall be designed for all equipment, appurtenances, ancillary equipment, antenna loading and include 25% additional future capacity. Any new towers shall comply with all Denver zoning and permitting codes.

A. The design shall be based on the minimum wind and ice requirements as specified for Structure Class III in TIA-222-G.

B. The tower shall be manufactured as a self-supporting lattice or a monopole design.

C. All structural steel and hardware shall be galvanized after fabrication in accordance with the appropriate standards. All tower materials shall be hot dip galvanized after

fabrication; with a minimum zinc coating of 2 oz. per sq. ft. Bolts shall be hot dip galvanized according to ASTM A-325 or the latest version of this standard.

D. The make, model, serial number and height of the tower shall be clearly labeled at the base of the tower. Labeling shall be weatherproof and durable such as a stamped metal plate or equivalent.

5.7.2 Waveguide Support

There shall be a ladder type support system associated with the tower to mount the transmission cables. In the case of a monopole, transmission lines will be routed internally. This support shall comply with tower and cable manufacturer's installation specifications.

A. The support system shall accommodate cable or waveguide mounting hardware at the proper intervals.

B. The support shall be equipped with precision punched or drilled holes to allow installation of snap-in type or bolt-in hangers.

C. The support system shall be sized for 25% growth beyond initial system implementation.

D. The support materials will be of similar construction as other tower materials so as to appear integral to the structure.

E. The support shall be designed to meet rigidity specifications similar to the tower.

5.7.3 Waveguide Bridge

The tower shall be equipped with a waveguide bridge with support posts spaced at intervals compliant to the wind loading specifications, but not more than 10 feet distant.

A. There shall be posts placed on both lateral sides of the bridge to fully support the load.

B. The bridge shall be designed to support all initial antenna transmission lines plus 25% growth capacity.

C. The structure shall have sufficient stiffness to comply with the tower wind and ice loading specifications.

D. The Selected Vendor shall furnish and install the waveguide bridge between the tower and equipment shelter. The following criteria shall govern the design of the waveguide bridge:

1. Structurally sturdy to support live and dead loads
2. Free standing (i.e., not attached to the shelter or tower)
3. Minimum width of 2 feet
4. Length/height as required by the site specifics

E. Bridge/ice shield material shall be fabricated from galvanized bar grating or approved equivalent

F. All components of the waveguide bridge shall be hot-dipped galvanized after fabrication

G. Posts shall have galvanized caps and be set in concrete foundations. Each post shall be separately grounded to the site ground system with 1/0 AWG stranded bare copper conductor

H. Waveguide bridge shall be adjustable in height so as to allow interface with shelter waveguide entry ports

I. Bridge shall be effectively grounded to the external ground bar

5.7.4 Climbing Equipment

A. The tower shall be equipped with an approved climbing ladder and safety device. The ladder may be integrated into the structural components of the tower.

B. There shall be a climbing safety system compliant to original manufacturer's specifications. The equipment must comply with TIA-222-G.

5.7.5 Lighting System and Control

A. The Selected Vendor shall furnish and install an obstruction lighting system approved by the FAA and compliant with applicable standards for each new tower constructed for the system, or where required lighting on existing towers requires replacement.

B. A lighting system is not required by the FAA for towers under 200 feet. However, due to the proximity of sites to the airport the FAA may require the installation of a lighting system. Therefore, a lighting system shall be proposed as an OPTION for towers under 200 feet.

C. The lighting system shall include controller, lamps/LEDs, lightning protection, mounting hardware, service cabling and conduit, conduit drain-breather system, wiring, and other material required for a complete installation.

D. The lighting system shall be controlled by a 120 VAC single phase solid state control unit and power supply. The unit shall be installed within a NEMA 3R metal cabinet or a NEMA 4X cabinet. The controller shall be mounted inside the equipment shelter.

E. The lights shall be automatically controlled by means of a photoelectric unit. The control unit shall be designed with relay control. The design shall include relays for:

1. ON-OFF status of lights
2. Control unit failure
3. Light failure

F. The lighting system design shall have automatic revert to back-up power sources and automatic reset upon power source restoral.

G. There shall be a test switch in the controller to simulate daytime, nighttime, and auto modes.

H. All wiring shall be contained within rigid galvanized conduit, junction boxes, and lighting equipment housings.

I. Vertical conduit runs shall be adjacent to the tower waveguide supports.

J. All levels of lighting shall be clearly visible from any direction of approach to the tower.

K. The photoelectric unit shall be installed in a moisture-proof protective metal or high impact plastic housing on the building in an inconspicuous location and adjusted to attain an unobstructed view of the NNE sky. The photocell shall be mounted

such that it is not affected by artificial light. Photocell wiring shall be completely installed within rigid galvanized conduit.

L. Ice shields shall be installed for all lighting system fixtures not mounted on top of the tower.

M. The controller case shall be grounded to the equipment shelter building ground with #4 AWG or larger copper wire.

5.7.6 Tower Installation

The Selected Vendor shall furnish all materials, labor, equipment, and mounting hardware to provide a complete functional tower installation, in accordance with the city's permitting laws where the work is being performed.

5.7.7 Tower Erection

A. Tower construction and erection shall be per the respective city permitting and inspection processes where work is being performed.

B. The foundation shall be allowed to cure for at least 7 days before erecting the tower and shall comply with city zoning and permitting process where work is being performed.

C. Manufacturer recommended bolts shall be used for all connections in accordance with the installation documentation. Bolts should be of such lengths as to protrude beyond the nuts a minimum of 1/4 inch and a maximum of 1/2 inch.

D. All bolts shall be equipped with self-locking nuts.

E. Field reaming of coated metal components will be acceptable only upon determining there is no structural damage to the tower.

F. Field remanufactured holes must be hot stick galvanized as specified and be completely filled by the use of a larger diameter bolt.

G. All bolts placed through slotted holes shall be equipped with flat washers.

H. Mud, dirt, and other foreign matter shall be removed from the tower sections before erection, with special attention given to cleaning the contact surfaces at joints before they are bolted together.

I. When portions of the tower are ground assembled, such assembly shall be on rigid surfaces or blocking which will provide support to prevent distortion of tower steel and damage to surface finish.

J. All bolts shall be installed in all connections of ground assembled portions of the tower. Temporary bracing of tower members shall be used to avoid overstressing or distortion.

K. The structure shall be erected plumb. The method of assembling and erecting shall be such that no member will be subjected to a load in excess of that for which it was designed.

L. Extreme care shall be taken to establish and maintain the true geometric shape of the portion of the tower assembled. All connections must lie flat where bolted together. No gaps between butt flanges or connections are acceptable after the bolts are tensioned.

M. Slings or other equipment used for picking up members or portions of the tower shall be of such material or protected in such a way as to not damage the tower section, the finish, or distort or overstress the tower when lifts are made.

N. Portions of the tower shall be raised in such a manner that no dragging on the ground or against other hard surfaces occurs.

O. Damaged tower sections can be used if properly repaired. If a damaged portion cannot be repaired to the satisfaction of CCD, it shall be replaced. For any galvanized surfaces, damaged for any reason, zinc-based solder repair shall be used. Solders in a rod form or a powder may be used.

P. Surfaces must be cleaned using a wire brush or a light grinding action. Surface preparation shall extend into the surrounding undamaged galvanized coating. The thickness of zinc solder repair shall be equivalent to the originally specified hot dip galvanizing process. Repairs shall be performed in accordance with the solder manufacturer's instructions.

Q. Only wrenches of proper size, which will not deform the nuts, nor injure the surface finish, are to be used. Standard ironworkers' 12-inch spud or 12-inch socket wrenches shall be used. Pipe extenders will not be permitted.

R. During construction of the tower where required, the obstruction lighting fixtures shall be installed and operated at each required level as each such level is exceeded in height during construction.

5.7.8 Grounding System

A. The tower and all appurtenances will be installed in accordance with the Motorola R56, Harris 4Z/LZT 123 4618/1 R3A or MIL-STD-188-124B.

B. All equipment mounted on the tower shall attach to the tower such that it will be electrically at ground potential.

C. All antenna systems shall be effectively grounded and provide surge protection to all equipment.

D. All antenna transmission lines shall be grounded at the antenna base, at the base of the tower, and at the exterior ground bar located at the entry to the building. Antenna transmission line ground conductors shall be bonded to the tower in compliance with standards.

E. The site installation should have less than 5 ohms resistance between any connected point on the ground bus and earth ground.

F. Ground resistivity shall be tested using the four-point method. The Selected Vendor shall supply a ground test report and shall fully describe the method used in testing.

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CITY AND COUNTY OF DENVER

SECTION 2.6

PROJECT STAFFING PLAN

P25 PUBLIC SAFETY RADIO SYSTEM REPLACEMENT PROJECT NOVEMBER 20, 2017

MOTOROLA SOLUTIONS

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SECTION 3

PROJECT STAFFING PLAN

3.1 KEY PROJECT STAFFING STATEMENT

Motorola understands that having the best resources assigned to a project ensures that the project will succeed. Along those lines, Motorola has reviewed and understands the requirements stated in Section 6, Project Staffing Requirements, of the RFP.

Motorola complies with the following specific requirements of the City and County of Denver (CCD):

The term "Key Project Staff" shall mean Motorola's Project Manager, Project Engineer, System Technician, Sales Representative and Service Manager. CCD reserves the right to interview substitute Key Project Staff prior to commencement of activity on the project.

A. CCD shall be entitled to request the removal of Key Project Staff and all other vendor individuals working on any project for any of the following grounds, provided that such request be in writing and shall specify the reasons for CCD's dissatisfaction:

    a. Unsatisfactory performance that causes negative operational impact at CCD or causes the CCD to commit additional resources to avoid operational impact

    b. Dishonesty or belligerent conduct

    c. Lack of compatibility with CCD staff

    d. Violation of CCD rules or policies

B. In the event of request for replacement, Motorola shall remove such person and shall promptly provide a qualified replacement.

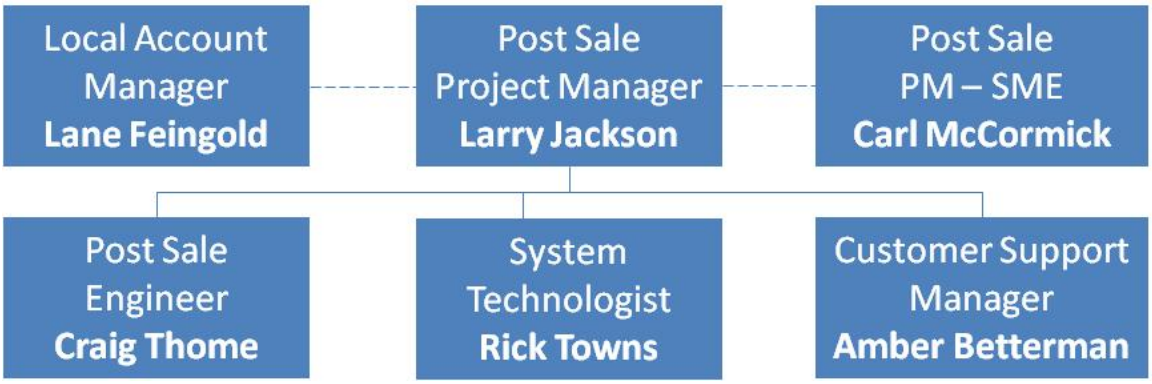
C. No changes to Key Project Staff shall be made without prior approval by CCD.

D. Motorola is responsible for ensuring that any substitute personnel have comparable skills and experience and CCD reserves the right to interview and approve replacement Key Project Staff.

The following section describes the personnel expected to work on the City and County of Denver project.

Project Organization Chart and Key Personnel with Experience

Project Team Organization Chart



3.2 PROJECT MANAGER–LARRY JACKSON

The Project Manager's primary responsibility is the successful implementation of CCD's system. Larry was selected for this project due to his significant experience in P25 deployments and site construction. He will have direct communication with CCD's Project Manager, as well as Motorola's Product Groups, Systems Technologists, Engineering, Financial, and Legal departments. He will be empowered to make binding commitments and decisions on Motorola's behalf.

Key responsibilities assigned to the Project Manager are as follows:

- Act as Motorola's single point of contact for all issues related to the contract
- Provide the leadership and vision for the team to thrive in an environment conducive to project success
- Maintain overall responsibility for Motorola project resources, including additional Project Managers who will implement major subsystems
- Provide and update the detailed Project Schedule, including major events, planned activities, and progress
- Oversee the management of all field installation and implementation teams, ensuring all integration and optimization tasks are performed to contract requirements
- Ensure quality workmanship by all Motorola subcontractors
- Oversee the product ordering process and assure manufacturing schedules meet the requirements of the Project Schedule
- Ensure that all deliverables are met according to Motorola's quality standards
- Manage the project to ensure total customer satisfaction
- Develop and manage a Risk Mitigation Plan designed to identify and address potential project risks and impact
- Manage contractual requirements including change orders and schedule adherence
- Prepare and conduct regular progress meetings and provide progress reports as required
- Ensure a successful transition to the warranty and maintenance phase of the project.

Larry Jackson's resume is provided below.

Larry Jackson - PMP #69081

18 years of experience leading complex systems integration and service delivery programs

Skilled at building strategic relationships with internal and external stakeholders and establishing trust within client organizations

Exceptional leadership and coaching skills, with the ability to guide a team to deliver high quality and profitable project outcomes, resulting in client satisfaction

Flexible and responsive service delivery skills and collaborating with internal and external stakeholders to resolve sensitive issues

Motorola Solutions, Inc. 2016–present

Sr. Program Manager

Manage a portfolio of systems integration projects to deliver voice and data radio communications and software systems to SLG clients. Responsible for financial performance, schedule performance, project quality, risk management and client satisfaction.

Manage all facets of complex, regional-system deployment programs including civil site construction, tower installation, microwave network and radio infrastructure, mobile and portable subscriber radios, and software applications.

Microsoft Corp. 2012 – 2015

Services Delivery Manager

Member of the Justice and Public Safety practice leadership team, responsible for a portfolio of projects to deliver solutions to State and Local Government (SLG) clients. Served as the primary escalation point for the team and client throughout the delivery phase. Implemented a continuous risk and issue management strategy to facilitate proactive decisions and actions throughout the project life-cycle. Exceeded targets for delivery quality, customer satisfaction and financial performance.

Microsoft technology based solutions include: Dynamics AX, Dynamics CRM, Azure, SQL Server

Dynamics Sure Step Certification (Manage ERP & CRM implementations)

Motorola Solutions, Inc. 2005–2012

Sr. Program Manager

Managed a $20M annual portfolio of systems integration projects to deliver voice and data radio communications and software systems to SLG clients. Responsible for financial performance, schedule performance, project quality, risk management and client satisfaction.

Managed all facets of complex, regional system deployment programs, including civil site construction, tower installation, microwave network and radio infrastructure, mobile and portable subscriber radios, and software applications, including Computer Aided Dispatch (CAD), Records Management System (RMS), IP logging, mobile data, message switch and related interfaces.

VisionTEK, Inc. 2002–2005

Sr. Project Manager

Managed systems integration projects to deliver CAD, RMS, and mobile data solutions to SLG clients. Responsible for solution development and led a team of software development and test engineers. Implemented improved product development practices including contract review, requirements traceability, and software design reviews.

RELERA Internet Solutions 2001

Director, Sales Engineering

Implemented national sales engineering organization to support sales operations launch for a start-up that provided web-hosting and related managed services (content distribution, network storage, business continuity/disaster recover, security, intrusion detection). Led a team of 22 sales engineers and two regional managers. Company ceased operations at the end of 2001.

Auto-trol Technology Corp. 1998–2001

Manager, Product Integration & Consulting

Led the national professional services organization to deliver software solutions to enterprise and government agency clients. Consistently exceeded services revenue goals and contributed 25percent of total company revenue.

Panasonic Avionics Corp. 1991–1998

Manager, Quality Assurance

Led the quality assurance organization during a period when the company grew from 35 to 600 employees and annual sales increased from $12M to $500M. Led a staff of 48 and managed the activities of the quality assurance, inspection & test, quality engineering, and configuration management departments.

U.S. Marine Corps 1984–1990

Repair Supervisor–Avionics; Electronic Countermeasures

EDUCATION

MBA, University of Colorado, 2002

MS - Information Systems, University of Colorado, 2002

BS - Business Management, Chapman University, 1992

OTHER

Advanced Master's Certificate in Project Management – George Washington University

Project Management Institute (PMI)

3.3 PROGRAM MANAGER/SUBJECT MATTER EXPERT –CARL MCCORMICK

The Program Manger's responsibility is to provide emphasis and technical expertise to the process of installation and activation of the FNE and Subscriber portion of the project. The Program Manager works with the shops and subcontractors directly involved with the installation of the system. The Program Manager provides status reports to the Project Manager.

Key responsibilities assigned to the Project Manager are as follows:

- Works with Engineering and CCD for delivery and inventory of equipment
- Works with the installation shop for FNE installation
- Develops punchlist items and tracks progress

- Provides reports to Project Manager for weekly status meetings

Carl McCormick's resume is provided below.

Carl McCormick -

Over twenty six years of proven experience implementing large scale communications projects. Projects include Las Vegas Metropolitan Police Department P25 Phase II Radio System, Utah Communications Network State Wide 7.13 Radio System Implementation and Upgrade, Southern Nevada Area Communications Counsel /Clark & Nye County 7.11 Radio System Upgrade, Salt Lake City 7.13 Radio System Implementation, Ada County Idaho 7X Smartzone, Bannock County Idaho 7X Smartzone, Bingham County Idaho 7X Smartzone, 2002 Salt Lake City Winter Olympics 4.1 Smartzone, Utah Communications Agency Network 4.1 Statewide Smartzone Implementation, Salt Lake County Sheriff's Smartzone, Sarpy County Nebraska Smartzone and O'Hare International Airport Smartnet Trunking and Conventional.

Utah (B100) General Contractors License and eight years of industrial electrical experience.

Motorola Solutions, Inc. 1989–present

Sr. Program Manager

Responsibilities include but are not limited to: Pre-Sale Project Support, Site Construction, Resource Scheduling, Project Scheduling, Equipment Inventory, Equipment Installation, System Optimization, System Testing, Project Team Meeting Facilitation, System Documentation, Contract Management, Change Order Management, Financial Management and Subcontract Management.

Industrial Electrical 1981 – 1989

Industrial Electrician

Responsibilities included but were not limited to: Cost Estimates, Resource Scheduling, Resource Management, Equipment Expediter, Conduit and Cable Tray Installation, Equipment Terminations and Grounding, Motor Control Center Implementation and Testing, Fire Control System Implementation and Testing and Department of Justice Security Systems Implementation and Testing.Motorola Solutions, Inc. 2005–2012

EDUCATION

1981-1985, Industrial Electrical Apprenticeship

1993, Motorola Program Management Academy

1998, General Contractor (Utah B100)

3.4 LEAD ENGINEER–CRAIG THOME

The Engineer's primary responsibility is to assure the technical integrity of the system design. Craig was selected for this project as he was the lead engineer for the City of Aurora and Las Vegas Metro EDACS to Motorola P25 Phase 2 system upgrades. The engineer will be responsible for adherence to the documented system design and implementation of that design through system optimization, programming, and acceptance testing.

Key responsibilities assigned to the Lead Engineer are as follows:

- System architecture
- Coverage design
- Oversee the design review
- Determine Final Bill of Materials (BOM)
- Oversee the development of all acceptance test plans
- Prepare final test reports
- Participate in product staging and testing at Motorola's Customer Center for Solutions Integration (CCSi)
- Oversee and manage other assigned staff engineers and resources supporting elements including:
  - RF and coverage design engineers
  - Spectrum engineer/SME
  - CCSi engineers, field engineering, and Acceptance Test Plan (ATP)/Coverage Acceptance Test Plan (CATP) engineering.

Craig Thome's resume is provided below.

EXPERIENCE **MOTOROLA SOLUTIONS**

Senior Systems Engineer **2008–Present**

- Design and implement Motorola ASTRO 25 radio systems.
- Expert in microwave network design based on hands-on experience on several projects.
- Experience designing and implementing IP Networks including Layer 2, Layer 3, MPLS.
- Deploy Motorola infrastructure and mobile backhaul for ISSI, CSSI, and WAVE interoperability solutions.
- Lead engineer for City of Aurora P25 project which included Aviat microwave supporting Ethernet and T1 traffic.
- Lead engineer for Las Vegas Metropolitan Police Department P25 system replacement. This project included a new Motorola system and a Cambium Microwave network supporting Ethernet and T1 traffic.
- Work with customers to develop IP Plans for their CEN and backhaul equipment.
- Member of Motorola NetSME group.
- Proven experience working with 3rd party vendors to integrate their products into the Motorola Radio Network.
- Plan and execute Coverage Test Plans and Customer Acceptance Test Plans.
- Work with Motorola Upgrade Operations team to upgrade system releases. I worked on the State of Colorado DTR upgrade in 2014, and other upgrades in Nevada prior to that.
- Create and maintain system network documentation in Visio and Excel.

SDI (Motorola Subcontractor for 800 MHz Rebanding) **Western Division**

Systems Engineer **2006–2008**

- Worked with various Motorola teams and Public Safety customers to develop implementation plans for 800 MHz Rebanding. I was the primary engineer for over 10 projects and assisted on several others.
- Worked with Motorola engineers to implement 800 MHz Rebanding projects; duties included verifying orders, troubleshooting issues, and providing expertise in the areas of radio systems, subscribers, and rebanding procedures.

MOTOROLA **Schaumburg, IL**

Senior System Test Engineer **2003-2006**

- Tested all features and configurations of Motorola radio systems in a lab environment to find software and hardware issues before they were released.
- Worked with field engineers to reproduce problems seen in live customer systems and then determine root-cause.
- Built and reconfigured Motorola Trunked Radio Systems as required for testing in a lab environment. This required extensive troubleshooting skills and a thorough understanding of the infrastructure from a system-level perspective.
- Configured and troubleshot LAN and WAN equipment including HP switches, routers, and Premisys WAN devices.

EDUCATION: **NORTHWESTERN UNIVERSITY, Evanston, IL**

B.S. in Electrical Engineering with Co-op Certificate, June 2003

CERTIFICATIONS:

- Juniper JNCIA
- CompTIA Network+
- CompTIA Security+

3.5 SYSTEM TECHNOLOGIST–RICK TOWNS

The System Technologist (ST) is responsible for ensuring that the system is tested and optimized to perform as designed. Rick was selected for this project as he was the system technologist for the City of Aurora EDACS to Motorola P25 Phase 2 system upgrade. The ST will oversee the team responsible for all subsystems and the integration of those subsystems into the final system. In addition, the System Technologist oversees installation quality, programming, optimization, and testing of the integrated system to ensure it operates according to the specifications and system design.

Key responsibilities assigned to the System Technologist are as follows:

- Participate in the staging and testing of the system at Motorola's CCSi
- Perform site link verification testing to validate connectivity and performance at CCD sites
- Oversee the integration and optimization of all system hardware and software
- Participate in all equipment programming and configuration development
- Perform the optimization of RF equipment
- Perform the optimization of the consoles
- Participate in the Acceptance Test Plan
- Assist in the development of the system Cutover Plan
- Provide customer technical support
- Oversee and manage other assigned system technologists and resources supporting optimization of the system and subsystems.

Rick Town's resume is provided below.

Richard C. Towns, CETsr.

SUMMARY

Technically-oriented System Technologist with extensive experience as a customer service provider for all types of radio communications equipment. Areas of customer focused expertise include system planning and installation, inventory management, computer support and follow-up evaluations. Results driven, with excellent customer relations skills.

EXPERIENCE

Technologist System II — July 2014 – Current

Motorola Solutions, Denver

Responsible for supporting the implementation of two-way radio, data, and E911 systems throughout the Western United States. Key responsibilities include;

- Providing technical implementation services for two-way radio, data, and computer networking equipment post-sale
- Program, configure, optimize, test, and document complex communications systems
- Provide weekly reports of activities and accomplishments
- My latest project was the implementation of a 4 site P25 Simulcast Trunking System for the City of Aurora, Colorado

System Technologist — January 2012–May 2014

Chicago Communications LLC, Elmhurst, IL

Chicago Communications serves as a premier service provider for Motorola Solutions. Key responsibilities included service maintainability, as well as fix-and-repair on many Motorola product lines and others, including:

- Simulcast and Conventional trunking systems
- MTR2000, MTR 3000 and Quantar base stations
- Centracom Consoles
- MCC5500 and MCC7500 Consoles
- ASTRO P25 IV&D 7.9 and 7.11
- Trak9100 and Efratom Time Systems
- Harris Constellation Microwave Products
- APX Consolettes, MCD5000 Desksets and the RGU interface
- Cambium Networks Point to Point equipment

Training programs completed:

- Networking Essentials in Motorola Communications Equipment
- ASTRO 25 IV&D MCORE Workshop
- ASTRO 25 IV&D GTR8000 Repeater Site Workshop
- ASTRO 25 IV&D IP based Digital Simulcast Workshop
- MCC7000 series Dispatch Console Workshop
- Cassidian 911
  - Sentinel Patriot Installation and Maintenance Administration Class
  - Sentinel Vesta 4.0 Installation and Maintenance Administration Class.

Manager Quality Assurance April 2005–April 2009

Enterprise Petrochemical Market, Motorola, Schaumburg, IL

Ensured accurate and swift problem resolution for Motorola's automotive, courier, petro-chemical, telco, transportation (air & rail), utility, and other Fortune 500 customers. Worked directly with Motorola sales, engineering, and product support teams to assist with resolving critical customer issues and maintained customer satisfaction during the technical issue resolution process.

Interfaced directly with our customer base, facilitated customer transactional surveys and customer score cards. Compiled customer satisfaction and survey metrics and presented to the executive management staff during our monthly quality reviews.

Interfaced with our end users, coordinated site visits for our engineering staff and system technologists responsible for activities related to issue resolution. Prioritized and coordinated field technical resources throughout the geographic divisions for the Enterprise customer base.

Key responsibilities included:

- Represented our division in the Failure Review Board, Crash Track Meetings, and Infrastructure/ Subscriber CASE Reviews. Ensured division awareness of critical issues and product stop-ships. Prepared weekly briefing room and customer satisfaction metric reports for divisional distribution.
- Monitored and drove improvements related to Division Technical Issue Resolution Performance Metrics such as Issue Backlog Reduction, Issue Cycle Time Reduction, and Outlier Performance. Provided root cause analysis and escalation of systemic issues through the FRB process. Communicated and coordinated the resolution implementation activities through Motorola Sales, SI/Service teams and end user accounts.
- Drove and participated in Divisional, Group, and Business Unit level quality initiatives and customer satisfaction survey follow-up programs. Participated in the annual Motorola Customer User Group Meetings.
- Prepared and presented in Division level Operations Reviews, Group level Customer Quality Reviews, and Group level M-Gates Release Reviews.

IExtensive experience with the Government & Enterprise Customer Technical Issue Resolution processes and tools (C3, FRB, SSC, etc).

Quality Project Manager for RSD June 1998–April 2005

CGISS (GEMS), Motorola, Schaumburg, IL

- Functional Failure Review Board (FRB) champion for all GEMS Infrastructure Products
- Coordinated with Field Engineering and Divisional Quality Managers on systemic issues related to their customer base
- Primary interface for FRB issues with Design Engineering, SCOG, Program Management, Infrastructure Business Organization, CCSI, WSDD Quality and 3rd party suppliers
- Monitor, report and present monthly FRB Cycle Time goals at the monthly TAG and RPSD Customer Quality reviews.

System Support Center–Group Leader April 1997–June 1998

CGISS, Motorola, Schaumburg, IL

- Responsible for managing technical consultants for SmartNet, SmartZone Products.
- Early pioneer of lessons learned case reviews to help drive characterization and decrease resolution cycle time.
- Responsible for managing high visibility customers while working towards a resolution.

Field Service Technician–Group Leader **April 1993–April 1997**

Baltimore Area / Data Group, Motorola

- Responsible for scheduling Field Service resources for customer related issues in the Baltimore Washington DC area.
- Responsible for employee time tracking, customer billing and managing customer contract renewals
- Coordinated directly with customers to resolve their issues and schedule PM's.
- Managed and supported installations of telecomm equipment, PC desktop installations, and networking equipment.

Field Service Technician **July 1985–April 1993**

LMPS, National Systems Service, Motorola

- On call seven days a week, twenty-four hours a day to resolve customer complaints.
- Responsible for ARDIS LSA in Cincinnati Ohio.
- Personally managed customer accounts in Indiana, Kentucky, Ohio, and West Virginia.

PROFESSIONAL DEVELOPMENT

- Senior Certified Electronics Technician in R56 Auditor, SETR56187193
- Certified Journeyman Electronics Technician in Antenna Systems Analysis, ASA174632
- Certified Journeyman Electronics Technician, USMSS152256
- PMP Masters Certificate from George Washington University.
- Trained in Motorola's Green Belt program

EDUCATION

DeVry Technical Institute, Chicago, IL

- Associates Degree in Electronic Engineering

3.6 CUSTOMER SERVICE MANAGER–AMBER BETTERMAN

The Customer Service Manager will work with CCD to develop a detailed service plan and ongoing maintenance schedule. The CSM ensures that customer satisfaction is met in the warranty and ongoing years of maintenance. The CSM tracks any issues that may arise during system operation and monitors open tickets to make sure they are addressed in a timely manner.

Key responsibilities assigned to the Customer Service Manager are as follows:

- Address any on issues with the system after acceptance
- Monitor and track service tickets that have been opened by the customer
- Advise customer of service ticket progress and work with Motorola's product group to elevate issues in a timely manner
- Provide customer with updates and service options

Amber Betterman's resume is provided below:

Amber Betterman

BACHELOR'S OF SCIENCE | APRIL 2013 | FLORIDA STATE UNIVERSITY

- Major: Psychology
- Minor: Family and Child Sciences

ASSOCIATES IN ARTS | MAY 2011 | ST. PETERSBURG COLLEGE

- Major: General

LEADERSHIP

- Currently active alumna of Delta Alpha Chi.

MANAGEMENT

- Serving as Purchasing Manager & Service Coordinator at First Communications Inc. Overseeing the actions of my team, reporting in management meetings our progress and expense report, and boosting employee morale.
- Acting as the Customer Support Manager for Motorola Solutions Inc. I manage a multitude of Motorola Support shops and maintain the relationships between end user and service provider.

COMMUNICATION

- Excellent experience in oral and written communication skills. I have eight years of experience in customer service, working directly with the end user.
- Ample experience with submitting written reports as well as verbal presentations.
- Ability to effectively communicate with clients concerning their potential resources and provide a source of encouragement in pursuing them.
- Ability to type 65 words per minute.
- Dealing with customer conflict resolution.
- Experience in Microsoft Office: Word, PowerPoint, & Excel.

CUSTOMER SUPPORT MANAGER | MOTOROLA SOLUTIONS INC. | FEBRUARY 2016-CURRENT

- Maintains service contracts for over 100 Motorola Solutions customers in the Western territory.
- Consult with customers on what the specific needs for their agency are and develop services that are to benefit the customer.
- Cultivate meaningful relationships with customers and work to obtain their trust, and become a technical advisor.
- Manage inventory of customers and track equipment to insure it is covered under contract.
- Oversee the transition of a new project to warranty and set the expectations of Motorola for the customer.
- Manage the Motorola shops and insure they are providing Motorola customers the level of service expected.

AFLAC BUSINESS CONSULTANT | AFLAC | AUGUST 2015 – FEBRUARY 2016

- Educate business owners as well as individuals about the importance of supplementary insurance in today's healthcare market.
- Cultivate meaningful relationships with perspective customers, and continue to manage their accounts throughout the life of their policy.

PURCHASING MANAGER& SERVICE COORDINATOR | FIRST COMMUNICATIONS INC. | OCTOBER 2012-JULY 2015

- Administers bidding process and contracts for vendor performance/compliance within established limits (e.g. prepare specifications, evaluate bids, recommend vendors, conduct bid meetings, etc.) for the purpose of securing items and/or services within budget and in compliance with regulatory requirements.
- Directs all functions related to the purchase of equipment, supplies and services for the company for the purpose of ensuring compliance with State and Federal regulations and accounting procedures.

- Maintains purchasing information, files and records (e.g. Requests, purchase orders, vender files, etc.) for the purpose of ensuring the availability of documentation and compliance with established policies and regulatory guidelines.
- Oversees required purchasing processes (e.g. orders, work orders and requisitions for supplies, equipment, conference requests, bids for potential commodities, supplies equipment and services, etc.) for the purpose of acquiring necessary resources to support company operation district operation.
- Supervises assigned staff (e.g. employee concerns/problems, directing work, training, disciplining, performance appraisals, etc.) for the purpose of ensuring work assignments are complete and within department objectives.
- Manages scheduling of all service related calls, as well as manages the service team. In addition, putting forth efforts to keep moral high, and instilling a sense of pride in the team.

RESIDENT CARE SPECIALIST | BIG BEND HOMELESS COALITION | JANUARY 2014-JULY 2015

- Assisting residents with daily activities, organizing community outreach events, and helping coordinate social media posts.
- Providing clients with all possible resources for their benefit such as: food stamps, section 8 housing, and job assistance programs.
- Directing residents with parenting skills that they may need.
- Counseling and guiding underage clients on getting their GED, or college applications.

REFERENCES

Personal

- Heath Williams 217-257-6144
- Gene Howard 727-423-9468
- Debbie Smith 850-445-7584

Professional

- Lamar Thomas (First Communications Inc.) 850-251-4382
- Jose Crespo (Motorola Solutions Inc.) 303-591-7620
- Larry Butterfield (Kilwins) 727-543-5226

3.7 ACCOUNT MANAGER–LANE FEINGOLD

The account manager is the ongoing contact between Motorola and CCD. The account manager provides new information about Motorola products and features, and works closely with CCD to determine where those might fit the needs of the City and County of Denver.

Key responsibilities assigned to the Account Manager are as follows:

- Work with CCD to identify needs and solutions available
- Provide CCD with up to date information about features and functionality offered by Motorola
- Provide insights to the Motorola technical and support team based on discussions with CCD

Lane Feingold's resume is provided below:

Lane Feingold

Account Manager

Date of Hire 1997

Motorola Professional Experience **2006 – Present**: *Senior Account Manager –*

Focused on selling solutions for government and public safety customers in Colorado, including two-way radio systems, body worn cameras, and software solutions in the dispatch center.

2004 – 2006: *Systems Engineer* - Presale and post sale design, engineering, and customer support.

1997- 2002: *System Architect* – Developed system requirements from business and marketing requirements for wireless data systems and also defined system interfaces

Related Project Experience

City of Aurora, CO (2014- Present)

Replacement of the City of Aurora EDACS system. Included Project 25 Phase 2 (TDMA) geo-redundant cores, a four (4) site simulcast cell, new microwave, and all new radios.

Douglas County, CO (2013- Present)

A gradual addition of updated Project 25 sites that formed two new simulcast cells in Douglas County on Zone 1 the Statewide DTR System. This included there (3) simulcast sites on the southern cell and in the process of completing the last of the six (6) site northern simulcast cell this year.

Front Range Communication Consortium (2013)

Procurement of a new Project 25 core and moving connectivity of all of ADCOM and Weld county radio sites from the Statewide Digital Trunked Radio (DTR) System to the new FRCC core.

State of Colorado (2006 - Present)

Continuous growth of the Statewide DTR System to over 200 RF sites and over 65,000 users radios. Sites and dispatch center are still being added to the system as it continues to grow.

Education Bachelor of Science – Electrical Engineering, University of Colorado, Boulder, Colorado

SECTION 2.7

PROJECT MANAGEMENT PLAN

P25 PUBLIC SAFETY RADIO SYSTEM REPLACEMENT PROJECT NOVEMBER 20, 2017

Request for Proposal No. 28435Q

MOTOROLA SOLUTIONS

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SECTION 2.7

PROJECT MANAGEMENT PLAN

2.7.1 DETAILED DESCRIPTION OF WORK

The following sections define in detail the expected project phases for the planning, design, manufacture, installation, optimization, and testing of the infrastructure proposed for the City and County of Denver's new Project 25 Digital Trunked Radio System. Each phase of the project defined by this Project Management Plan includes a Responsibility Matrix. These matrices define the responsibilities of Motorola and CCD and detail the tasks and deliverables for each phase. Tasks within each project phase described in this Scope of Work are meant to define the order in which each task or group of tasks occurs. In many cases, such as installation, tasks for one subsystem occur in different stages of the project, depending on which subsystem is being installed. The scheduled dates of tasks are depicted in the project schedule located in Section 2E – Implementation Schedule.

2.7.1.1 General Project Responsibilities

The following general project responsibilities, not defined by specific tasks, include:

2.7.1.2 Motorola Solutions Responsibilities

Motorola has designated a Project Manager who will direct Motorola's efforts and serve as the primary point of contact for CCD. The Motorola Project Manager will have significant authority to make certain decisions relative to the project on behalf of Motorola and will have direct access to Motorola's executive management for resolving problems beyond their immediate authority. The responsibilities of the Motorola Project Manager include:

- Participating with CCD team in progress review meetings every week and submitting status reports that identify the activities of the previous review period, as well as activities planned for the upcoming review period, including an updated Project Schedule
- Maintaining project communications with CCD's Project Manager and project team members (Motorola will provide a record of correspondence as part of the progress reports provided prior to each progress meeting)
- Managing the efforts of Motorola staff and coordinate Motorola activities with CCD project team members
- Participating in weekly status meetings and issuing a mutually-agreed-upon agenda for each call or meeting
- Issuing reports that include the project status, milestones accomplished, tasks behind schedule, actual and potential problems
- Measuring, evaluating, and reporting the progress against the Project Schedule
- Resolving deviations from the Project Schedule
- Monitoring and managing risks via Risk Management Plan
- Maintaining a documentation schedule that identifies and shows the status of documents to be transmitted for review during the next two reporting periods
- Coordinating and overseeing the installation of all licensed Motorola application software
- Reviewing and administering change control procedures through CCD Project Manager, commonly referenced as a "Project Change Request" (PCR), issued by the Motorola Project Manager

2.7.1.3 CCD Responsibilities

CCD will designate a Project Manager who will direct CCD's efforts and serve as the primary point of contact for CCD project team. CCD Project Manager will have significant authority to make certain decisions relative to the project on behalf of CCD and will have direct access to CCD's executive management for resolving problems beyond the Project Manager's immediate authority. The responsibilities of CCD Project Manager include:

- Maintaining project communications with Motorola's Project Manager
- Identifying the efforts required of CCD staff to meet the task requirements and milestones in the Statement of Work and Project Schedule
- Interfacing with members of each CCD team to ensure appropriate participation in meetings and timely decisions
- Monitoring the project to ensure that support resources are available as scheduled
- Participating in weekly conference meetings/calls
- Acting as liaison for and coordinating with other agencies and CCD partners, vendors, and contractors
- Reviewing and administering change control procedures
- Providing any required parking permits to Motorola personnel for restricted access entry and/or parking
- Providing all travel accommodations for visits to Factory Testing.

2.7.2 PROJECT INITIATION AND KICKOFF MEETING

The project begins with the Project Kickoff Meeting, which will include key project participants from both CCD and Motorola. The objectives of the Kickoff Meeting include the following:

- Introduction of the Project Managers from both CCD and Motorola as the single points of contact, with the authority to make routine project decisions
- Introduction of all radio project team participants
- Review of the roles of the project participants to identify communication flow and decision-making authority between participants
- Review of the overall project scope and objectives
- Review of the resource and scheduling requirements
- Project Management Plan and processes.

During the Project Initiation phase, Motorola will review and work with CCD to finalize the following project processes and procedures:

- Detailed Project Schedule
- Risk Management Plan
- Change Control Plan
- Issues Document and Action Item Log.

Responsibilities and deliverables for Motorola and CCD during the Design Review phase are defined in Table 2-1.

Table 2-1: Responsibility Matrix

Task	Responsibility	Deliverable
Initiate the Project 25 Trunking project with a Kick Off Meeting.	Motorola and CCD	Documented project personnel names, responsibilities, contacts, and project review procedures
Begin creating Risk Management Plan.	Motorola	Initial Risk Management Plan
Define format of the Issues and Action Item Log.	Motorola	Initial Issues and Action Item Log
Review change control procedures with CCD Project Manager.	Motorola	Initial Change Control Plan
Work with Motorola personnel in finalizing and approving the Change Control Plan.	CCD	Approved Initial Change Control Plan
Develop a communication plan to address the types of communication that will be established such as the weekly status meetings and status reports. The communication plan will also indicate the appropriate points of contact for different types of communication.	Motorola and CCD	Communications Plan

Completion Criteria

This task is considered complete when the Project Kickoff Meeting has been held with Motorola and CCD representatives in attendance, and when project scope, schedules, procedures, roles, and responsibilities have been documented and agreed upon.

2.7.3 DETAILED DESIGN REVIEW

2.7.3.1 Site Walks

Each proposed site will have a civil site walk conducted. While the RF site walk determines the feasibility of installing the RF equipment, a civil site walk evaluates modifications that may have to be made to life safety equipment, grounding, surge suppression, lightning suppression, towers, shelters, and the compound that secures the RF site.

An R-56 audit will be completed and submitted to CCD for review.

Motorola will work with CCD to finalize space, power and HVAC requirements for the sites based on the agreed upon design as a part of finalizing the backhaul and LMR designs. A separate Site Development Statement of Work is included in section 2.7.24 below, which details the scope and responsibilities of Motorola and the Counties on a site by site basis.

Responsibilities and deliverables for Motorola and CCD are defined in Table 2-9.

Table 2-9: Responsibility Matrix

Task	Responsibility	Deliverable
Site Walks: Motorola will conduct site walks for all sites.	Motorola	Site Audits
Motorola will conduct an R-56 audit of the sites and provide any recommendations for site upgrades to support the Project 25 Trunking System outside of those already identified in the Site Development Statement of Work.	Motorola	Site Upgrade Recommendations

Completion Criteria

This task is considered complete upon CCD's acceptance and approval of the site audit reports.

2.7.3.2 Detailed Design Review

The Design Review will be conducted by phase and by subsystem. The steps outlined below are included in this effort. After the Project Initiation and Kickoff Meeting, Motorola will meet with CCD's project team to achieve written agreement on the final system design, identify any special system or product requirements and their impact on system design or implementation, and refine the system implementation plan and plan documentation.

Motorola's system design in this contract will serve as the *baseline* design for the Design Review.

During the Detailed Design Review phase, Motorola and CCD team will work together to *finalize* the system design.

CCD and Motorola will review and finalize the Project 25 trunking design through analysis of the system functionality, interface requirements, and end-user requirements, as mutually agreed upon by Motorola and CCD.

Document List

Motorola will provide draft and final versions of the following documents to CCD for review and approval.

- Document index
- Project schedule
- Statement of Work
- System descriptions
- Final design of backhaul system:
  - Microwave system description
  - Microwave network maps
  - Microwave path analysis for each hop
  - MPLS configuration plan
  - Microwave path survey report with evidence of field validation of paths
  - Frequency coordination submittals for FCC Part 101 licensing
- Final design of land mobile radio system
- Equipment lists
- System block diagrams
- Drawings:

  - Site layout drawings
  - Shelter floor plan drawings
  - Tower elevation / antenna placement diagrams
  - Antenna System diagrams, including combiners, tower top amplifiers and receiver multicoupler systems
  - Rack elevation drawings
- Site equipment Information:
  - Power consumption data
  - Site alarm definition
  - DC power system description
  - Testing plans:
    - Land mobile radio system factory acceptance test plan
    - Functional acceptance test plan
    - Coverage acceptance test plan
    - Land mobile radio system field installation, inspection and test plan
    - Backhaul system field test plan
- System administrator documentation and system programming parameters
- Final implementation plan
- Installed equipment inspections
- Training plan
- Preliminary cutover plans.

As part of the DDR, CCD shall specify the racks to be used by Motorola to house equipment at sites. This may include the identification of any available/open rack space in existing racks at CCD sites. Motorola shall procure racks per CCD's requirements and CCD and Motorola shall agree to adjust contract cost if there are cost savings or extra costs to Motorola.

During this period, Motorola and CCD will have the following responsibilities as shown in Table2-2.

Table 2-2: Responsibility Matrix

Task	Responsibility	Deliverable
Conduct site walks of radio, control, and dispatch sites to gather detailed information regarding site preparation and equipment installation requirements.	Motorola and CCD	Completed Site Walks
Review baseline design with CCD. Motorola and CCD will participate in a series of meetings where the baseline design will be reviewed.	Motorola	Review of Baseline Design
Determine the equipment and subsystems that will be implemented by Phase. Dependencies, including legacy equipment support, will be taken into account in finalizing the phased implementation plan.	CCD and Motorola	Finalize Equipment Implementation by Phase and System Upgrades
Finalize the design. Based on the design feedback from CCD, Motorola will present the final design documents listed above.	Motorola	Final Design

Task	Responsibility	Deliverable
CCD will approve the Final Design and issue a notice to proceed	CCD	Final Design Approval Notice to Proceed

Completion Criteria

This activity is complete when all documentation and detailed documents associated with this phase have been delivered to CCD, reviewed and approved by CCD, and signed by the designated representative from CCD. Once all documentation and design reviews are completed a Notice to Proceed will issued by CCD. After receiving the Notice to Proceed, Motorola will schedule all factory orders for shipment to meet the approved project schedule. Each of the specific design activities associated with developing these design documents is described in the following section. Some detailed design development activities will involve the review and finalization of multiple documents.

2.7.3.3 Finalize Project Schedule

Motorola and CCD will finalize the Project Schedule, based on the plans contained in the proposal and updates from the design effort.

The finalization of the Project Schedule and Implementation Plan will be based upon the requirements identified in the Detailed Design Review and will take into account the project objectives, plans, schedules, approvals, priorities, and inter-dependencies among tasks. These tasks will be finalized through the change order process and mutually agreed upon between the parties at the end of the Design Review. The resulting document defines the specific project tasks to be completed and documents the final Project Schedule for implementation of each subsystem.

Responsibilities and deliverables for Motorola and CCD during the Finalize Project Schedule phase are defined in Table 2-3.

Table 2-3: Responsibility Matrix

Task	Responsibility	Deliverable
Review with CCD personnel the identified implementation tasks, priorities, inter-dependencies and other requirements needed to establish the final Project Schedule. The Project Schedule will identify key project milestones, in addition to tasks that will impact existing communications to move the new system into live operations.	Motorola	Project Schedule and Implementation Plan Review
Analyze the identified requirements and make such implementation decisions as are reasonably required to finalize the Project Schedule and Implementation Plan.	CCD and Motorola	Project Schedule and Implementation Plan Review
Prepare the final Project Schedule and Implementation Plan documents and deliver it to CCD as a deliverable of the Design Review. Review the Project Schedule with CCD personnel and make changes and/or corrections that are mutually agreed upon through the change order process.	Motorola	Project Schedule Finalization

Task	Responsibility	Deliverable
Review the final Project Schedule and identify in writing any specific deficiencies found within ten business days of receipt.	CCD	Project Schedule Approval

Completion Criteria

This task is considered complete upon mutual agreement of the parties to implement in accordance with the final Project Schedule that has been developed within the Design Review. The accepted Project Schedule will become the governing Project Schedule incorporated into the contract, and is subject to change only upon mutual agreement of Motorola and CCD. The acceptance of the project schedule will be the final activity of detailed design development and review process.

2.7.3.4 Develop Transition/Cutover Plan

As a critical part of the final design documentation, the implementation of your Project 25 trunking System will require a detailed transition plan for a smooth migration from the existing radio system to the new radio system. During the Design Review, a high level cutover plan will be developed. As the implementation proceeds, further detail will be incorporated into the cutover plan.

Individual cutover plans will be developed for individual systems and subsystems including:

- Fixed radio equipment
- Microwave/MPLS network equipment
- Dispatch operations
- Radio sites and towers
- DC power systems.

Responsibilities and deliverables for Motorola and CCD during the Develop Cutover Plan phase are defined in Table 2-4.

Table 2-4: Responsibility Matrix

Task	Responsibility	Deliverable
CCD will provide existing system, dispatch, and user information which must be taken into account in developing the detailed cutover plan.	CCD	Existing system, dispatch, and User Information
The high-level Project 25 Trunking System cutover plan will be developed. It will take into account the need to minimize the impact to users migrating to system.	Motorola	Cutover Plan

Completion Criteria

This task is considered complete when the high-level cutover plan is mutually agreed upon by CCD and Motorola.

2.7.3.5 Finalize Acceptance Test Plan (ATP) Procedures

Motorola will finalize ATP documents, including the Functional and Coverage ATPs, in the detailed design review to provide the required procedures to be used for testing the functionality and performance of the system for CCD's approval. The ATP includes the criteria to ensure that the equipment operates according to specifications, design, and standards identified in the Proposal. This acceptance testing is completed in the factory. These tests will also be performed during the ATP that will be performed in the field.

Responsibilities and deliverables for Motorola and CCD are defined in Table 2-5.

Table 2-5: Responsibility Matrix

Task	Responsibility	Deliverable
Work with CCD in finalizing the ATPs. Review the overall approach to testing including hardware, software and pass/failure criteria. The review will be based on the Acceptance Test Plan included with this proposal.	Motorola	Finalize ATPs and Methodology
Work with Motorola in finalizing the ATPs, using the ATPs submitted with this proposal as a baseline. Provide related information requested by Motorola to assist Motorola in completing the ATP. Review the baseline ATP document and identify in writing any specific deficiencies found within ten business days.	CCD	Review ATPs, provide written information and feedback
Submit a final ATP document to CCD for approval.	Motorola	Final ATPs
Review and approve the final ATP.	CCD	Approval of Final ATPs

Completion Criteria

This task is considered complete upon CCD's acceptance and approval of the ATP.

2.7.3.6 Finalize Maintenance plan

Motorola will work with CCD to finalize the maintenance plan for your Project 25 Trunking System, addressing Motorola and CCD-provided services for the system post-warranty.

Responsibilities and deliverables for Motorola and CCD are defined in Table 2-6.

Table 2-6: Responsibility Matrix

Task	Responsibility	Deliverable
Review all Maintenance options and agree upon a Maintenance Plan.	CCD and Motorola	Presentation of Maintenance Plan Options
Finalize the Maintenance Plan	CCD	Selection of Final Maintenance Plan

Completion Criteria

This task is considered complete when CCD selects a final maintenance plan.

2.7.3.7 Finalized Training Plan

Motorola will work with CCD to develop the finalized training plan. The Training Plan submitted with this proposal (Section 2.8 of this proposal) serves as the baseline. Changes made to the quantities of classes are considered a change in scope.

Responsibilities and deliverables for Motorola and CCD are defined in Table 2-7.

Table 2-7: Responsibility Matrix

Task	Responsibility	Deliverable
Review all training requirements, training classes included, and the proposed Training Schedule.	CCD and Motorola	Review of Baseline Training Plan and Schedule
Finalize the Training Plan and the schedule for class delivery.	CCD and Motorola	Final Training Plan and Training Schedule

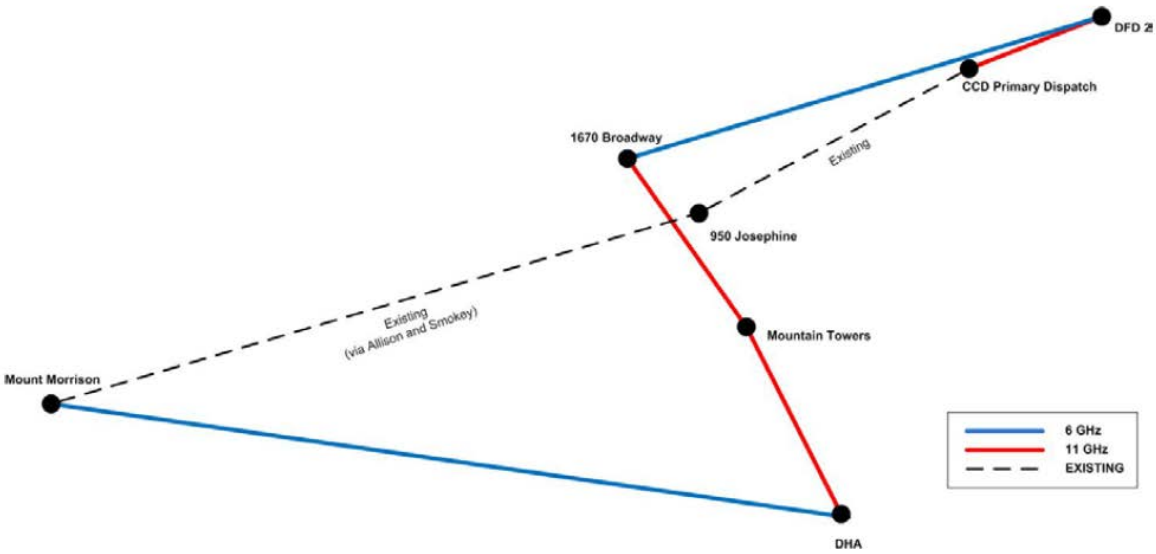
Completion Criteria

This task is considered complete when the Training Plan and Project Schedule are mutually agreed upon by CCD and Motorola.

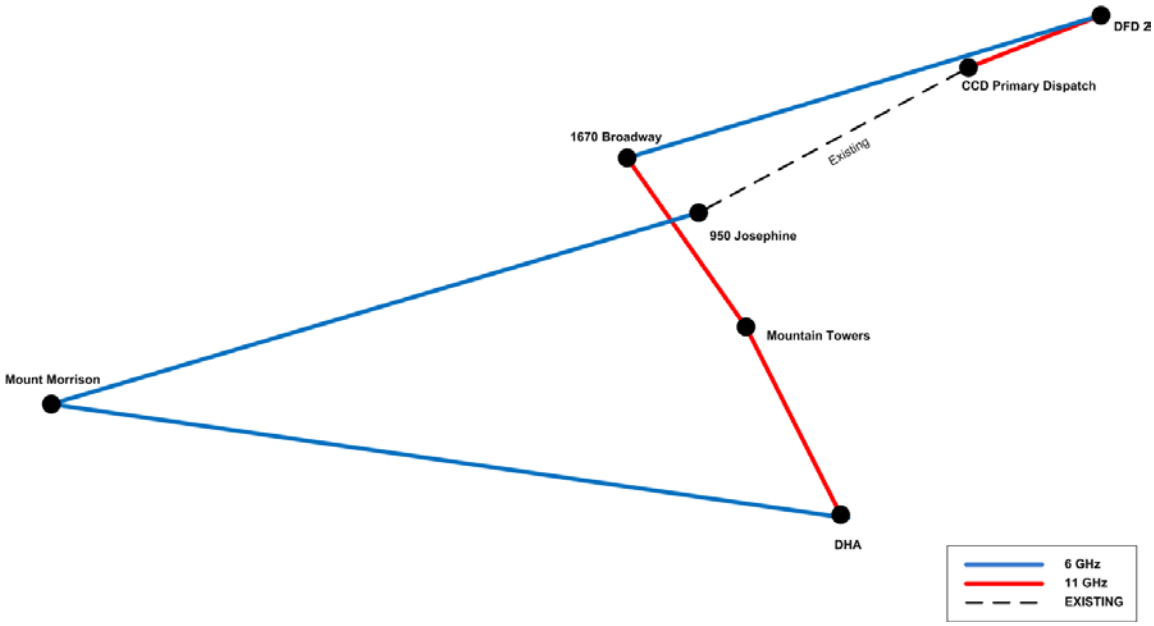
2.7.3.8 Finalize Microwave Backhaul System Design

Final Design Documentation includes the finalization of the backhaul system. Motorola will finalize the microwave design.

Motorola's original microwave design had 5 new microwave hops and utilized 2 existing hops.



In response to a request by CCD, and as part of Motorola's BAFO response, the existing link between Josephine and Mount Morrison was also replaced.



All efforts and responsibilities noted below relate to all proposed hops, including the new one between Josephine and Mount Morrison.

Motorola will explain and document all engineering assumptions and performance validation data for site links. This will include software modeling for path engineering, review of map or topographic data used in the model, and all assumptions used in determining optimal path configuration.

Responsibilities and deliverables for Motorola and CCD are defined in Table 2-10.

Table 2-10: Responsibility Matrix

Task	Responsibility	Deliverable
The microwave design will be adjusted based on the physical site locations and dish locations on the towers.	Motorola	Microwave Design
Motorola will conduct a single set of physical path surveys for new microwave links. The microwave design will be finalized and guaranteed once physical path surveys have been conducted. Any changes resulting from the physical path surveys are considered a change in scope from the baseline. Path design will identify Fresnel zone clearances, fade margin and terrain path obstructions to include projected tree growth over the assumed lifetime of the Project 25 Trunking. Motorola will establish with CCD the path clearance objective for each path and will, as part of its field investigations, establish accurate site elevation and coordinates for all facilities. In addition to the required reliability and design using path design software, all paths will be fully field verified through field surveys that examine tower space availability, near field obstructions, and any mid-path obstacles. Results from any optical path verification surveys performed will be incorporated into the final system design and design documentation.	Motorola	Physical Path Surveys
Motorola will work with CCD to develop a comprehensive provisioning plan for the microwave transport. Motorola will conduct meetings with CCD to define microwave path channel assignments, circuit labeling/mapping, and discuss effective organization of QoS Label priorities, and detail how to set up IP routing tables throughout the system. The microwave infrastructure equipment in the system will be configured based on this provisioning plan. During system implementation Motorola will revise the provisioning plan as necessary.	Motorola	Backhaul Provisioning Plan
Development of all programming templates for the microwave equipment.	Motorola	Backhaul Programming Templates

Task	Responsibility	Deliverable
Motorola will inspect all existing antenna mounting structure hardware as required to design and supply all antenna mounting, waveguide attachments, entry ports/waveguide boots and microwave cable management systems. Motorola will create final path calculations and path profiles for each hop, and identify the required antenna size, type and mounting height.	Motorola	Site plan drawings Path Calculations and Profiles Antenna specifications and Mounting Heights
Motorola will submit the final design to CCD for approval.	Motorola	Final Microwave Design
Review and approve the final Backhaul Design.	CCD	Approval of Final Microwave Design

Completion Criteria

This task is considered complete upon CCD's acceptance and approval of the Microwave Design.

Milestone	
	Completion of all activities in Sections 2.7.2 and 2.7.3 shall constitute the project milestone of Detailed Design Review.

2.7.4 FCC LICENSING AND COORDINATION

Motorola will identify the frequencies necessary for the system's RF and Microwave licenses. See Section 2.9.1.2 of the System Implementation Plan for details.

Responsibilities and deliverables for Motorola and CCD are defined in Table 2-8.

Table 2-8: Responsibility Matrix

Task	Responsibility	Deliverable
Complete frequency identification and coordination.	Motorola	Frequency Coordination
Complete all FCC license applications and technical exhibits necessary to license the frequencies used in the system.	Motorola	License Applications
Submit licenses to the FCC	CCD	FCC License Applications

Completion Criteria

This task is considered complete when the FCC applications have been submitted for licensing.

2.7.5 ORDER PROCESSING AND MANUFACTURING

After the completion of Detailed Design Review and subsequent contract signature, Motorola will process orders for equipment and begin equipment manufacturing. Motorola will place factory orders for the system hardware that is being purchased for the communications system.

Responsibilities and deliverables for Motorola and CCD are defined in Table 2-11.

Table 2-11: Responsibility Matrix

Task	Responsibility	Deliverable
Factory orders placed for all Motorola manufactured equipment.	Motorola	Orders for Motorola-manufactured Equipment
Order placed for any third-party equipment.	Motorola	Third-party Equipment Orders

Completion Criteria

This phase is considered complete when all equipment orders have been placed.

2.7.5.1 Factory Staging

This phase of the project includes factory staging of the LMR system. Motorola will provide factory staging for all major fixed-end equipment, including the Master sites, Prime sites, RF sites, and Console sites. The LMR system will be staged at Motorola's Customer Center for Solutions Integration (CCSi) in Elgin, Illinois.

Factory staging at CCSi provides for initial assembly and testing of all Motorola manufactured radio system components along with the third-party equipment required for a successful system demonstration. System components will be staged and tested to simulate final operation; this allows the system to be configured as closely as possible to its final configuration during factory staging. Factory staging will allow testing of the functional capabilities of the communications system. This process will enable CCD representatives to witness factory testing in a controlled environment, with the same equipment that will be used in the field, to provide a smooth and easy field installation.

Motorola will assemble the LMR hardware at a single location. Cables will be cut and labeled with information to clarify interconnection for field installation. All provided inter-rack and inter-equipment cables will have connectors attached and tested. No DC power systems will be staged at the factory location.

After assembling the equipment, Motorola's staging team will power it up, load software, set levels, program, and configure and optimize the equipment. System parameters will be set according to inputs from Motorola's design team. System software and system features will be tested and validated.

The system will be exercised while in factory staging, allowing for testing and burn-in of components and boards for proper operation as a complete system before shipping to the field. Once the system or subsystem has been assembled, optimized, and integrated as a complete working unit, the system will be tested according to the Factory Acceptance Test procedures.

Additional details regarding the Factory Staging process are included in Section 2.9.2 of the System Implementation Plan.

2.7.6 FACTORY ACCEPTANCE TESTING

Upon satisfactory completion of the staged system, Motorola will coordinate with CCD for a visit to CCSi to participate in a system demonstration and factory acceptance testing. This visit will provide CCD personnel with the opportunity to see the equipment assembled and working as an integrated system and to test in a hands-on manner, most functionality and features of the communication system that are capable of operation in a factory environment.

Additional details regarding the Factory Acceptance Testing process are included in Section 2.9.2. of the System Implementation Plan.

Responsibilities and deliverables for Motorola and CCD are defined in Table 2-12 for factory testing.

Table 2-12: Responsibility Matrix

Task	Responsibility	Deliverable
Functional Performance Testing: - Motorola will perform a Functional Performance Test to verify the functionality of the communications system. The Functional Performance Test will include the following: - Physical inspection. - Thorough exercise of the hardware and software. - Testing of the voice communications features. - Verification of device and system recovery from failures.	Motorola	Functional Performance Tests
CCD representative will sign written acceptance documents at the successful completion of the Factory Acceptance Testing Period.	CCD	Written Approvals of Factory Acceptance Test

Completion Criteria

This task is considered complete when CCD representative signs a certificate of acceptance of the factory acceptance test.

2.7.7 SHIPPING AND WAREHOUSING PLAN

Upon completion of the customer-witnessed Staging Acceptance Test, Motorola will ship all equipment to a CCD-supplied, secure warehouse location. Upon arrival, CCD will be notified and a full inventory of all equipment will be conducted by both CCD and Motorola. Motorola shall provide an updated version of the electronic inventory report, if any changes have occurred during the staging process.

Milestone	Completion of all activities in Sections 2.7.5 and 2.7.6, as well as the shipment of all staged equipment from Motorola to CCD as described in Section 2.7.7 shall constitute the project milestone of Equipment Shipment. Shipment of the subscriber radios that are ordered with the original execution of this contract may occur at a different time than the shipment of equipment from staging. Shipment of all subscriber radios, including accessories, that are ordered with the original execution of this contract shall constitute the project milestone of Subscriber Shipment.

Third-party equipment will be inventoried by CCD and Motorola upon arrival.

As equipment is removed for installation, it will be tracked by the Motorola project manager and noted in the weekly project reports.

2.7.8 FIXED NETWORK EQUIPMENT INSTALLATION

Motorola will be responsible for inventorying the equipment and delivery of equipment to the sites. Motorola will be responsible for all installation of Motorola-furnished equipment. Installation of the Fixed Network Equipment (FNE) will consist of installing the radio communications infrastructure and computer equipment at the dispatch and control centers. This will include installation of a second logging interface – Archiving Interface Server (AIS) – at the Peoria Street dispatch location. All consoles will be based on the MCC7500E (enhanced) platform.

Per post selection meetings with CCD, Motorola will install 17 channels at each simulcast site as well as a 17 channel Rx only site at the Mount Morrison location. The 17 channel count is a 4 channel expansion from the originally proposed 13 channel simulcast cell. A 9 channel ASR site at Mount Morrison will also be installed as part of the original design.

CCD has also requested an additional console position at a 6th location in EEB's offices. This console will be installed in the same manner as the other dispatch locations. CCD will provide any necessary backhaul network to connect this location to the proposed microwave network, or directly to the primary and backup Master sites.

All installation work will meet Denver specification noted in Section 5 of the RFP, including the CCD Technology Cabling, Infrastructure, and Installation Requirements

During field installation of the equipment, any required changes to the installation will be noted and assembled with the final as-built documentation of the system. The as-built documents will be provided at the end of the project, along with the maintenance and operator manuals. Upon completion of installation, Motorola will perform final site inspections to verify proper physical installation and operational configurations of each individual site. Responsibilities and deliverables for Motorola and CCD are defined in Table 2-13.

Table 2-13: Responsibility Matrix

Task	Responsibility	Deliverable
Site Ready: Based on the site surveys and the R-56 report, CCD will prepare the site for equipment installations, resolving site deficiencies identified in the Site Audit Reports. Sites will be ready according to the project schedule for equipment installation.	CCD	Sites Meeting Site Preparation Requirements for Installation
Provide access to all facilities for system equipment installation. CCD will provide reasonable site access for scheduled site walks, installation, optimization, system troubleshooting and performance of acceptance testing for the duration of the project.	CCD	Site Access

Task	Responsibility	Deliverable
General Installation Responsibilities: Motorola will inventory all new equipment Motorola will install the new system equipment that is provided in the equipment list. Motorola will furnish all cables for power, audio, control, and microwave transmission to connect the supplied equipment to the power panels or receptacles and the audio/control line connection point. All cabling will be cut to length, properly connected and terminated per CCD installation standards and clearly labeled at both ends. All associated punch block connections will be properly labeled. Motorola will ground and bond all provided equipment during installation and is responsible for connecting all equipment to the common ground system at the existing facilities. All cabinets, racks, enclosures, telephone circuit surge protectors, and transmission line surge protectors provided will be connected to the single-point ground. Motorola will connect all ground connections using approved non-reversible crimp or clamp connections. All punch blocks used will be 66-block style. All associated punch block connections will be properly labeled. Motorola will remove and dispose of any debris that is a result of the project activities from the site. All cabling, port assignments, and punch block connections will be recorded into the final system as-built documentation	Motorola (NOTE: CCD personnel shall be allowed to witness Motorola's performance of the listed tasks.)	New Equipment Installations per Motorola's Site Quality Standards

Task	Responsibility	Deliverable
Install and Test DC Power: Motorola will deliver and bolt the DC power system to the floor. Motorola will connect the DC power to the AC power panel. Motorola will perform startup services on the DC power equipment. DC Power System components will be installed per quantities and at locations identified in the Design Review, and subsequent CCD approved design changes. Motorola will cable the equipment and provide any required cable management materials. AC and DC primary power 7wiring will not be exposed and will be installed within conduit as per the National Electrical Code, and any applicable Local Codes. Motorola will test, verify, and document proper operation of the DC Power systems. Any issues and their resolution will also be documented.	Motorola CCD	DC Power System Installation Audit and Test Results AC Panel Demarcation
Install and Test Backhaul Equipment and Software: Motorola will install all new microwave equipment. Motorola will test, verify, and document proper operation of the backhaul systems. Any issues and their resolution will also be documented. Removal of existing microwave gear will be conducted after system acceptance.	Motorola	Radio System Installation Audit and Test Results
Install and Test Master Site and DSR Master Site Equipment & Software The Master Site equipment and the redundant DSR Master Site equipment will be installed and tested in accordance with the Design Review Scope of Services and Equipment Lists Motorola will test, verify, and document proper operation of the Master Site and DSR Master Site subsystems. Any issues and their resolution will also be documented.	Motorola	Radio System Installation Audit and Test Results

Task	Responsibility	Deliverable
Install and Test Prime Site and Geo Diverse Prime Site Equipment & Software Simulcast Prime Site equipment and Geo Diverse Prime Site equipment will be installed and accordance with the Design Review Scope of Services and Equipment Lists Motorola will test, verify, and document proper operation of the Prime Site and Geo Diverse Prime site subsystems. Any issues and their resolution will also be documented.	Motorola	Radio System Installation Audit and Test Results
Install and Test LMR Base Station Equipment and Software: Motorola will install ASTRO 25 Trunked Repeater Site equipment in accordance with the Design Review Scope of Services and Equipment Lists. This includes a 4 channel increase from the original design to 17 channels for the simulcast cell, including a 17 channel Rx only site at Mount Morrison. Motorola will test, verify, and document proper operation of the LMR base radio equipment. Any issues and their resolution will also be documented	Motorola	Radio System Installation Audit and Test Results

Task	Responsibility	Deliverable
Install and Testing of Dispatch Center Equipment: Motorola will install dispatch equipment in accordance with the Design Review Scope of Services and Equipment Lists. Installation includes a second AIS per the request of the CCD. Consoles will be based on the MCC7500E (enhanced) platform. Motorola will test, verify, and document proper operation of the dispatch equipment. Any issues and their resolution will also be documented	Motorola	Radio System Installation Audit and Test Results
CCD will sign installation acceptance certificates after inspection and check out of Master sites, Prime sites, RF sites and Console sites on a site-by-site, system-by-system basis and in accordance with CCD identified Milestones	CCD	Signed Installation Acceptance Documents

Completion Criteria

This task is considered complete when CCD reviews installations with Motorola and approves by signing the installation check sheets. The installation of each subsystem (Master Site, Prime Site, RF Site, Console Site) must be completed for this phase of the project to be considered complete.

2.7.9 SYSTEMS INTEGRATION AND OPTIMIZATION

System Integration and Optimization includes configuration, optimization, and programming for all system equipment. Motorola will integrate all of the Motorola provided subsystems. At least one Motorola Systems Technologist will be onsite for this phase and will prepare the system for acceptance testing.

Once installation in the field is complete, Motorola will verify that all equipment is operating properly and that all levels are properly set. Motorola will optimize each subsystem individually.

- All audio and data levels will be checked to verify factory settings.
- All voltage and current levels will be checked to verify factory settings.
- All communication interfaces between devices will be verified for proper operation.
- All features and functionality will be tested by Motorola to ensure that they are functioning according to the manufacturer's specifications and the final configuration established during system staging.

The Motorola system technologist will maintain a punchlist of items that need resolution. CCD will be responsible for directing the activities of non-Motorola subcontractors and supporting agencies. CCD is also responsible to coordinate all on-site integration activities including assistance to Motorola for system testing requiring participation from non-Motorola subcontractors. Responsibilities and deliverables for Motorola and CCD are defined in Table 2-14.

Motorola and CCD will each ensure that any of their subcontractors perform in accordance with the implementation schedule.

Table 2-14: Responsibility Matrix

Task	Responsibility	Deliverable
Provide and install all communication lines, equipment, and interfaces that are not Motorola provided deliverables. Provide all required liaison support with the agencies and vendors required to support the solution. Ensure that the necessary technical support is made available for installation and testing with third party vendors and interfaces.	CCD	CCD provided equipment and interfaces required for integration
Optimize each individually and then integrated as a system. Install, integrate and test the hardware, software and interfaces as specified in the contract at a system level.	Motorola (NOTE: CCD personnel shall be allowed to witness Motorola's performance of the listed tasks.)	Installation and integration of equipment
Maintain a punchlist of items that need resolution. Manage the resolution of punchlist items.	Motorola and CCD	Punchlist resolution

Completion Criteria

This task is considered complete when the system is ready for acceptance testing.

2.7.9.1 Field Operational Tests

Motorola proposes a multi-level operational testing process that complies with CCD's requirements and prescribed milestones. This process provides multiple checkpoints for CCD to oversee the overall progress that is being made as the Project 25 Trunking System implementation progresses. This testing is composed of equipment installation and functional operation tests. These tests will verify each subsystem in correct operation. These tests are in preparation of the Acceptance Tests described later in this document

Motorola will provide to CCD the approved Field Test plans 30 days before the operational tests commence. System testing will occur only in accordance with the operational test plan. CCD has 14 days to approve, conditionally approve, or reject the test plan.

Motorola shall provide the test results, including the test expected results (pass/fail criteria) and the measured results, to CCD.

2.7.10 SITE DECOMMISSIONING – DFD STATION 26, QWEST/ZUNI, MOUNT MORRISON, AND LORETTO HEIGHTS

Description

DFD Station 26 and the Qwest/Zuni sites are two existing RF sites that were not necessary to meet the coverage requirements set forth by CCD and were not included as part of Motorola's design. At the request of CCD, Motorola will decommission these sites. This decommissioning will include removal of all equipment, antennas, and lines.

The Loretto Heights location was a site that was not considered for the new system but was optionally priced to decommission. CCD has requested that Motorola also decommission the Loretto Heights location. This decommissioning will include removal of all equipment, antennas and lines, and removal of the communication shelter and its concrete foundation.

At all sites listed above, Motorola will remove RF equipment including DC plants, RF equipment, antennas and lines and deliver them to a local CCD location. No remediation of the facilities (ex. wall patches, tile replacement, floor repairs) are included.

Mount Morrison will have its existing equipment and antennas removed once the new system has been accepted.

Table 2-15: Responsibility Matrix

Task	Responsibility	Deliverable
Remove power to equipment at the circuit breakers. Remove equipment and racks, antennas and lines from tower and deliver to a local CCD location for proper disposal.	Motorola	Site Decommissioned and equipment delivered to a local CCD facility.
Provide Access to sites	CCD	Proper access and escorts if required.
Provide a local location for delivery of decommissioned equipment	CCD	Facility for decommissioned equipment

Completion Criteria

This task is considered complete when the sites have been decommissioned and the equipment has been delivered to a local CCD location.

2.7.11 EQUIPMENT INSTALLATION ACCEPTANCE

Description

Equipment installations will be inspected to ensure adherence to quality standards. Inspections will include measurement of all equipment levels, settings, and input/output values, as well as a complete review of all measured values by CCD. Measurements may be witnessed by CCD's representative technical staff. Responsibilities and deliverables for Motorola and CCD are defined in Table 2-15.

Equipment installation acceptance will occur on a site-by-site, system-by-system basis.

Table 2-15: Responsibility Matrix

Task	Responsibility	Deliverable
Master Site Installation Inspection.	Motorola	Installation inspection audit
Prime Site Installation Inspection.	Motorola	Installation inspection audit
RF Site Subsystem Installation Inspections.	Motorola	Installation inspection audit
Dispatch Site Installation Inspections.	Motorola	Installation inspection audit

Completion Criteria

This task is considered complete when the installation inspections are complete and signed off by CCD and Motorola.

Milestone	Completion of all activities in Sections 2.7.8, 2.7.9, 2.7.10, 2.7.11, and 2.7.20 shall constitute the project milestone of Equipment Installation.

2.7.12 FLEETMAPPING AND CODEPLUG DEVELOPMENT

Description

Fleetmapping allows the CCD to determine how their portable and mobile subscriber radios will operate. Motorola will meet with the various agencies that use the system to review the operation and features available for the subscribers. Motorola then develops the various codeplugs for the agencies. A subset of radios can then be tested on the system to validate the codeplug. It is expected that testing will not take longer than 10 business days. Based on this testing and any requested modifications, Motorola will revised the codeplugs for their final configuration. The codeplugs are then used for the full deployment of the subscribers. Any subsequent modification requests by CCD will be handled as a change order.

Motorola will work with CCD and a limited set of “super users” to demonstrate the functionality and features of the subscriber units so that the agencies have an idea of how they’d like the radio to operate. This aids in developing the codeplug.

Motorola will develop ten (10) templates for the agencies that CCD identifies. Motorola will also provide a training guide that documents the mandatory, typical, and recommended programming settings for radios to be used by various CCD departments. This guide will assist CCD in developing additional templates as they deem necessary. Motorola can provide pricing to assist CCD with any codeplug development beyond the initial ten (10) templates.

Motorola shall also provide support to CCD for CCD’s development of codeplugs for non-Motorola radios. This support shall be limited to approximately 12 staff hours of providing programming advice on a best-effort basis and the responsibility for developing codeplugs for non-Motorola radios shall rest with CCD or other 3rd parties. Additional support for programming of non-Motorola radios can be provided by Motorola at additional costs.

Table 2-16: Responsibility Matrix

Task	Responsibility	Deliverable
Identify user groups and operational parameters	CCD	List of user groups
Provide CCD with radio functionality training	Motorola	User familiarity with radio operations/features
Meet with user groups and develop fleetmap and first round of codeplugs	Motorola	Initial fleetmap and codeplugs development
Program a subset of radios for testing by agencies	Motorola	Programmed radios
Testing of initial codeplug and modification request	CCD	Codeplug modification requests delivered to Motorola
Develop training guide on templates	Motorola	CCD Codeplug Development Guide
Provide best-effort assistance (12 staff hours) for the development of codeplugs for non-Motorola radios	Motorola	Best-effort Assistance
Development of codeplugs for non-Motorola radios	CCD	Codeplugs for Non-Motorola Radios
Revise codeplugs based on requests from CCD.	Motorola	Final revision of codeplugs

Completion Criteria

This task is considered complete once the second set of codeplugs have been delivered to CCD.

2.7.13 MOBILE INSTALLATION AND SUBSCRIBER RADIO PROGRAMMING

This phase of the project includes the delivery, programming, and as required installation of all subscriber equipment purchased with the original execution of this contract.

During this phase of the project, Motorola will install mobile radios in vehicles and control stations based upon a mutually agreed upon schedule. Motorola will identify the number of mobiles it can install per day. CCD is expected to deliver the vehicles to the installation location. Installations take place at CCD provided facilitie(s) and normally will take place during normal business hours (M-F 8:00 – 5:00). If necessary, Motorola will work with CCD for installing mobiles during weekend hours. Motorola will verify that all radio subscriber Equipment is operating properly and that all parameters are properly set once installation in the field is complete. Motorola will also program, as necessary, existing non-Motorola radios to operate on the new system. Responsibilities and deliverables for CCD and Motorola are defined in Table 2-17.

Table 2-17: Responsibility Matrix

Task	Responsibility	Deliverable
Deliver agreed upon number of vehicles per day for mobile radio installation Work.	CCD	Vehicles for Installations
Motorola will install and program mobile radios. Radios will be installed a CCD provided locations.	Motorola	Mobile Radio Installation and Programming
Motorola will prepare portable radios for use, assemble radios, charge the batteries, and program portable radios, which will be delivered to the CCD for distribution.	Motorola	Programmed Portable Radios
Provide existing non-Motorola radios for programming	CCD	Existing Non-Motorola portables and mobile
Programming of existing non-Motorola radios	Motorola	Reprogrammed Existing Non-Motorola Radios

Completion Criteria

This activity is complete all subscriber radios have been programmed and installed.

Milestone	
	Completion of all activities in Sections 2.7.12 and 2.7.13 shall constitute the project milestone of Subscriber Installation.

Motorola can provide these same services for additional subscriber radios purchased after the execution of this contract at additional costs.

2.7.14 SYSTEM FUNCTIONAL TESTS

Description

Operational and Functional System testing includes the system functional acceptance tests, which will be performed when the system optimization is complete. These tests will verify the entire system in operation. During the Detailed Design Review, the final selection of Functional tests will be defined.

Motorola and CCD agree that a Functional Acceptance Test Plan is provided as an example of the tests that can be completed as part of Field and/or Factory Acceptance Testing as well as a sample of test methods and processes. Motorola and CCD agree that CCD shall reserve the right to edit these tests and add additional tests to them prior to their execution so long as the edits and additions are: i) made to test a feature, operation, or specification specifically described in the System Design Description or in Motorola's published specifications for the provided Equipment or Software, ii) developed jointly between the Parties such that they agree to the Setup, Test Process, and Pass/Fail Criteria, and iii) able to be completed as part of the FATP in a reasonable timeframe and with available test methods and tools.

Additional details regarding the Field Functional Acceptance Testing process are included in Section 2.9.2 of the System Implementation Plan included with this contract.

If deficiencies are found during testing, both the deficiencies and their resolutions will be agreed upon and documented. If the documented deficiencies do not prevent productive operational use of the system, as determined by CCD, then the test will be deemed complete. Regardless, Motorola will remain responsible for the resolution of the documented deficiencies using a punchlist as a controlling document for resolution planning. This punchlist will be tracked by the Motorola and CCD PMs.

Responsibilities and deliverables for Motorola and CCD are defined in Table 2-18.

Table 2-18: Responsibility Matrix

Task	Responsibility	Deliverable
Motorola will perform functional ATPs for the communications system. During each test, test results will be recorded for review and approval of the test.	Motorola	Execution of functional acceptance testing
Upon successful completion of each Acceptance Test on a site-by-site and system-by-system level, CCD and Motorola will sign acceptance certificates documenting acceptance.	CCD	Written approval of successful functional acceptance testing

2.7.14.1 System Coverage Tests

Description

Motorola will conduct system coverage testing as defined in the Coverage Acceptance Test Plan (CATP) include in Section 2.9- System Implementation Plan. All data collection for the CATP will occur during full foliage conditions from May 1st to September 30th. If it becomes clear that the data collection will need to occur outside of this timeframe, Motorola and CCD will mutually agree to a plan to address this situation (which may include delaying the CATP, agreeing to apply a loss for the effects of foliage to applicable areas, or agreeing to a plan for future retesting at reduced granularity).

CCD may request that Motorola conduct coverage testing associated with the ASR at the Mt. Morrison site. This testing would beyond the system CATP and for informational purposes only. If requested, testing will be conducted in a manner similar to the system CATP.

Responsibilities and deliverables for Motorola and CCD are defined in Table 2-19.

Table 2-19: Responsibility Matrix

Task	Responsibility	Deliverable
Motorola will perform coverage testing for the communications system. During each test, test results will be recorded for review and approval of the test.	Motorola	Execution of coverage acceptance testing

Task	Responsibility	Deliverable
Upon successful completion of the coverage testing, CCD and Motorola will sign acceptance certificates documenting acceptance.	CCD	Written approval of successful coverage acceptance testing

2.7.15 TRAINING–CUTOVER–30 DAY TEST–SYSTEM ACCEPTANCE

2.7.15.1 Technical and Usage Training

The purpose of the training program is to provide CCD with a core set of technical training sessions that will ensure the successful integration of the system into daily fleet operations. Dispatcher, System Admin, and first-level diagnostic training will be provided for end users per the selected training courses identified the Training Plan in Section 2.8 – Training Plan. Motorola will conduct courses to thoroughly train CCD personnel on use of the system, and CCD technical personnel on operation and support of the system.

Upon completion of the training program, CCD personnel will be able to operate and manage the system. Responsibilities and deliverables for Motorola and CCD are defined in the responsibility matrix in Table 2-20.

Table 2-20: Responsibility Matrix

Task	Responsibility	Deliverable
Motorola will schedule the training classes defined in the training plan with CCD personnel and the training provider.	Motorola	Scheduled Training Classes
CCD will provide the facility for all scheduled training classes.	CCD	Training Facility
CCD will provide access to the system equipment required for all field training, as defined in the Training Plan.	CCD	Equipment for Training
Upon approval of Field Performance Tests, Motorola will provide training to designated personnel in accordance with the Training Plan.	Motorola	Deliver Training

Completion Criteria

This task is considered complete when the training has been delivered as described in the Training Plan.

2.7.15.2 30-Day Operational Test Plan

Once Motorola has completed the training, a subset of the CCD users; whose number and expected usage will be mutually agreed to by CCD and Motorola; will be activated on the system and a 30-day operational test period will commence. During these 30 days, CCD will note any critical system faults.

Prior to the start of the 30 day operational test, Motorola and CCD will jointly define critical faults.

Critical system faults are issues that severely impact the use of the system and/or affect multiple users, such as link failures, site failures, or controller failures. Critical failures include:

- A failure that causes a loss of more than 15percent of capacity or coverage
- A failure that causes a loss of Simulcast Capability
- A failure which causes loss of Core Equipment
- A system failure that cause a loss of 2 or more console positions
- A failure that renders the logging recorder inoperable or causes the irretrievable loss of recorded audio
- A failure that causes the concurrent loss of two (2) or more repeaters
- A failure that causes the concurrent loss of two (2) or more switches and/or routers
- A failure of the receiver voting system.

The failure of a redundant control component shall not be considered a major failure if the system maintains normal operation without the loss of capacity, coverage, or normal call processing.

Any major system issues will be immediately addressed by Motorola and CCD to find a resolution.

Configuration changes, such as code plugs on subscribers or console resources, are not considered major system failures and will not impact the results of the 30 day operational test.

Use of the system by the subset of users as is required to complete the 30-Day Burn-In Test shall not constitute Beneficial Use as defined in Section 2.7.17, below.

Additional details regarding the 30-Day Burn-In Test are included in Section 2.9.2 of the System Implementation Plan.

Responsibilities and deliverables for Motorola and CCD are defined in Table 2-20.

Table 2-22: Responsibility Matrix

Task	Responsibility	Deliverable
Motorola and CCD will define critical faults.	Motorola and CCD	Critical fault list
30-day operational test commences. All critical faults are captured.	CCD	Fault list
Correction of any critical faults	Motorola	Remediation plan and correction of fault
Sign off on 30-day operation test result	CCD	30-day test sign off

Completion Criteria

This task is considered complete when no critical faults have occurred over a 30-day period and CCD has signed off on the 30-day Operational test results.

2.7.15.3 Cutover to New System Operations

Motorola will develop a comprehensive series of cutover plans that demonstrate the strategy for transitioning the existing radio system to the new P25 Trunked Radio system. In developing the cutover plan, Motorola will work with CCD to minimize the operational impact on system users. Motorola will work directly with CCD's Project Manager, and user agencies, as well as departments and communications center dispatchers and supervisors. These meetings will address how to deal with technical issues, communication impact to users, and general operational issues and planning that need to be accommodated for CCD's various agencies.

A cutover plan timetable listing the chronological order and time frames for all events will be developed. The cutover plan will consider, at a minimum, site equipment and RF system cutover (spectrum management, and tower and equipment space considerations).

The cutover plan will detail timelines, sequence of events, resources involved, potential downtime, operational details, which departments move to the new system, and the order in which they will migrate. The cutover plan will also detail how communications will occur for each department during the transition process with minimal impact to the users.

The cutover plan will consider, at a minimum, the following components:

- The existing CCD radio system and existing microwave network will need to remain functional to the greatest extent possible through system transition without significant loss of dispatch features and radio user communications capability.
- Site equipment and RF system cutover (spectrum management, and tower and equipment space considerations)
- Site power-management strategy (managing peak loads with both systems active)
- Dispatch console upgrade and cutover
- Site "turn up" sequencing.

Responsibilities and deliverables for Motorola and CCD are defined in Table 2-21.

Table 2-21: Responsibility Matrix

Task	Responsibility	Deliverable
Motorola will review the communications system acceptance status, cutover plan, and schedule system cutover with CCD.	Motorola	Completed Cutover Checklist
CCD will review the Cutover Checklist and request any modifications for approval.	CCD	Written Approval of Cutover Check List
Motorola and CCD will execute the cutover plan.	Motorola and CCD	Cutover to New System Operations

Completion Criteria

This task is considered complete when users are fully cut over to operation on the new system.

2.7.16 DOCUMENTATION

During the 30-day test, as-built documentation and manuals will be provided to CCD for review. This documentation will include such project-specific items as: system block and level diagrams, IP network configurations and IP addressing plans, parts/equipment/serial number lists (by location), as well as, passwords and login information for all software, applications, operating systems, including technician, admin, and user accounts, logons, and passwords.

Motorola provides documentation of the system configurations, physical installation, and system testing. Documentation will be created and updated during the project. Electronic versions of custom documentation will be provided both in a viewable format and in the documents standard format. Documentation will be provided in CCD-maintainable formats (MS Office, Visio, AutoCAD or other formats), and may be provided in PDF format where the provided documentation depends on Motorola-proprietary formats.

Table 2-23: Responsibility Matrix

Task	Responsibility	Deliverable
All documents listed in the System Manual – “As-Built” Documentation Section will be submitted, as they become ready.	Motorola	System Manual – “As-Built” Documents
Final approvals of all System Manual – “As-Built” Documents.	CCD	Written Approval by CCD

2.7.17 SYSTEM ACCEPTANCE

System acceptance will occur upon successful completion of the functional system tests, coverage tests, training, and the 30-day operational test. Upon system acceptance, Motorola and CCD will memorialize the event by promptly executing a system acceptance certificate.

If CCD believes the system has failed the completed acceptance tests, CCD will provide Motorola a written notice that includes the specific details of the failure. Minor omissions or variances in the system that do not materially impair the operation of the system as a whole will not postpone system acceptance or subsystem acceptance, but will be corrected according to a mutually-agreed schedule.

CCD acknowledges that Motorola's ability to perform its implementation and testing responsibilities may be impeded if CCD begins using the System before system acceptance. Therefore, CCD will not commence beneficial use before system acceptance without Motorola's prior written authorization, which will not be unreasonably withheld. Use of the system by CCD for the purposes of testing; including functional, coverage, or 30-Day Burn-in testing; optimization; training; cutover preparation; or other purposes agreed to mutually by CCD and Motorola shall not constitute beneficial use. Motorola is not responsible for performance deficiencies that occur during unauthorized beneficial use. Upon commencement of beneficial use, CCD assumes responsibility for the use and operation of the system.

Milestones 	Use of the system by CCD in accordance with the provisions listed above shall constitute the project milestone of Beneficial Use. Completion of all activities in Sections 2.7.14 and 2.7.15, along with execution by CCD of a system acceptance certificate, shall constitute the project milestone of System Acceptance.

2.7.18 EXISTING/LEGACY SYSTEM EQUIPMENT REMOVAL

Motorola shall remove existing equipment (e.g., transmitters, consoles, mobiles, cables, antenna systems, and if applicable, shelters from existing sites) not being reused in the new system.

Motorola shall return removed equipment to a CCD-provided location prior to disposal. Motorola shall be responsible for the disposal of the removed equipment from this location but only following written approval by CCD and per equipment disposal polices to be provided by CCD to Motorola.

Motorola shall maintain a detailed inventory of the removed equipment, listing the following at a minimum:

1. The owning agency
2. Model numbers
3. Serial numbers
4. Asset numbers
5. Location removed from
6. Location within the warehouse

Motorola shall transport removed equipment to CCD-specified disposal location.

2.7.19 PROJECT FINALIZATION

The finalization phase of the project consists of ensuring that all criteria for final project completion have been met. Responsibilities and deliverables for Motorola and CCD are defined in Table 2-22.

Table 2-24: Responsibility Matrix

Task	Responsibility	Deliverable
Motorola will resolve punchlist items documented at System Acceptance.	Motorola	Approved Punchlist Resolution
Motorola will ensure that the project team and the Service organization work closely together to provide a seamless transition to the warranty phase of the project.	Motorola	Service Transition Certificate and Customer Support Plan
CCD will acknowledge Final Project Completion upon completion of the criteria for Final Project Completion for the communications system.	CCD	Signed Final Acceptance Documents

Completion Criteria

This task is considered complete when CCD and Motorola have signed the final project completion certificate, representing the completion of the system and acknowledgement of system acceptance as described in the acceptance test plan.

Final project acceptance will occur after system acceptance, when all deliverables and other work have been completed. When final project acceptance occurs, the parties will promptly memorialize this final event by so indicating on the system acceptance certificate.

2.7.20 CIVIL WORK

This Section provides an initial plan for the site preparation, site development, and site civil work to be performed by Motorola. Motorola and CCD will perform site walks as part of the Detailed Design Review, as described above in Section 2.7.2, and shall, prior to completion of the Detailed Design Review, adjust this section to reflect any required changes to tasks.

2.7.20.1 Site Development at Mountain Towers Site

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.

Motorola Responsibilities:

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.).
- 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 record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection

1.1307 that may be potentially 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. Perform a cultural resource study, as needed to identify sensitive historical and archaeological monuments that might be impacted by propose construction.

- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed the proposed equipment loads.
- Design multi antenna support platform to support proposed antennas and dishes.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

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.

Antenna and Transmission Line Installation

- Install 4 antenna(s) for the RF system as well as antenna dishes as required to complete backhaul design.
- Remove existing microwave dishes and microwave transmission line as part of removal of existing/legacy system.
- Supply and install an antenna mount system to as is required to support proposed antennas on either rooftop or tower.
- Install 2 GPS antenna(s).
- Install up to 720 linear feet of 1/2-inch transmission line.
- Install up to 720 linear feet of 7/8-inch transmission line.
- Install required antenna line for microwave dishes.
- Perform sweep tests on transmission lines and provide results to CCD.
- Provide and install six hole hanger blocks and attachment hardware for supporting transmission lines on the antenna support structure every three feet.
- Provide and install up to 500 linear ft of PVC sleepers and attachment hardware for supporting transmission lines on rooftop every three feet.
- Supply and install ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.
- Supply and install #2/0 stranded copper ground (not to exceed300 linear feet) for grounding the antennas to the building ground.

Existing Facility Improvement Work

- Supply and install 1 100-amp breaker panel with capacity for 20 circuits.
- Supply and install up to 20 20-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Install up to 8 8-outlet distribution-bar(s) and wire each outlet to individual breaker.
- Install 1 Type 2 surge protector on electrical service side of the ATS.
- Supply and install 24-inch-wide cable runway (up to 220 linear feet) inside the existing room.
- Supply and install cable entry port.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.
- Supply and install 1 copper ground buss bar(s).

- Supply 50KVA, 120/240V primary and 120/240V secondary, four winding, single-phase, 60Hz transformer.
- Install isolation transformer including bolting down and wiring to disconnect located within 20'.

Miscellaneous Work

- Provide rooftop cranes and rigging
- Cut cable ports

2.7.20.2 Site Development at Denver Housing Site

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.

Motorola Responsibilities:

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.).
- 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 record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially 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. Perform a cultural resource study, as needed to identify sensitive historical and archaeological monuments that might be impacted by propose construction.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed the proposed equipment loads.
- Design multi antenna support platform to support proposed antennas and dishes.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

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.

Antenna and Transmission Line Installation

- Install 4 antenna(s) for the RF system.
- Supply and install 6 rooftop non-penetrating antenna mount(s) to support proposed antennas.
- Install 2 GPS antenna(s).
- Install up to 320 linear feet of 1/2-inch transmission line.

- Install up to 320 linear feet of 7/8-inch transmission line.
- Perform sweep tests on transmission lines.
- Provide and install six hole hanger blocks and attachment hardware for supporting transmission lines on the antenna support structure every three feet.
- Provide and install up to 500 linear ft of PVC sleepers and attachment hardware for supporting transmission lines on rooftop every three feet.
- Supply and install ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.
- Supply and install #2/0 stranded copper ground (not to exceed300 linear feet) for grounding the antennas to the building ground.

Existing Facility Improvement Work

- Supply and install 1 100-amp breaker panel with capacity for 20 circuits.
- Supply and install up to 20 20-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Install up to 8 8-outlet distribution-bar(s) and wire each outlet to individual breaker.
- Install 1 Type 2 surge protector on electrical service side of the ATS.
- Supply and install 24-inch-wide cable runway (up to 100 linear feet) inside the existing room.
- Supply and install cable entry port.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.
- Supply and install 1 copper ground buss bar(s).
- Supply 50KVA, 120/240V primary and 120/240V secondary, four winding, single-phase, 60Hz transformer.
- Install isolation transformer including bolting down and wiring to disconnect located within 20'.

Miscellaneous Work

- Provided rooftop cranes and rigging
- Cut cable ports

2.7.20.3 Site Development at 1670 Broadway Site

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.

Motorola Responsibilities:

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.).
- 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 record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and

cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially 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. Perform a cultural resource study, as needed to identify sensitive historical and archaeological monuments that might be impacted by propose construction.

- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed equipment loads.
- Design multi antenna support platform to support proposed antennas and dishes.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

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.

Antenna and Transmission Line Installation

- Install 4 antenna(s) for the RF system.
- Supply and install 6 rooftop non-penetrating antenna mount(s) to support proposed antennas.
- Install 2 GPS antenna(s).
- Install up to 1060 linear feet of 1/2-inch transmission line.
- Install up to 1060 linear feet of 7/8-inch transmission line.
- Perform sweep tests on transmission lines.
- Provide and install six hole hanger blocks and attachment hardware for supporting transmission lines on the antenna support structure every three feet.
- Provide and install up to 500 linear ft of PVC sleepers and attachment hardware for supporting transmission lines on rooftop every three feet.
- Supply and install ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.
- Supply and install #2/0 stranded copper ground (not to exceed300 linear feet) for grounding the antennas to the building ground.

Existing Facility Improvement Work

- Supply and install 1 100-amp breaker panel with capacity for 20 circuits.
- Supply and install up to 20 20-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Install up to 8 8-outlet distribution-bar(s) and wire each outlet to individual breaker.
- Install 1 Type 2 surge protector on electrical service side of the ATS.
- Supply and install 24-inch-wide cable runway (up to 100 linear feet) inside the existing room.
- Supply and install cable entry port.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.
- Supply and install 1 copper ground buss bar(s).
- Supply 50KVA, 120/240V primary and 120/240V secondary, four winding, single-phase, 60Hz transformer.
- Install isolation transformer including bolting down and wiring to disconnect located within 20'.

Miscellaneous Work

- Provided rooftop cranes and rigging
- Install 6" conduit for coax
- Remove existing HVAC units
- Supply and install split system HVAC
- Remove 20' tower sections on existing antenna structure used for the new system.

2.7.20.4 Site Development at DFD 2 Site

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- New tower to be used for antennas – 125-foot self-supported tower.
- New 20’ Ice Bridge for tower to shelter span
- New tower foundation size – 60 cubic yard, Type – Pier and pad.

Motorola Responsibilities:

Site Acquisition

- Prepare initial zoning analysis of municipal and zoning districts within each search ring, along with an overview of the zoning and permitting process accompanying timeframes.
- Conduct a constructability analysis of the site with respect to feasibility, cost, time and effort required to construct the site.
- Coordinate zoning and permitting of the new tower site such that it is in full compliance with applicable jurisdictional requirements.

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 boundary and topographic survey for the property on which the communication site is located or will be located.
- 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.
- Perform construction staking around the site to establish reference points for proposed construction.
- 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

- 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.

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.

Tower Work

- Construct pier and pad type tower foundations including excavation, rebar and concrete (not to exceed 60 cubic yards).
- Erect new 125-foot self-supported tower which shall have the capacity to support all antennas (radio and microwave) required by this system plus and excess capacity of 25% additional antenna load.
- Supply and install grounding for the tower base for self-supported towers
- Supply and install an ice bridge between the tower and comm shelter
  - Since the exact location of the tower at DFD Station #2 is unknown, Motorola is providing a 20' ice bridge. Final location of the tower may change the length required for the ice bridge.
- Remove existing tower after legacy system is decommissioned and notice for removal is received from CCD

Antenna and Transmission Line Installation

- Install 4 antenna(s) for the RF system.
- Install 2 GPS antenna(s).
- Install up to 300 linear feet of 1/2-inch transmission line.
- Install up to 300 linear feet of 7/8-inch transmission line.
- Perform sweep tests on transmission lines.
- 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 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work

- Supply and install 1 100-amp breaker panel with capacity for 20 circuits.
- Supply and install up to 20 20-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Install up to 8 8-outlet distribution-bar(s) and wire each outlet to individual breaker.
- Install 1 Type 2 surge protector on electrical service side of the ATS.
- Supply and install 24-inch-wide cable runway (up to 100 linear feet) inside the existing room.
- Supply and install cable entry port.

- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.
- Supply and install 1 copper ground buss bar(s).
- Supply 50KVA, 120/240V primary and 120/240V secondary, four winding, single-phase, 60Hz transformer.
- Install isolation transformer including bolting down and wiring to disconnect located within 20'.

Miscellaneous Work

- Cut cable ports
- Remove existing HVAC units
- Supply and install split system HVAC

2.7.20.5 Site Development at Mt Morrison Site

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- Existing tower to be used for antennas – 270 ' Guyed Tower.

Motorola Responsibilities:

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.).
- 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 record drawings of the site showing the as-built information.
- Perform a boundary and topographic survey for the property on which the communication site is located or will be located.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially 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.
- Perform four point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. If the tower structure fails the analysis, the cost of any site relocation or modifications to the tower required to support the antenna system will be the responsibility of City and County of Denver. NOTE: This task does not include mapping, structural measurement survey, materials testing, geotechnical investigation, and/or other field investigation to acquire the data. If applicable, these tasks will be noted separately in the SOW.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

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.

Antenna and Transmission Line Installation

- Install 4 antenna(s) for the RF system.
- Supply and install 4 heavy duty mount(s) for Bogner antennas.
- Install 2 GPS antenna(s).
- Install up to 390 linear feet of 1/2-inch transmission line.
- Install up to 390 linear feet of 7/8-inch transmission line.
- Perform sweep tests on transmission lines.
- Provide and install six hole hanger blocks and attachment hardware for supporting transmission lines on the antenna support structure every three feet.
- Provide and install up to 500 linear ft of PVC sleepers and attachment hardware for supporting transmission lines on on rooftop every three feet.
- Supply and install ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.
- Supply and install #2/0 stranded copper ground (not to exceed300 linear feet) for grounding the antennas to the building ground.

Existing Facility Improvement Work

- Supply and install 1 100-amp breaker panel with capacity for 20 circuits.
- Supply and install up to 20 20-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Install up to 8 8-outlet distribution-bar(s) and wire each outlet to individual breaker.
- Install 1 Type 2 surge protector on electrical service side of the ATS.
- Supply and install 24-inch-wide cable runway (up to 100 linear feet) inside the existing room.
- Supply and install cable entry port.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola’s Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.
- Supply and install 1 copper ground buss bar(s).
- Supply 50KVA, 120/240V primary and 120/240V secondary, four winding, single-phase, 60Hz transformer.
- Install one isolation transformer including bolting down and wiring to disconnect located within 20'.

Miscellaneous Work

- Cut cable ports

2.7.20.6 Global Customer Civil Responsibilities, as required:

- At the Josephine location, a new microwave hop will be installed to replace an existing microwave link. At this location, it is the responsibility of CCD to conduct a structural analysis of the structure which will support the new microwave dish.
- 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.
- Arrange for space on the structure for installation of new antennas at the proposed heights on designated existing antenna-mounting structures.
- Provide as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) for Motorola to conduct a structural analysis.
- Provide support facilities for the antenna cables (cable ladder, entry ports, waveguide bridge) from the antenna to the equipment room.
- Secure power connection to the site, associated permitting and installation of a meter, and disconnect within 50 feet of the proposed equipment room location.
- Provide space, HVAC, backup power (UPS, generator), outlets, grounding, surge suppression, lighting, fire suppression and cabling facilities for the equipment room per Motorola's R56 specifications. Ceiling and cable tray heights in the equipment rooms should be such as to accommodate 7-1/2-foot equipment racks, and the ceiling should be 9 feet or greater.
- Confirm that there is adequate utility service to support the new equipment and ancillary equipment.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.
- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Supply required standby generator power to support the additional proposed equipment. This power source shall be adequate to back up all radio equipment, future equipment growth, and ancillary equipment such as, but not limited to, interior lighting, tower lighting and HVAC.
- Secure power connection to the room, associated permitting, and installation of a meter and disconnect within 50 feet of the proposed shelter location.

2.7.20.7 Global Civil Assumptions, as applicable:

- All installation work will meet Denver specification noted in Section 5 of the RFP, including the CCD Technology Cabling, Infrastructure, and Installation Requirements

- 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.
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing, geotechnical borings or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- The new shelter can be located within 20 feet of the existing tower location and the generator/fuel tank can be located within 25 feet of the shelter.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.

- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on “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.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola’s R56 standards.
- The existing utility service and backup power facilities (UPS, generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The Customer does not desire upgrade of the existing site to meet Motorola’s R56 standards.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.

2.7.20.8 Civil Completion Criteria

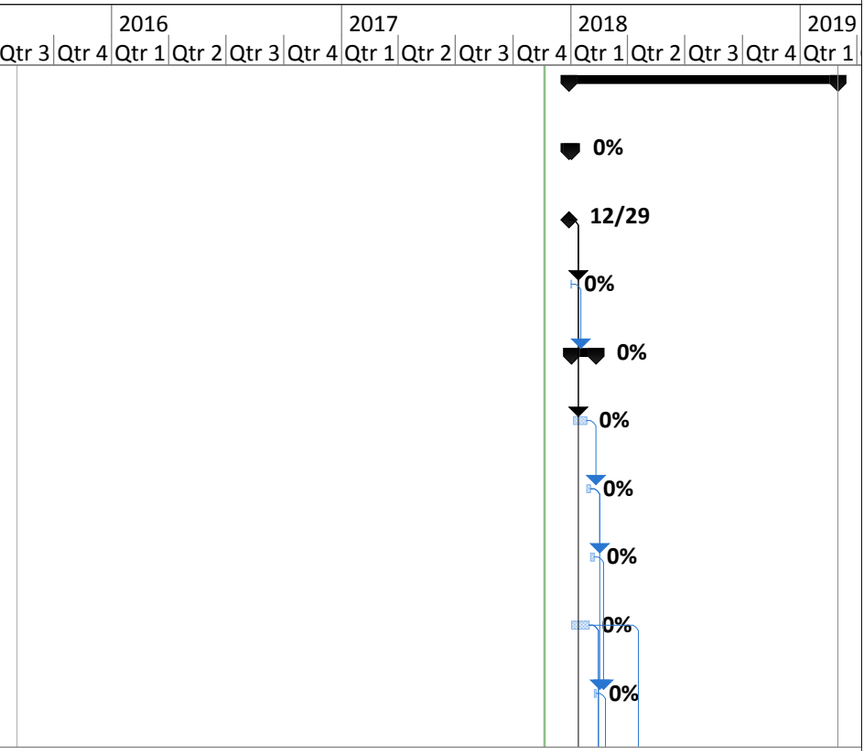
- Site development completed per issued for construction (IFC) construction drawings, project requirements, contractual obligations (including any customer/Motorola approved changes) and approved by City and County of Denver.
  - This shall be confirmed by contractor and reviewed with Motorola construction 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 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.

2.7.21 PROJECT SCHEDULE

Project Schedule is included on the pages that follow.

City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
1	City and County of Denver - Preliminary Schedule	**306 days**	**Fri 12/29/17**	**Fri 3/1/19**
2	Contract	**2 days**	**Fri 12/29/17**	**Mon 1/1/18**
3	Contract Award	0 days	Fri 12/29/17	Fri 12/29/17
4	Kickoff Meeting	1 day	Mon 1/1/18	Mon 1/1/18
5	Contract Design Review	**29 days**	**Tue 1/2/18**	**Fri 2/9/18**
6	Site Survey	15 days	Fri 1/5/18	Thu 1/25/18
7	Finalize Coverage	4 days	Fri 1/26/18	Wed 1/31/18
8	Overall System Design Locked Down	4 days	Thu 2/1/18	Tue 2/6/18
9	Structural/Site Design	20 days	Tue 1/2/18	Mon 1/29/18
10	Update Design Documentation	3 days	Wed 2/7/18	Fri 2/9/18



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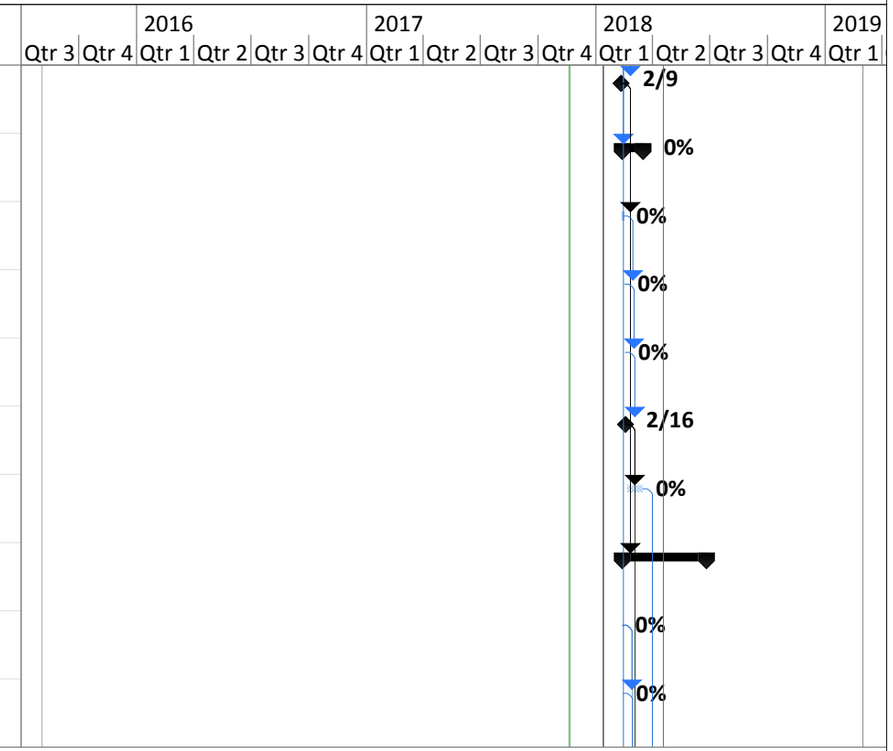
City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
11	Customer Approval on Updated System Design	0 days	Fri 2/9/18	Fri 2/9/18
12	Order Processing	**25 days**	**Mon 2/12/18**	**Fri 3/16/18**
13	Finalize Equipment Lists and Trial Validation	2 days	Mon 2/12/18	Tue 2/13/18
14	Order Administration and Shipping Information	2 days	Wed 2/14/18	Thu 2/15/18
15	Make Order	1 day	Fri 2/16/18	Fri 2/16/18
16	Order Bridged	0 days	Fri 2/16/18	Fri 2/16/18
17	Manufacture Equipment	20 days	Mon 2/19/18	Fri 3/16/18
18	Install tower at FS2	**96 days**	**Mon 2/12/18**	**Mon 6/25/18**
19	Site visit with A&E	0.5 days	Mon 2/12/18	Mon 2/12/18
20	Prepare site sketch/Lease Exhibit	1 day	Mon 2/12/18	Tue 2/13/18



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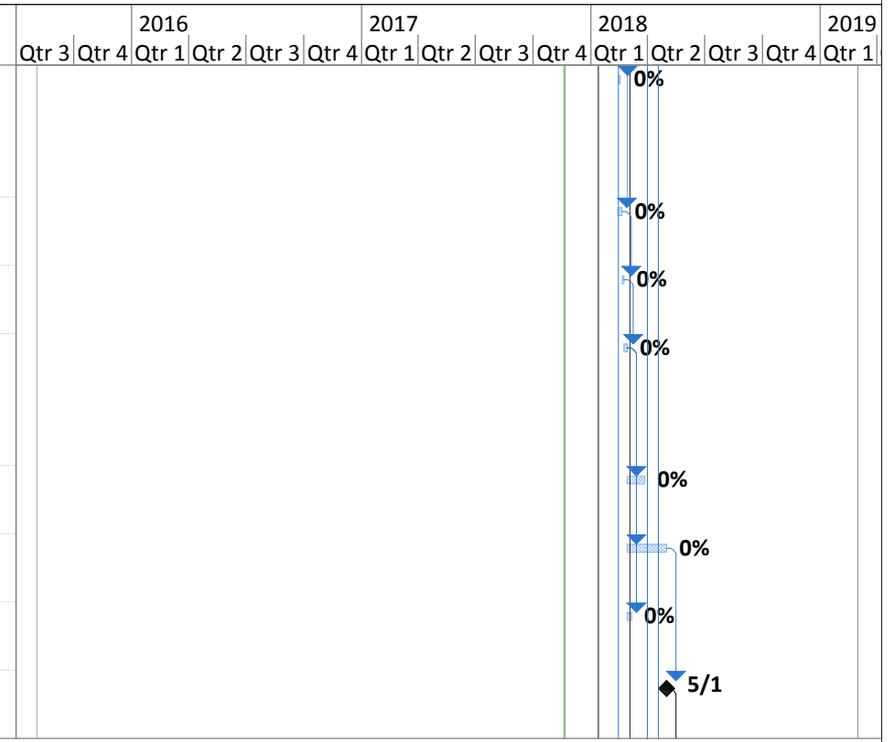
City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
21	Review and approval of site sketch by City and County of Denver, owner and Motorola	3 days	Tue 2/13/18	Fri 2/16/18
22	Site survey and mapping	5 days	Mon 2/12/18	Mon 2/19/18
23	Preliminary drawings for zoning/City and County of Denver approval	3 days	Mon 2/19/18	Thu 2/22/18
24	Review and approval of drawings by City and County of Denver, owner and Motorola	3 days	Thu 2/22/18	Tue 2/27/18
25	New tower zoning application and approvals	20 days	Tue 2/27/18	Tue 3/27/18
26	NEPA/SHPO studies and approvals	45 days	Tue 2/27/18	Tue 5/1/18
27	Geotechnical Testing and Report	5 days	Tue 2/27/18	Tue 3/6/18
28	*Order Tower Materials based on final antenna locations*	*0 days*	Tue 5/1/18	Tue 5/1/18



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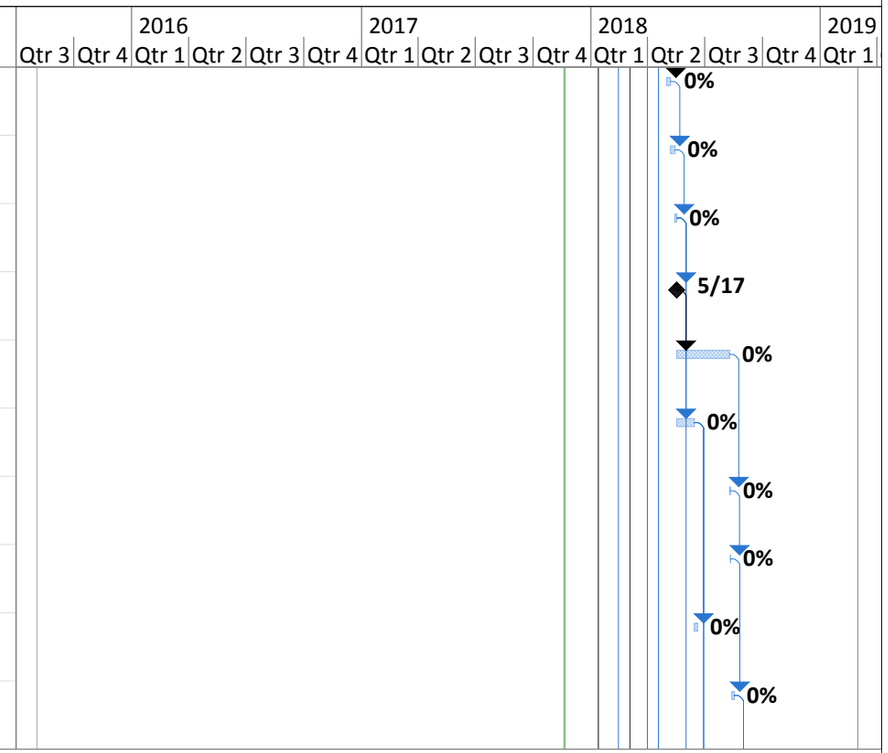
City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
29	Tower design and drawings	4 days	Tue 5/1/18	Mon 5/7/18
30	Complete Final Detailed drawings for City and County of Denver rev	5 days	Mon 5/7/18	Mon 5/14/18
31	City and County of Denver approval of Final Construction drawings	3 days	Mon 5/14/18	Thu 5/17/18
32	*Site release/ Construction NTP to Contractor*	*0 days*	Thu 5/17/18	Thu 5/17/18
33	Building and construction permit application and approval	60 days	Thu 5/17/18	Thu 8/9/18
34	Tower Manufacturing	20 days	Thu 5/17/18	Thu 6/14/18
35	Locate existing utilities	1 day	Thu 8/9/18	Fri 8/10/18
36	Construction staking	0.5 days	Fri 8/10/18	Fri 8/10/18
37	Ship anchor bolts and base plates to the site	3 days	Thu 6/14/18	Tue 6/19/18
38	Drill, rebar and pour pier and pad foundation	4 days	Mon 8/13/18	Thu 8/16/18



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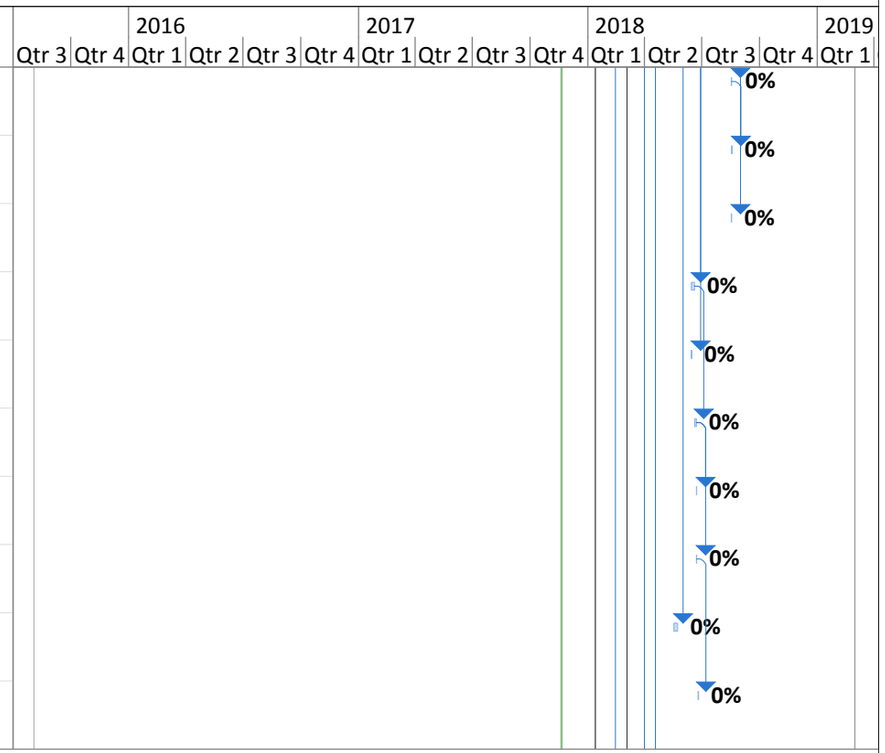
City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
39	Foundation Inspection/concrete testing	0.5 days	Fri 8/17/18	Fri 8/17/18
40	Tower grounding	0.5 days	Fri 8/17/18	Fri 8/17/18
41	Strip forms, backfill and compaction	0.5 days	Fri 8/17/18	Fri 8/17/18
42	Ship tower to site	3 days	Thu 6/14/18	Tue 6/19/18
43	Notify FAA of impending tower construction (7460-2)	0.5 days	Thu 6/14/18	Thu 6/14/18
44	Tower assembly and stacking	3 days	Tue 6/19/18	Fri 6/22/18
45	Tower plumbness testing	0.5 days	Fri 6/22/18	Fri 6/22/18
46	Notify FAA of tower completion (7460-2)	0.5 days	Fri 6/22/18	Fri 6/22/18
47	Ship antennas, line and accessories to the site	4 days	Thu 5/17/18	Wed 5/23/18
48	Install cable support facilities on existing structure	1 day	Mon 6/25/18	Mon 6/25/18



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City and County of Denver
Preliminary Project Schedule

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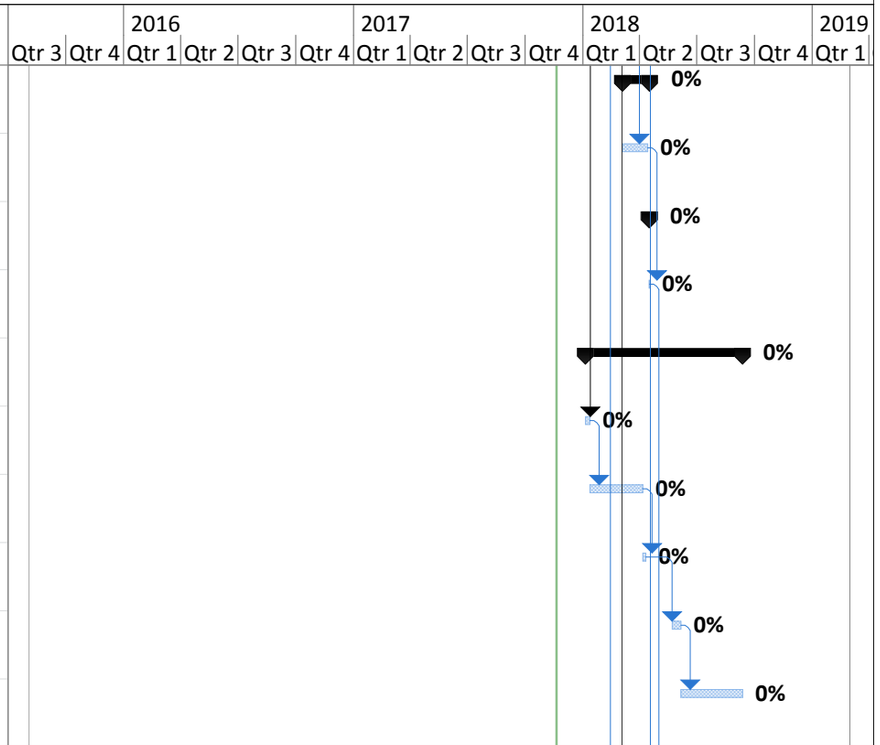
49	**Manufacturing and Staging**	**31 days**	**Mon 3/5/18**	**Mon 4/16/18**
50	CCSi Factory Staging	30 days	Mon 3/5/18	Fri 4/13/18
51	**Factory System Acceptance Test (FATP)**	**1 day**	**Mon 4/16/18**	**Mon 4/16/18**
52	CCSi Factory Staging Complete	1 day	Mon 4/16/18	Mon 4/16/18
53	**Microwave Design & Installation**	**178 days**	**Fri 1/5/18**	**Tue 9/11/18**
54	Physical Path Surveys	5 days	Fri 1/5/18	Thu 1/11/18
55	FCC Coordination	60 days	Fri 1/12/18	Thu 4/5/18
56	Order	3 days	Fri 4/6/18	Tue 4/10/18
57	Stage Microwave	10 days	Wed 5/23/18	Tue 6/5/18
58	Installation & Commissioning Onsite	70 days	Wed 6/6/18	Tue 9/11/18



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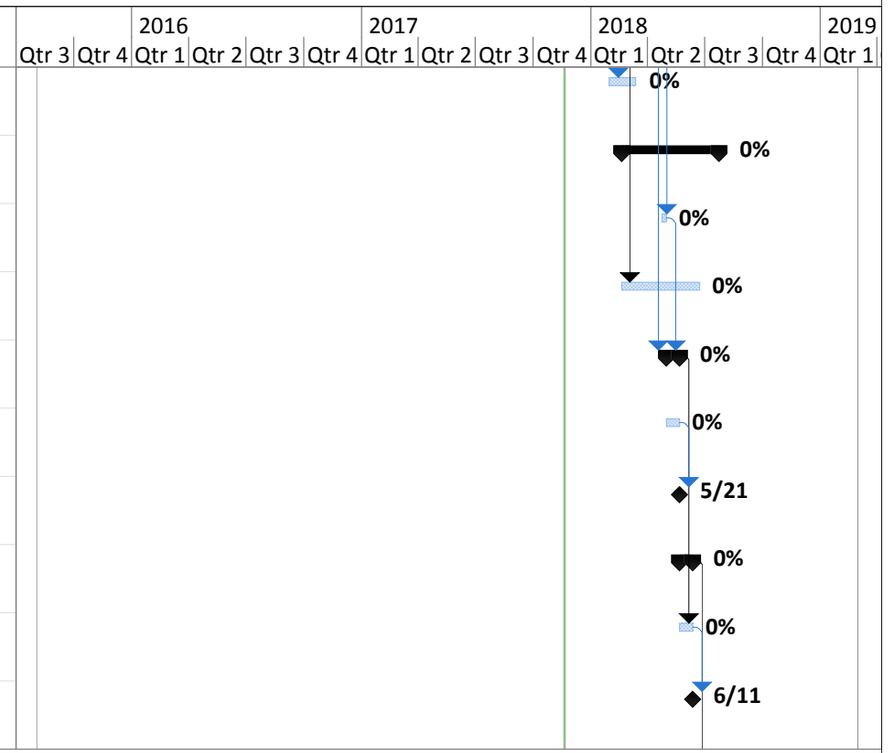
City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
59	Permitting	30 days	Tue 1/30/18	Mon 3/12/18
60	FNE Installation	**111 days**	**Mon 2/19/18**	**Mon 7/23/18**
61	Receive and Inventory Equipment	5 days	Tue 4/24/18	Mon 4/30/18
62	Receive and Inventory Non Motorola Manufactured Equipment	90 days	Mon 2/19/18	Fri 6/22/18
63	Site Main Master and Prime Site	**15 days**	**Tue 5/1/18**	**Mon 5/21/18**
64	Install Master Site/Prime Site Equipment	15 days	Tue 5/1/18	Mon 5/21/18
65	Site Equipment Install Complete	0 days	Mon 5/21/18	Mon 5/21/18
66	Site - DSR Master and Redundant Prime	**15 days**	**Tue 5/22/18**	**Mon 6/11/18**
67	Install DSR Master/Geo-Prime Equipment	15 days	Tue 5/22/18	Mon 6/11/18
68	Site Equipment Install Complete	0 days	Mon 6/11/18	Mon 6/11/18



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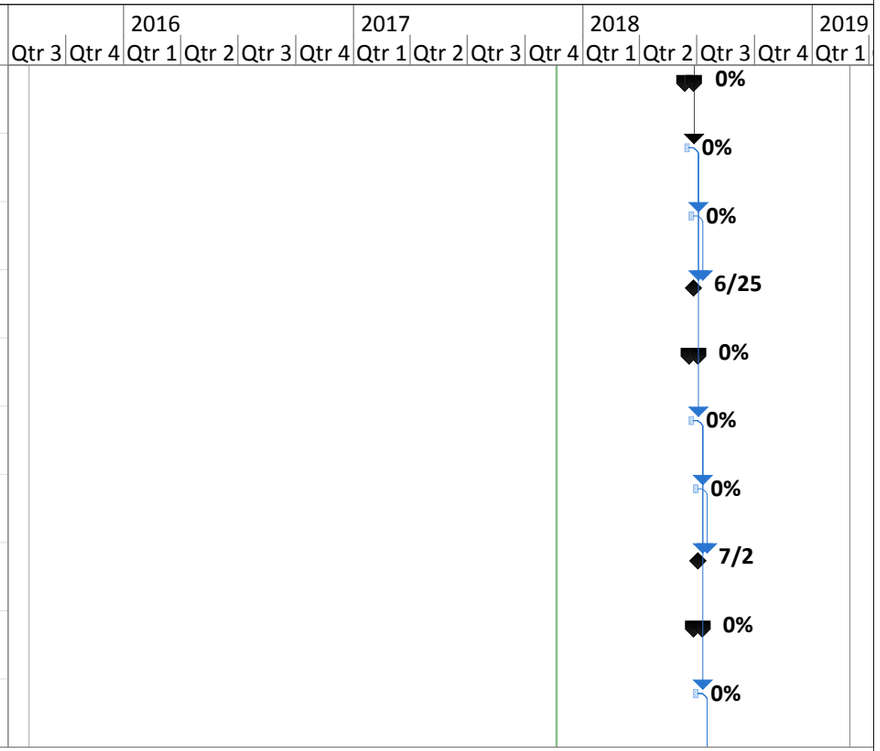
City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
69	**RF Site 1 (Broadway)**	**10 days**	**Tue 6/12/18**	**Mon 6/25/18**
70	RF Equipment	5 days	Tue 6/12/18	Mon 6/18/18
71	Install Antenna System	5 days	Tue 6/19/18	Mon 6/25/18
72	Site Equipment Install Complete	0 days	Mon 6/25/18	Mon 6/25/18
73	**RF Site 2 (Denver Housing Authority)**	**10 days**	**Tue 6/19/18**	**Mon 7/2/18**
74	RF Equipment	5 days	Tue 6/19/18	Mon 6/25/18
75	Install Antenna System	5 days	Tue 6/26/18	Mon 7/2/18
76	Site Equipment Install Complete	0 days	Mon 7/2/18	Mon 7/2/18
77	**RF Site 3 (Denver FD Stn 2)**	**10 days**	**Tue 6/26/18**	**Mon 7/9/18**
78	RF Equipment	5 days	Tue 6/26/18	Mon 7/2/18



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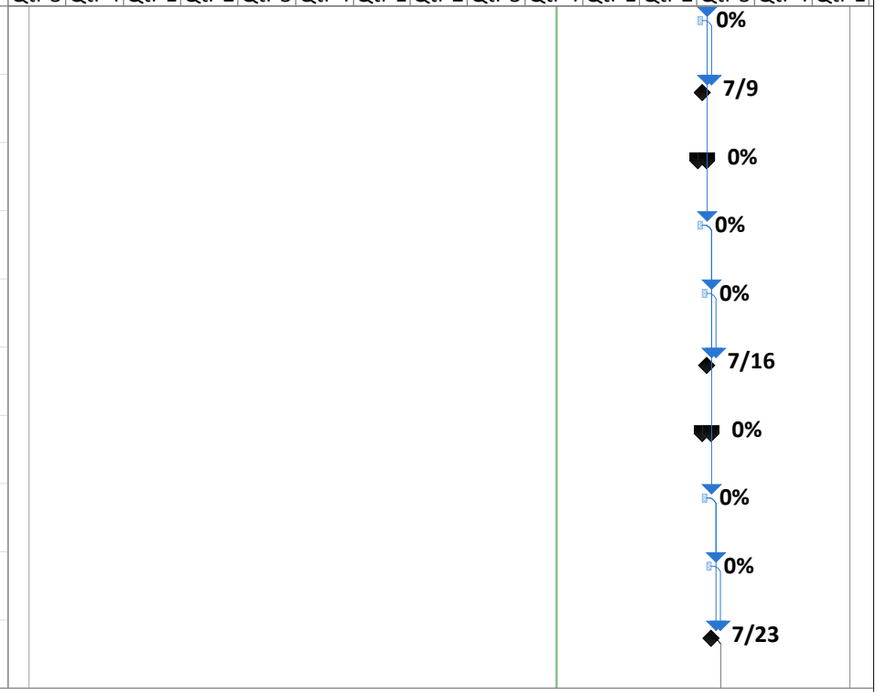
City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
79	Install Antenna System	5 days	Tue 7/3/18	Mon 7/9/18
80	Site Equipment Install Complete	0 days	Mon 7/9/18	Mon 7/9/18
81	**RF Site 4 (Mountain Towers)**	**10 days**	**Tue 7/3/18**	**Mon 7/16/18**
82	RF Equipment	5 days	Tue 7/3/18	Mon 7/9/18
83	Install Antenna System	5 days	Tue 7/10/18	Mon 7/16/18
84	Site Equipment Install Complete	0 days	Mon 7/16/18	Mon 7/16/18
85	**RF Site 5 (Mount Morrison)**	**10 days**	**Tue 7/10/18**	**Mon 7/23/18**
86	RF Equipment	5 days	Tue 7/10/18	Mon 7/16/18
87	Install Antenna System	5 days	Tue 7/17/18	Mon 7/23/18
88	Site Equipment Install Complete	0 days	Mon 7/23/18	Mon 7/23/18



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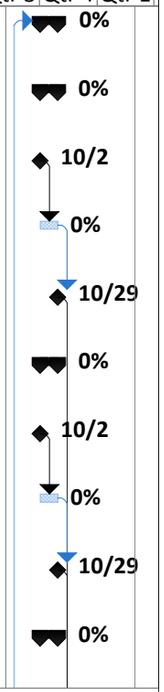
City and County of Denver
Preliminary Project Schedule

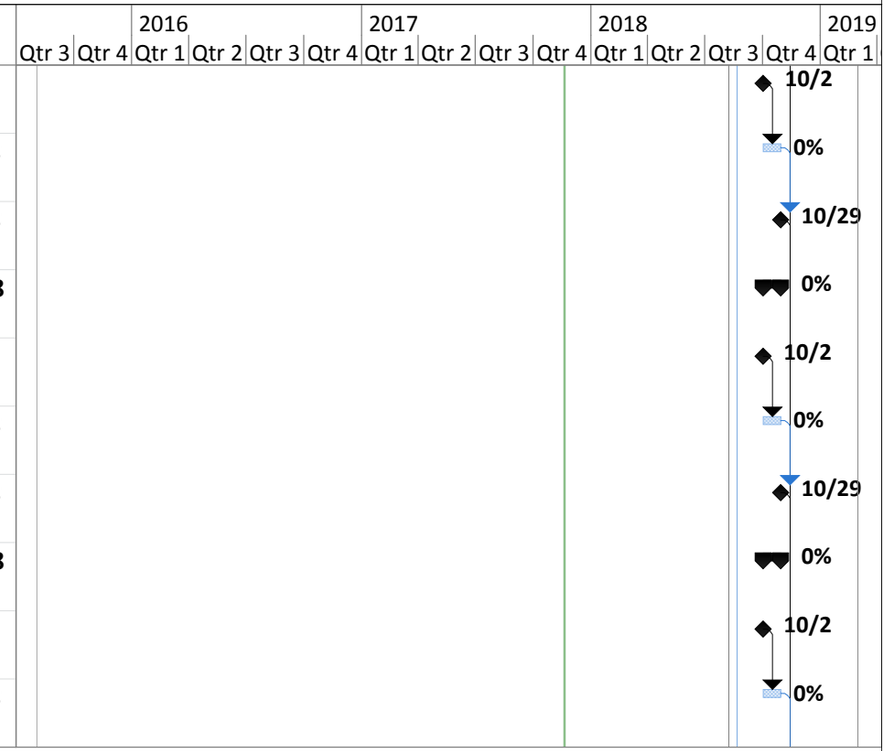
ID	Task Name	Duration	Start	Finish
89	Dispatch Center Equipment Installation	**20 days**	**Tue 10/2/18**	**Mon 10/29/18**
90	Primary Dispatch 26 positions	**20 days**	**Tue 10/2/18**	**Mon 10/29/18**
91	Site Ready for install	0 days	Tue 10/2/18	Tue 10/2/18
92	Install New Dispatch Console Equipment	20 days	Tue 10/2/18	Mon 10/29/18
93	Site Equipment Install Complete	0 days	Mon 10/29/18	Mon 10/29/18
94	Backup Dispatch 16 positions	**20 days**	**Tue 10/2/18**	**Mon 10/29/18**
95	Site Ready for install	0 days	Tue 10/2/18	Tue 10/2/18
96	Install New Dispatch Console Equipment	20 days	Tue 10/2/18	Mon 10/29/18
97	Site Equipment Install Complete	0 days	Mon 10/29/18	Mon 10/29/18
98	Denver Criminal Courts Dispatch 1 position	**20 days**	**Tue 10/2/18**	**Mon 10/29/18**



Critical		Duration-only		Summary	
Critical Split		Path Successor Milestone Task		Manual Summary	
Critical Progress		Path Successor Summary Task		Project Summary	
Task		Path Successor Normal Task		External Tasks	
Split		Baseline		External Milestone	
Task Progress		Baseline Split		Inactive Task	
Manual Task		Baseline Milestone		Inactive Milestone	
Start-only		Milestone		Inactive Summary	
Finish-only		Summary Progress		Deadline	

City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
99	Site Ready for install	0 days	Tue 10/2/18	Tue 10/2/18
100	Install New Dispatch Console Equipment	20 days	Tue 10/2/18	Mon 10/29/18
101	Site Equipment Install Complete	0 days	Mon 10/29/18	Mon 10/29/18
102	Denver County Corrections Dispatch 2 positions	**20 days**	**Tue 10/2/18**	**Mon 10/29/18**
103	Site Ready for install	0 days	Tue 10/2/18	Tue 10/2/18
104	Install New Dispatch Console Equipment	20 days	Tue 10/2/18	Mon 10/29/18
105	Site Equipment Install Complete	0 days	Mon 10/29/18	Mon 10/29/18
106	Denver Right of Way Dispatch 3 positions	**20 days**	**Tue 10/2/18**	**Mon 10/29/18**
107	Site Ready for install	0 days	Tue 10/2/18	Tue 10/2/18
108	Install New Dispatch Console Equipment	20 days	Tue 10/2/18	Mon 10/29/18



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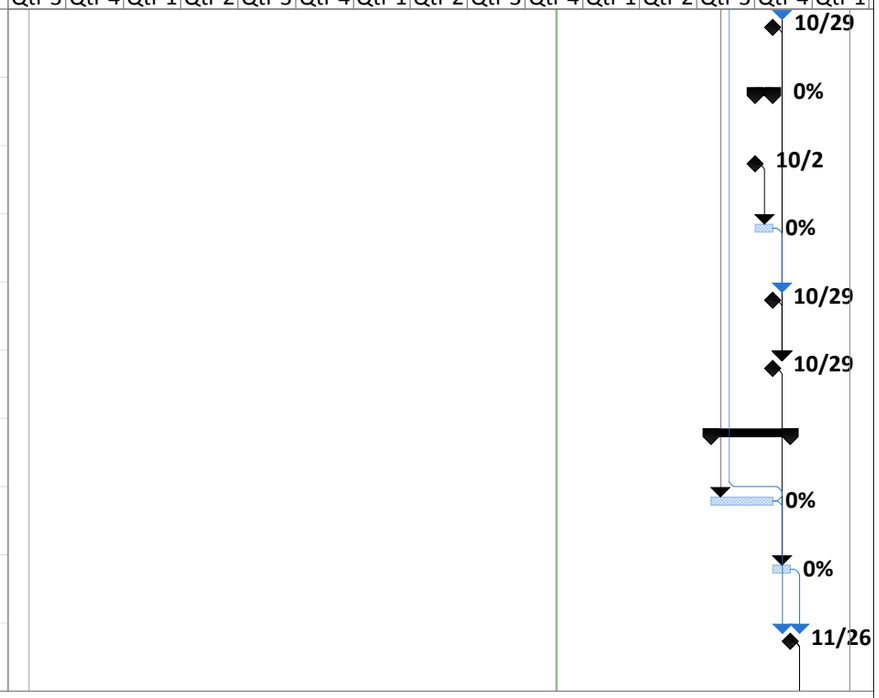
Manual Task		Baseline Milestone		Inactive Milestone	
Start-only		Milestone		Inactive Summary	
Finish-only		Summary Progress		Deadline	

City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
109	Site Equipment Install Complete	0 days	Mon 10/29/18	Mon 10/29/18
110	Radio Shop Dispatch 1 position	**20 days**	**Tue 10/2/18**	**Mon 10/29/18**
111	Site Ready for install	0 days	Tue 10/2/18	Tue 10/2/18
112	Install New Dispatch Console Equipment	20 days	Tue 10/2/18	Mon 10/29/18
113	Site Equipment Install Complete	0 days	Mon 10/29/18	Mon 10/29/18
114	All Dispatch Installation Complete Ready for Optimization	0 days	Mon 10/29/18	Mon 10/29/18
115	System Optimization	**90 days**	**Tue 7/24/18**	**Mon 11/26/18**
116	Optimization of Master Site, Prime & Remote Sites	70 days	Tue 7/24/18	Mon 10/29/18
117	Optimization of Dispatch Consoles	20 days	Tue 10/30/18	Mon 11/26/18
118	Optimization Complete	0 days	Mon 11/26/18	Mon 11/26/18



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Critical Progress		Path Successor Summary Task		Project Summary	
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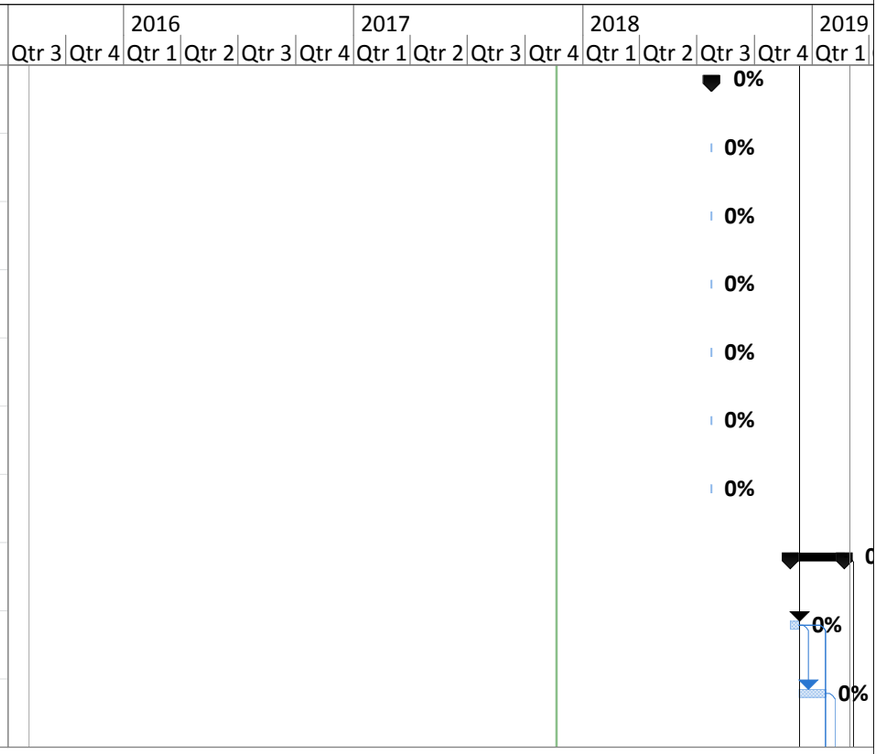
Manual Task		Baseline Milestone		Inactive Milestone	
Start-only		Milestone		Inactive Summary	
Finish-only		Summary Progress		Deadline	

City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
119	**Develop Fleetmap and Codeplugs**	**1 day?**	**Tue 7/24/18**	**Tue 7/24/18**
120	Meet with Agencies to gather info for fleetmaps and codeplugs	1 day?	Tue 7/24/18	Tue 7/24/18
121	Develop first pass codeplugs	1 day?	Tue 7/24/18	Tue 7/24/18
122	Program subset of subscribers with first pass codeplug	1 day?	Tue 7/24/18	Tue 7/24/18
123	Testing of first pass codeplugs	1 day?	Tue 7/24/18	Tue 7/24/18
124	Modify codeplugs based on testing	1 day?	Tue 7/24/18	Tue 7/24/18
125	Program subscribers with final codeplugs	1 day?	Tue 7/24/18	Tue 7/24/18
126	Acceptance Testing and Cutover	**62 days**	**Tue 11/27/18**	**Wed 2/20/19**
127	Acceptance Testing	10 days	Tue 11/27/18	Mon 12/10/18
128	Coverage Acceptance Test (CATP)	30 days	Tue 12/11/18	Mon 1/21/19



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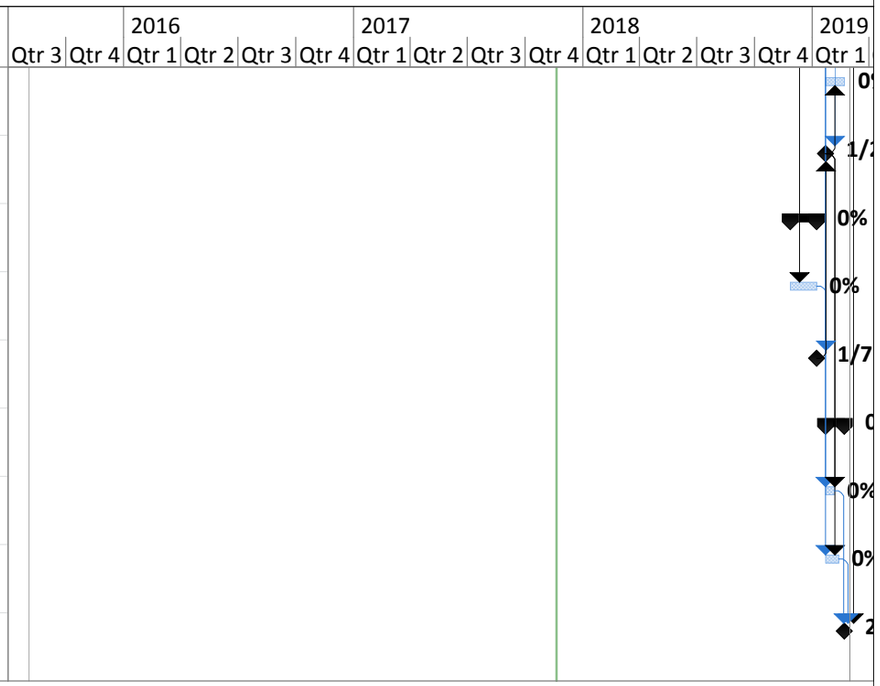
Critical Progress		Path Successor Summary Task		Project Summary	
Task		Path Successor Normal Task		External Tasks	
Split		Baseline		External Milestone	
Task Progress		Baseline Split		Inactive Task	
Manual Task		Baseline Milestone		Inactive Milestone	
Start-only		Milestone		Inactive Summary	
Finish-only		Summary Progress		Deadline	

City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
129	30 Day Operational Test	**30 edays**	**Mon 1/21/19**	**Wed 2/20/19**
130	Cutover	0 days	Mon 1/21/19	Mon 1/21/19
131	Training	**30 days**	**Tue 11/27/18**	**Mon 1/7/19**
132	Technical Training Classes	30 days	Tue 11/27/18	Mon 1/7/19
133	All Training Complete	0 days	Mon 1/7/19	Mon 1/7/19
134	Finalize	**22 days**	**Tue 1/22/19**	**Wed 2/20/19**
135	Resolve Punchlist	10 days	Tue 1/22/19	Mon 2/4/19
136	Finalize Documentation	15 days	Tue 1/22/19	Mon 2/11/19
137	Final Acceptance	0 days	Wed 2/20/19	Wed 2/20/19



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Start-only		Milestone		Inactive Summary	
Finish-only		Summary Progress		Deadline	

2.7.22 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC) PLAN

2.7.22.1 Quality Assurance and Coordination

It is Motorola's policy to produce and provide products and services of the highest quality, meeting or exceeding our customers' needs at all times (Figure 1). Motorola has a well-established reputation for designing and developing high quality products and systems on schedule and within budget.

Motorola will perform all work consistent with high-quality commercial practices, in accordance with Motorola's quality standards for fixed equipment installations and all applicable manufacturer installation and maintenance manuals.

2.7.22.2 Quality Philosophy

Motorola uses the ISO 9001 Quality Management System (Figure 1) as the quality management system standard to control our business activities. We have developed a quality manual that includes the scope of our quality management system, the documented procedures established for the quality management system, and a description of the interaction between the processes of the quality management system.

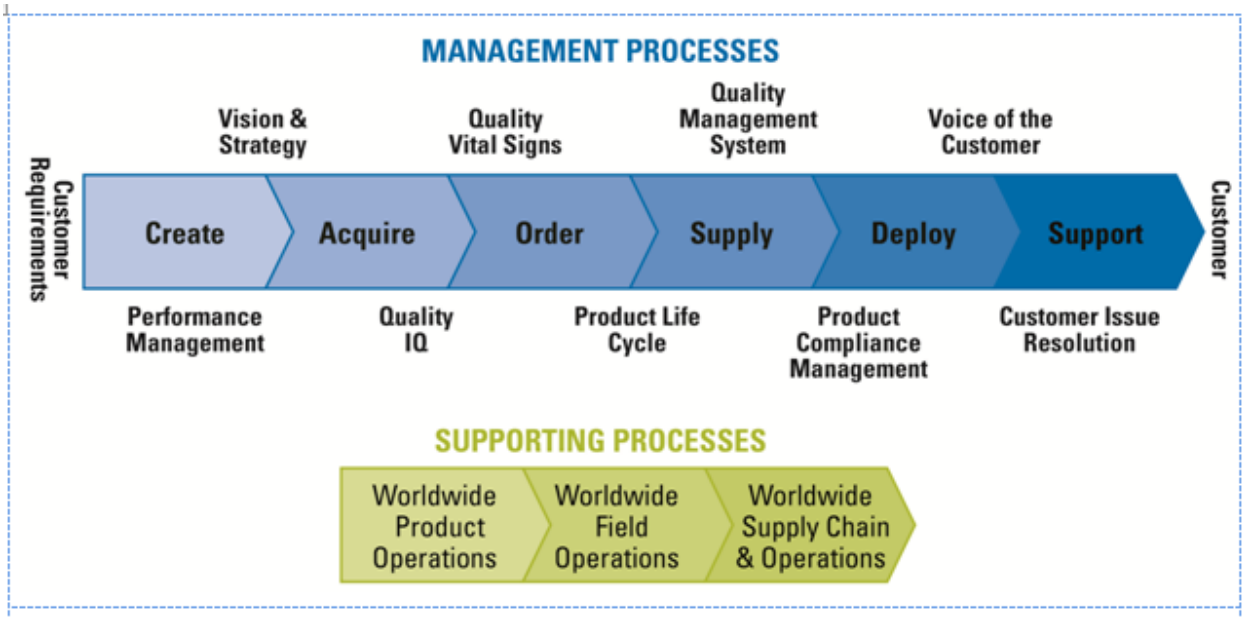

Figure 2-1: Motorola's customer-focused quality processes

In addition to our ISO 9001 Quality Management Certification, Motorola has a robust Environmental, Health, and Safety (EHS) policy. Our stated vision for EHS is for it to be a globally-recognized benchmark within our industry for the successful integration of environmental, health, safety, and corporate responsibility principles in our company's day-to-day operations, to ensure superior business performance.

2.7.22.3 Quality Assurance and Quality Control Plan

Motorola's quality methods for projects start with the Quality Control Plan (QCP), quality monitoring, and monthly quality reports and reviews to determine the effectiveness of the quality plan. Once feedback has been reviewed, changes may be made to the plan. Reporting, monitoring, and correcting according to the Quality Control Plan enables Motorola to tailor the project's processes to meet the needs of the Owner.

Because Motorola's QCP is an end-to-end quality management system, the entire span of the project will be monitored vigilantly and continuously to ensure quality deliverables. The QCP for the project will identify processes and activities that are monitored and actively managed to ensure compliance with quality metrics, from proposal through final acceptance, as represented below in Table 2-23.

Table 2-23: Processes in place to verify quality in specific implementation and deployment activities

Deployment	System	Assurance
System Design	- System Requirements - Design Review - Site Design - Coverage Design	- Compliance to Requirements - Joint approval
Project Management	- SI-Gates - Status Reports - Status Meetings - Project/Milestone Schedule - Issue Tracking Log - Risk Analysis - Shipping, storage, receiving - Change orders	- Supervision - Sample Inspection - Audits - Project Reviews - PMO Governance - Dedicated Master Schedule
Site Preparation	- Drawings/Site Plan - Motorola R56 Standards	- Supervision - Sample Inspection
Network Equipment Installation	- Motorola R56 Standards - System Design Diagrams/Documentation - Optimization Procedures	- Supervision - Sample Inspection
Mobile/Portable Installation	- Programming Templates - Installation Guides	- Supervision - Sample Inspection - Installation Logs
System Acceptance	- Equipment Verification - Feature/Functionality Testing - Coverage Testing - System migration and cut-over - Customer Training	- Sample Inspection - Contract Review

2.7.22.4 Project Manager Quality Duties

The role of the Project Manager (PM) is to assist the technical staff to continuously improve the quality of their work products and services. The PM is responsible for establishing processes and procedures that accurately verify and validate the adherence to applicable standards, guidelines, and procedures.

The PM will participate in the development of the Project Management Plan (PMP) to establish his function within the project and to provide input into the project's schedule and Work Breakdown Structure (WBS) to identify and allot time for QA activities.

During the project, our PM will audit the project team to ensure processes are being followed, as shown in Table 2-24. These quality audits will be used to verify that the project team is following prescribed processes/procedures and to develop corrective/preventative actions. The following audit information will be monitored and reported on a regular basis to the project team by the PM:

- Manage and track daily progress of team members and subcontractors.

- Identify potential risks or issues that may cause delays and assure that mitigation plans are identified.
- Monitor risk items and determine the status of action plans, if any.
- Conduct "lessons learned" reviews at prescribed points during the project to improve the project performance.
- Monitor the training plans.

The audit takes into consideration the status and importance of the processes and areas to be audited, as well as the results of previous audits.

Table 2-24: Quality audits and review opportunities

Project Quality Audit Review	Purpose
Documentation Reviews	Review of the project's management plans and other project documentation to determine if the project's documentation standards are being followed.
Quality Audits	Project deliverables subject to quality audits and reviews: - Master Project Plan - Risk Management Plan - Communication Management Plan - Document Management Plan - Configuration Management Plan - Cost Management Plan.

Other reviews and audits may be held throughout the course of the project. Such reviews will be held on an as-needed basis and may include reviews of contractor plans and processes.

2.7.23 CHANGE ORDER PROCESS/CHANGE MANAGEMENT PLAN

Motorola's Change Management Plan is used on all projects and includes elements of Scope, Cost, Schedule, Risk, Quality, Communications, and Subcontract Management to minimize the need for changes.. Motorola's approach to Change Management is focused on the consistent application of the elements that make up Motorola's Project Management Methodology:

- **Quality Management**: The project and its deliverables meet Motorola's exacting standards and all of the RFP's requirements for quality and performance.
- **Scope Management**: The scope of the project will be managed through the Change Management process to ensure that any changes in scope are identified and the impact of those changes are communicated and approved prior to implementation. Motorola's integrated team will manage the scope of the project following the same rigorous scope and change management processes to ensure the project is completed on time and on budget.
- **Risk Management**: Motorola's risk management process keeps the potential risks highlighted during the project. As a risk item is eliminated, it is removed from the list, any new risks are added and mitigation plans are developed to minimize the impact of an event to the project.
- **Schedule Management**: Schedules are utilized to manage resources, equipment, subcontractors, and tasks on the project. The schedule management process shows the status of each task and allows the project manager to allocate resources as needed to ensure timely completion of all tasks. This allows optimal use of project resources and reduces the possibility of delays.
- **Communications Management**: Keeps all project stakeholders informed of the status of the project and enables them to get timely information regarding the project progress.

Communications Management ensures all team members are kept informed of the upcoming tasks and assignments so they can provide feedback to improve the project performance.

- **Subcontractor Management**: Motorola's subcontractors are critical to the success of the project and are managed as team members and key contributors. Their experience and expertise enables Motorola to provide CCD with world-class technologies and a world-class implementation while keeping the project cost- effective and predictable.

This proven cost-management methodology has been used successfully to deliver many complex projects in the United States and internationally within their anticipated timelines and projected budgets. The process has already begun with this proposal, and will continue with regular meetings and dialog through all of the system's lifecycle phases, including design, design review, and design approval, implementation, testing, acceptance, initiation into service, and the Maintenance phase. With even the most rigorous process, some changes are inevitable, and Motorola has a comprehensive Change Management Plan to address any mutually agreed-upon changes in scope; often resulting in financial benefit to the Customer. This section will detail Motorola's processes used to manage change during implementation of the proposed radio system.

2.7.23.1 Change Management Objectives

Motorola's project philosophy is to invest in pre-contract efforts to understand CCD objectives from the initiation phase of the proposal and to use our proven, advanced tools to develop a system design, scope of work, and realistic schedule that matches these objectives up front, which results in minimized change orders that can improve cost and schedule performance during implementation.

The objective of Motorola's Change Management Plan is to manage the project scope, and comply with project timelines and budgetary requirements. Motorola's process includes structured meetings beginning in the System Design Phase between our pre-contract team and the customer. We strive to understand our customer needs, goals, objectives, and any special circumstances that need to be addressed to ensure the success of the project.

2.7.23.2 Change Recommendations Based on Risk Management

During the pre-contract process, Motorola's engineers and project management team will develop a detailed design plan, using our advanced coverage design tools to ensure that the proposed system design meets CCD's needs. Motorola will review the detailed design plan, as compared to the requirements, with CCD team.. When a change is required, Motorola will analyze the potential impact to the entire project and determine whether any adjustments can be made to scope, schedule, or costs to mitigate, neutralize, or offset the impact of the change. The resultant change will be documented in a Change Request and sent to CCD's Project Manager for approval prior to the change being implemented. Due to our extensive pre-contract investment with our customers, Motorola has demonstrated success in minimizing the need for change orders, and thereby minimizes their impact on our customers' budgets. An example Change Request form is included below.

Example - Change Order Form

Change Order No.	
Date:	

Project Name:	
Customer Name:	
Customer Project Mgr:	

The purpose of this Change Order is to: (highlight the key reasons for this Change Order)

Contract #	REQUIRED	Contract Date:	

In accordance with the terms and conditions of the contract identified above between the Customer and Motorola Solutions, Inc., the following changes are approved:

Contract Price Adjustments

Original Contract Value:	$
Previous Change Order amounts for Change Order numbers _____through_____	$
This Change Order:	$
New Contract Value:	$

Completion Date Adjustments

Original Completion Date:	
Current Completion Date prior to this Change Order:	
New Completion Date:	
Changes in Equipment: *(additions, deletions or modifications)* Include attachments if needed	
Changes in Services: *(additions, deletions or modifications)*	

Schedule Changes: ***(describe change or N/A)***
Pricing Changes: ***(describe change or N/A)***
Customer Responsibilities: ***(describe change or N/A)***
Payment Schedule for this Change Order: **(describe new payment terms applicable to <u>this</u> change order)**

Unless amended above, all other terms and conditions of the Contract shall remain in full force. If there are any inconsistencies between the provisions of this Change Order and the provisions of the Contract, the provisions of this Change Order will prevail.

IN WITNESS WHEREOF the parties have executed this Change Order as of the last date signed below.

Motorola Solutions, Inc.		Customer	
By:		**By:**	
Printed Name:		**Printed Name:**	
Title:		**Title:**	
Date:		**Date:**	

Reviewed by:

Motorola Solutions Project Manager Date

SECTION 2.8
TRAINING PLAN

P25 PUBLIC SAFETY RADIO SYSTEM REPLACEMENT PROJECT NOVEMBER 20, 2017

MOTOROLA SOLUTIONS

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Section 2.8

SECTION 3

TRAINING PLAN

3.1 TRAINING PLAN

Motorola Solutions understands that successful implementation, use, and maintenance of your communications system depends on effective training. We have developed a training plan for the City and County of Denver to ensure a comprehensive understanding of your proposed system and all user equipment. The training plan detailed in the following pages incorporates lessons learned and best practices established during more than 85 years of previous experience to produce effective course delivery and content.

Our commitment to the City and County of Denver is to provide unsurpassed services that ensure the equipment operates efficiently for the life of the system. To do so, we directly train your personnel to utilize the system to its maximum potential.

All City and County of Denver personnel will gain an in-depth understanding of the power of your new system through education and daily use. Our high-quality training focuses on student needs. The training is complemented by both detailed documentation and continuing education programs.

Training is broken into various sections that apply to specific users and phases. Motorola shall deliver the following training classes to be offered for the City and County of Denver:

Planning Stage

- ASTRO 25 Systems Fleetmapping Workshop
- ASTRO 25 IV&D System Overview

End-User Training (Consoles and Subscribers)

- MCC7500E Console Operator and Administration Training
- APX6000 Portable and APX6500 Mobile Training

Maintenance and Troubleshooting System Technician Training

- ASTRO 25 Systems Applied Networking Training
- ASTRO 25 IV&D M Core Workshop
- ASTRO 25 IV&D GTR8000 Repeater Site and IP Based Digital Simulcast Workshop
- MCC7500E Series Console Workshop

System Management/Administrator Training

- ASTRO 25 IV&D Radio System Administrator Workshop
- ASTRO 25 IV&D Domain Controller Administration
- ASTRO 25 IV&D ISSI8000/CSSI8000 Feature Overview
- ASTRO 25 IV&D Dynamic System Resilience Overview

Radio Management Training

- APX CPS Programming and Template Building and Radio Management Workshop
- APX Technical Subscriber Academy

Refresher Training

- Management and Maintenance Refresher Training

Specifics of each course are listed below.

3.1.1 ASTRO 25 Systems Fleetmapping Workshop

Target Audience:

Pre-sale customers, system managers, administrators, planners and technicians

Course Synopsis:

This workshop addresses topics necessary for the effective planning and mapping of an ASTRO 25 IV&D radio system. During this course, the participants will learn about ASTRO 25 features, capabilities, and restrictions in order to effectively plan for a new or upgraded ASTRO 25 system.

Prerequisite:

None

A) Location/Duration:

Denver

4.5 days

B) Number of Sessions:

1

C) Course Outline

Course Modules:

Module 1: Introduction

Module 2: ASTRO 25 System Architecture

2-1: Overview
2-2: Supported Architecture Types
2-3: ASTRO 25 IP Integration
2-4: Basic Components
2-5: Characteristics
2-6: Network Management Applications
2-7: Radio Frequency Subsystems
2-8: Repeater Site
2-9: Multisite Subsystems – Simulcast

Module 3: Frequency Band Plan Management

3-1: Considerations and Warnings
3-2: Overview
3-3: Elements
3-4: Foreign System Frequency Plan
3-5: Channel Assignment Methods
3-6: UNC Wizard
3-7: Channel Access

Module 4: Fleetmapping Technical Overview

4-1: Set Up
4-2: System Organization
4-3: Benefits
4-4: Talkgroups/Multi-groups/Agency groups
4-5: Radio Users
4-6: Talkgroups in an Organization
4-7: Organizing Fleetmap Tasks
4-8: Organizing Fleetmap Other Factors
4-9: Identifying Radio Users
4-10: Identifying Data Services Users
4-11: Radio Users into Talkgroups
4-12: Radio Users and All Assigned Talkgroups
4-13: Talkgroups in Multi-groups
4-14: Multi-groups in Agency Groups
4-15: Assigning IDs and Aliases
4-16: Creating ID Ranges
4-17: Identifying Talkgroup, Multi-group, and Agency Group IDs
4-18: Identifying Console IDs
4-19: Console ID Assignment
4-20: Alias Assignment
4-21: Home Zones
4-22: Home Location Register (HLR)
4-23: Visitor Location Register (VLR)
4-24: HLR and VLR per Zone
4-25: Priority Levels
4-26: Secure Keys

Module 5: Fleetmapping Configuration

5-1: Feature Assignment
5-2: Home Zone Assignments
5-3: Data Services
5-4: Secure Voice Requirements
5-5: System Access
5-6: User Access
5-7: Hierarchy of System Management Users
5-8: System Management
5-9: Database Access
5-10: Subscriber Programming
5-11: Radio Programming
5-12: Subscriber Ranges
5-13: Subscriber Range Assignment
5-14: Additional Considerations

Module 6: Fleetmapping Operation

6-1: ASTRO 25 System Checklist
6-2: Contingency Planning
6-3: Escalation Plan
6-4: Additional Contingency Planning

Module 7: Worksheets

7-1: List of Fleetmapping Worksheets
7-2: Current and Future Equipment Quantities Worksheet
7-3: Available Sites Worksheet
7-4: Individual Radio Users Worksheet
7-5: Serial Number to Radio ID Worksheet
7-6: Radio User to Radio ID Worksheet
7-7: Talkgroup IDs and Aliases Worksheet
7-8: Multi-groups and Associated Talkgroups Worksheet
7-9: Agency Groups and Associated Multi-groups
7-10: Radio Users Assigned to Talkgroups Worksheet
7-11: Communications and Radio Feature Mapping Worksheet
7-12: Console IDs Worksheet
7-13: Secure Keys Worksheet
7-14: Talkgroup Matrix Worksheet
7-15: Lab - Create a Fleetmap
7-16: Course Conclusion

D) Expectations of Attendees

After completing the course, the participant will be able to:

- Define what a fleetmap is and why one is needed.
- Understand the methodologies used to configure radio users groups with the goal of optimizing the system resources.
- Enable participants to knowledgably assist with fleetmapping decisions.
- Discuss frequency band plan, organization, and management.
- Describe basic planning requirements.
- Complete worksheets required to create a fleetmap based on sample operational requirement information.

E) Number of Attendees

12 Attendees

F) Delivery Method:

ILT – Instructor-led training

3.1.2 ASTRO 25 IV&D System Overview

Course Description

The ASTRO®25 IV&D System Overview course will provide participants with knowledge and understanding of the ASTRO®25 IV&D system. This course will address M, L and K Core systems. System architecture, components and features will be explained. In addition, RF and console sites and their architecture, features and components will be discussed. Finally, call processing for voice and mobile data applications will be covered, and an introduction to applications available in the ASTRO®25 system will be provided.

Target Audience

- Core Technicians
- Site Technicians
- Console Technicians
- Core Managers

Secondary audience: Anyone seeking general information on the ASTRO®25 system.

A) Location/Duration:

On line course

2.5 hours

B) Number of Sessions:

1

C) Course Outline

M Core/L Core:

1. System Architecture
2. System Features and Options
3. Zone Core Components
4. Repeater Sites
5. Simulcast Sites
6. Console Sites
7. Conventional Sites
8. Site Status
9. Information Types and Paths
10. Voice and Data Processing
11. Mobility Management

Applications Overview

D) Expectations of Attendees

At the end of this course, the participant should:

- Understand the general architecture of an ASTRO®25 IV&D Radio System
- Understand key features of available in the ASTRO®25 IV&D Radio System
- Understand the components of the ASTRO®25 Zone Core
- Understand site components in the ASTRO®25 system
- Understand the features, capabilities and components of the MCC7000 series dispatch consoles

- Understand concepts of Mobility and Call Processing in the ASTRO®25
- Understand the applications for managing the ASTRO®25 system

E) Number of Attendees

12 Attendees

F) Delivery Method:

Online Training

G) Description of materials provided, limitations on CCD ongoing use of materials

This is an online course. No materials are provided.

H) Any materials required or other expectations of CCD

3.1.3 Console Operator & Supervisor Training Plan

Operator Course Synopsis

This course provides participants with an introduction to the dispatch console, its basic operation and tailored job aids which will be available for assistance in operation. Through facilitation and hands-on activities, the user learns how to perform common tasks associated with the console operation.

The first half of the class is the operator portion. The Admin training and how to utilize the Interactive End User Tool Kit are covered in the second half of the session.

A) Location/Duration

Denver, 4 hours

B) Number of sessions

3 sessions to cover 3 shifts

C) Course outline

- Overview
- Communicating with Radios
- Advanced Signaling Features
- Resource Groups
- Working with Configurations
- Working with Aux IOs
- Troubleshooting

D) Expectations of attendees

- Perform basic operational tasks of the dispatch console
- Utilize the provided job aids to perform specific tasks associated with the console
- Understand a high level view of the system configuration
- High-level overview of the customer system configuration
- General console operation
- Proper operating procedures for specific customer features

E) Number of attendees

Up to 7 per session

F) Delivery method

Instructor lead training - Train the Trainer

G) Description of materials provided, limitations on CCD ongoing use of materials

Training will be conducted on MCC7500E consoles configured for City and County of Denver operation.

H) Any materials required or other expectations of CCD

Supervisor Course Synopsis

This course provides participants with the knowledge and skills to manage and utilize the MCC7500E console administrator functions. Through facilitation and hands-on activities, the participant learns how to customize the console screens.

A) Location/Duration

Denver, 4 hours

B) Number of sessions

3 sessions to cover 3 shifts

C) Course outline

- Introduction
- Configurations
- Folders and Resource Setup
- Customizing Folders
- Auto Starting the MCC 7500E Dispatch Console
- Editing Preferences
- Configuring the Toolbar
- Setting Up Aux IOs
- Resource Groups

D) Expectations of attendees

- Understand the menu items and tool bar icons
- Edit folders, multi-select/patch groups, auxiliary input output groups, windows and toolbars
- Add/delete folders

E) Number of attendees

Up to 7 per session

F) Delivery method

Instructor led training - Train the Trainer

G) Description of materials provided, limitations on CCD ongoing use of materials

Training will be conducted on MCC7500E consoles configured for City and County of Denver operation.

H) Any materials required or other expectations of CCD

3.1.4 Subscriber Training Plan

Operator Course Synopsis

This course provides APX radio trainers with an introduction to their radio, its basic operation and tailored job aids available for assistance in operation. The learning experience is a mix of facilitation and hands-on activities to help users perform common tasks associated with their radio operation. Segmentation between user groups (i.e. Police, Fire/EMS, and Public Service) is encouraged to help focus instruction on the specific operational issues of the individual user group. This course is geared for customers who have an experienced dedicated training staff in their organization. It provides the customer's identified training personnel with the knowledge and practice applying training techniques that will enable them to successfully train their students. Trainers will use audio visual (Interactive End User Toolkits – iEUTK), facilitation and hands-on activities to facilitate learning events supported by tailored or customized training materials and job aides. They will become proficient in discussing common tasks associated with the operation of the customer's radios.

A) Location/Duration

Denver, 8 hours

B) Number of sessions

3 sessions to cover 3 shifts

C) Course outline

- Basics
  - Controls
    - Top and Side Buttons
    - Switches
      - 3 Position toggle
      - 2 Position Concentric
    - Home key
    - Data Key
  - Display
    - Front Display
    - Top Display
    - Display light
    - Intelligent Lighting
  - Push To Talk or Accessory PTT found on the microphone
  - Hub, hang up box (Mobile)
  - Menu
    - Menu Screen Anatomy
    - Navigating Menu Screen
  - Recent Call List (Model 3.5)
  - Unified Call List - Contacts (Model 3.5)
  - Dual Sided Radio (Model 3.5)
    - Dual Mics
    - Dual Speakers
  - Accessory Connector
- Specific Features
  - Changing Talkgroups/Channels
  - Changing Zones

  - Mute tones of keypad
  - Talkgroup Call
  - Private Call
    - Accessing Private Call Feature
    - Initiating Private Call
    - Call List Programming
  - Announcement/All Call (Calls involving Multiple Talkgroups)
    - Initiating Announcement/All Call
  - Direct/Talkaround
  - Failsoft
  - Radio Profiles
    - Accessing and changing Radio Profile
- Optional Features
  - Scan
    - Scan program
    - Priority Scan
    - Dynamic Priority
  - Telephone Interconnect
    - Accessing Telephone Interconnect Feature
    - Initiating a Phone Call
    - Phone List Programming
  - Data Services
    - Text Messaging
      - Accessing the Text Messaging Feature
      - Creating a Free Form Text Message
      - Sending a “Canned Text Message
    - GPS
    - OTAP
  - Encryption
  - Emergency

D) Expectations of attendees

- High-level overview of the customer system configuration
- General radio operation
- Proper operating procedures for specific customer features
- Perform basic operational tasks of the radio
- Utilize the provided job aids to perform specific tasks associated with the radio

E) Number of attendees

Up to 7 per session

F) Delivery method)

Instructor lead training - Train the Trainer

G) Description of materials provided, limitations on CCD ongoing use of materials

Training will be conducted on subscribers configured for City and County of Denver operation.

Motorola trainers will provide CCD with the Interactive End Users Training Toolkit (iEUTK) which is customized for CCD’s various agencies. CCD can utilize the iEUTK for subsequent training sessions. CCD is also allowed to video the training to assist in future training opportunities.

H) Any materials required or other expectations of CCD

To make the training as close to day to day operations as possible, Motorola requests that CCD provide a portable for each participant of the training. CCD should also provide 2 mobile units with adequate power supply for training personnel on mobile radio operations.

3.1.5 Maintenance and Troubleshooting System Technician Training Plan

ASTRO 25 Systems Applied Networking

Course Synopsis

The ASTRO® 25 Systems Applied Networking course provides technicians with the necessary networking information required for understanding the network components installed in Motorola communications systems. The course includes familiarization with basic networking concepts and the networking components deployed in the ASTRO SmartZone System and ASTRO® 25 System.

A) Location/Duration

Denver, 40 hours/5 days

B) Number of sessions

1 session

C) Course outline

Module 1: Course Introduction

Module 2: Basic IP Network Review

- Networks
- Hardware
- Protocols and messaging
- Addressing and routing
- Basic networking tools

Module 3: Master Site VLAN/VRRP Operation

- ASTRO 25 Master Site VLAN/VRRP Operation
- HP Switch hardware
- Accessing the HP Switch
- HP Switch Menu
- HP Switch Command Line Interface
- Motorola Network Resource Hardware
- Accessing the MNR
- MNR Command Line Interface
- Compare GTWYR01 and GTWYR02 Configurations

Module 4: ASTRO 25 Network Transport

- Multicast Call Processing
- Training Lab Diagram
- Cooperative wan routing (cwr)

- Flexible wan Links Ethernet Layer 2 & 3
- Network Analysis
- ASTRO 25 System Network components

Module 5: ASTRO 25 UEM/UNC

- Unified event manager (UEM)
- Unified network Configurator (UNC)
- UnC wizard subnet discovery
- UnC wizard Mac Port Lockdown
- UnC Ionix test credentials
- UnC Ionix change router/gateway configuration
- UnC Ionix rollback router/gateway configuration
- UnC Ionix update router/gateway operating system
- UnC Ionix Cut-Through In-Band router/gateway
- UnC Ionix Out of sync hp switch

Module 6: Information Assurance

- Information Assurance Goals
- Access Control List (ACL)
- Securing protocols with SSH
- SNMPv3
- Anti-virus, Anti-spyware, Anti-malware
- Firewalls
- Intrusion detection system sensor
- Link encryption and authentication
- MAC port lockdown and 802.1x service port access

Module 7: Data Subsystem

- ASTRO 25 Data Subsystem Networking
- ASTRO 25 Data Subsystem hardware

Module 8: Appendix - Router Commands

D) Expectations of attendees

After completing this course, the student will be able to:

- Recall basic network concepts
- Identify the various system network components
- Define the LAN topologies for each system
- Define the WAN topologies for each system
- Diagram SNMP deployment throughout the system
- Identify the HP switches and Motorola series routers
- Perform backup, restore, and recovery procedures of routers and LAN switches
- Identify network security components and concepts in an ASTRO® 25 system

E) Number of attendees

Up to 12 per session

F) Delivery method

Instructor lead training Trainer

Course will utilize the deployed system.

3.1.6 ASTRO 25 IV&D M Core Workshop

Course Synopsis

The ASTRO 25 IV&D with M Core course teaches advanced troubleshooting skills and best practices for Trunked Large Systems. The course also focuses on gathering and analyzing system information to implement appropriate actions that return a system to full operational status.

A) Location/Duration

Denver, 40 hours/5 days

B) Number of sessions

1 session

C. Course outline

Module 1: Introduction to M Core
Module 2: Required Subsystems
Module 3: Optional Subsystems
Module 4: IP Addresses and ASTRO 25 Networks
Module 5: Call Control and Audio Paths
Module 6: Multizones
Module 7: Optional Services and Subsystems
Module 8: Data Subsystem Overview
Module 9: Tools Maintenance
Module 10: UEM Module
Module 11: Network Transport Subsystem
Module 12: Core Switch Installation
Module 13: Routers Installation
Module 14: Backhaul Connectivity Installation
Module 15: Switch Maintenance
Module 16: Routers/CWR Maintenance
Module 17: UNC Maintenance
Module 18: Virtual Management Server Installation
Module 19: Virtual Management Server Maintenance
Module 20: DAS Installation
Module 21: DAS Maintenance
Module 22: iLOM
Module 23: vSphere
Module 24: RAIDar/DAS
Module 25: Backup and Restore
Module 26: Hardware Replacement

D) Expectations of attendees

After completing this course, the participant will be able to:

- Describe the ASTRO 25 System architecture.
- Identify the functional and radio subsystems that comprise the ASTRO 25 System.

- Explain and discuss call flow and data flow through Large System Core devices and their subsystems.
- Perform recommended routine maintenance procedures for the ASTRO 25 Large System Core.

Utilize the troubleshooting tools to diagnose a fault and restore the Large System Core to the level of the Motorola-supported service strategy.

E) Number of attendees

Up to 12 per session

F) Delivery method

Instructor lead training Trainer

G) Description of materials provided, limitations on CCD ongoing use of materials

This course will utilize the deployed system to provide training related to maintenance and troubleshooting of the system.

H) Any materials required or other expectations of CCD

Prerequisites

Completion of the following courses or equivalent knowledge:

- Networking Essentials in Communication Equipment
- ASTRO 25 Systems Applied Networking
- ASTRO 25 IV&D System Overview

3.1.7 ASTRO 25 IV&D GTR 8000 Repeater Site Workshop

Course Synopsis

This workshop describes the components in the ASTRO 25 IV&D System Repeater Site with GTR 8000 expandable site subsystem. This course also presents how the GTR 8000 expandable site subsystem operates and explains the tools and methods available for troubleshooting components within the subsystem.

A) Location/Duration

Denver, 24 hours/3 days

B) Number of sessions

1 session

C) Course outline

Module 1: Course Introduction

Module 2: GTR 8000 Repeater Site

Topic 2-1: GTR 8000 Repeater Site Overview
Topic 2-2: Operational Modes
Topic 2-3: Site Configurations
Topic 2-4: Site Components
Topic 2-5: Time Synchronization and Frequency Reference
Test Your Understanding Exercise

Module 3: GCP 8000 Site Controller

Topic 3-1: GCP 8000 Overview
Topic 3-2: GCP 8000 Physical Description
Topic 3-3: GCP 8000 Configuration
Topic 3-4: GCP 8000 Diagnostics and Troubleshooting
Test Your Understanding Exercise

Module 4: GTR 8000 Expandable Site Subsystem

Topic 4-1: GTR 8000 Expandable Site Subsystem Overview
Topic 4-2: GTR 8000 Expandable Site Subsystem Theory of Operation
Topic 4-3: GTR 8000 Expandable Site Subsystem Configuration
Topic 4-4: GTR 8000 Expandable Site Subsystem Diagnostics and Troubleshooting
Test Your Understanding Exercise

Module 5: Radio Frequency Distribution System (RFDS)

Topic 5-1: RFDS Overview
Topic 5-2: RFDS Physical Description
Topic 5-3: RFDS Configuration
Topic 5-4: RFDS Diagnostics and Troubleshooting
Test Your Understanding Exercise

Module 6: Network Transport Subsystem

Topic 6-1: Network Transport Subsystem Overview
Topic 6-2: Ethernet Switch Diagnostics and Troubleshooting

Topic 6-3: Site Gateways
Topic 6-4: Gateway Diagnostics and Troubleshooting
Test Your Understanding Exercise

Module 7: GTR 8000 Site Maintenance and Troubleshooting

Topic 7-1: Unified Event Manager
Topic 7-2: Troubleshooting Tools
Topic 7-3: Troubleshooting Methodology
Topic 7-4: Troubleshooting Repeater Site Link
Topic 7-5: Motorola Support Centers

D) Expectations of attendees

After completing this course, the participant will be able to:

- Describe the ASTRO 25 IV&D Repeater Site with GTR 8000 Expandable Site Subsystem configurations and components.
- Identify the GCP 8000 Site Controller functions and configuration requirements.
- Describe the connections and interfaces to the GCP 8000.
- Diagnose and troubleshoot the GCP 8000.
- Describe the functionality of the GTR 8000 Expandable Site Subsystem.
- Configure and troubleshoot the ASTRO 25 Repeater Site with GTR 8000 Expandable Site Subsystem.
- Configure and troubleshoot the Network Transport subsystem.

E) Number of attendees

Up to 12 per session

F) Delivery method

Instructor lead training Trainer

G) Description of materials provided, limitations on CCD ongoing use of materials

This course will utilize the deployed system to provide training related to maintenance and troubleshooting of the GTR8000ESS and its various components

H) Any materials required or other expectations of CCD

Completion of the following courses or equivalent experience:

- Networking Essentials in Communication Equipment
- ASTRO® Systems Applied Networking
- ASTRO 25 IV&D with M core System Overview (ACS715200)

3.1.8 ASTRO 25 IV&D IP Based Digital Simulcast Workshop

Course Synopsis:

The ASTRO® 25 IV&D IP Based Digital Simulcast workshop provides an understanding of the components that comprise the ASTRO® 25 IV&D IP Simulcast subsystem, and how they operate in conjunction with each other. The workshop also explains the tools and methods available for troubleshooting components within the IP Based Simulcast subsystem.

A) Location/Duration

Denver, 16 hours/2 days

B) Number of sessions

1 session

C) Course outline

Section: Installation

Module: RF Site
Module: GCP 8000 Site Controller
Module: GTR 8000 Base Radio
Module: GCM 8000 Comparator
Module: Radio Frequency Distribution System (RFDS)
Module: Simulcast Site Reference (TRAK)
Module: Network Transport
Module: Edge Availability Installation

Section: Configuration

Module: Software Download (SWDL)
Module: CSS
Module: UNC

Section: Maintenance

Module: GCP 8000 Site Controller Diagnostics
Module: GTR 8000 Base Radio Diagnostics
Module: GCM 8000 Comparator Diagnostics
Module: Radio Frequency Distribution System (RFDS) Diagnostics
Module: Simulcast Site Reference (TRAK) Diagnostics
Module: Network Transport Diagnostics

Section: Troubleshooting

Module: Overview
Module: CSS Diagnostics
Module: Unified Event Manager

D) Expectations of attendees

After completing this course, the participant will be able to:

- Recognize the flow of message and control data within an ASTRO® 25 IV&D IP Digital Simulcast subsystem.

- Identify the major components and connections within an ASTRO® 25 IV&D IP Digital Simulcast subsystem prime and remote sites.
- Recognize how calls are processed within an ASTRO® 25 IV&D IP Digital Simulcast subsystem.
- Perform maintenance and troubleshooting of select components in an ASTRO® 25 IV&D IP Digital Simulcast subsystem.

E) Number of attendees

Up to 12 per session

F) Delivery method

Instructor lead training Trainer

G) Description of materials provided, limitations on CCD ongoing use of materials

This course will utilize the deployed system to provide training related to maintenance and troubleshooting of the simulcast portion of the system.

H) Any materials required or other expectations of CCD

Completion of the following courses or equivalent experience:

- Networking Essentials in Communication Equipment
- ASTRO® 25 IV&D System Overview

3.1.9 MCC7500E Series Console Workshop

Course Synopsis:

This course familiarizes participants with the installation, configuration, management, and repair of MCC 7500E Series IP dispatch consoles. It also covers Archiving Interface Servers, AUX I/O servers, and Conventional Channel Gateways. The focus is on a detailed discussion of console hardware and hands-on activities with the installation and configuration of the MCC 7000 Series IP dispatch consoles

A) Location/Duration

Denver, 32 hours/4 days

B) Number of sessions

1 session

C) Course outline

Module 1: Course Introduction

Module 2: Dispatch Console Overview

2-1: Features
2-2: System Views
2-4: Call Processing

Module 3: Dispatch Console Hardware

3-1: Dispatch Console Configuration

Module 4: AUX I/Os

4-1: Auxiliary Inputs/Outputs (Aux I/Os)

Module 5: Conventional Communication

5-1: Conventional Communication

Module 6: Domain Controllers

6-1: Domain Controllers and Active Directory

Module 7: Administrator Functions

7-1: Editing Current Configurations
7-2: Setting Up Folders and Resources
7-3: Setting Up Auxiliary I/Os
7-4: Configuring Toolbars
7-5: Editing Preferences
7-6: Auto Starting the MCC 7500E Dispatch Console
7-7: Setting up Inbound Event Display
7-8: MKM 7500E Console Alias Manager

Module 8: Troubleshooting

8-1: Troubleshooting with UEM
8-2: Troubleshooting MCC 7000 Series Components

D) Expectations of attendees

After completing the course, the participant will be able to:

- Install and configure the hardware and software components of the MCC 7000 Dispatch Console Subsystem
- Perform MCC 7000 Series site connectivity and bandwidth management
- Perform System Administrator functions using the Elite Administrator software
- Troubleshoot installation and configuration problems for the MCC 7000 Series Dispatch Consoles

E) Number of attendees

Up to 12 per session

F) Delivery method

Instructor lead training Trainer

G) Description of materials provided, limitations on CCD ongoing use of materials

This course will utilize the deployed MCC7500Es to provide training related to maintenance and troubleshooting of the the dispatch consoles.

H) Any materials required or other expectations of CCD

Prerequisite:

- MCC 7500E Series Console Overview
- ASTRO 25 IV&D with M Core System Overview
- Introduction to Radio System Management Applications

3.1.10 System Management/Administrator Training Plan

ASTRO 25 IV&D Radio System Administrator Workshop

Course Synopsis:

This workshop covers administrator functions for an ASTRO 25 Integrated Voice and Data (IV&D) System. Learning activities in this course focus on how to use the different ASTRO 25 IV&D System Management applications. Participants will be provided with an opportunity to discuss how to structure their organization and personnel for optimal ASTRO 25 IV&D system use.

A) Location/Duration

Denver, 40 hours/5 days

B) Number of sessions

1 session

C) Course outline

Module 1: Subscriber Provisioning
Module 2: Talkgroup Provisioning
Module 3: Radio System Application User Access
Module 4: Zone Watch
Module 5: Affiliation Display
Module 6: Radio Control Manager
Module 7: Reports
Module 8: License Manager
Module 9: UNC Network Manager

D) Expectations of attendees

After completing the course the participant will be able to:

- Describe the relationship between radio programming, console administration and system management, and the impact of this relationship on system planning.
- List the network management tools applicable at each phase of the system life cycle.
- Identify the advantages and disadvantages of options available for the configuration of system infrastructure and user parameters.
- Use the report and real-time data to monitor performance and make adjustments necessary to maintain acceptable system performance levels.

E) Number of attendees

Up to 12 per session

F) Delivery method

Instructor lead training Trainer

G) Description of materials provided, limitations on CCD ongoing use of materials

This course will utilize the deployed system to provide training related to administration of the system

H) Any materials required or other expectations of CCD

Prerequisite:

- Networking Essentials in Communication Equipment
- ASTRO 25 Systems Applied Networking
- ASTRO 25 IV&D System Overview

3.1.11 ASTRO 25 IV&D Domain Controller Administrator Workshop

Course Synopsis:

This workshop covers the administrator and management functions in the ASTRO 25 Domain Controller and how these functions affect both users and computers in the ASTRO 25 system. Learning activities in this course focus on how to use the Domain Controllers to authenticate, administer, and authorize users and devices in the ASTRO 25 System. Group Policies and Organizational Units, RADIUS, and DNS structure will be addressed during this course.

A) Location/Duration

Denver, 24 hours/3 days

B) Number of sessions

1 session

C) Course outline

Module 1: Course Introduction
Module 2: Underlying Administrative Software
Module 3: Domain Controller Software
Module 4: Authentication and Authorization
Module 5: Domain Controller Implementation
Module 6: Groups, Users, and Policies
Module 7: Troubleshooting Issues

D) Expectations of attendees

After completing the course the participant will be able to:

- Understand the Domain Controller server platform
- Understand the DNS Hierarchy in the ASTRO25 system
- Implement RADIUS authentication in applicable devices in an ASTRO 25 system.
- Use Active Directory to control users in the ASTRO 25 system.
- Understand Group Policy objects and how they impact users in the ASTRO 25 Domain.

E) Number of attendees

Up to 12 per session

F) Delivery method

Instructor lead training Trainer

G) Description of materials provided, limitations on CCD ongoing use of materials

This course will utilize the deployed system to provide training related to networking configuration of the system.

H) Any materials required or other expectations of CCD

Prerequisite:

Completion of the following courses or equivalent knowledge:

- ASTRO 25 IV&D with M Core System Overview

3.1.12 ASTRO 25 IV&D ISSI 8000 / CSSI 8000 Feature Overview

Course Synopsis:

The ISSI 8000 / CSSI 8000 Feature Overview self-paced course describes the optional Inter-RF Subsystem Interface available in an ASTRO 25 IV&D System. It presents a description of the features and benefits, and components, as well as call processing scenarios and an overview of the installation process.

A) Location/Duration

Online Course - 1 hour

B) Number of sessions

1 session

C) Course outline

Module 1: ISSI8000/CSSI800 Introduction
Module 2: Installation Overview

D) Expectations of attendees

After completing the course the participant will be able to:

- Describe the ISSI 8000 / CSSI 8000 feature
- Describe the components of the ISSI 8000 / CSSI 8000 feature
- Describe the communication scenarios if this feature is enabled

Follow the installation and configuration process if this feature is added to an ASTRO system.

E) Number of attendees

Up to 12 per session

F) Delivery method

Online Course

G) Description of materials provided, limitations on CCD ongoing use of materials

This is an online course. No materials are provided

H) Any materials required or other expectations of CCD

Prerequisite:

Completion of the following courses or equivalent knowledge:

- ASTRO 25 IV&D with M Core System Overview

3.1.13 ASTRO 25 IV&D Dynamic System Resilence Overview

Course Synopsis:

The Overview for ASTRO®25 IV&D Dynamic System Resilience is a self-study training course intended to provide a technical overview of DSR. The course describes how DSR adds a geographically separate backup for the Master Site to protect against a catastrophic failure.

A) Location/Duration

Online Course - 2 hours

B) umber of sessions

1 session

C) Course outline

Module 1: DSR Introduction
Module 2: DSR Features and Functionality

D) Expectations of attendees

After completing this course, the student will be able to:

- Differentiate between a non-DSR Master Site and a DSR Master Site
- Describe the DSR components, operation and functionality of each of the following services:
- Voice
- Data
- Network Management
- Network Transport
- IP Services

E) Number of attendees

Up to 12 per session

F) Delivery method

Online Course

G) Description of materials provided, limitations on CCD ongoing use of materials

This is an online course. No materials are provided

H) Any materials required or other expectations of CCD

Prerequisite:

Completion of the following courses or equivalent knowledge:

- ASTRO 25 IV&D with M Core System Overview

3.1.14 Radio Management Training Plan

APX CPS Programming and Template Building

Course Synopsis:

The APX CPS Programming and Template Building course provides communications management personnel and technicians with the knowledge and training necessary to build templates and program APX portable/mobile subscriber radio's in the most efficient way possible. The content, parameters and exercises demonstrated in this class apply to the APX portable and APX mobile.

A) Location/Duration

Denver - 16 hours/2 days

B) Number of sessions

1 session

C) Course outline

- Introduction to APX portable Radio
- Introduction to APX CPS
- APX CPS Install, Setup and Configuration
- Navigating APX CPS
- APX CPS Data Transfer including POP25/OTAP
- Understanding and Interpreting Radio Information
- Detailed Review of Codeplug Contents
- APX Conventional Codeplug Build
- APX Type II Trunking Codeplug Build
- APX ASTRO 25 Trunking Codeplug Build
- Building Scan List
- Additional/Advanced CPS Functionality

D) Expectations of attendees

After completing this course, the student will be able to:

- Build APX potable/mobile templates using the APX Customer Programming Software (CPS) Program the specific parameters related to various radio system configurations: Conventional, Single Site Trunking, Simulcast, SmartZone, ASTRO 25 and ASTRO 25 X2
- Demonstrate detailed knowledge of APX CPS navigation, tools, options and features that make efficient programming of the radio possible
- Demonstrate a complete understanding of APX CPS efficiency tools, such as Cloning, Drag and Drop, Codeplug Comparison, Radio Flashing, Advance System Key Administration and others

E) Number of attendees

Up to 12 per session

F) Delivery method

Instructor Lead Training

G) Description of materials provided, limitations on CCD ongoing use of materials

This training will utilize the Motorola programming software to configure subscriber radios.

H) Any materials required or other expectations of CCD

3.1.15 APX Radio Management Workshop

Course Synopsis:

Participants will learn the capabilities, features, and functions of the APX Radio Management Suite. This course will cover an APX CPS overview, APX Radio Management Overview, Basic Networking Primer, ASTRO25/CEN Networking and UNS Overview, and APX Radio Management Installation, Configuration, and Operations. In addition, the course will contain labs that will focus on installation, configuration, and operation using both wired and POP25 updates to APX Subscriber radios in both a LAN and WAN environment.

A) Location/Duration

Denver - 24 hours/3 days

B) Number of sessions

1 session

C) Course outline

- Radio Management Overview
- Radio Management Features
- Network Requirements
- Radio Management Installation and Configuration

D) Expectations of attendees

After completing this course, the student will be able to:

- Describe the APX Radio Management Suite operations and required software and hardware components
- Describe all deployment options for APX Radio Management Suite
- Configure a basic APX Radio Management system using a single PC, multiple PCs on a LAN, and multiple PCs on a WAN.
- Troubleshoot common APX Radio Management installation, configuration, and operation issues
- Use Best Practices to implement and optimize Radio Management Performance

E) Number of attendees

Up to 12 per session

F) Delivery method

Instructor Lead Training

G) Description of materials provided, limitations on CCD ongoing use of materials

This training will utilize the Motorola programming software to configure subscriber radios.

H) Any materials required or other expectations of CCD

3.1.16 APX Technical Subscriber Academy

Course Synopsis:

This course focuses on the knowledge required for a 2-way Radio Technician working in a communication environment or using the family of APX radios in the field. The course is specifically designed to provide significant amounts of hands-on, scenario based labs around configuration and troubleshooting. Key Loading and Management, Encryption, Over-The Air Programming and Mobile Radio Installation are some of the topics that will be covered in detail for both mobile and portable radios.

A) Location/Duration

Denver - 40 hours/5 days

B) Number of sessions

1 session

C) Course outline

- APX Radio Introduction
- APX Radio Performance Checks
- APX Radio Alignment
- APX Radio Theory Of Operation
- Radio Disassembly / Reassembly
- Vacuum Testing For Submergibility
- Mobile Radio Installation & Configuration
- Advanced Customer Programming Software
- Radio Troubleshooting

D) Expectations of attendees

After completing this course, the student will be able to:

- Distinguish between the features and specifications of the APX portable and the APX mobile radio
- Verify the correct operations of the APX portable and the APX mobile radio
- Maintain and troubleshoot an APX portable and APX mobile radio
- Disassemble and reassemble the radio using the documented procedures
- Verify the housing integrity of an APX portable radio
- Flash upgrade an APX portable and APX mobile radio

E) Number of attendees

Up to 12 per session

F) Delivery method Instructor Lead Training

G) Description of materials provided, limitations on CCD ongoing use of materials

This course will utilize the subscribers that will be used on the system to provide training on the maintenance and repair of the APX subscriber

H) Any materials required or other expectations of CCD

3.1.17 Refresher Training Plan

Course Synopsis:

This course will be specially tailored to meet refresher training needs. This training will cover the same material as the courses previously delivered in an abbreviated format.

A) Location/Duration

Denver - 80 hours/10 days

B) Number of sessions

1 session

C) Course outline

This course will be specially tailored to meet refresher training needs. This training will cover the same material as the courses previously delivered in an abbreviated format.

D) Expectations of attendees

E) Number of attendees

Up to 12 per session

F) Delivery method

Instructor Lead Training

G) Description of materials provided, limitations on CCD ongoing use of materials

This course is a refresher course which will cover those specific requests by the customer and will utilize those components of the system that relate to the specific training.

H) Any materials required or other expectations of CCD

SECTION 2.9

SYSTEM IMPLEMENTATION PLAN

P25 PUBLIC SAFETY RADIO SYSTEM REPLACEMENT PROJECT NOVEMBER 20, 2017

Request for Proposal No. 28435Q

MOTOROLA SOLUTIONS

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SECTION 2.9

SYSTEM IMPLEMENTATION PLAN

2.9.1 IMPLEMENTATION PLAN

2.9.1.1 System Continuity Statement

Motorola understands that the City and County of Denver (CCD) will continue to operate their existing radio system during the implementation and testing of the new system. Motorola will work with CCD to eliminate any interruptions of service on the existing system during the deployment of the new system. If any part of the existing system must be taken out of service for any period of time, Motorola will coordinate such efforts with CCD prior to taking any action.

2.9.1.2 Frequency Coordination Plan

It is Motorola's intent to reuse frequencies that are already licensed to CCD. As part of the Frequency Coordination Plan, Motorola will:

- Research existing licensed 800 MHz channels to determine frequency reuse for a seventeen channel, four (4) site simulcast system with a 17 channel Rx only site, and one ASR location with nine (9) channels
- Provide FCC licensing assistance to support the filing of up to three (3) FCC Form 601 applications to support a simulcast system including four (4) sites with seventeen (17) channels at each site including a 17 channel Rx only site, and a nine (9) channel ASR site License application preparation related research and consultation, including review and recommendation of filing strategy
- Conduct routine monitoring of the FCC filings throughout the frequency coordination and/or FCC processes
- Draft one sample consent letter (if needed)
- Assist with drafting an extended implementation letter (if needed)
- Draft, file, and monitor up to three (3) annual FCC construction notifications for the first annual notification requirement following license grants for the applications processed under this proposal and related contract.

Licensing – Includes preparation and filing FCC Form 601 applications and FCC construction notifications for the first annual notification requirement for the licenses granted as a result of this project, as well as routine monitoring of the FCC filings throughout the frequency coordination and/or FCC processes.

Microwave frequency coordination will also be handled by Motorola for all microwave links.

2.9.2 STATEMENT OF WORK (SOW)

A detailed Statement of Work is included in Section 2.7 (Project Management Plan).

2.9.2.1 Responsibility Matrix

A responsibility matrix is included in Statement of Work that is included in Section 2.7 (Project Management Plan).

2.9.2.2 Staging and Factory Test Plan

The following tests (Section 2.9.2 [FUNCTIONAL ACCEPTANCE TESTING PLAN]) are a preliminary set of tests that will be conducted on the staged system at Motorola's Facilities in Elgin, IL. As part of the Detailed Design Review, the specific tests that will occur will be determined by CCD and Motorola.

2.9.2.2.1 Staging at the Customer Center for Solutions Integration (CCSi)

As part of our commitment to quality, we will stage the solution's Fixed Network Equipment (FNE) systems at CCSi. Motorola achieves its high levels of customer satisfaction by assembling and testing every communications system using stringent quality and functional performance tests prior to shipment. Throughout this process, CCD's personnel will have the opportunity to witness the LMR system in operation prior to field deployment.

Motorola's dedicated staging center is where our customers, field teams, engineering groups, and integrators come together to participate in the final manufacturing process. Integrating the system components and performing function testing prior to shipment from CCSi reduces cycle time from Contract Design Review to system operation.

Factory staging at CCSi includes the initial assembly and testing of all Motorola-manufactured radio system components, along with the third-party equipment required for a successful system demonstration. System components will be staged and tested to simulate final operation; this allows the system to be configured as closely as possible to its final configuration during factory staging. Factory staging will allow testing of the functional capabilities of the communications system. This process will enable CCD to witness factory testing in a controlled environment, and facilitate smooth and easy field installation.

2.9.2.2.2 Factory Staging Process

The representative radios will be assembled at a single location. After assembly, the staging technicians and engineers will power-up the equipment, load software, set parameters, program, configure, and optimize operations. Radio parameters will be set according to inputs from the project team. System software and system features will be tested and validated. Additionally, MCC 7500E dispatch positions will be assembled, configured, and optimized in order to execute all the ATP tests.

All system parameters will be set according to specifications to verify proper operation and functionality. These parameter settings will be recorded and documented to provide baseline information to the field integration team.

Major equipment serial numbers and firmware/software versions (if applicable) will be recorded during the staging process to create a baseline for future reference. In the unlikely event that a change needs to be made after the start of testing, the baseline will be revised to reflect the current state of the system. After each test, the equipment will be returned to its original operating condition.

At Factory Staging, Motorola shall provide an electronic copy of the inventory of all system infrastructure items to include their model number, serial number, description, final CCD site location, and, if applicable rack number. Representatives from CCD may use their time at Factory Staging to apply CCD-provided asset tags to any equipment that will ship to CCD.

2.9.2.3 Functional Acceptance Test Plan

This section addresses these testing requirements of the RFP, including both staging and factory functional testing and field functional testing.

2.9.2.4 Factory Functional Acceptance Testing

Factory functional acceptance testing for the proposed P25 system will be conducted at Motorola's Customer Center for Solutions Integration (CCSi), and completed prior to installation at CCD's sites. At CCSi, representatives from CCD will be able to see their equipment assembled and to participate in functional testing of the system before shipping to CCD's sites. The Factory Acceptance Test will verify the functionality of CCD's new system.

2.9.2.4.1 Factory Functional Acceptance Testing Process

The system will be exercised while in factory staging, which will allow testing and burn-in of components and boards for proper operation as a complete system prior to shipping to CCD's locations. Once the system or subsystem has been assembled, optimized, and integrated as a complete working unit, the system will be tested according to the Factory Functional Acceptance Test procedures. During testing, all measurements or outcomes will be recorded within the test script, as indicated in the test. The result of a test procedure will be "Pass," "Fail," or a measured value.

Upon satisfactory completion of installation and optimization, Motorola will coordinate with CCD for a factory visit to participate in system testing. This visit will provide CCD with the opportunity to observe the radio subscriber equipment programmed and optimized as an integrated system and to test in a hands-on manner, most functionality and features of the radios that are capable of operation in a factory environment. Factory acceptance testing will comprise all major systems in the radio solution.

Table 2-1 provides a preliminary outline of the factory functional testing to be completed.

Table 2-1: Preliminary Factory Functional Acceptance Test Procedures

Wide Area Trunking	▪ Talkgroup Call. ▪ Secure Operation. ▪ Continuous Assignment Updating. ▪ Dynamic FDMA/TDMA Talkgroup Call Mode Change. ▪ Call Alert. ▪ Private Call. ▪ Multigroup Call in Wait Mode. ▪ Audio Interrupt / Interrupt Never Mode. ▪ Busy Queue Conversion. ▪ Emergency Alarm and Call. ▪ Priority Monitor/Non-Priority Scan.
Site Trunking	▪ Site Trunking Indication. ▪ Talkgroup Call. ▪ Dynamic FDMA/TDMA Talkgroup Call. ▪ Call Alert. ▪ Private Call. ▪ Continuous Assignment Updating. ▪ Emergency Alarm and Call. ▪ Wide Area Recovery.
MCC 7500E Trunked Resources	▪ Talkgroup Selection and Call. ▪ PTT Unit ID/Alias Display. ▪ Emergency Alarm and Call Display. ▪ Multi-Select Operation. ▪ Talkgroup Patch. ▪ Alert Tones. ▪ Call Alert. ▪ Console Priority. ▪ Console Initiated Private Call to a Console. ▪ Instant Recall Recording (IRR). ▪ Acoustic Crossmute.
Fault Management	▪ Unified Event Manager—Views. ▪ Station Power Amp Failure Reports to the Unified Event Manager (UEM). ▪ Console PC - Voice Processing Module Link Failure Reports to the Unified Event Manager. ▪ Core Router Failure Reports to the Unified Event Manager. ▪ Site Path Failure (Ethernet) Reports to the Unified Event Manager. ▪ GCP 8000 MultiSite Controller (UEM). ▪ GCM 8000 Comparator (UEM). ▪ Physical Inputs/Outputs - Digital Inputs (UEM). ▪ Physical Inputs/Outputs - Digital Outputs (UEM). ▪ MSBR (Multisite Base Radio) GTR 8000 Diagnostics-Ext. Ref. Status (UEM). ▪ TRAK GPS - GPS Fault (UEM). ▪ TRAK Communication Status Fault (UEM). ▪ TRAK GPS - Power Supply Fault (UEM).
System Reliability Features	▪ Multiple Control Channels. ▪ Receiver Interference Shutdown. ▪ Transmitter Power Failure Shutdown. ▪ Station Failure. ▪ Link Failure between CCGW and Zone Controller. ▪ Link Failure between MCC 7500E site and Zone Controller. ▪ Redundant Console Site Link Failure. ▪ Redundant Site Controller Switching - Automatic Switchover. ▪ Redundant Site Link Failure. ▪ Redundant Zone Controller Switching/Automatic Switchover.

	▪ Redundant Comparator Switching—Comparator Failure. ▪ Redundant Comparator Switching–Switch Failure. ▪ Failure of Prime Site LAN Switch 1 at GEO Prime Site. ▪ Failure of the Ethernet Backhaul Switch at the Primary GEO Prime Site. ▪ Primary Prime Site Link Failure—Simulcast GEO Prime Site to Zone ▪ Core Ethernet Link. ▪ Single Comparator Failure at Primary GEO-Prime Site.
System Management Tests	▪ ZoneWatch. ▪ Affiliation Display. ▪ Configuration Management - Access Permissions. ▪ Configuration Management - Subscriber Capabilities. ▪ Configuration Management - Talkgroup Capabilities. ▪ Unified Event Manager - Diagnostics - Multisite Site. ▪ Unified Event Manager - User Actions Create Audit Trails. ▪ Unified Network Configurator Device Management - Channel Parameter. ▪ Unified Network Configurator Device Management - Site Parameter.

2.9.3 EQUIPMENT INSTALLATION AND OPTMIZATION

2.9.3.1 Shipping and Warehouse Plan

Upon completion of the customer-witnessed Staging Acceptance Test, Motorola will ship all equipment to a CCD-supplied, secure warehouse location. Upon arrival, CCD will be notified and a full inventory of all equipment will be conducted by both CCD and Motorola. Motorola shall provide an updated version of the electronic inventory report, if any changes have occurred during the staging process.

Third-party equipment will be inventoried by CCD and Motorola upon arrival.

As equipment is removed for installation, it will be tracked by the project manager and noted in the weekly project reports.

2.9.3.2 Implemetation and Field Functional Acceptance Testing

Following the Factory Acceptance Test Plan, equipment will be shipped to the field for installation. As part of the installation process, Motorola will perform site audits to ensure that the equipment will function properly and that the site is ready for installation. Post-install site audits will be performed to confirm that all equipment has been installed properly and according to code.

Field Functional Acceptance Testing will be conducted to verify that each subsystem delivers the features and functions as defined in CCD's contract and during Contract Design Review. These tests primarily represent user operations on the voice subsystem, and will be performed during system field testing in each implementation phase and as part of the final system acceptance testing.

The major subsystems will be tested using scripts to demonstrate their functionality as part of the radio system. In addition, system redundancy and reliability will be verified to ensure that users have continuous communication in the event of a failure. These tests will be performed during Phase II of the implementation plan.

Acceptance Tests are guided and completed through the execution of test scripts. These scripts will be finalized with CCD during the detailed Contract Design Review. Sample test scripts are provided below. These test scripts will be reviewed and finalized during the Contract Design Review process.

Field Acceptance Testing will include site measurements to ensure that all appropriate levels have been set, and that the equipment is functioning according to system design and manufacturer specifications. Functional testing, which is typically an extended version of the factory ATP previously completed at staging, will be performed to ensure the system is functioning properly. This testing will include testing the roaming capabilities of the system.

2.9.3.2.1 Component Test

Components will be measured and verified as part of the optimization process once equipment arrives on-site. Component acceptance tests will verify that the infrastructure equipment meets specifications and works as designed. A complete list of components that can be tested in the field will be provided during the Contract Design Review process. Those components will be tested upon installation at the sites.

2.9.3.2.2 Installation Quality Audit

After equipment has been installed at each of the sites in the system, Motorola will verify the installation. For quality control, Motorola will maintain strict adherence to documented procedures including: Motorola's R56 Manual, Standards and Guidelines for Communication Sites; ISO 9000/1, EIA 632, the Uniform Building Code, the National Fire Protection Association's National Electric Code, and all applicable federal, state, and local codes and ordinances. This testing ensures that the quality of the installation will support the system's performance and safeguard against site safety issues.

2.9.3.2.3 Field Functional Acceptance Testing Process

Under the direction of the Motorola Project Manager, teams consisting of representatives from CCD and Motorola will execute agreed-upon test procedures to confirm that the communications system has been designed and installed to meet the features and performance capabilities described in the contract. The table below provides a preliminary outline of the functional testing to be completed.

Motorola and CCD agree that a Functional Acceptance Test Plan is provided as an example of the tests that can be completed as part of Field and/or Factory Acceptance Testing as well as a sample of test methods and processes. Motorola and CCD agree that CCD shall reserve the right to edit these tests and add additional tests to them prior to their execution so long as the edits and additions are: i) made to test a feature, operation, or specification specifically described in the System Design Description or in Motorola's published specifications for the provided Equipment or Software, ii) developed jointly between the Parties such that they agree to the Setup, Test Process, and Pass/Fail Criteria, and iii) able to be completed as part of the FATP in a reasonable timeframe and with available test methods and tools.

Table 2-2: Preliminary Field Functional Acceptance Test Procedures

Wide Area Trunking	▪ Talkgroup Call. ▪ Secure Operation. ▪ Continuous Assignment Updating. ▪ Dynamic FDMA/TDMA Talkgroup Call Mode Change. ▪ Call Alert. ▪ Private Call. ▪ Multigroup Call in Wait Mode.

	▪ Audio Interrupt/Interrupt Never Mode. ▪ Busy Queue Conversion. ▪ Emergency Alarm and Call. ▪ Channel Partitioning Operation. ▪ Priority Monitor/Non-Priority Scan.
Site Trunking	▪ Site Trunking Indication. ▪ Talkgroup Call. ▪ Dynamic FDMA/TDMA Talkgroup Call. ▪ Call Alert. ▪ Private Call. ▪ Continuous Assignment Updating. ▪ Emergency Alarm and Call. ▪ Wide Area Recovery.
MCC 7500E Trunked Resources	▪ Talkgroup Selection and Call. ▪ PTT Unit ID/Alias Display. ▪ Emergency Alarm and Call Display. ▪ Multi-Select Operation. ▪ Talkgroup Patch. ▪ Alert Tones. ▪ Call Alert. ▪ Console Priority. ▪ Console Initiated Private Call to a Console. ▪ Instant Recall Recording (IRR). ▪ Acoustic Crossmute.
Fault Management	▪ Unified Event Manager—Views. ▪ Station Power Amp Failure Reports to the Unified Event Manager (UEM). ▪ Console PC - Voice Processing Module Link Failure Reports to the Unified Event Manager. ▪ Core Router Failure Reports to the Unified Event Manager. ▪ Site Path Failure (Ethernet) Reports to the Unified Event Manager. ▪ Unified Event Manager - MOSCAD Management. ▪ GCP 8000 MultiSite Controller (UEM). ▪ GCM 8000 Comparator (UEM). ▪ Physical Inputs/Outputs - Digital Inputs (UEM). ▪ Physical Inputs/Outputs - Digital Outputs (UEM). ▪ MSBR (Multisite Base Radio) GTR 8000 Diagnostics-Ext. Ref. Status (UEM). ▪ TRAK GPS - GPS Fault (UEM). ▪ TRAK Communication Status Fault (UEM). ▪ TRAK GPS - Power Supply Fault (UEM).
System Reliability Features	▪ Multiple Control Channels. ▪ Receiver Interference Shutdown. ▪ Transmitter Power Failure Shutdown. ▪ Station Failure. ▪ Link Failure between CCGW and Zone Controller. ▪ Link Failure between MCC 7500E site and Zone Controller. ▪ Redundant Console Site Link Failure. ▪ Redundant Site Controller Switching - Automatic Switchover. ▪ Redundant Site Link Failure. ▪ Redundant Zone Controller Switching/Automatic Switchover. ▪ Redundant Comparator Switching—Comparator Failure. ▪ Redundant Comparator Switching–Switch Failure. ▪ Failure of Prime Site LAN Switch 1 at GEO Prime Site. ▪ Failure of the Ethernet Backhaul Switch at the Primary GEO Prime Site. ▪ Primary Prime Site Link Failure—Simulcast GEO Prime Site to

	Zone Core Ethernet Link. - Single Comparator Failure at Primary GEO-Prime Site.
System Management Tests	- ZoneWatch. - Affiliation Display. - Configuration Management - Access Permissions. - Configuration Management - Subscriber Capabilities. - Configuration Management - Talkgroup Capabilities. - Unified Event Manager - Diagnostics - Multisite Site. - Unified Event Manager - User Actions Create Audit Trails. - Unified Network Configurator Device Management - Channel Parameter. - Unified Network Configurator Device Management - Site Parameter.
Microwave and MPLS system Tests	- Microwave Radio Receiver Checks: frequency, sensitivity, AGC calibration, MHSB switching, alarm verification to NMS - Microwave Radio Transmitter Checks: frequency, power, MHSB switching, alarm verification, MPLS functionality - Antenna system alignment test and sweep - Waveguide leakdown tests - Transmit/Receive parameter measurements and validation - Path BER tests - Network QoS queue verification - Network resiliency/availability - Traffic verification; - Fast Reroute functionality

Successful completion of Functional Acceptance Testing requires the system to be operational and the necessary parties to be available to participate in the testing. During testing, all measurements or outcomes will be recorded within the test script, as indicated in the test. The result of a test procedure will be "Pass", "Fail", or a measured value. A checkmark in the "Pass" field or in the appropriate box will be sufficient to indicate that a step has passed the test. When all steps in a specific test pass, representatives from Motorola and CCD will sign the test procedure form to indicate the system has passed that test.

If a failure occurs, a check will be placed in the "Fail" field within the test procedure and an entry made on a Punchlist Form. Procedures that fail will be remedied and retested. The Punchlist Form includes the date and time the entry was opened, the date closed, the test number and step, and a description of the failure.

2.9.3.2.4 System Reliability and Fallback Testing

During the functional testing as described above, the system will also be tested for system reliability and fallback operation. Testing will be performed to verify each of the failure scenarios in the table below.

Table 2-3: Failure Modes Tested During System Reliability and Fallback

Master Site	- Zone Controller Failure. - Core LAN Switch Failure. - Core Router Failure. - Gateway Router Failure. - Backhaul Switch Failure. - Complete Master Site Failure.
Dispatch Console System	- Site Gateway Failure. - Site LAN Switch Failure. - Single MCC 7500E Console Position Failure.

Prime Sites	- Main Gateway Failure. - Main and Redundant Gateway Failure. - Site LAN Switch Failure. - Comparator Failure. - Subsite Access Gateway Failure. - Controller Failure. - Main and Redundant Site Controller Failure. - Reference (GPS) Failure.
Remote Sites	- Main Gateway Failure. - Main and Redundant Gateway Failure. - Site LAN Switch Failure. - Site Main and Redundant LAN Switch Failure. - Control or Voice Channel Failure
ASR Site	- Main Gateway Failure. - Site LAN Switch Failure - Controller Failure - Control or Voice Channel Failure

2.9.3.2.5 Field Functional Acceptance Testing Documentation and Results

Following completion of functional acceptance testing, Motorola will document the results of the acceptance test plan and provide them to CCD in a final system documentation package. The documentation will include:

- Testing procedures utilized
- Test dates and locations
- Testing results.

2.9.3.3 30-Day Burn-in (Operations) Testing

The operational test is a 30-day standalone performance test designed to demonstrate successful operation of the system over an extended period of time. Prior to the 30-day burn-in period, all users/operators will have been migrated to the new ASTRO 25 system and will operate in P25 mode to verify extended operation of the system. To successfully complete the 30-day test, the system must operate within required parameters of the final system design for the duration of the test, without any major operational faults.

2.9.3.3.1 Evaluation Period

The evaluation period for the system will begin at 8:00 AM on the first calendar day following successful commissioning of the radio system, as agreed upon by CDD and Motorola, and will run for 30 calendar days. If at any time during the 30-day test period, CCD believes that the system has met all requirements, and is operating properly, the test can be terminated and the project will proceed to the Final Project Acceptance phase.

2.9.3.3.2 Testing Process

The 30 day test will begin by migrating a defined set of users as agreed to by CCD and Motorola users to the new system and will run for 30 days without a major failure, as defined below. Agencies who will be involved in the 30-day burn-in period will be notified in advance and a timeline will be set up for transition to the new system. These agencies will be determined during Contract Design Review and will be based on a capacity analysis performed to ensure that a balanced number of agencies and system channels are transitioned to the new system.

Motorola will investigate any user or system issues to ensure that the system is operating as designed. The process agreed upon for critical failures will be followed to determine whether to freeze or restart the 30-day burn-in period. This process will be finalized during the Contract Design Review.

CCD and Motorola will document any communications outages or degradation to communications quality, whether or not they are attributable to work or materials provided by Motorola. Documentation will include:

- Test start and stop dates and times
- Explanations for the outages or degradation
- All corrective action.

A copy of this documentation will be provided to CCD on a weekly basis during the test. Completed original documentation will be provided to CCD upon termination of the 30-day test. Final system acceptance and use of the new system will follows the successful completion of the test.

2.9.3.3.3 Definition of "Critical Failure"

Per RFP Section 9.11, a critical failure is defined as the following:

- Any failure which causes a loss of 15% or more in capacity or coverage
- Any failure which causes a loss of simulcast capability
- Any failure which causes a loss of Core equipment (if centralized architecture)
- Any system failure that causes the loss of two or more console positions
- Any failure that renders the logging recorder inoperable or causes the irretrievable loss of recorded audio
- The concurrent failure of two or more repeaters
- Concurrent failure of two or more switches and/or routers
- Failure of the receiver voting system
- Two or more repetitive minor failures of the same functionality with or without the same root cause.

Any of the above faults will be considered a critical failure, if they indicate the failure of Motorola-provided equipment. Any equipment that fails during the Operational Period will be repaired at that time. If a repair can't be made immediately, CCD will be notified of the scheduled repair time.

2.9.3.3.4 Restart for Critical Failures

If a fault occurs, CCD must notify Motorola within 12 hours, the fault will then be verified with the system's network management applications. In the event of a critical failure as defined above, the 30-day operational test will terminate. Motorola will repair any verified Operational Fault. If the repair cannot be made immediately, we will notify CCD regarding the time needed for the repair. Upon completion of repairs, Motorola will notify CCD. CCD, in conjunction with Motorola, will test the repairs to ensure that the system is operating according to specification. At the completion of repairs and verification, a new 30-day test will begin on the following calendar day.

Except as listed above, any other defect is not a critical failure. All failures beyond the Motorola-defined demarcation points are the responsibility of CCD. Other Motorola components that may fail during the evaluation period will be repaired under warranty at no charge to CCD, but shall not be considered a major operational failure.

2.9.3.3.5 Successful Completion of the 30-Day Burn-in Testing

Upon successful completion of the 30 day Operational Test Period, the test will be deemed successful.

2.9.3.4 Fleetmapping Plan

Fleetmapping allows CCD to configure and segment radio operations based on the needs of the various agencies. Each agency will need to have their radios operate in a certain manner.

Motorola will meet with representatives from the agencies to gather information about the unique requirements of the agencies.

Once the information gathering has been completed, Motorola will develop a sample set of codeplugs for the agencies to test.

Agencies will be given 30 days to test the initial configuration. After 30 days, CCD will provide Motorola with requested changes to the fleetmap.

Motorola will modify the fleetmap and deliver to CCD. At this point, Motorola will deploy the codeplug on the full set of CCD radios.

As part of the overall training program, Motorola will provide training that will allow CCD to make fleetmap changes to their radios in the future. Any additional fleetmap changes requested by CCD will be considered on a time and materials basis.

2.9.4 COVERAGE ACCEPTANCE TESTING

2.9.4.1 Overview

This Coverage Acceptance Test Plan (CATP) is designed to verify that the voice radio system implemented by Motorola for CCD meets or exceeds the required reliability as specified by CCD. The CATP defines the coverage testing method and procedure, the coverage acceptance criterion, the test documentation, and the responsibilities of both Motorola and CCD.

Coverage Acceptance Testing is based on a coverage prediction that accurately represents the implemented infrastructure and parameters that are consistent with the contract agreements.

Subsequent sections define the coverage acceptance test configuration(s) and test criteria.

2.9.4.2 CATP Definitions

Several definitions are needed to accurately describe the coverage acceptance test method and criteria. Where cited, these terms or methods are defined in TIA TSB-88.1-D or TSB-88.3-D.

2.9.4.2.1 Defined Test Area

The defined test area is the geographical area in which communications will be provided that meet or exceed the specified Channel Performance Criterion (CPC) at the specified reliability for the specified equipment configuration(s). The defined test area(s) are listed in Table 2-5 Coverage Acceptance Test Summary.

For coverage testing, the defined composite test area will be divided into a grid pattern by Motorola to produce at least the number of uniformly sized test locations (or tiles) required by the Estimate of Proportions formula [TSB-88.3-D, §5.2.1, equation 2]. The minimum number of test tiles required varies, from a hundred to many thousands, depending on the size of the defined test area, desired confidence in results, type of coverage test, and the predicted versus required reliability.

2.9.4.2.2 Channel Performance Criterion (CPC)

The CPC is the specified minimum design performance level in a faded channel. [TSB-88.1-D, §5.2] For this system, the CPC is the Delivered Audio Quality (DAQ) as stated in Table 2-4 Coverage Acceptance Test Summary. The DAQ definitions are provided in Table 2-4 [TSB-88.1-D, §5.4.2,].

Table 2-4: DAQ Definitions

DAQ	Subjective Performance Description
1	Unusable, speech present but unreadable.
2	Understandable with considerable effort. Frequent repetition due to noise/distortion.
3	Speech understandable with slight effort. Occasional repetition required due to noise/distortion.
3.4	Speech understandable with repetition only rarely required. Some noise/distortion.
4	Speech easily understood. Occasional noise/distortion.
4.5	Speech easily understood. Infrequent noise/distortion.
5	Speech easily understood.

The CPC pass/fail criterion is the faded performance threshold, plus any adjustments for antenna performance, external noise, and in-building or in-vehicle losses [TSB-88.1-D, §5.4.2, Figure 5]. The faded performance threshold for the specified CPC is determined using the receiver's static reference sensitivity, adjusted by the projected CPC parameters for the applicable Modulation Type and DAQ, as listed in the current version of TSB-88.1, Annex A, Table A-1. For coverage testing of digital voice radio systems, the faded performance threshold is the applicable Bit Error Rate (BER) from the projected CPC parameters.

2.9.4.2.3 Reliability

The Service Area reliability is the percentage of locations within the defined test area that are predicted to meet or exceed the specified CPC. The Motorola map(s) provided in section 2.1 System Design indicate the Service Area(s) within which this system is predicted to provide at least the reliability of meeting or exceeding the CPC as stated in Table 2-5 Coverage Acceptance Test Summary.

After all accessible tiles in the defined composite test area have been tested, the Service Area reliability will be determined by dividing the number of tiles tested that meet or exceed the CPC pass/fail criterion by the total number of tiles tested [TSB-88.3-D, §5.1, equation 1].

2.9.4.2.4 Direction(s) of Test

The direction(s) of test in Table 2-5 Coverage Acceptance Test Summary defines the direction(s) which will be tested for coverage acceptance. Outbound (also called forward link, downlink, or talk-out) is the path from the fixed equipment to the mobile or portable radios. Inbound (also called reverse link, uplink, or talk-in) is the path from the mobile or portable radios to the fixed equipment. Outbound and Inbound independently means each direction will be evaluated as a separate independent test.

2.9.4.2.5 Equipment Configurations

This section defines the equipment configurations and infrastructure design parameters upon which the coverage guarantee and the coverage acceptance test are based. The equipment configurations are defined in Table 2-5 Coverage Acceptance Test Summary, and include user equipment, outdoor/in-building definition, defined test area, number of test tiles, reliability, CPC, CPC pass/fail, and direction(s) of test. The infrastructure design parameters are defined in Table 2-6 Infrastructure Design Parameters, and include site names, site locations, and antenna system parameters. If the implemented system equipment configuration and/or infrastructure design parameters vary from these configurations and/or parameters, a revised coverage acceptance test plan may be required.

Coverage testing will be conducted with equipment installed per the configurations in Table 2-5 Coverage Acceptance Test Summary, and with the antennas in unobstructed locations that are not adjacent to other large objects or metallic items that would distort the antenna patterns.

Table 2-5: CCD Coverage Acceptance Test Summary

User Equipment	Outdoor / In-Building	Defined Test Area	Number of Test Tiles	Service Area Reliability	CPC	CPC Pass/Fail	Direction(s) of Test
800MHz P25 TDMA							
APX Portable with quarter-wave flex whip antenna in belt clip with remote speaker microphone for transmit and receive	In-Building (Various loss values)	Composite Service Area	2016 (0.25 mile tiles)	95%	DAQ-3.4	2.4% BER Outbound. 2.6% BER Inbound	Outbound and Inbound Independently
APX Portable with quarter-wave flex whip antenna in belt clip with remote speaker microphone for transmit and receive	In-Building (Various loss values)	Composite Service Area	2016 (0.25 mile tiles)	95%	DAQ-3.4	SSI provided for informational purposes	Outbound

As specified, the loss value used for the APX portable during test will be based on TSB-88.1-D, Table D, which specified a value of -14.3 dB.

During testing, the in-building loss value will be based on the specific test area in which the tile under test is located. The specific loss values are defined as follows:

- Downtown: 21 dB
- Denver Tech Center: 18 dB
- General Coverage Area (consisting of the following): 15 dB
  - Political boundaries of the City and County of Denver, less the area east of E-470 and the aforementioned Downtown and Denver Tech Center
  - Political boundaries of the City of Glendale and the service area of the Skyline Fire District
  - Political boundaries of the City of Sheridan
  - Political boundaries of the City of Englewood
  - Red Rocks Mountain Park

The figure below represents the test areas as defined above.

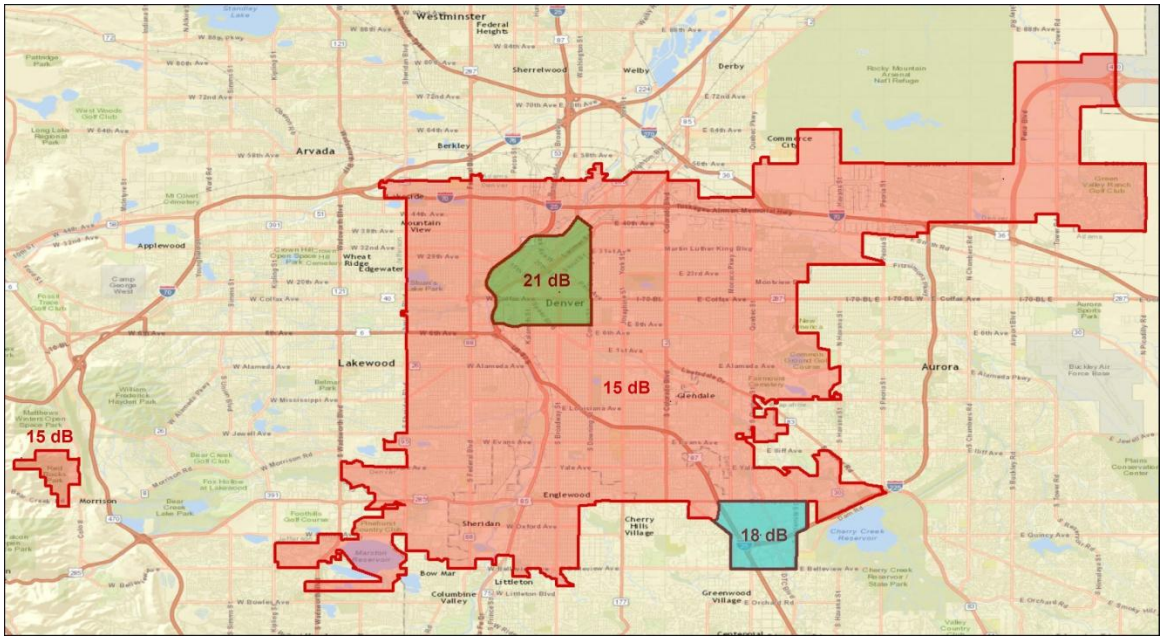


Figure 2-1: Specified Test Areas

Table 2-6: CCD Infrastructure Design Parameters

Site Name	Latitude	Longitude	Transmit Antenna System		Receive Antenna System		
			Mount Height	Antenna Model	Mount Height	Antenna Model	Sensitivity Degradation assumed
Simulcast Cell							
1670 Broadway	39°44'34.4" N	104°59'12.2" W	480 ft	Sinclair: SC476-HF1LDF(D00) – Qty2	480 ft	Sinclair: SC412-HF2LDF(D00) – Qty 2	0 dB
Denver Housing Authority	39°38'18.0" N	104°53'59.9" W	110 ft	Sinclair: SC476-HF1LDF(D00) – Qty 2	110 ft	Sinclair: SC412-HF2LDF(D00) – Qty 2	0 dB
DFD Station 2	39°47'29.7" N	104°47'42.8" W	100 ft	Sinclair: SC476-HF1LDF(D00) – Qty 2	100 ft	Sinclair: SC412-HF2LDF(D00) – Qty 2	0 dB
Mountain Towers	39°41'45.1" N	104°56'20.0" W	310 ft	Sinclair: SC476-HF1LDF(D00) – Qty 2	310 ft	Sinclair: SC412-HF2LDF(D00) – Qty 2	0 dB
Mount Morrison (Receive Only)	39°40'17.51" N	105°13'7.81" W	145 ft	RFS: BMR8-A (D06) – Qty 1	165 ft	RFS: BMR8-A (D06) – Qty 2	0 dB
ASR							
Mount Morrison	39°40'17.51" N	105°13'7.81" W	145 ft	RFS: BMR8-A (D06) – Qty 1	165 ft	RFS: BMR8-A (D06) – Qty 2	0 dB

2.9.4.2.6 CPC Pass/Fail Criterion for a Test Tile

For the composite service area, the CPC pass/fail criterion for a test tile is stated in Table 2-5 Coverage Acceptance Test Summary.

To measure BER, the coverage test will be performed with the appropriate attenuator value installed in the test radio antenna line, to establish an equivalent signal level performance for the specific test area in which the tile under test is located.

Coverage for portable outdoor equipment configurations will be verified for acceptance by attenuation of the test radio for BER tests. The attenuation will be the difference between the test radio's antenna system and the additional loss used in Motorola's coverage prediction to account for portable antenna performance. The attenuator values are provided in Table 2-7.

This provides a method of verifying that the radio system provides the required BER for the specified CPC for each of the defined test areas.

Below are the attenuator values required to evaluate each equipment configuration. The methodology to determine the attenuator value is demonstrated in TSB-88.1-D §5.4.2, Figure2-7. The attenuator value includes the proper values for the equipment configuration requirement plus adjustments for the test equipment setup. Should the test equipment setup losses (e.g. cable length) vary, an adjustment to the attenuator value may be required to represent the required equipment configuration accurately.

Table 2-7: Attenuator Values Each Test Area

Test Area	Attenuator Value
General Coverage Area	[portable antenna loss = 14.3] + 15 dB – [test equipment losses]
Denver Tech Center Coverage Area	[portable antenna loss = 14.3] + 18 dB – [test equipment losses]
Downtown Coverage Area	[portable antenna loss = 14.3] + 21 dB – [test equipment losses]

2.9.4.2.7 Required Number of Test Tiles in the Defined Test Area

The method used to test coverage is a statistical sampling of the defined test area to verify that the CPC is met or exceeded at the required reliability for the composite service area. It is impossible to verify every point within a defined test area, because there are infinite points. Therefore, coverage reliability will be verified by sampling a statistically significant number of randomly selected locations, quasi-uniformly distributed throughout the composite test area. There is one test sample per test tile, where a sample consists of multiple sub-samples.

Coverage acceptance testing will be performed in the composite test area as indicated on Motorola-provided maps included in Section 2.1 System Design. To verify that the reliability requirement is met, the composite test area indicated on Motorola's maps will be divided into uniformly sized test tiles, with at least the number of test tiles indicated in Table 2-5 Coverage Acceptance Test Summary.

Per TSB-88.3-D, the stated minimum tile size is 100 by 100 wavelengths; however, the minimum *practical* test tile size is typically about 400 by 400 meters (about 0.25 by 0.25 miles) and, as specified in Table 2-5, this size of 0.25 mile by 0.25 miles shall be used in this CATP for CCD. The minimum practical tile size for any system is determined by the distance traveled at the speed of the test vehicle while sampling, GPS error margin, and availability of road access within very small test tiles. Related considerations include the time, resources, and cost involved in testing very large numbers of very small tiles. For a given defined test area, all test tiles must be of equal size. In some wide-area systems, this constraint on maximum tile size may dictate a greater number of test tiles than the minimum number required by the Estimate of Proportions formula.

No acceptance testing will be performed in locations outside the composite test area as indicated on the Motorola-provided maps. Motorola and CCD may agree to perform "information only" tests in locations outside the composite test area. However, these "information only" test results will not be used for coverage acceptance. Any "information only" test locations must be defined before starting the test. If the added locations require significant additional time and resources to test, a change order will be required and Motorola may charge CCD on a time-and-materials basis.

2.9.4.2.8 Accessibility to Test Tiles

Prior to testing, Motorola and CCD will plan the route for the test vehicle(s) through the defined test area, to ensure testing for at least the minimum required number of tiles is tested. While planning the route (if possible) or during the test, Motorola and CCD will identify any large areas of test tiles that are inaccessible for the coverage test (due to lack of roads, restricted land, etc.). Examples of such large areas are airports, large privately-held lands, etc. Motorola will make a reasonable effort to test such large areas of inaccessible tiles, however, should they not be able to be tested, they will be removed from the definition of the test area.

TSB-88.3-C provides consideration for inaccessible test locations called "Estimated based on adjacent tiles (single tiles only)". Single inaccessible test locations will be considered a "pass" if five of the eight surrounding test tiles provide passing results, provided that the CATP test tiles are defined as follows:

1. Only those test tiles where the majority of the tile falls within the boundaries of the CATP area under test.
2. Those test tiles within the CATP boundaries that are actually tested.
3. Inaccessible test tiles which are surrounded by not less than five contiguous test tiles which have been tested and show an actual passing result (untested test tiles are not counted).
4. Any other untested test tiles that do not fit any of the criteria above (e.g., untested test tiles surrounded by other untested test tiles, or less than five passed test tiles, etc.) shall be categorized as simply "untested" and will be eliminated from the acceptance test calculation.

If elimination of inaccessible test tiles results in less than a statistically significant number of test tiles or substantially alters the defined test area, Motorola reserves the right to adjust the committed reliability based on the reduced number of accessible test tiles within the altered test area and the Estimate of Proportions formula [TSB-88.3-D, §5.2.1, equation 2].

2.9.4.2.9 Random Selection of a Test Location in Each Tile

This CATP provides an objective method of randomly selecting and tracking test locations using Motorola's Voyager℠ coverage testing tool. The method has direct correlation with Motorola's coverage prediction methodology.

Using Voyager, the actual test location within each test tile will be randomly selected by the test vehicle crossing into the tile at an arbitrary point, with an arbitrary speed and direction. If the selected test location is in a shielded area such as a tunnel or underground parking garage, the data from that test location must be eliminated in favor of a replacement test location.

2.9.4.2.10 CPC Measurements in Each Tile

For Outbound and Inbound BER testing, complementary timing profiles will be used by Voyager and the Voyager Fixed Network application, VFNE-2, to interleave the inbound and outbound testing. VFNE-2 will be used to gather inbound test statistics. The mobile application, Voyager, will gather outbound test statistics and will send an inbound test pattern to VFNE-2.

2.9.4.2.11 Responsibilities and Preparation

This section identifies the responsibilities of CCD and Motorola regarding requirements for equipment, personnel, and time during the coverage test.

CCD will provide the following for the duration of the coverage test:

- At least one driver and test vehicle that is representative of the vehicles to be installed with radios
- Exclusive use of the test channels required by Motorola during the test.

Motorola will provide the following for the duration of the coverage test:

- At least one Motorola Voyager coverage testing tool.
- One or more computers equipped with Motorola VFNE-2 software and connected to the radio network for collecting inbound signal statistics.
- A timing profile to allow the test radio to transmit and receive at regular intervals will be established to facilitate automatic inbound and outbound BER statistics gathering.

As required, Motorola will also provide a receiver signal strength calibration file for the test radio(s) used with the Voyager coverage testing tool.

Before starting the test, CCD and Motorola will agree upon the time frame for Motorola's submission of a report containing the coverage test results.

Prior to the start of the CATP, Motorola shall provide a calibrated service monitor that CCD and Motorola will use to establish that the test radio(s) is (are) reporting accurate data regarding the received signal strength of the system as well as to confirm the loss values for each attenuator used in testing.

2.9.4.2.12 CATP Procedures

A coverage acceptance test will be performed using Motorola's Voyager tool to randomly select test locations and to manage BER data collection.

Voyager consists of the following:

- A voice test radio connected to an antenna installed in a representative location on the test vehicle. The test radio will monitor transmissions from the fixed network radio site(s)
- A Global Positioning System (GPS) receiver, which will provide the computer with the location and speed of the test vehicle
- A laptop computer with Voyager software and a mapping database, which includes highways and local streets
- A computer with the Voyager Fixed Network (VFNE-2) application, connected to the system network to retrieve inbound BER statistics and to initiate the outbound test pattern.

The procedure for the objective BER coverage test will be as follows:

- The Voyager tool will be installed in a test vehicle, which will be driven over a route planned to cover the accessible tiles within the defined test area.
- During the coverage test, the laptop computer screen will display the vehicle's location on a map of the defined test area, overlaid with the grid of test tiles. Voyager will automatically initiate outbound measurements and inbound transmissions based on the defined timing profile. The computer will provide a visual indication that a measurement has been completed. Voyager will manage the coverage test data collection and store the outbound measurements for each tested tile for later analysis. Voyager will use the information collected by the VFNE-2 fixed-end application for the inbound tests. Voyager will use its merge and export feature to match the inbound measurements to a test tile and display the BER statistics.
- For TDMA System Inbound/Outbound BER/SSI Coverage Testing, one channel is required. The TDMA inbound and outbound test will use a 1031Hz test pattern. A single TDMA channel can be used for both the inbound and outbound testing. The TDMA base stations must be put into test mode to gather inbound signal strength and BER information and to transmit the outbound test pattern. The outbound test will send the 1031 Hz pattern on both TDMA logical channel 0 and 1

at the same time. The inbound test from the mobile can use either TDMA logical channel 0 or TDMA logical channel 1. The Voyager Fixed Network (VFNE-2) application will connect to the system test port to establish an IP session to each base station to gather inbound signal statistics and initiate the outbound signal. The outbound test pattern, once initiated, will send a continuous O.153 test pattern over the air to allow the radio in the Voyager test vehicle to gather signal statistics whenever a test is initiated.

- Motorola shall conduct an "initial/simulcast round" test covering all coverage grids using the frequencies and equipment of the simulcast system. The results of this "initial/simulcast round" test may be used to determine pass/fail outcome of this CATP. Motorola shall also conduct a "secondary/ASR round" using the frequencies and equipment of the simulcast system. This "secondary/ASR round" shall be conducted covering the coverage grids of the Red Rocks Park area as well as many coverage grids that can be driven in a total of two 8-hour shifts. The results of this "secondary/ASR round" may be used by Motorola, if necessary, to determine pass/fail outcome of this CATP and they shall be provided to CCD for information purposes.

2.9.4.2.13 CATP Documentation and Coverage Acceptance

During the coverage acceptance test, Voyager will generate computer files that include the raw test data. A copy of this data will be provided to CCD at the conclusion of the coverage test. Motorola will process this data to produce a map detailing the coverage test results and to determine whether the coverage test was passed for the composite test area.

The coverage acceptance criterion for a user equipment configuration will be that the voice radio system implemented by Motorola for CCD meets or exceeds the reliability stated in Table 2-29 (Coverage Acceptance Test Summary) for that user equipment configuration. The system coverage acceptance criterion will be the successful passing of each of the user equipment configurations defined in Table 2-29 (Coverage Acceptance Test Summary).

Motorola reserves the right to review any test tiles that fail. If a coverage test, or a portion thereof, is suspected by Motorola to have failed due to external interference, those tiles suspected of being affected by an interferer may be re-tested. If the test tiles re-tested are confirmed to have failed due to interference or external noise, those test tiles will be excluded from all acceptance calculations and Motorola will work with CCD to identify potential solutions to the interference issues.

Motorola will conduct this Coverage Acceptance Test only once. If any portion of the test is determined to be affected by proven equipment malfunctions or failures, Motorola will repeat the portion of the test affected by the equipment malfunction or failure. CCD will have the option to accept the coverage at any time prior to completion of the coverage test or documentation process.

This CATP shall be considered as passed if, after testing per the methods described herein, 95% or more of the grids tested (or otherwise included in the test) are found to meet both of the CPC Pass/Fail criteria listed in Table 2-5.

Motorola will submit a report detailing the coverage test results to CCD. This report will include a document, which is to be signed by both CCD and Motorola, indicating the test was performed in accordance with this CATP, the results of the test indicate the acceptance or non-acceptance of the coverage portion of the system, and a table that shows the following: i) the latitude and longitude of each test grid, ii) the time and date each grid was tested, iii) the test equipment set that was used to test each test grid, iv) the inbound BER% and signal strength level recorded in each grid and v) the outbound BER% and signal strength recorded in each grid.

2.9.5 SYSTEM IMPLEMENTATION PLAN

The system implementation plan is a coordinated effort between Motorola and the CCD which will follow the agreed upon schedule at is the outcome of the Detailed Design Review.

The Project Management Plan included as Section 2.7 of this Statement of Work is the System Implementation Plan for this project.

2.9.6 TRANSITION AND MIGRATION PLANNING

2.9.6.1 Site Equipment and RF System Cutover

Motorola has transitioned many competitive proprietary systems to Motorola P25 trunking systems and carries that knowledge and experience forward in how we crafted the CCD system, site and user group specific migration.

To transition from the existing system to the proposed Motorola P25 digital system, Motorola and CCD will develop and agree upon a system transition plan. This plan, when executed precisely, will allow the end users to transition as smoothly as possible and without interruption onto the new system.

It is not the purpose of this section to present the final plan, but to identify the key components that will be transitioned, to highlight the challenges associated with those transitions, and to present recommended directions and solutions for each. The final, detailed plan will be developed as a joint collaboration between representatives of the CCD and Motorola and will be detailed with Gantt and/or flowcharts.

2.9.6.2 Site Equipment and RF System Transition

Motorola proposes a completely parallel implementation of the new P25 system. This will allow P25 equipment at each RF site to be powered up and brought online with the Wide Area Controller Sites. Each site in the system has unique requirements that will be addressed during the design review process.

Frequency Migration – For testing purposes, the new system will require a minimum of two frequencies at each site, a control channel and a voice channel. These frequencies will need to be deactivated from the existing system, or obtained from another source. To prevent interference, only one system will be able to use any pair of existing 800 MHz frequencies at a time per site.

Once the new system has been made live, the frequencies can be deactivated from the existing system and made live on the new system at each site. Sites with space constraints will require a temporary move of existing equipment. Motorola will coordinate with CCD to agree upon final transition plans for each site.

2.9.6.2.1 Transition for Sites

Detailed transition plans will be developed for each site during the Detailed Design Review and Implementation phases of the project. The table below illustrates an example of a high-level transition plan. For purposes of the transition plan for the site, it is assumed that the following steps have been completed at a system level and/or at other sites prior to transition:

Step	Site Transition Step	User Impact of Step
1	Install P25 Radio Equipment – Parallel installation to existing EDACS system.	No impact to radio users or dispatchers
2	Interface Site to Wide Area Trunked System Controller – Base repeaters will be put on dummy loads and will train to the new system controllers (no EDACS channels impacted).	No impact to radio users or dispatchers
3	Turn off EDACS channels as required by the frequency plan to support one (1) control channel and one (1) voice channel on the Simulcast cell P25 system. Two channels (different frequency) will be required for the ASR site. Enable four (4) channels total on the P25 for testing.	EDACS channels reduced up to 4 channels
4	Perform function acceptance testing and coverage testing.	No impact to radio users or dispatchers
5	Program CCGW interfaced control stations with EDACS talkgroup for patching to P25 talkgroup (do not patch yet).	No impact to radio users or dispatchers
6	Dispatch supervisor sets up patches at the console between EDACS talkgroups and P25 talkgroups to support interoperability of the user transition group. Dispatchers for transition group move to new consoles.	No impact to radio users. Dispatchers who are not part of the transition group are not impacted.
7	Radio users in the selected transition group will switch over to their respective talkgroups on the P25 system.	Radio users and dispatchers now use the new system.
8	Decommission talkgroups on the EDACS system, as appropriate once all users of the transition group have migrated to the new system.	Radio users and dispatchers must use new talkgroups.
9	As required to maintain proper loading, turn off channels on the EDACS system and turn on channels on the P25 system.	No impact to radio users or dispatchers.
10	Take down patches as old talkgroups are vacated (as appropriate) so that CCGWs can be used for the next user transition group(s).	No impact to radio users or dispatchers

Antenna Systems – This proposal requires new antenna systems for each site. Completely new antennas, tower top amplifiers, feed-lines and connectors will be used. The new antenna installation locations have been estimated based on the site information provided and site walks conducted, and have been detailed in the RFP response. It is anticipated that the new antennas will be installed in parallel with the existing antennas where possible. Where this is not possible, a migration plan for the antenna systems will be developed during the design review.

2.9.6.3 Dispatch Console Upgrade And Cutover

The Primary Dispatch center will be located at 12025 East. 45th Street. Twenty-six new MCC 7500E consoles will be installed at this location. The Backup dispatch center will be located at 950 Josephine . Sixteen positions will be located at this facility. The remaining console positions at various dispatch centers may involve parallel installations with existing consoles.

Working with CCD, Motorola will deactivate a minimum number of dispatch positions at each location, remove them from service, and install the new MCC7500E positions in their location. Consoles and interfaces will be tested. Once testing is complete, CCD can begin to move dispatchers to the new positions. The remaining positions can then be deactivated and replaced in the same manner.

As an alternative, CCD can move their operations to the backup dispatch center while the primary dispatch center consoles are replaced. Once the primary center has been brought on line, operations can move from the backup center to the primary center. The backup center could then be transitioned to the new consoles.

2.9.6.4 Radio Subscriber Fleet Cutover Approach (Programming)

All subscribers will be programmed, commissioned, and made active on the new system prior to transition.

Motorola’s conceptual project schedule proposes cutting over users by agency, and in many cases agencies will be brought over by subgroups. Continuity between the users on the P25 system and the EDACS system will be achieved through patching critical talkgroups between systems.

Motorola will assist CCD in developing subscriber migration instructions tailored to each specific group of radio users. Instructions will include talkgroup assignments and how to navigate to those talkgroups. These migration instructions will include fallback instructions in case the end user experiences system or subscriber issues.

Motorola will work closely with the CCD to develop procedures as users are transitioned to ensure that they are communicating properly on the new network.

2.9.6.5 Site "Turn Up" Sequencing

P25 sites will be installed and tested in parallel with the existing system and will be “in-service” upon completion of the acceptance and coverage tests. Motorola has carefully developed the frequency plan and frequency/channel transition plan such that specific site “turn-up” sequencing does not have an impact to ongoing operations.

The new P25 system will use many of the frequencies that are currently being used by the EDACS system. As such, a limited number of channels at each P25 site will be in operation for the first phase of the subscriber migration. As users are transitioned to the P25 system, additional frequencies will be moved from the EDACS system to the new P25 system, maintaining properly loading on each system.

A parallel installation and interoperability between new and old systems will allow subsets of users to communicate on the new system prior to the official transition. The actual transition will simply increase the number of active channels on the new system, while simultaneously reducing the number of active channels on the legacy system until the legacy system is completely taken off-line.

2.9.6.6 Network Management

Prior to the cutover of any sites to active mode, all sites will have been configured in the Core database and in the Fault management system. The Unified Network Configurator (UNC) allows for proper configuration on a channel and site level. As channels are brought into operation, they will be detected and monitored by the fault management system.

Network management terminals will be located at the Prime and Backup Master sites and will allow authorized technical personnel to monitor the progress of the cutover as well as the ability to manage and configure the system.

The Provisioning Manager is the tool to configure the subscribers that will access the system. Prior to any subscribers being granted access to the system, the PM will already have the radios provisioned in the database. This will allow for an orderly transition of radios onto the new system.

2.9.6.7 Voice Logger Transition

The Voice logging system uses an Archiving Interface Server (AIS) and the Verint Audio Logger. The AIS is configured to pass specific Talkgroup audio to the Verint which stores the audio. With the transition of the consoles, and the required patches, audio from the existing system and the new system can be passed through the AIS to the logging recorder.

2.9.6.8 Risk Mitigation

Risk mitigation is accomplished with detailed planning for each phase of the transition. This detailed plan will be developed by Motorola and CCD during the detailed design review.

Each phase will be reviewed and potential risks identified. After risks have been identified, each risk will be analyzed as to its potential impact. Plans will be developed to address each identified risk.

For the system overall, risk is minimized through the use of redundancy and a no-single-point-of-failure design. A parallel installation provides risk mitigation because of the ability to revert to the existing system at any time. It also provides through testing prior to any movement to the new system.

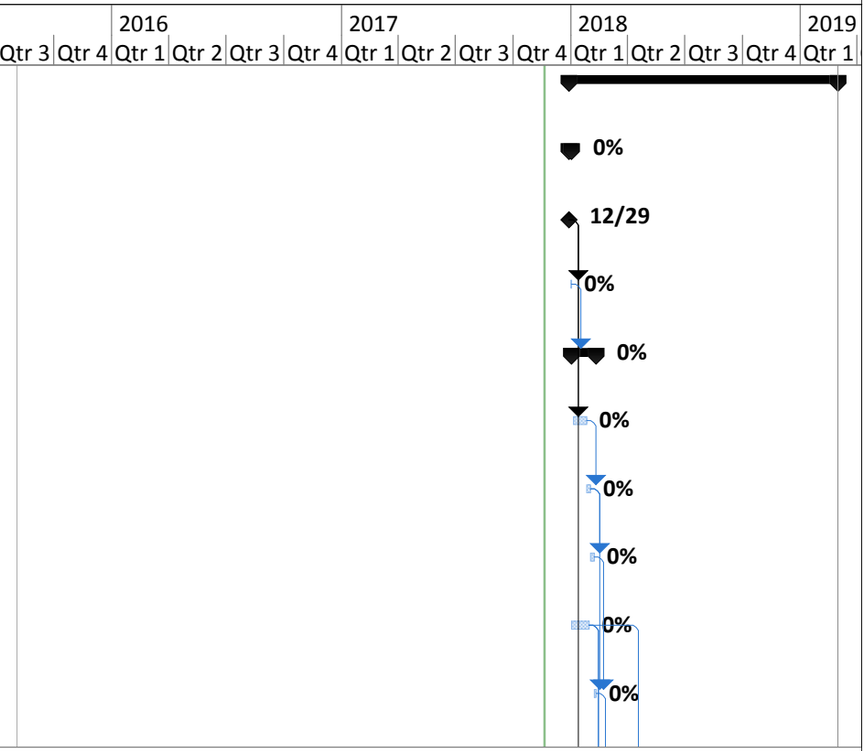
2.9.6.9 Subscriber installation and distribution

If subscribers are purchased, Motorola will work with the CCD to develop a detailed plan for the provisioning, configuration, and installation of subscriber radios. Agencies and their vehicles will be identified and scheduled for installation and cutover. With the ability to patch EDAC system talkgroups to the P25 system, mobile units will have their existing radios swapped out for new P25 radios. The patch allows talkgroups on the EDACS system to communicate with talkgroups on the new P25 system. As complete groups are moved over, the patches can be removed. Portables can be programmed and configured prior to distribution for users.

Prior to any distribution, training on proper operation will have occurred.

City and County of Denver
Preliminary Project Schedule

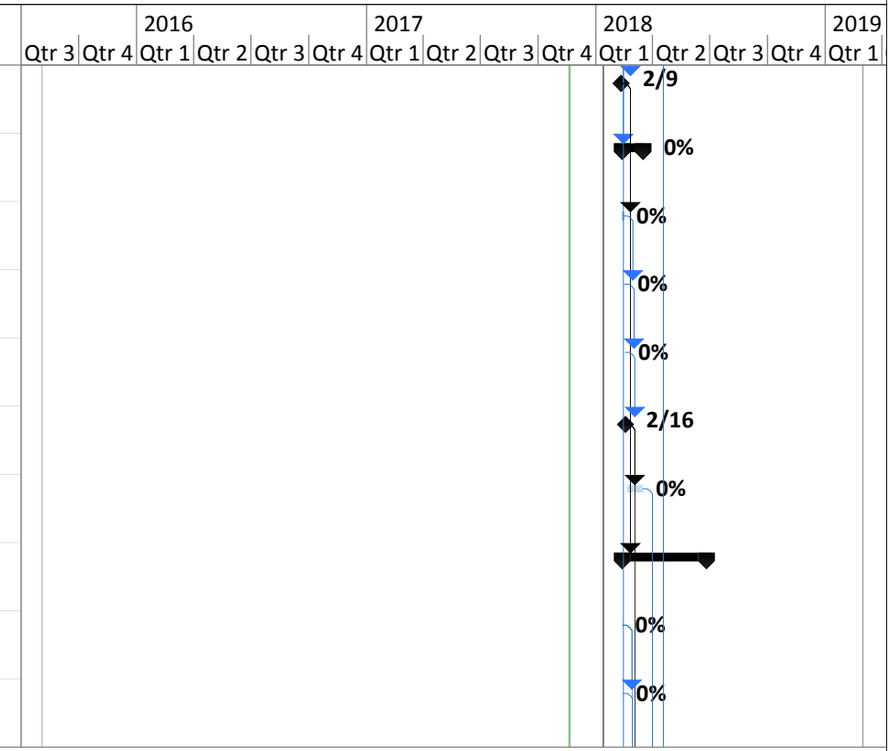
ID	Task Name	Duration	Start	Finish
1	City and County of Denver - Preliminary Schedule	**306 days**	**Fri 12/29/17**	**Fri 3/1/19**
2	Contract	**2 days**	**Fri 12/29/17**	**Mon 1/1/18**
3	Contract Award	0 days	Fri 12/29/17	Fri 12/29/17
4	Kickoff Meeting	1 day	Mon 1/1/18	Mon 1/1/18
5	Contract Design Review	**29 days**	**Tue 1/2/18**	**Fri 2/9/18**
6	Site Survey	15 days	Fri 1/5/18	Thu 1/25/18
7	Finalize Coverage	4 days	Fri 1/26/18	Wed 1/31/18
8	Overall System Design Locked Down	4 days	Thu 2/1/18	Tue 2/6/18
9	Structural/Site Design	20 days	Tue 1/2/18	Mon 1/29/18
10	Update Design Documentation	3 days	Wed 2/7/18	Fri 2/9/18



Critical		Duration-only		Summary	
Critical Split		Path Successor Milestone Task		Manual Summary	
Critical Progress		Path Successor Summary Task		Project Summary	
Task		Path Successor Normal Task		External Tasks	
Split		Baseline		External Milestone	
Task Progress		Baseline Split		Inactive Task	
Manual Task		Baseline Milestone		Inactive Milestone	
Start-only		Milestone		Inactive Summary	
Finish-only		Summary Progress		Deadline	

City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
11	Customer Approval on Updated System Design	0 days	Fri 2/9/18	Fri 2/9/18
12	Order Processing	**25 days**	**Mon 2/12/18**	**Fri 3/16/18**
13	Finalize Equipment Lists and Trial Validation	2 days	Mon 2/12/18	Tue 2/13/18
14	Order Administration and Shipping Information	2 days	Wed 2/14/18	Thu 2/15/18
15	Make Order	1 day	Fri 2/16/18	Fri 2/16/18
16	Order Bridged	0 days	Fri 2/16/18	Fri 2/16/18
17	Manufacture Equipment	20 days	Mon 2/19/18	Fri 3/16/18
18	Install tower at FS2	**96 days**	**Mon 2/12/18**	**Mon 6/25/18**
19	Site visit with A&E	0.5 days	Mon 2/12/18	Mon 2/12/18
20	Prepare site sketch/Lease Exhibit	1 day	Mon 2/12/18	Tue 2/13/18



Critical		Duration-only		Summary	
Critical Split		Path Successor Milestone Task		Manual Summary	
Critical Progress		Path Successor Summary Task		Project Summary	
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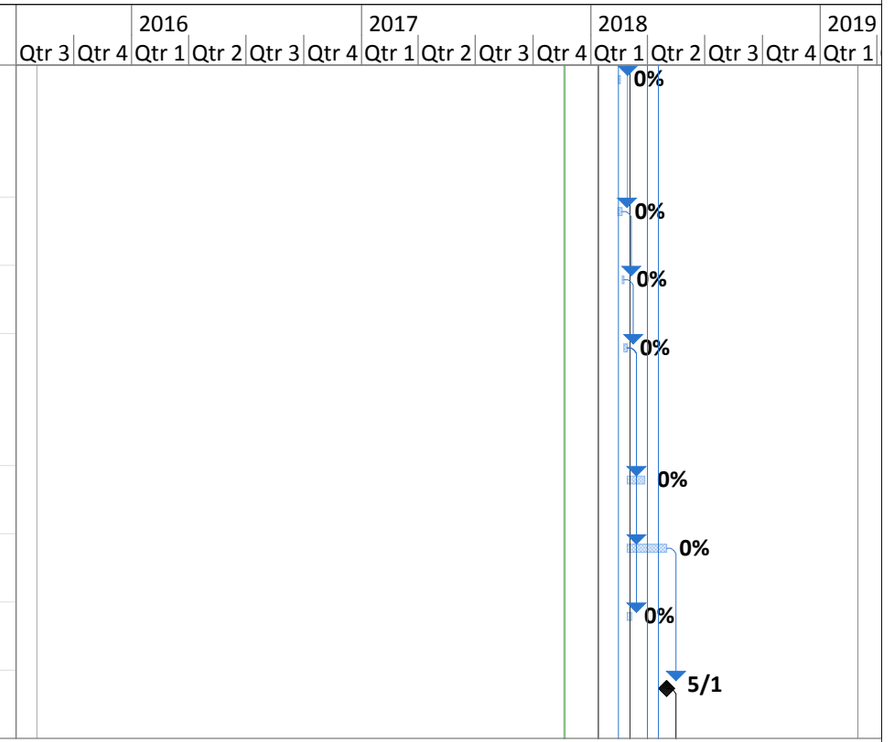
Task Progress		Baseline Split		Inactive Task	
Manual Task		Baseline Milestone		Inactive Milestone	
Start-only		Milestone		Inactive Summary	
Finish-only		Summary Progress		Deadline	

City and County of Denver
Preliminary Project Schedule

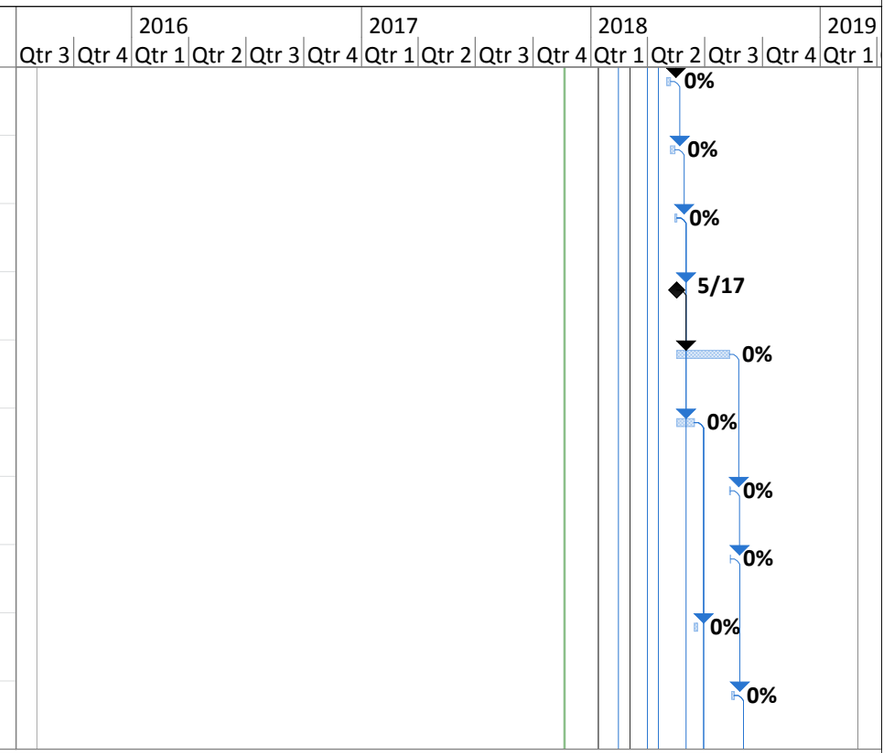
ID	Task Name	Duration	Start	Finish
21	Review and approval of site sketch by City and County of Denver, owner and Motorola	3 days	Tue 2/13/18	Fri 2/16/18
22	Site survey and mapping	5 days	Mon 2/12/18	Mon 2/19/18
23	Preliminary drawings for zoning/City and County of Denver approval	3 days	Mon 2/19/18	Thu 2/22/18
24	Review and approval of drawings by City and County of Denver, owner and Motorola	3 days	Thu 2/22/18	Tue 2/27/18
25	New tower zoning application and approvals	20 days	Tue 2/27/18	Tue 3/27/18
26	NEPA/SHPO studies and approvals	45 days	Tue 2/27/18	Tue 5/1/18
27	Geotechnical Testing and Report	5 days	Tue 2/27/18	Tue 3/6/18
28	*Order Tower Materials based on final antenna locations*	*0 days*	Tue 5/1/18	Tue 5/1/18



Critical		Duration-only		Summary	
Critical Split		Path Successor Milestone Task		Manual Summary	
Critical Progress		Path Successor Summary Task		Project Summary	
Task		Path Successor Normal Task		External Tasks	
Split		Baseline		External Milestone	
Task Progress		Baseline Split		Inactive Task	
Manual Task		Baseline Milestone		Inactive Milestone	
Start-only		Milestone		Inactive Summary	
Finish-only		Summary Progress		Deadline	

City and County of Denver
Preliminary Project Schedule

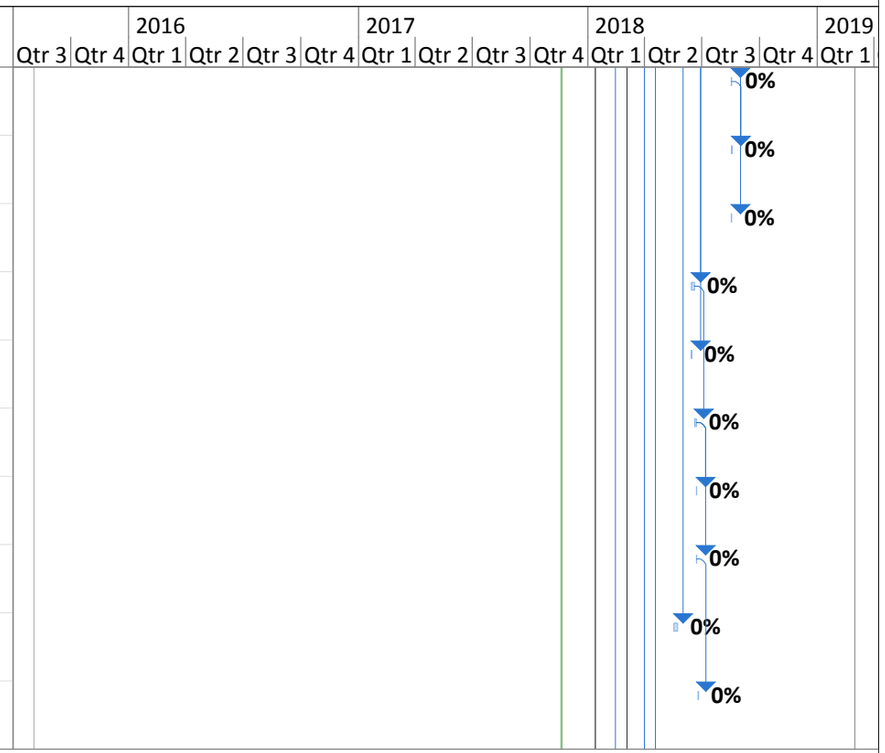
ID	Task Name	Duration	Start	Finish
29	Tower design and drawings	4 days	Tue 5/1/18	Mon 5/7/18
30	Complete Final Detailed drawings for City and County of Denver rev	5 days	Mon 5/7/18	Mon 5/14/18
31	City and County of Denver approval of Final Construction drawings	3 days	Mon 5/14/18	Thu 5/17/18
32	*Site release/ Construction NTP to Contractor*	*0 days*	Thu 5/17/18	Thu 5/17/18
33	Building and construction permit application and approval	60 days	Thu 5/17/18	Thu 8/9/18
34	Tower Manufacturing	20 days	Thu 5/17/18	Thu 6/14/18
35	Locate existing utilities	1 day	Thu 8/9/18	Fri 8/10/18
36	Construction staking	0.5 days	Fri 8/10/18	Fri 8/10/18
37	Ship anchor bolts and base plates to the site	3 days	Thu 6/14/18	Tue 6/19/18
38	Drill, rebar and pour pier and pad foundation	4 days	Mon 8/13/18	Thu 8/16/18



Critical		Duration-only		Summary	
Critical Split		Path Successor Milestone Task		Manual Summary	
Critical Progress		Path Successor Summary Task		Project Summary	
Task		Path Successor Normal Task		External Tasks	
Split		Baseline		External Milestone	
Task Progress		Baseline Split		Inactive Task	
Manual Task		Baseline Milestone		Inactive Milestone	
Start-only		Milestone		Inactive Summary	
Finish-only		Summary Progress		Deadline	

City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
39	Foundation Inspection/concrete testing	0.5 days	Fri 8/17/18	Fri 8/17/18
40	Tower grounding	0.5 days	Fri 8/17/18	Fri 8/17/18
41	Strip forms, backfill and compaction	0.5 days	Fri 8/17/18	Fri 8/17/18
42	Ship tower to site	3 days	Thu 6/14/18	Tue 6/19/18
43	Notify FAA of impending tower construction (7460-2)	0.5 days	Thu 6/14/18	Thu 6/14/18
44	Tower assembly and stacking	3 days	Tue 6/19/18	Fri 6/22/18
45	Tower plumbness testing	0.5 days	Fri 6/22/18	Fri 6/22/18
46	Notify FAA of tower completion (7460-2)	0.5 days	Fri 6/22/18	Fri 6/22/18
47	Ship antennas, line and accessories to the site	4 days	Thu 5/17/18	Wed 5/23/18
48	Install cable support facilities on existing structure	1 day	Mon 6/25/18	Mon 6/25/18



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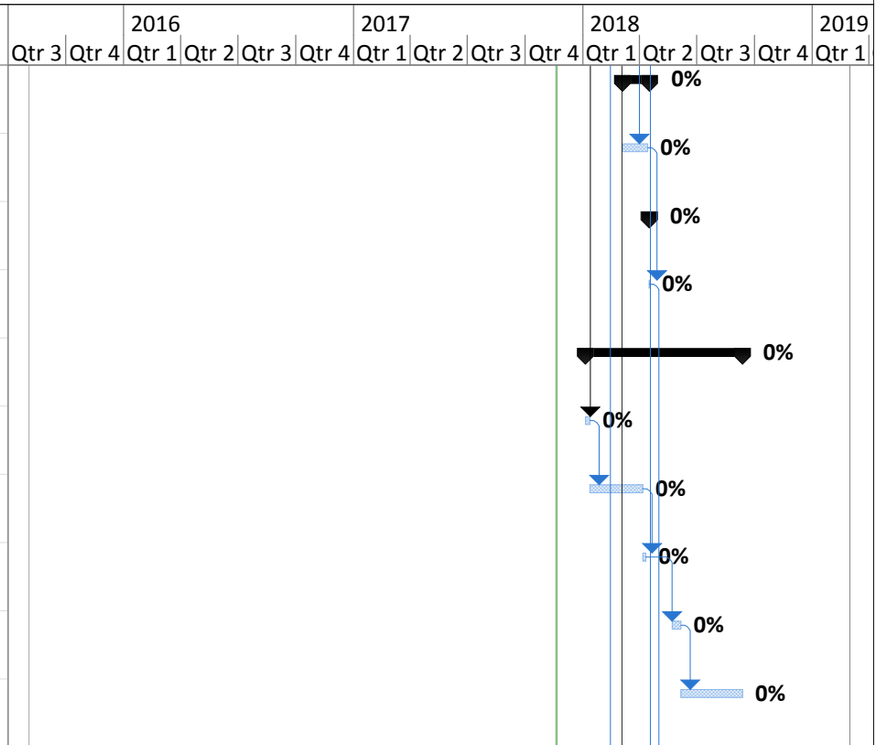
Start-only		Milestone		Inactive Summary	
Finish-only		Summary Progress		Deadline	

City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
49	**Manufacturing and Staging**	**31 days**	**Mon 3/5/18**	**Mon 4/16/18**
50	CCSi Factory Staging	30 days	Mon 3/5/18	Fri 4/13/18
51	**Factory System Acceptance Test (FATP)**	**1 day**	**Mon 4/16/18**	**Mon 4/16/18**
52	CCSi Factory Staging Complete	1 day	Mon 4/16/18	Mon 4/16/18
53	**Microwave Design & Installation**	**178 days**	**Fri 1/5/18**	**Tue 9/11/18**
54	Physical Path Surveys	5 days	Fri 1/5/18	Thu 1/11/18
55	FCC Coordination	60 days	Fri 1/12/18	Thu 4/5/18
56	Order	3 days	Fri 4/6/18	Tue 4/10/18
57	Stage Microwave	10 days	Wed 5/23/18	Tue 6/5/18
58	Installation & Commissioning Onsite	70 days	Wed 6/6/18	Tue 9/11/18



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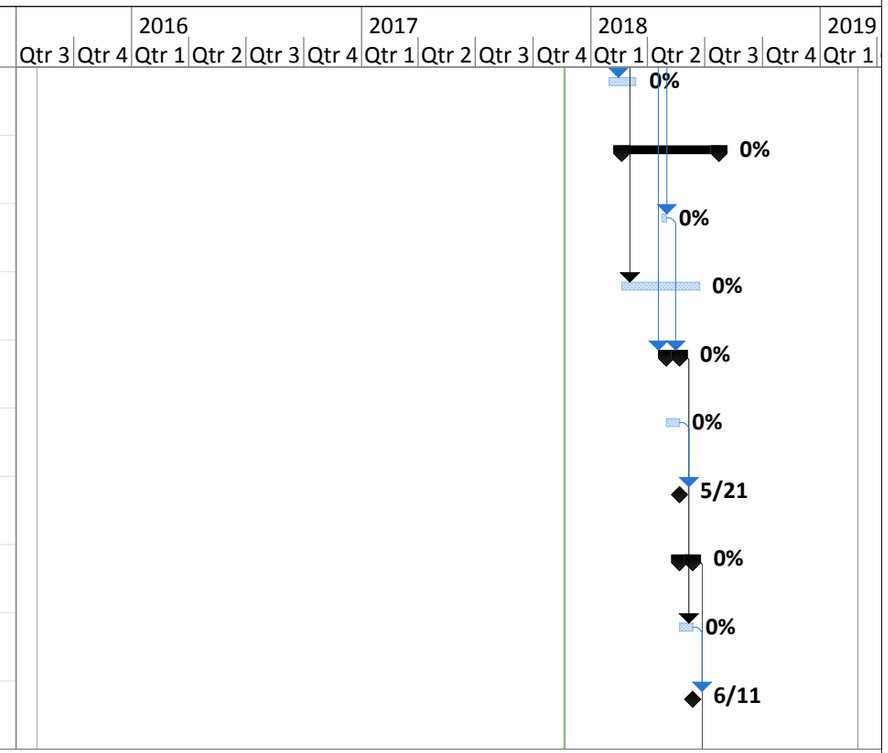
Finish-only		Summary Progress		Deadline	

City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
59	Permitting	30 days	Tue 1/30/18	Mon 3/12/18
60	FNE Installation	**111 days**	**Mon 2/19/18**	**Mon 7/23/18**
61	Receive and Inventory Equipment	5 days	Tue 4/24/18	Mon 4/30/18
62	Receive and Inventory Non Motorola Manufactured Equipment	90 days	Mon 2/19/18	Fri 6/22/18
63	Site Main Master and Prime Site	**15 days**	**Tue 5/1/18**	**Mon 5/21/18**
64	Install Master Site/Prime Site Equipment	15 days	Tue 5/1/18	Mon 5/21/18
65	Site Equipment Install Complete	0 days	Mon 5/21/18	Mon 5/21/18
66	Site - DSR Master and Redundant Prime	**15 days**	**Tue 5/22/18**	**Mon 6/11/18**
67	Install DSR Master/Geo-Prime Equipment	15 days	Tue 5/22/18	Mon 6/11/18
68	Site Equipment Install Complete	0 days	Mon 6/11/18	Mon 6/11/18



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City and County of Denver
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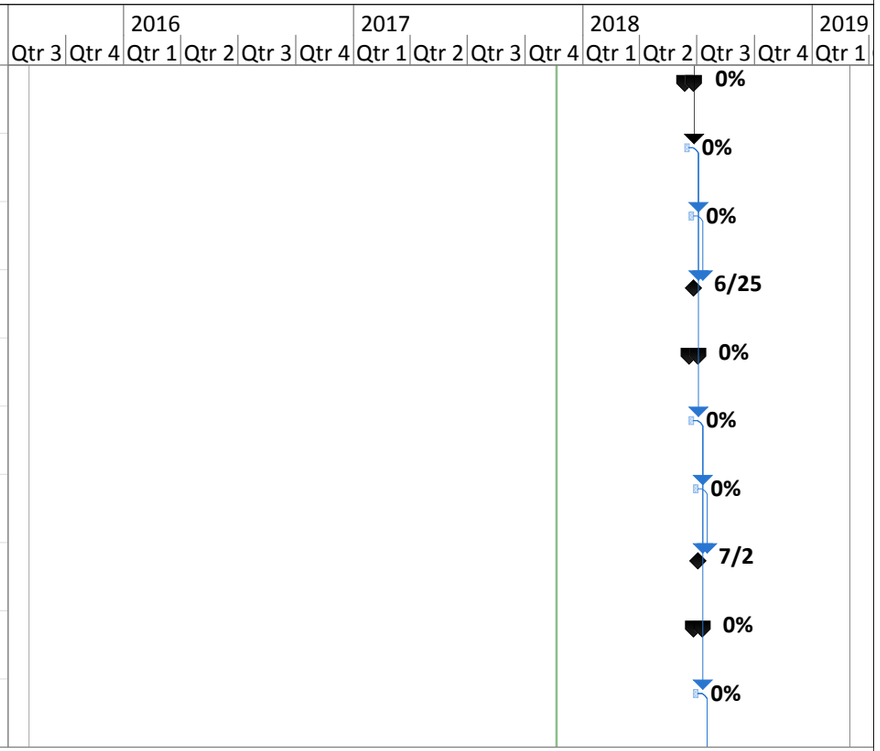
ID	Task Name	Duration	Start	Finish
69	**RF Site 1 (Broadway)**	**10 days**	**Tue 6/12/18**	**Mon 6/25/18**
70	RF Equipment	5 days	Tue 6/12/18	Mon 6/18/18
71	Install Antenna System	5 days	Tue 6/19/18	Mon 6/25/18
72	Site Equipment Install Complete	0 days	Mon 6/25/18	Mon 6/25/18
73	**RF Site 2 (Denver Housing Authority)**	**10 days**	**Tue 6/19/18**	**Mon 7/2/18**
74	RF Equipment	5 days	Tue 6/19/18	Mon 6/25/18
75	Install Antenna System	5 days	Tue 6/26/18	Mon 7/2/18
76	Site Equipment Install Complete	0 days	Mon 7/2/18	Mon 7/2/18
77	**RF Site 3 (Denver FD Stn 2)**	**10 days**	**Tue 6/26/18**	**Mon 7/9/18**
78	RF Equipment	5 days	Tue 6/26/18	Mon 7/2/18



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City and County of Denver
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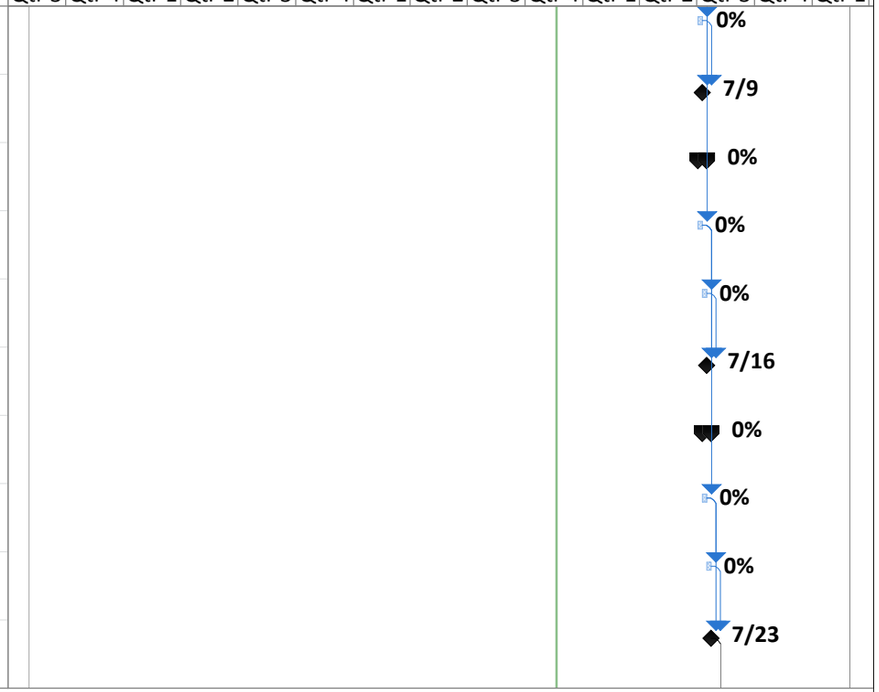
ID	Task Name	Duration	Start	Finish
79	Install Antenna System	5 days	Tue 7/3/18	Mon 7/9/18
80	Site Equipment Install Complete	0 days	Mon 7/9/18	Mon 7/9/18
81	**RF Site 4 (Mountain Towers)**	**10 days**	**Tue 7/3/18**	**Mon 7/16/18**
82	RF Equipment	5 days	Tue 7/3/18	Mon 7/9/18
83	Install Antenna System	5 days	Tue 7/10/18	Mon 7/16/18
84	Site Equipment Install Complete	0 days	Mon 7/16/18	Mon 7/16/18
85	**RF Site 5 (Mount Morrison)**	**10 days**	**Tue 7/10/18**	**Mon 7/23/18**
86	RF Equipment	5 days	Tue 7/10/18	Mon 7/16/18
87	Install Antenna System	5 days	Tue 7/17/18	Mon 7/23/18
88	Site Equipment Install Complete	0 days	Mon 7/23/18	Mon 7/23/18



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City and County of Denver
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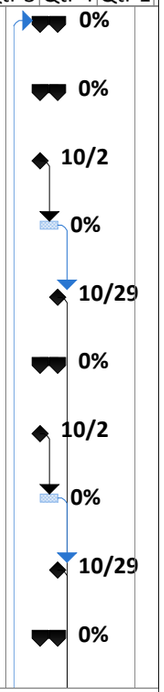
ID	Task Name	Duration	Start	Finish
89	Dispatch Center Equipment Installation	**20 days**	**Tue 10/2/18**	**Mon 10/29/18**
90	Primary Dispatch 26 positions	**20 days**	**Tue 10/2/18**	**Mon 10/29/18**
91	Site Ready for install	0 days	Tue 10/2/18	Tue 10/2/18
92	Install New Dispatch Console Equipment	20 days	Tue 10/2/18	Mon 10/29/18
93	Site Equipment Install Complete	0 days	Mon 10/29/18	Mon 10/29/18
94	Backup Dispatch 16 positions	**20 days**	**Tue 10/2/18**	**Mon 10/29/18**
95	Site Ready for install	0 days	Tue 10/2/18	Tue 10/2/18
96	Install New Dispatch Console Equipment	20 days	Tue 10/2/18	Mon 10/29/18
97	Site Equipment Install Complete	0 days	Mon 10/29/18	Mon 10/29/18
98	Denver Criminal Courts Dispatch 1 position	**20 days**	**Tue 10/2/18**	**Mon 10/29/18**



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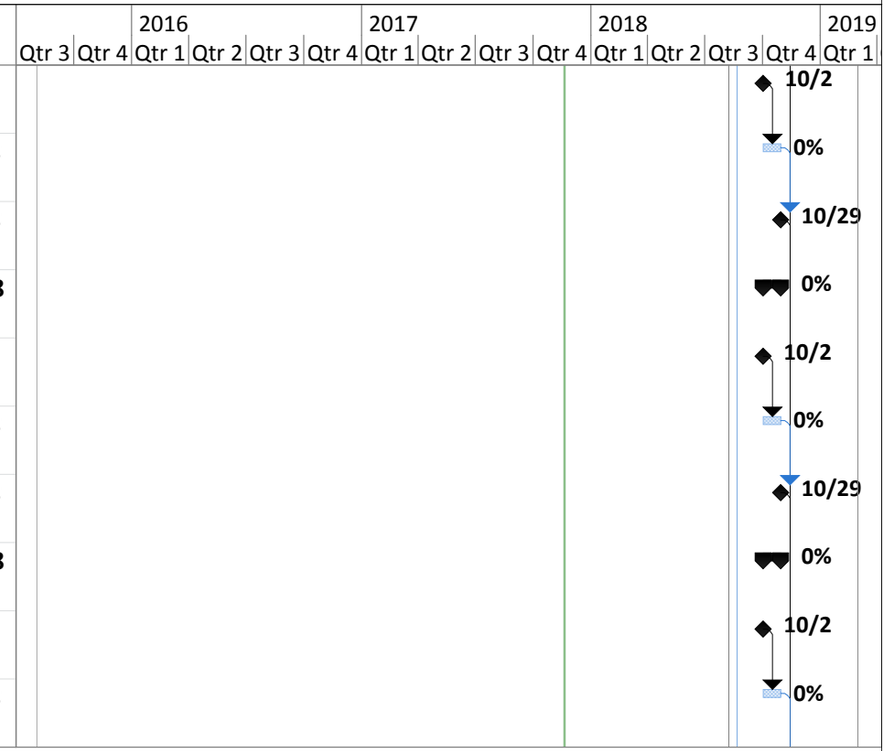
ID	Task Name	Duration	Start	Finish
99	Site Ready for install	0 days	Tue 10/2/18	Tue 10/2/18
100	Install New Dispatch Console Equipment	20 days	Tue 10/2/18	Mon 10/29/18
101	Site Equipment Install Complete	0 days	Mon 10/29/18	Mon 10/29/18
102	Denver County Corrections Dispatch 2 positions	**20 days**	**Tue 10/2/18**	**Mon 10/29/18**
103	Site Ready for install	0 days	Tue 10/2/18	Tue 10/2/18
104	Install New Dispatch Console Equipment	20 days	Tue 10/2/18	Mon 10/29/18
105	Site Equipment Install Complete	0 days	Mon 10/29/18	Mon 10/29/18
106	Denver Right of Way Dispatch 3 positions	**20 days**	**Tue 10/2/18**	**Mon 10/29/18**
107	Site Ready for install	0 days	Tue 10/2/18	Tue 10/2/18
108	Install New Dispatch Console Equipment	20 days	Tue 10/2/18	Mon 10/29/18



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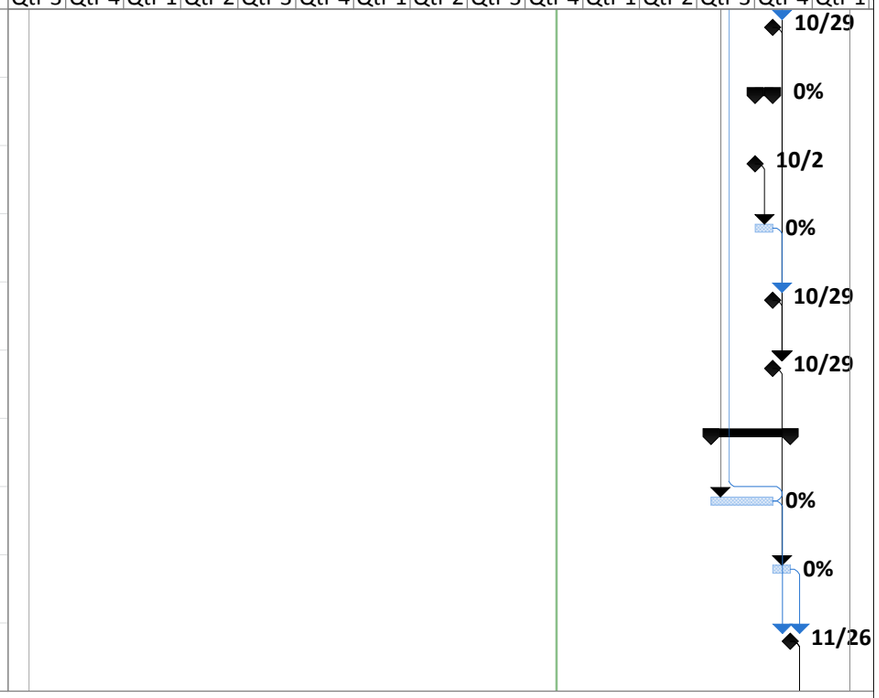
City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
109	Site Equipment Install Complete	0 days	Mon 10/29/18	Mon 10/29/18
110	Radio Shop Dispatch 1 position	**20 days**	**Tue 10/2/18**	**Mon 10/29/18**
111	Site Ready for install	0 days	Tue 10/2/18	Tue 10/2/18
112	Install New Dispatch Console Equipment	20 days	Tue 10/2/18	Mon 10/29/18
113	Site Equipment Install Complete	0 days	Mon 10/29/18	Mon 10/29/18
114	All Dispatch Installation Complete Ready for Optimization	0 days	Mon 10/29/18	Mon 10/29/18
115	System Optimization	**90 days**	**Tue 7/24/18**	**Mon 11/26/18**
116	Optimization of Master Site, Prime & Remote Sites	70 days	Tue 7/24/18	Mon 10/29/18
117	Optimization of Dispatch Consoles	20 days	Tue 10/30/18	Mon 11/26/18
118	Optimization Complete	0 days	Mon 11/26/18	Mon 11/26/18



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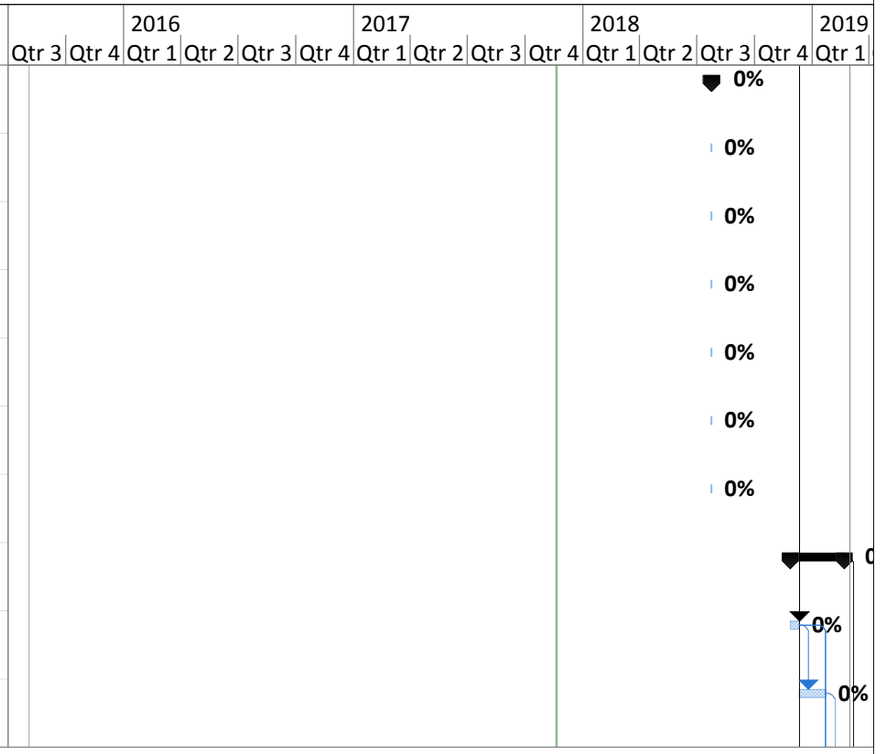
City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
119	**Develop Fleetmap and Codeplugs**	**1 day?**	**Tue 7/24/18**	**Tue 7/24/18**
120	Meet with Agencies to gather info for fleetmaps and codeplugs	1 day?	Tue 7/24/18	Tue 7/24/18
121	Develop first pass codeplugs	1 day?	Tue 7/24/18	Tue 7/24/18
122	Program subset of subscribers with first pass codeplug	1 day?	Tue 7/24/18	Tue 7/24/18
123	Testing of first pass codeplugs	1 day?	Tue 7/24/18	Tue 7/24/18
124	Modify codeplugs based on testing	1 day?	Tue 7/24/18	Tue 7/24/18
125	Program subscribers with final codeplugs	1 day?	Tue 7/24/18	Tue 7/24/18
126	Acceptance Testing and Cutover	**62 days**	**Tue 11/27/18**	**Wed 2/20/19**
127	Acceptance Testing	10 days	Tue 11/27/18	Mon 12/10/18
128	Coverage Acceptance Test (CATP)	30 days	Tue 12/11/18	Mon 1/21/19



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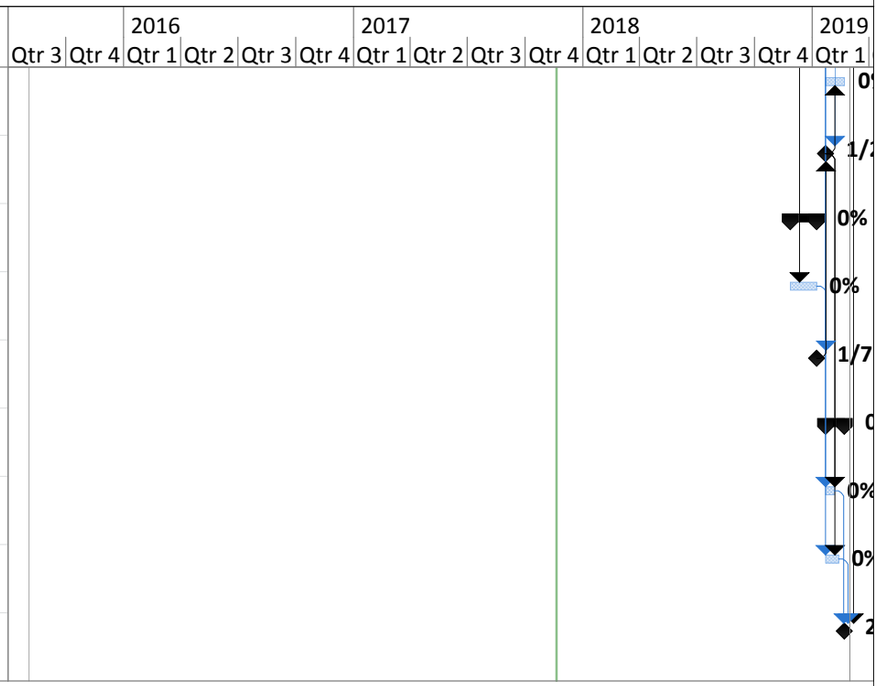
City and County of Denver
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
129	30 Day Operational Test	**30 edays**	**Mon 1/21/19**	**Wed 2/20/19**
130	Cutover	0 days	Mon 1/21/19	Mon 1/21/19
131	Training	**30 days**	**Tue 11/27/18**	**Mon 1/7/19**
132	Technical Training Classes	30 days	Tue 11/27/18	Mon 1/7/19
133	All Training Complete	0 days	Mon 1/7/19	Mon 1/7/19
134	Finalize	**22 days**	**Tue 1/22/19**	**Wed 2/20/19**
135	Resolve Punchlist	10 days	Tue 1/22/19	Mon 2/4/19
136	Finalize Documentation	15 days	Tue 1/22/19	Mon 2/11/19
137	Final Acceptance	0 days	Wed 2/20/19	Wed 2/20/19



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CITY AND COUNTY OF DENVER

SECTION 2.4

LIFECYCLE STATEMENT

P25 PUBLIC SAFETY RADIO SYSTEM REPLACEMENT PROJECT NOVEMBER 20, 2017

REQUEST FOR PROPOSAL NO. 28435Q

MOTOROLA SOLUTIONS

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Section 2.4

SECTION 2.4

LIFECYCLE STATEMENT

2.4.1 LIFECYCLE STATEMENT

Motorola Solutions has completed a thorough review of Section 4, (Product Lifecycle Requirements). The proposed system meets or exceeds all specifications as described by the City and County of Denver (CCD).

Motorola's proposed system is based on the ASTRO 25 platform, which is a P25-compliant trunked radio system. It encompasses Master Site equipment, Control Equipment (Simulcast Controllers, Simulcast Comparators, RF Site controllers), Console/Dispatch equipment, and optional subscriber radios.

The Proposed Solution is the ASTRO 25 7.17 release. This platform and the features it supports were released November of 2016.

There is currently no intent to cancel any products of this ASTRO system. Newer releases are expected to be released as new features and functionality is introduced.

The System is made up of various G-Series components:

- The GTR8000ESS is the transmitter/receiver at the RF sites. The GTR8000ESS came into service in 2005. At this time, there is no intent to cancel.
- The GCP8000 is the station controller located at the Prime Site for the simulcast cell and at the RF sites for the standalone ASR site. The GCP8000 came into service in 2005. At this time, there is no intent to cancel.
- The GCM8000 is the comparator located at the Prime site. The GCM8000 came into service in 2005. At this time, there is no intent to cancel.

The MCC7500 is the dispatch console platform. The MCC7500 was brought into service in 2007 and the MCC7500E is being brought into service in late 2017. At this time, there is no intent to cancel the MCC7500 platform or the MCC 7500E.

Subscribers (Portable/Mobile)

- APX1000 - Beginning ship date July 2014
- APX4000 - Beginning ship date January 2012
- APX6000 - Beginning ship date December 2010 - Refreshed August of 2016
- APX8000 - Beginning ship date August 2015
- APX 4500 - Beginning ship date December 2012
- APX 6500 - Beginning ship date December 2011
- APX 8500 - Beginning ship date December 2016

There is currently no intent to cancel the APX product line.

Motorola products provide 7 years of support after cancellation.

Commercial products provide 2 years of support after cancellation.

CITY AND COUNTY OF DENVER

SECTION 2.10

WARRANTY, MAINTENANCE AND SUPPORT PLAN

P25 PUBLIC SAFETY RADIO SYSTEM REPLACEMENT PROJECT NOVEMBER 20, 2017

REQUEST FOR PROPOSAL NO. 28435Q

MOTOROLA SOLUTIONS

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Section 2

SECTION 2

WARRANTY, MAINTENANCE AND SUPPORT PLAN

2.10.1 WARRANTY PLAN

Motorola provides a one year warranty on all components that compose the radio system and will commence upon full system acceptance. All Motorola supplied system components & equipment will be fully covered during the warranty period.

After 1 year, Motorola has proposed optional pricing to extend the warranty and services. Items not covered as part of the warranty and support programs would include:

- Any CCD supplied equipment
- Batteries
- Antennas, microwave dishes, and transmission lines
- Surge suppression devices

Motorola provides a robust warranty and support plan for all components of the proposed system. Our detailed plan meets all requirements described in Section 10 of the original RFP document (Warranty, Maintenance, and Support), including the following key areas:

1. Support and resolution is provided through a single phone call to the Motorola Customer Support Center, 24 hours a day, 7 days a week, 365 days a year. Additionally the support center has the capability to remotely monitor the system and oftentimes detect faults before they have any impact on the system.

   The Customer is always kept aware of any actions taken by the support center and the local resources.

2. After training on the system, CCD's own support team will have the knowledge and skills to repair/maintain the system. This will allow CCD personnel to handle any maintenance or repairs necessary during the warranty period without impacting Motorola's warranty.

Motorola has over 75 years of experience supporting mission critical communications for public safety and public service agencies. Motorola's technical and service professionals use a structured approach to life cycle service delivery and provide comprehensive maintenance and support throughout the life of the system. The value of support is measured by system availability, which is optimized through the use of proactive processes, such as preventive maintenance, fault monitoring and active response management. System availability is a function of having in place a support plan delivered by highly skilled support professionals, backed by proven processes, tools, and continuous training.

System responses are 7x24x365 based on the severity level. All severity level 1 issues are responded to within 2 hours of the notification. Severity Level 2 issues are notified 24/7 but response time is within 4 hours of notification during normal business hours (8-5). Severity Level 3 issues are responded within 24 hours of notification during normal business hours (8-5).

Table 2-1 lists the services included in the proposed warranty program.

Table 2-1: Warranty Support Services

Warranty Support Services	Included
Network Monitoring	✓
Dispatch and Case Management	✓
Technical Support Operations	✓
Onsite Infrastructure Response	✓
Preventive Maintenance Level 1	✓
Security Update Services	✓

Details about each of these services are noted below in section 2.10.3 Advanced Services Package Plan

Motorola provides 24x7x365 support through the use of a toll free number for the customer support center. During the warranty period, the system is monitored by the Customer Support Center. When a fault is detected, the CSC will notify both the designated CCD representative as well as the local support shop until CCD is confident in their training to handle faults on their own. CCD technical support personnel can also respond and take corrective actions without impacting the warranty

After the support center receives the call or detects a fault through remote monitoring, a ticket is created with associated response times based on the severity of the fault. The support center will attempt to correct the fault remotely if possible as long as it will not interfere with the operation of the rest of the system. The support center will also track the response by CCD, or the local radio shop until CCD is responding on their own.

The local radio shop, or CCD technical personnel, will respond to the site of the fault, notify the support center and the customer that they are on site and the actions they plan on taking.

Once the fault has been corrected, the support center will confirm with the customer that the fault has been corrected and that the system is back to normal operation. Only at that time will the ticket be closed.

Any issues that cannot be immediately corrected will be escalated to the specific product group for advice and testing of possible solutions. The product group has Motorola's System Integration Test lab available which can be configured to replicate a customer's system to recreate the fault and determine root cause and possible solutions.

While the customer support center remotely monitors the system, CCD's support personnel also have access to the Network Management clients for system monitoring anywhere they have a network connection. Authorized users can be configured to have access to the NM tools through the use of a VPN and Firewall into the system, to allow remote access when they are not at the local Network Monitoring terminals.

2.10.2 SUPPORT PLAN

2.10.2.1 Customer Support Manager

Your Motorola Customer Support Manager (CSM) provides coordination of support resources to enhance the quality of service delivery and to ensure your satisfaction. The Customer Services Manager (CSM) is responsible to oversee the execution of the Warranty and Service Agreement and ensure that Motorola meets its response and restoration cycle time commitments. The CSM will supervise and manage the Motorola Authorized Servicer's functions as well as support CCD in their efforts to service the system.

2.10.2.2 Motorola System Support Center

Located in Schaumburg, Illinois, the System Support Center (SSC) is a key component to the overall management and system maintenance. Motorola Local Service Provider Motorola's authorized service centers are staffed with trained and qualified technicians. They provide rapid response, repair, restoration, installations, removals, programming, and scheduled preventive maintenance tasks for site standards compliance and RF operability. Motorola's authorized service centers are assessed annually for technical and administrative competency.

Motorola places great emphasis on ensuring that communications systems meet high standards for design, manufacture, and performance. To enhance the value of the communications system being acquired, Motorola offers customized warranty and post-warranty services as outlined in this section.

2.10.2.3 Local Certified Motorola Radio Shop

Our local radio shop is Crosspoint Communications. Crosspoint Communications is a full service wireless integrator serving Colorado from their Denver location at 5855 Stapleton Drive North.

Crosspoint Communications is a Premier Service Partner for Motorola Solutions and has successfully implemented operations critical and mission critical communications solutions for numerous entities throughout the years, including the recently installed City of Aurora P25 system. The designation of Premier Service Partner means that Crosspoint Communications meets Motorola's high level of service requirements including compliance with Motorola's internal Environmental Health and Safety policy, and requires that a minimum number of a Crosspoint's technicians achieve certification and meet rigorous training requirements to perform services on new and existing Motorola radio systems and subscribers.

2.10.3 WARRANTY & SUPPORT SERVICES

Motorola will provide warranty services per our standard warranty terms and conditions as outlined in the RFP Sample Contract within this Proposal. In addition to the warranty services, Motorola will provide at no charge during the Warranty Period above-warranty services that are described generally below. A full description and Statement of Work describing the services that will be provided are are provided at the end of this section.

2.10.3.1 Advanced Services Package Overview

In order to ensure the continuity of the system and reduce system downtime Motorola has proposed our Advanced Services offering.

Advanced Services Package provides the following services during the Warranty Year and is available as an option for additional years after the warranty period.

- Network Monitoring
- Technical Support
- Dispatch Service
- On Site Response
- Infrastructure Repair
- Remote Security Update Service
- Annual Preventative Maintenance

Details of these services are noted below.

2.10.3.1.1 Network Monitoring

Network Event Monitoring provides real-time fault monitoring for radio communications networks on a continuous basis. Network Event Monitoring utilizes sophisticated tools for remote monitoring and event characterization of your communications networks. When an event is detected, skilled technologists acknowledge and assess the situation, and initiate a defined response. Network Monitoring is provided 24x7x365.

When the SSC detects an event, then, based on the severity of the event, trained technologists acknowledge and remotely diagnose the event and initiate an appropriate response in accordance with the customer handling procedure. Appropriate responses could include, but are not limited to, continuing to monitor the event for further development, attempting remote remediation via engagement of Technical Support resources, or initiating dispatch of a Field Servicer for onsite remediation if required.

2.10.3.1.2 Technical Support

Motorola's Technical Support service provides telephone consultation for technical issues that require a high level of ASTRO 25 network knowledge and troubleshooting capabilities. Remote Technical Support is delivered through the Motorola Solutions Support Center (SSC) by a staff of technical support specialists skilled in diagnosis and swift resolution of infrastructure performance and operational issues.

Motorola applies leading industry standards in recording, monitoring, escalating and reporting for Technical Support calls from its contracted customers, reflecting the importance of maintaining mission critical systems.

Motorola's Solutions Support Center's (SSC) primary goal is Customer Issue Resolution (CIR), providing Incident Restoration and Service Request Fulfillment on Motorola's currently supported infrastructure. This team of highly skilled, knowledgeable, and experienced specialists is available to the customer as an integrated part of the support and technical issue resolution process. The SSC remotely supports the customer and works with but not limited to fault diagnostics tools, simulation networks and fault database search engines.

Technical Support is available 24 hours a day, 7 days a week for Severity 1 Incidents and Monday - Friday 8:00am - 5:00pm local site time for severity 2, 3 and 4 incidents. Calls requiring incidents or service requests will be logged in Motorola's Customer Relationship Management (CRM) system. This helps ensure that technical issues are prioritized, updated, tracked and escalated as necessary, until resolution. Technical Support Operations assigns the impact level in accordance with the agreed Severity Level Definitions.

Motorola will track the progress of each case from initial capture to resolution. Motorola will advise and inform the customer of the case progress and tasks that require further investigation and assistance from the customer's technical resources.

This service requires the customer to provide a suitably trained technical resource that delivers maintenance and support to the customer's system, and who is familiar with the operation of that system. Motorola provides technical consultants to support the local resource in the timely closure of infrastructure, performance and operational issues.

2.10.3.1.3 Dispatch Services

In the event that Network Monitoring or Technical Support requires a response by the local Motorola service shop, Motorola's Customer Support Center will create the ticket and notify the local service shop to respond to address the issue. CCD's own technical staff can also be notified and respond during the warranty period in addition to or instead of the service shop. The personnel who are notified are part of the Customer Support Plan that is developed during the Detailed Design Review and reviewed/revised prior to the system going live. The network management client can also be configured to alert technical personnel via email whenever a fault occurs on the system.

2.10.3.1.4 OnSite Response

When necessary, the Motorola SSC will dispatch the local service shop. Since CCD will have the training required to support the system and handle faults that occur, the Customer Support Plan can be configured to have the Motorola SSC dispatch CCD technical personnel to respond in place of, or in conjunction with, Motorola's local service shop. The servicer will respond to the customer location based on pre-defined severity levels and the associated severity level response times in order to restore the system.

Motorola will provide case management as the response progresses. The SSC will maintain contact with the on-site Motorola Service Shop, or CCD's personnel if they are responding, until system restoral and case closure. The SSC will continuously track and manage cases from creation to close through an automated case tracking process.

2.10.3.1.5 Infrastructure Repair

Motorola provides a hardware repair service for all of the Motorola and select third-party infrastructure equipment supplied by Motorola. The Motorola authorized Repair Depot manages and performs the repair of Motorola supplied equipment as well as coordinating the equipment repair logistics process.

Infrastructure components are repaired at a Motorola authorized Infrastructure Depot Operations (IDO). At Motorola's discretion, select third party Infrastructure may be sent to the original equipment manufacturer or third party vendor for repair.

2.10.3.1.6 Security Update Services (Remote or Local)

To verify compatibility with your ASTRO 25 system, Motorola's Remote Security Patch Installation provides pre-tested 3rd party software (SW) security updates.

In addition to testing the security updates, Remote Security Patch Installation includes remote installation of the updates.

Motorola maintains a dedicated vetting lab for each supported ASTRO 25 release for the purpose of pre-testing security updates. In some cases, when appropriate, Motorola makes the updates available to outside vendors, allow them to test, and then incorporate those results into this offering. Antivirus definitions are released every week. Microsoft patches are released on a monthly basis. Motorola obtains and tests these updates as they are released. Other products have different schedules or are released "as-required." Motorola will obtain and test these OEM vendor supported updates on a quarterly basis.

To accommodate remote installation of security updates, a connection is required from Motorola to the customer ASTRO 25 network. There are two different options. 1) T1 line purchased and maintained by Motorola, or 2) The customer internet connection is used and a Virtual Private Network (VPN) is established between Motorola and the ASTRO 25 network. Since this relies on the customer internet connection, the customer is responsible for the availability of the connection.

Motorola shall push the tested security updates over the established connection. The timing and coordination with the customer of each update depends on the updates themselves. Motorola requires IP connectivity to all elements that are in scope for patching. If IP connectivity from Motorola is not available then those elements will not be considered for remote patching and will require alternative arrangements outside of the scope of this statement of work.

With the Local Security Update Services option, CCD downloads all verified and tested patches from a secure Motorola website. CCD then installs the patches on their system.

2.10.3.1.7 Annual Preventative Maintenance

Annual Preventative Maintenance will provide an annual operational test and alignment, on the customer's infrastructure equipment (Infrastructure or Fixed Network Equipment or "FNE") to monitor the Infrastructure's conformance to specifications. This can be performed by CCD personnel if desired.

2.10.4 SUBSCRIBER – SERVICE FROM THE START LITE (SFS)

Service From the Start-LITE provides board level service for the subscribers that you purchase. Services are performed at the Radio Support Center (RSC), or Federal Technical Support Center.

Service From the Start LITE excludes repairs to: optional accessories; standard mobile palm microphones; non- standard mobile microphones; iDEN accessories; iDEN mobile microphones; portable remote speaker microphones; optional or additional control heads; mobile external speakers; single and multiple unit portable chargers; batteries; mobile power and antenna cables; mobile antennas; portable antennas, and power supplies. Engraving service is not covered under standard Service From the Start LITE. This service does not cover defects, malfunctions, performance failures or damage to the unit resulting from physical, liquid, or chemical damage. An estimate for non-covered repairs will be provided for units displaying extensive damage.

The terms and conditions of this Statement of Work are an integral part of the Motorola Service Agreement or other applicable agreement to which it is attached and made a part thereof by this reference. If there are any inconsistencies between the provisions of the Motorola Service Agreement or other applicable agreement and this Statement of Work, the provisions of this Statement of Work shall prevail.

All subscribers purchased under this contract come with a 3 year Service from the Start package.

Motorola has the following responsibilities:

- Test and Restore the Equipment to Motorola factory specifications, including Factory Mutual (FM), and Mine Hazard Safety Association (MHSA).
- Reprogram Equipment to original operating parameters based on the Customer template, if retrievable, or from a Customer supplied backup. If the Customer template or code plug is not usable, a generic template or code plug utilizing the latest Radio Service Software (RSS) or Customer Programming Software (CPS) version for that Equipment will be used. The Equipment will require additional programming by the Customer to Restore the original template. All Firmware is upgraded to the latest release for each individual product line.
- Clean external housing of the Equipment. External components of unit will only be replaced when functionality has been diminished.
- Pay the outbound freight charges. Motorola will pay the inbound freight charges if the Customer uses the Motorola designated delivery service.
- Provide the Motorola repair request and Inventory Adjustment Form (IAF) via Motorola On Line (MOL).
- Process inventory adjustment requests received by email or fax from Customer. If the request is received by email, Motorola will email an acknowledgement to the sender.
- Perform covered services as requested by Customer on the Motorola repair request form.
- If applicable, notify Customer of changes in Motorola designated inventory adjustment email address or fax number.

The City and County of Denver has the following Responsibilities:

- Supply Motorola complete and accurate serial numbers and model description.
- Utilize the Motorola designated delivery service program to obtain Motorola payment for inbound shipping
- Access the Motorola repair request form and Inventory Adjustment Form (IAF) through Motorola On Line (MOL).
- Initiate service request via Motorola On Line (MOL) or complete a Motorola repair request form with contract number referenced, and submit with each unit of Equipment sent in for service. Mobile control heads or accessory items sent in must reference the serial number of the main unit.
- If desired, supply Motorola with a Software template or programming in order to assist in returning the Equipment to original operating parameters. This step must be completed for Equipment that will not power up. If applicable, record the current flashcode for each radio.
- If Motorola must utilize a generic template or code plug to Restore Equipment to operating condition, Customer is responsible for any programming required to Restore Equipment to desired parameters.
- Provide a signed or emailed Motorola Inventory Adjustment Form (IAF) for all Equipment additions.
- Local services or annual maintenance required for maintaining normal operation of the equipment, unless specified on the service agreement.

2.10.5 WARRANTY LABOR CREDIT

During the warranty period, Motorola will issue service credits for labor performed by the Electronics and Engineering Bureau (EEB) on the proposed City and County of Denver radio system in accordance with our Warranty Labor Guidelines. Credits will be available to the City and County of Denver to use towards future purchases.

The Motorola Customer Support Manager (CSM) will review cases on a quarterly basis with the EEB to calculate the credit amount.

1. LABOR RATE

Motorola will issue labor credits equal to $75 per hour.

2. TRAVEL RATE

When travel is applicable, the hourly credit rate is not to exceed $70 per hour.

3. ALLOWABLE CHARGES

Motorola Solutions (Schaumburg) Manufactured Infrastructure

Consoles, Repeaters, Controllers, SLR

- LABOR—2 hours max for repairs, replacements, SSC board / FRU exchanges, and sending unit in to a Motorola Solutions or OEM Depot.
- 1 hour max on NTF, resets, reboots, and recycling of power.
- TRAVEL—actual travel time in hours, up to a $70 per hour max

3rd Party / Original Equipment Manufacturer (OEM) / Drop Ship Infrastructure

Non-Motorola Solutions manufactured products are covered by the terms of the OEM's Standard Commercial Warranty. Those warranties typically provide one (1) year on parts and labor. All defective OEM equipment is designated as Depot Only, with 'Depot' being either the SSC or the OEM Vendor. Initial contact regarding a defective OEM unit, must first be made through the SSC, who will then provide instructions to the servicer on whether the unit needs to be sent in to the SSC or be sent directly to the OEM Vendor.

- LABOR—2 hours max for Depot Only repairs / replacements. This includes; troubleshooting, removal, shipping, reinstallation, and testing after receipt back from the Depot.
- 1 hour max on NTF, resets, reboots, and recycling of power.
- TRAVEL—actual travel time in hours, up to a $70 per hour max.

1. CHARGES / REPAIRS NOT REIMBURSED UNDER STANDARD COMMERCIAL WARRANTY (Applicable throughout the life of a product)

- END-USER CUSTOMER REQUESETED CHECK OUTS
- END-USER CUSTOMER-CAUSED ISSUES and USER / OPERATOR ERRORS
- FCC CHECKS, and PREVENTATIVE MAINTENANCE (PM)
- LEVEL SETTINGS, LEVEL ADJUSTMENTS, OPTIMIZATION
- OVERTIME AND AFTER HOUR RATES
- PART REPLACEMENT COSTS
- ATTEMPTED REPAIRS OF A UNIT
- REPAIRS TO MOTOROLA SOLUTIONS EQUIPMENT DUE TO USE OF NON-AUTHORIZED MANUFACTURERS PRODUCTS
- PHYSICAL, ACCIDENTAL, LIQUID OR CHEMICAL DAMAGE
- ACCIDENTS OF NATURE
- RF / OUTSIDE INTERFERENCE
- TELCO RELATED ISSUES
- POWER COMPANY RELATED ISSUES
- 45-DAY REPLACEMENTS
- SALES ERRORS
- SOFTWARE / FIRMWARE RELATED ISSUES
- SHIPPING DAMAGE OR LOST PACKAGES
- TEST EQUIPMENT REPAIRS

- MORE THAN 1 TECHNICIAN WORKING THE SAME ISSUE AT THE SAME TIME
- STOLEN MERCHANDISE
- TRAVEL ONLY REIMBURSEMENTS
- DELIVERY OF EQUIPMENT
- EQUIPMENT COVERED UNDER A REPAIR BANK / MAINTENANCE CONTRACT / SERVICE AGREEMENT
- EQUIPMENT COVERED UNDER AN ESP / RSA / SfS CONTACT
- TELEPHONE SUPPORT WITH / TO THE END-USER CUSTOMER

Allowable Charges Subscribers

1. Portable Radios

- LABOR:
  - **$20**—shipping a radio in to a Depot for repair.
  - **$35**—repair / replacement of **external** radio components performed by the City and County of Denver EEB
  - **$70**—repair / replacement of **internal** radio components performed by the City and County of Denver EEB
- TRAVEL—not reimbursed.
- VEHICLE MILES—not reimbursed.
- FREIGHT—not reimbursed.
- All **BRANDED SUBSCRIBER NOTES** listed below apply.

2. Mobile Radios

- Includes Consolettes.
- LABOR:
  - **$20**—shipping a radio in to a Depot for repair.
  - **$45**—repair / replacement of **external** radio components performed by the City and County of Denver EEB
  - **$80**—repair / replacement of **internal** radio components performed by the City and County of Denver EEB
- TRAVEL—up to $70 per hour max **not to exceed 2 hours**, and **only** reimbursed when the end-user customer is using the mobile in an ambulance or fire truck, or using the mobile as a base, control station, or RF Modem.
- VEHICLE MILES—not reimbursed.
- FREIGHT—not reimbursed.
- All **BRANDED SUBSCRIBER NOTES** listed below apply.

3. Subscriber Notes:

- **#1:** Labor / shipping charges for *any* type of (re)alignments or *any* type of (re)programming are not reimbursed if needed after a repair performed by the City and County of Denver EEB , or if received back ‘blank’ after a Depot repair.
- **#2:** Charges for repairs / replacements performed by an the City and County of Denver EEB, or sent in to a Depot for repair, of any accessory items (e.g. batteries, antennas, chargers, mics, control heads, control cables, power supplies, etc.) or any parts associated with an accessory, are not reimbursed. All accessories and their components are covered under *Parts Warranty* for replacement only.
- **#3:** NTF claims are no longer reimbursed.

2.10.6 POST WARRANTY MAINTENANCE SERVICES

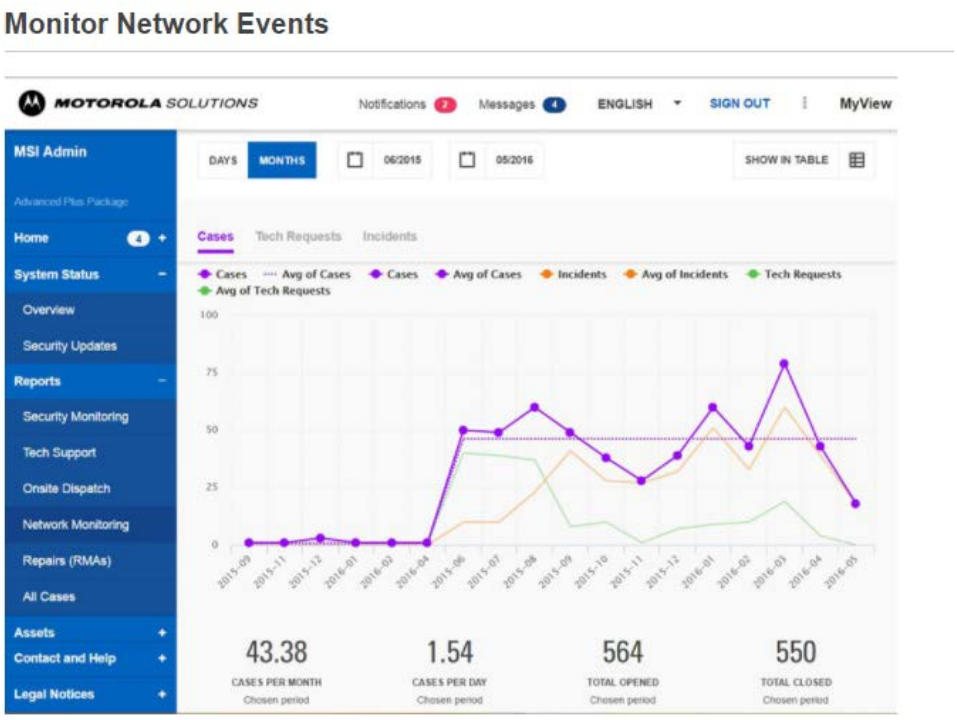
After the first year warranty period is complete, CCD will have the opportunity to choose which of the available services are needed during post-warranty maintenance and can contract for those yearly or for a number of years at a time. The list of available services is in section 2.10.3.

2.10.7 CENTRALIZED SERVICE DELIVERY

The Service Desk provides a single point of contact for all Service related items, including communications between Customer, Third-Party Subcontractors, and Motorola. The Service Desk provides an ingress/egress point for Service Requests, Service Incidents, Changes, and Dispatch. All incoming transactions through the Service Desk are recorded, tracked and updated through the Motorola Customer Relationship Management (CRM) system. Key responsibilities are: Documentation of customer inquiries, requests, concerns and related tickets. Tracking and resolution of issues, and timely communication with all stakeholders is based on the nature of the incident and the requirements of the CSP. The Services Desk will manage service requests received from authorized parties and will coordinate the appropriate response with Customer and third parties, as necessary.

2.10.8 MY VIEW PORTAL

MyView Portal is a web-based platform that provides a transparent, single source view of network maintenance and operations along with historical system and service delivery information. It can be accessed from a desktop, laptop or tablet web browser.



With MyView Portal, you have access to dashboards of current data from our Network Operations and Security Operations Center (NOC/SOC). You can also check the network status of your sites, leverage performance trending reports, track cases from creation to resolution, view and update case

management details and receive information on security updates. These system insights give you valuable information to make data-driven decisions that keep your network running efficiently.

Information available through My View Portal

- **TECHNICAL SUPPORT**: View all of your case status details to compare them to our committed response time.
- **NETWORK HARDWARE REPAIR**: Track your return material authorizations (RMAs) shipped to our repair depot and eliminate the need to call for status updates.
- **SECURITY PATCHING**: Download your pre-tested security updates to ensure your system is protected.
- **TRENDING REPORTS**: Access up to 13 months of your historical data and system activity to analyze case management.
- **ASSET AND CONTRACT INFORMATION**: View all the assets you purchased for your network, recent orders, and contract information.
- **EVENT MONITORING REPORTS**: See resolution status for incidents and notifications by severity level.
- **SECURITY PATCHING**: Receive automated patch downloads and status on competed updates.
- **SYSTEM UPGRADE NOTIFICATIONS**: View hardware and software updates in addition to alerts to areas that need compliance attention.
- **ONSITE SUPPORT**: Observe case details by severity level and track the progress of onsite support issue resolution.
- **ANNUAL PREVENTIVE MAINTENANCE**: Access the maintenance status for all of your sites and quickly identify actions you need to take to optimize system performance.

2.10.9 OPTIONAL SYSTEM SOFTWARE/HARDWARE REFRESH

Modern LMR systems are specialized Information Technology (IT) networks that are a hybrid composition of commercial off-the-shelf IT components, specialized Radio Frequency (RF) components and software designed to comply with standards-based specifications. To ensure the

highest level of operation, allow for system expansion, provide maximum lifespan and protect the initial investment, regular update and replacement of individual software and hardware components is required.

The Motorola System Upgrade Agreement (SUA) is comprehensive approach to technology refreshment of the ASTRO 25 system aligned with the Motorola lifecycle roadmap. The SUA is a complete package of hardware, software and implementation services required to update the ASTRO 25 system. Motorola has included optional pricing for up to 2 system upgrades over the course of the life of the proposed system to keep the system at a level consistent with the latest systems leaving the factory and on a supportable release.

Updates to OEM components are also included and ensure availability of repair services support and may also provide increased capacity and processing speed. Regular updates enable system expansion (i.e. expansion of RF sites, dispatch positions, data sub-systems, network management positions, etc.). Professional implementation services guarantee live system upgrades are performed with minimal interruption to system operation with minimal reliance on owner resources. SUA ensures the ASTRO 25 system functions at the highest level of operation, allows for expansion and feature enhancement and maximizes the lifespan of the investment. For owners that are committed to upgrading their system on a regular basis, SUA provides a consistent budgeting solution that provides complete coverage.

2.10.10 SERVICE STATEMENTS OF WORK

The following Statements of work are included on the pages that follow.

- Network Monitoring
- Technical Support
- Dispatch Service with On Site Response
- Infrastructure Repair
- Security Update Service
- Preventive Maintenance

2.10.11 NETWORK MONITORING

Network Monitoring Overview

Motorola's Network Monitoring Operations (NMO) within the Motorola Solutions Support Center (SSC) provides real-time fault monitoring for radio communications networks on a continuous basis. NMO utilizes sophisticated tools for remote monitoring and event characterization of your communications networks. When an event is detected, NMO technologists acknowledge and assess the situation, and initiate a defined response.

The terms and conditions of this Statement of Work (SOW) are an integral part of Motorola's Service Agreement or other applicable agreement to which it is attached and made a part thereof by this reference.

1.0 Description of Network Monitoring Services

Network Monitoring is a service designed to electronically monitor elements of a communication system for events, as set forth in the Monitored Elements Table. When the SSC detects an event, (based on the severity of the event) trained technologists acknowledge and remotely diagnose the event, and initiate an appropriate response in accordance with the customer handling procedure. Appropriate responses could include, but are not limited to, continuing to monitor the event for further development, attempting remote remediation via engagement of Technical Support resources, or initiating dispatch1 of a Field Servicer for onsite remediation.

1.1 Availability

Network Monitoring service is available 24 hours a day, 7 days a week. Network Monitoring availability is based on the level of contracted service and defined in the Customer Support Plan (CSP).

1.2 Geographic Availability

Network Monitoring is a globally provided service unless limited by data export control regulations. Timeframes are based on the customer's local time zone.

1.3 Inclusions

Network monitoring service can be delivered on Motorola sold infrastructure as stated in Monitored Elements Table.

1.4 Limitations and Exclusions

1.4.1 Does not include monitoring of anything outside of the radio network or monitoring of infrastructure provided by a third party, unless specifically stated. Monitored elements must be within the radio network and capable of sending traps to the Unified Event Manager (UEM).

1.4.2 Additional support charges above and beyond the contracted service agreements may apply if it is determined that system faults were caused by the customer making changes to critical system parameters.

1.4.3 The following activities are outside the scope of the Network Monitoring service, but are optional services that are available to remote Network Monitoring customers at an additional cost:

1.4.3.1 Emergency on-site visits required to resolve technical issues that cannot be resolved by with SSC working remotely with the local customer technical resource.

1.4.3.2 System installations, upgrades, and expansions.

1.4.3.3 Customer training.

1.4.3.4 Hardware repair and/or exchange.

1.4.3.5 Network security services.

1.4.3.6 Network transport.

1.4.3.7 Information Assurance.

1.4.3.8 Any services not expressly included in this statement of work.

1.4.4 Reference the event catalogue to confirm monitored equipment.

1 Dispatch service with OnSite Response is a separate service that is required with Network Monitoring.

1.5 Motorola has the following responsibilities:

1.5.1 Provide dedicated connectivity through a network connection necessary for monitoring communication networks. The Connectivity Matrix further describes the connectivity options.

1.5.2 If determined necessary by Motorola, provide Motorola owned equipment for monitoring system elements. If Motorola installs or replaces Motorola owned equipment, the type of equipment and location installed is listed in the Motorola Owned & Supplied Equipment Table.

1.5.3 Verify connectivity and event monitoring prior to system acceptance or start date.

1.5.4 Monitor system continuously during hours designated in the CSP in accordance with the pre-defined times specified in section 1.6.2 below.

1.5.5 Remotely access the customer's system to perform remote diagnosis as permitted by customer pursuant to section 1.6.4.

1.5.6 Create a case, as necessary. Gather information to perform the following:

1.5.6.1 Characterize the issue

1.5.6.2 Determine a plan of action

1.5.6.3 Assign and track the case to resolution.

1.5.7 Cooperate with customer to coordinate transition of monitoring responsibilities between Motorola and customer as specified in section 1.6.13 and 1.6.13.1.

1.5.8 Maintain communication with the customer in the field as needed until resolution of the case

1.6 The Customer has the following responsibilities:

1.6.1 Allow Motorola continuous remote access to enable the monitoring service.

1.6.2 Provide continuous utility service to any Motorola equipment installed or utilized at customer's premises to support delivery of the service.

1.6.3 Provide Motorola with pre-defined customer information and preferences prior to Start Date necessary to complete the CSP, including, but not limited to:

1.6.3.1 Case notification preferences and procedure

1.6.3.2 Repair Verification Preference and procedure

1.6.3.3 Database and escalation procedure forms.

1.6.3.4 Submit changes in any information supplied to Motorola and included in the CSP to the CSM.

1.6.4 Provide the following information when initiating a service request:

1.6.4.1 Assigned system ID number

1.6.4.2 Problem description and site location

1.6.4.3 Other pertinent information requested by Motorola to open a Case.

1.6.5 Notify the SSC when customer performs any activity that impacts the system. (Activity that impacts the system may include, but is not limited to, installing software or hardware upgrades, performing upgrades to the network, or taking down part of the system to perform maintenance.)

1.6.6 Allow Servicers access to equipment (including any connectivity or monitoring equipment) if remote service is not possible.

1.6.7 Allow Servicers access to remove Motorola owned monitoring equipment upon cancellation of service.

1.6.8 Provide all customer managed passwords required to access the customer's system to Motorola upon request or when opening a case to request service support or enable response to a technical issue.

1.6.9 Pay additional support charges above and beyond the contracted service agreements that may apply if it is determined that system faults were caused by the customer making changes to critical system parameters

1.6.10 Obtain all third party consents or licenses required to enable Motorola to provide the monitoring service.

1.6.11 Cooperate with Motorola and perform all acts that are reasonable or necessary to enable Motorola to provide the services described in this SOW.

1.6.12 Contact Motorola to coordinate transition of monitoring when monitoring responsibility is to be transferred to or from Motorola. (I.e. normal business hours to after-hours monitoring) as set forth in pre-defined information provided by customer CSP.

1.6.12.1 Upon contact, customer must provide customer name, site id, status on any open cases, severity level, and brief description of case and action plan to Motorola.

1.6.13 Acknowledge that cases will be handled in accordance with the times and priorities as defined in the Event Definition table- Appendix A .

1.6.14 Cooperate with Motorola and perform all acts that are reasonable or necessary to enable Motorola to provide the Network Monitoring service.

The event types are based on the defined levels as follows:

Appendix A Engagement Matrix

Severity Level	Severity Definition	Engagement Times

1	This is defined as a critical/major incident that causes the system and/or infrastructure to experience a loss of call processing functionality and no work- around or immediate solution is available.
	The following are examples of this kind of failure:
	- 33% of call processing resources impaired
	- Remote Site/sub-system severed
	- Site Environment alarms:
	  - Smoke
	  - Unauthorized access
	  - Temperature
	  - Power failure
		Response provided 24 hours, 7 days a week, including US Holidays.

2	This is defined as a moderate/minor incident that causes the system to operate with a continuous reduction in capacity or functionality of core services (core services include, voice, data or network management). The following are examples of this kind of failure: - Less than 33% of call processing resources impaired - Failure of a single redundant component	Response provided 8 x 5 on standard business days, which is normally Monday through Friday 8AM to 5PM, excluding US Holidays.
3	This is defined as a minor issue, which has little or no impact on the functionality, efficiency or usability of core services. The following are examples of this kind of severity: - Faults that have no impact in how the user perceives the system to work - Intermittent issues - Requests for information Preventive Maintenance or upgrade related work	Response provided 8 x 5 on standard business days, which is normally Monday through Friday 8AM to 5PM, excluding US Holidays.

Connectivity Matrix

Request connectivity 8 weeks in advance of service start date

System Type	Connectivity	Set up and Maintenance
ASTRO® 25	Internet VPN	Motorola
ASTRO® 25	T1	Motorola

Motorola Owned & Supplied Equipment Table

Equipment Type	Location Installed
Firewall/Router	Master Site
Service Delivery Management Server	Master Site for each Zone

Monitored Elements Table

Master Site Infrastructure	RF Site Equipment	Dispatch Site Equipment
Servers & Back up Servers	Channels	Consoles
MOSCAD (digital inputs & RS232 serial alarms)	MOSCAD (digital inputs & RS232 serial alarms)	AIS Servers
TRAK	RF Site Communication Path	Operator Position (OP)
Core LAN Switch	Switch	Motorola Gold Elite Gateway (MGEG)
Packet Data Gateway (PDG)	Site Controller	Call Processor
Radio Network Gateway (RNG)	Router	Logging Replay Station (only within the RNI)
Zone Database Server (ZDS)	Site	Ambassador (AMB)
Gateway Router	Gateway Router	Client Station
Controller – Zone & Domain	Network Time Protocol (NTP)	Voice Processing Module (VPM)
Firewall Manager Servers	Firewall	MCC 7500 IP Logging Recorders
Air Traffic Router (ATR)	SmartX Site Converter (only the converter, not the legacy sites)	MCC 7100 (only within the RNI)
Unified Event Manager (UEM)		
Zone Statistical Server (ZSS)		
Install Server		

**Some or all of the above equipment may be monitored depending on system configuration and need. Other equipment (not listed) may be monitored as an option, consult with your Customer Support Manager for details.*

2.10.12 TECHNICAL SUPPORT

Technical Support Overview

Motorola's Technical Support service provides telephone consultation for technical issues that require a high level of ASTRO network expertise and troubleshooting capabilities. Remote Technical Support is delivered through the Motorola System Support Center (SSC) by a staff of technical support specialists skilled in diagnosis and swift resolution of infrastructure performance and operational issues. Technical Support provides access to a solutions database, as well as access to in house test labs and additional Motorola technical resources

Motorola applies industry best practices in recording, monitoring, escalating and reporting for Technical Support calls from its contracted customers, reflecting the importance of maintaining mission critical systems.

The terms and conditions of this Statement of Work (SOW) are an integral part of Motorola's Service Agreement or other applicable agreement to which it is attached and made a part thereof by this reference.

1.1 Description of Technical Support Services

Motorola's System Support Center (SSC) will provide technical support to assist the customer's technical resources of the Motorola's currently supported infrastructure. This team of highly skilled professionals is available to the customer as an integrated part of the support and technical issue resolution process. The SSC remotely supports the customer and works with but not limited to fault diagnostics tools, simulation networks and fault database search engines.

The Technical Support Operations is available 24 hours a day; 7 days per week to support technical requests (see severity level response time commitments). Calls requiring incidents, problems, or service requests will be logged in Motorola's issue management system. This ensures that technical issues are prioritized, updated, tracked and escalated as necessary, until resolution. The Technical Support Operations shall assign the priority level as in accordance with the agreed Severity Level Definitions stated in this document.

Motorola will track the progress of each case from initial logging to resolution. Motorola will ensure that the customer is advised of the case progress and informed of tasks that require further investigation and assistance from the customer's technical resources

The provision of this service requires that the customer provides a suitably trained technical resource that delivers maintenance and support to the system, and who is familiar with the operation of that system. Motorola provides technical consultants to support the local resource in the timely closure of infrastructure, performance and operational issues.

1.2 Scope

Technical Support service is available 24 hours a day, 7 days a week based on Severity Level Definitions.

1.3 Geographic Availability

Technical Support is available to any customer regardless of their geographic location and timeframes are based on the customer's local time zone.

1.4 Inclusions

Technical Support service will be delivered on Motorola sold infrastructure including integrated 3rd party products.

1.5 Limitations and Exclusions

The following activities are outside the scope of the Technical Support service, but are optional services that are available to remote Technical Support customers at an additional cost:

1.5.1 Emergency on-site visits required to resolve technical issues that cannot be resolved by with SSC working remotely with the local customer technical resource.
1.5.2 Third party support for equipment not sold by Motorola as part of the original system.
1.5.3 System installations, upgrades, and expansions.
1.5.4 Customer training.
1.5.5 Hardware repair and/or exchange.
1.5.6 Network security services.
1.5.7 Network transport.
1.5.8 Information Assurance.
1.5.9 Motorola services not included in this statement of work.
1.5.10 Any technical support required as a result of a virus or unwanted intrusion is excluded if the system is not protected against these security threats by Motorola's Pre-tested Security Update Service when applicable.

1.6 Motorola has the following responsibilities:

1.6.1 Enable customer access to the Motorola Technical Support Center (800-221-7144), 24 hours a day, 7 days per week, to answer, document and respond to requests for support.

1.6.2 Respond to requests for Technical Support in accordance with the response times set forth in the Severity Level Response Time Commitments section of this document and the severity level defined in the Severity Level Definitions section of this document.

1.6.3 Advise caller of procedure for determining any additional requirements, activities or information relating to issue restoration and/or characterization.

1.6.4 Maintain communication with the customer in the field as needed until resolution of the case

1.6.5 Coordinate technical resolutions with agreed upon third party vendors, as needed.

1.6.6 Escalate and manage support issues, including systemic issues, to additional Motorola technical resources, as applicable.

1.6.7 Escalate the case to the appropriate party upon expiration of a response time.

1.6.8 Determine, in its sole discretion, when a case requires more than the Technical Support services described in this SOW and notify customer of an alternative course of action.

1.7 The Customer has the following responsibilities:

1.7.1 Provide Motorola with pre-defined information prior to contract start date necessary to complete Customer Support Plan (CSP).

1.7.2 Submit changes in any information supplied in the Customer Support Plan (CSP) to the Customer Support Manager (CSM).

1.7.3 Contact the SSC in order to engage the Technical Support service, providing the necessary information for proper entitlement services. Including but not

limited to the name of contact, name of customer, system ID number, site(s) in question, and brief description of the problem including pertinent information for initial issue characterization.

1.7.4 Maintain suitable trained technical resources that provide field maintenance and technical maintenance services to the system, and who are familiar with the operation of that system.

1.7.5 Provide SSC access via the remote connection that has been established through other sold services (e.g. Network Fault Monitoring)

1.7.6 Supply suitably skilled and trained on-site presence when requested by the SSC.

1.7.7 Validate issue resolution prior to close of the case in a timely manner.

1.7.8 Acknowledge that cases will be handled in accordance with the times and priorities as defined in the Severity Level Definitions and in the Severity Level Response Time Commitments section in this document.

1.7.9 Cooperate with Motorola and perform all acts that are reasonable or necessary to enable Motorola to provide the Technical Support service.

1.8 Severity Level Definitions

The following severity level definitions will be used to determine the maximum response times:

Severity Level	Severity Definition

Severity 1	This is defined as a failure that causes the system and/or infrastructure a loss of voice functionality and no work-around or immediate solution is available.
	The following are examples of this kind of failure:
	- 33% of call processing resources impaired
	- Site Environment alarms:
	  - Smoke,
	  - Unauthorized access
	  - Temperature
	  - Power failure

Severity 2	This is defined as a fault that causes the system to operate with a continuous reduction in capacity or functionality of core services (core services include, voice, data or network management). The following are examples of this kind of failure: - Less than 33% of call processing resources impaired - Failure of a single redundant component
Severity 3	This is defined as a fault which reduces the functionality, efficiency or usability of core services (voice, data and network management) and there is a viable work-around in place. The following are examples of this kind of severity: - Intermittent faults that are infrequent and minor impact to core services - Statistical reporting problems
Severity 4	This is defined as a minor issue, which has little or no impact on the functionality, efficiency or usability of core services. The following are examples of this kind of severity: - Faults resulting in minor functions or features being unsupported or unreliable in ways that are not noticeable to the user. - Faults that have no impact in how the user perceives the system to work. - Cosmetic issues. - Requests for information. - Preventive Maintenance

1.9 Severity Level Response Time Commitments

The response times are based on the defined severity levels as follows:

Severity Level	Response Time
Severity 1	A Motorola SSC Technician will make contact with the customer technical representative within one hour of the request for support being logged in the issue management system. Continual effort will be maintained to restore the system or provide a workaround resolution. Response provided 24 x 7.
Severity 2	A Motorola SSC Technician will make contact with the customer technical representative within four hours of the request for support being logged at the issue management system. Response provided 8 x 5 on standard business days, which is normally Monday through Friday 8AM to 5PM, excluding US Holidays.
Severity 3	A Motorola SSC Technician will make contact with the customer technical representative within the next business day of the request for support being logged at the issue management system. Response provided 8 x 5 on standard business days, which is normally Monday through Friday 8AM to 5PM, excluding US Holidays.
Severity 4	A Motorola SSC Technician will make contact with the customer technical representative within the next business day of the request for support being logged at the issue management system. Response provided 8 x 5 on standard business days, which is normally Monday through Friday 8AM to 5PM, excluding US Holidays.

2.10.13 DISPATCH SERVICE WITH ON SITE RESPONSE

OnSite Infrastructure Response and Dispatch Service Overview

Motorola's OnSite Infrastructure Response & Dispatch service provides case management and escalation for onsite technical service requests. The service is delivered by the Motorola's Solutions Support Center (SSC) in conjunction with a local service provider. The SSC is responsible for opening a case for onsite support and monitoring the status of that case to ensure strict compliance to committed response times.

The terms and conditions of this Statement of Work (SOW) are an integral part of Motorola's Service Agreement or other applicable agreement to which it is attached and made a part thereof by this reference.

1.0 Description of Services

The Motorola SSC will receive customer request for OnSite service provider and dispatch a servicer. The servicer will respond to the customer location based on pre-defined Severity Levels set forth in Section 4.0 - Severity Level Definitions able and Response times set forth in Section 5.0 – Severity Level Response Time Commitments table in order to restore the system.

Motorola will provide case management as set forth herein. The SSC will maintain contact with the on-site Motorola Service Shop until system restoral and case closure. The SSC will continuously track and manage cases from creation to close through an automated case tracking process.

1.1 Scope

OnSite Infrastructure Response & Dispatch service is available 24 hours a day, 7 days a week in accordance with Severity Level Definitions and Severity Level Response Time Commitments listed in sections 4.0 and 5.0 of this document.

1.2 Geographic Availability

OnSite Infrastructure Response and Dispatch is available to customers worldwide where Motorola servicers are present. Response times are based on the customer's local time zone.

1.3 Inclusions

Onsite Infrastructure Response and Dispatch Service can be delivered on Motorola-sold infrastructure.

2.0 Motorola has the following responsibilities:

2.1. Receive service requests.
2.2. Create a case as necessary when service requests are received. Gather information to perform the following:
  2.2.1. Characterize the issue.
  2.2.2. Determine a plan of action.
  2.2.3. Assign and track the case to resolution.
2.3. Dispatch a servicer as required by Motorola standard procedures and provide necessary case information collected in 2.2.
2.4. Ensure the required personnel have access to customer information as needed.
2.5. Servicer will perform the following on-site:
  2.5.1. Run diagnostics on the Infrastructure or Field Replacement Units (FRU).
  2.5.2. Replace defective Infrastructure or FRU, as supplied by customer[1].

2.5.3. Provide materials, tools, documentation, physical planning manuals, diagnostic/test equipment and any other requirements necessary to perform the maintenance service.

2.5.4. If a third party vendor is needed to restore the system, the Servicer may accompany that vendor onto the customer's premises.

2.6. Verify with customer that restoration is complete or system is functional, if required by customer's repair verification in the Customer Support Plan required by section 3.2. If verification by customer cannot be completed within 20 minutes of restoration, the case will be closed and the Servicer will be released.

2.7. Escalate the case to the appropriate party upon expiration of a response time.

2.8. Close the case upon receiving notification from customer or servicer, indicating the case is resolved.

2.9. Notify customer of case status as defined by the Customer Support Plan:

2.9.1. Open and closed; or

2.9.2. Open, assigned to the servicer, arrival of the servicer on-site, deferred or delayed, closed.

2.10. Provide Case activity reports to customer if requested.

3.0 Customer has the following responsibilities:

3.1. Contact Motorola, as necessary, to request service.

3.2. Provide Motorola with the following pre-defined customer information and preferences prior to start date necessary to complete Customer Support Plan (CSP):

3.2.1. Case notification preferences and procedure.

3.2.2. Repair verification preference and procedure.

3.2.3. Database and escalation procedure forms.

3.2.4. Submit changes in any information supplied in the CSP to the Customer Support Manager (CSM).

3.3. Provide the following information when initiating a service request:

3.3.1. Assigned system ID number.

3.3.2. Problem description and site location.

3.3.3. Other pertinent information requested by Motorola to open a case.

3.4. Allow Servicers access to equipment.

3.5. Supply infrastructure or FRU, as applicable, in order for Motorola to restore the system as set forth in paragraph 2.5.2.

3.6. Maintain and store in an easily accessible location any and all software needed to restore the system.

3.7. Maintain and store in an easily accessible location proper system backups.

3.8. For E911 systems, test the secondary/backup Public Safety Answering Point (PSAP) connection to be prepared in the event of a catastrophic failure of a system. Train appropriate personnel on the procedures to perform the function of switching to the backup PSAP.

3.9. Verify with the SSC that restoration is complete or system is functional, if required by repair verification preference provided by customer in accordance with section 3.2.

3.10. Cooperate with Motorola and perform all acts that are reasonable or necessary to enable Motorola to provide these services.

[1] Infrastructure Repair with Advanced Replacement (IRAR) is a service offering that provides repair and replacement of infrastructure equipment. IRAR enhances Onsite and Dispatch Service by enabling a faster response and repair times.

4.0 Severity Level Definitions

The following severity level definitions will be used to determine the maximum response times:

Severity Level	Severity Definition

Severity 1	This is defined as a failure that causes the system and/or infrastructure a loss of voice functionality and no work-around or immediate solution is available.
	The following are examples of this kind of severity:
	- 33% of call processing resources impaired
	- Site Environment alarms:
	  - Smoke
	  - Unauthorized access
	  - Temperature
	  - Power failure

Severity 2	This is defined as a fault that causes the system to operate with a continuous reduction in capacity or functionality of core services (core services include, voice, data or network management). The following are examples of this kind of severity: - Less than 33% of call processing resources impaired - Failure of a single redundant component
Severity 3	This is defined as a fault which reduces the functionality, efficiency or usability of core services (voice, data and network management) and there is a viable work- around in place. The following are examples of this kind of severity: - Intermittent faults that are infrequent and minor impact to core services - Statistical reporting problems
Severity 4	This is defined as a minor issue, which has little or no impact on the functionality, efficiency or usability of core services. The following are examples of this kind of severity: - Faults resulting in minor functions or features being unsupported or unreliable in ways that are not noticeable to the user. - Faults that have no impact in how the user perceives the system to work. - Cosmetic issues. - Requests for information. - Preventive Maintenance

5.0 Severity Level Response Time Commitments

(Customer's Response Time Classification is designated in the Customer Support Plan.)

Severity Level	Standard Response Time
Severity 1*	Within 4 hours from receipt of notification continuously
Severity 2	Within 4 hours from receipt of notification Standard Business Day
Severity 3	Within 8 hours from receipt of notification Standard Business Day
Severity 4	Within 12 hours from receipt of notification Standard Business Day

*Premier Response is an option that provides a 2-hour response time for severity 1 issues.

2.10.14 INFRASTRUCTURE REPAIR

Infrastructure Repair Overview

Motorola provides a hardware repair service for all of the Motorola and select third-party infrastructure equipment supplied by Motorola. The Motorola authorized Repair Depot manages and performs the repair of Motorola supplied equipment as well as coordinating the equipment repair logistics process.

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1.1 Description of Services

Infrastructure components are repaired at a Motorola authorized Infrastructure Depot Operations (IDO). At Motorola's discretion, select third party Infrastructure may be sent to the original equipment manufacturer or third party vendor for repair.

1.2 Scope

Repair Authorizations are obtained by contacting the Solutions Support Center (SSC) which is available 24 hours a day, 7 days a week.

Repair authorizations can also be obtained online via Motorola Online at https://businessonline.motorolasolutions.com, under Repair Status/Submit Infrastructure RA.

1.3 Geographic Availability

Infrastructure repair is supported globally; geographic proximity will determine repair location.

1.4 Inclusions

Infrastructure repair is available on Motorola sold communication systems which may include some aspect of third party hardware and software. Motorola will make a "Commercially Reasonable Effort" to repair Motorola manufactured infrastructure products for seven years after product cancellation.

1.5 Exclusions

If infrastructure is no longer supported by Motorola, the original equipment manufacturer or a third party vendor, Motorola may return said equipment to the customer without repair or replacement. The following items are excluded from Infrastructure Repair:

1.5.1 All Motorola infrastructure hardware over seven (7) years from product cancellation date.

1.5.2 All Third party infrastructure hardware over two (2) years from pr5oduct cancellation date.

1.5.3 All Broadband infrastructure over three (3) years from product cancellation date

1.5.4 Physically damaged infrastructure.

1.5.5 Third party equipment not shipped by Motorola

1.5.6 Consumable items including, but not limited to, batteries, connectors, cables, toner/ink cartridges, tower lighting, laptop computers, monitors, keyboards and mouse.

1.5.7 Video retrieval from Digital In-Car Video equipment.

1.5.8 Infrastructure backhaul including but not limited to, Antennas, Antenna Dehydrator, Microwave1, Line Boosters, Amplifier, Data Talker Wireless Transmitter, Short haul modems,

UPS[1]

1.5.9 Test equipment.

1.5.10 Racks, furniture and cabinets.

1.5.11 Firmware and/or software upgrades.

[1] Excluded from service agreements but may be repaired on an above contract, time and material basis. All UPS Systems must be shipped to IDO for repair. Note! Excludes batteries and on-site services

1.6 Motorola has the following responsibilities:

1.6.4 Enable Customer access to the Motorola call Center operational 24 hours a day, 7 days per week, to create requests for repair service.

1.6.5 Provide repair return authorization numbers when requested by Customer.

1.6.6 Receive malfunctioning infrastructure from customer and document its arrival, repair and return.

1.6.7 Perform the following service on Motorola infrastructure:

1.6.7.1 Perform an operational check on the infrastructure to determine the nature of the problem.

1.6.7.2 Replace malfunctioning Field Replacement Units (FRU) or components.

1.6.7.3 Verify that Motorola infrastructure is returned to Motorola manufactured specifications, as applicable.

1.6.7.4 Perform a box unit test on all serviced infrastructure.

1.6.7.5 Perform a system test on select infrastructure.

1.6.8 Provide the following service on select third party infrastructure:

1.6.8.1 Perform pre-diagnostic and repair services to confirm infrastructure malfunction and eliminate sending infrastructure with no trouble found (NTF) to third party vendor for repair, when applicable.

1.6.8.2 Ship malfunctioning infrastructure components to the original equipment manufacturer or third party vendor for repair service, when applicable.

1.6.8.3 Track infrastructure sent to the original equipment manufacturer or third party vendor for service.

1.6.8.4 Perform a post-test after repair by Motorola, original equipment manufacturer, or third party vendor to confirm malfunctioning infrastructure has been repaired and functions properly in a Motorola system configuration, when applicable.

1.6.8.5 Re-program repaired infrastructure to original operating parameters based on software/firmware provided by customer as required by section

1.6.8.6 1.6.7. If the customer software version/configuration is not provided, shipping times will be delayed. If the Infrastructure repair depot determines that the malfunctioning infrastructure is due to a software defect, the repair depot reserves the right to reload infrastructure with a similar software version.

1.6.8.7 Properly package repaired infrastructure.

1.6.8.8 Ship repaired infrastructure to the customer specified address during normal operating hours of Monday through Friday 7:00am to 7:00pm CST, excluding holidays. FRU will be sent two-day air unless otherwise requested. Motorola will pay for such shipping, unless customer requests shipments outside of the above mentioned standard

business hours and/or carrierprograms, such as NFO (next flight out). In such cases, customer will be responsible for payment of shipping and handling charges.

1.7 The Customer has the following responsibilities:

1.7.1 Contact or instruct Servicer to contact the Motorola System Support Center (SSC) and request a return authorization number prior to shipping malfunctioning infrastructure.

1.7.2 Provide model description, model number and serial number, type of system, software and firmware version, symptom of problem and address of site location for FRU or infrastructure.

1.7.3 Indicate if infrastructure or third party infrastructure being sent in for service was subjected to physical damage or lightning damage.

1.7.4 Follow Motorola instructions regarding inclusion or removal of firmware and software applications from infrastructure being sent in for service.

1.7.5 Provide customer purchase order number to secure payment for any costs described herein.

1.7.6 Properly package and ship the malfunctioning FRU, at customer's expense. Customer is responsible for properly packaging the malfunctioning infrastructure FRU to ensure that the shipped infrastructure arrives un-damaged and in repairable condition.

1.7.6.8 Clearly print the return authorization number on the outside of the packaging.

1.7.7 Maintain versions and configurations for software/applications and firmware to install repaired equipment.

1.7.8 Provide Motorola with proper software/firmware information to reprogram equipment after repair unless current software has caused this malfunction.

1.7.9 Cooperate with Motorola and perform all acts that are reasonable or necessary to enable Motorola to provide the infrastructure repair services to customer.

2.10.15 SECURITY UPDATE SERVICE

Security Update Service Overview

To verify compatibility with your ASTRO system, Motorola Solutions, Inc.'s ("Motorola") Security Update Service (SUS) provides pre-tested 3rd party software (SW) security updates.

This service was formerly called Pre-tested Software Subscription (PTSS). Additionally, SUS Platinum has been eliminated. The additional SUS Platinum features have been merged into this one SUS offering.

This Statement of Work ("SOW") is subject to the terms and conditions of Motorola's Professional Services Agreement, Service Agreement or other applicable agreement in effect between the parties ("Agreement"). Motorola and Customer may be referred to herein individually as a "Party or together as "Parties."

1.0 Description of Security Update Services

Motorola shall maintain a dedicated vetting lab for each supported ASTRO release for the purpose of pre-testing security updates. In some cases, when appropriate, Motorola will make the updates available to outside vendors, allow them to test, and then incorporate those results into this offering. Depending on the specific ASTRO release and customer options, these may include updates to antivirus definitions, OEM vendor supported Windows Workstation and Server, Solaris and RedHat Linux (RHEL) operating system patches, VMware ESXi Hypervisor patches, Oracle database patches, PostgreSQL patches, and patches for other 3rd party Windows applications such as Adobe Acrobat and Flash.

Motorola has no control over the schedule of releases. The schedule for the releases of updates is determined by the Original Equipment Manufacturers (OEMs), without consultation with Motorola. Antivirus definitions are released every week. Microsoft patches are released on a monthly basis. Motorola obtains and tests these updates as they are released. Other products have different schedules or are released "as-required." Motorola will obtain and test these updates on a quarterly basis.

SUS Delivery Methods

Method of Delivery	Description	What to Order
SUS	Manual download from SUS Google Site	SUS
OPTION…. Reboot Support of SUS	Local On-Site support for Rebooting Servers & Dispatch Ops	SUS + Reboot Support
Remote SUS (RSUS)	Patches pushed from a central location	SUS + RSUS
OPTION…. Reboot Support of RSUS	Local On-Site support for Rebooting Servers & Dispatch Ops	SUS + RSUS + Reboot Support
On-Site Delivery of SUS	Local On-Site FSO to download patches from Google Site, perform patching, and reboot Servers & Dispatch Ops	SUS + On-SIte

Service	Essential/+	Advanced/+	Premier
SUS	X	X	X
Remote SUS (RSUS)		X	X
Reboot Support of SUS/RSUS	X (SUS)	X	X
On-Site Delivery of SUS		X	X

SUS

Once tested, Motorola will post the updates to a secured extranet website and send an email notification to the customer. If there are any recommended configuration changes, warnings, or workarounds, Motorola will provide detailed documentation along with the updates on the website.The customer will be responsible for the download and deployment of these updates to their ASTRO System.

Remote Delivery of SUS (RSUS)

Remote Delivery of SUS. Motorola's dedicated staff remotely installs the required security updates and operating system patches onto your radio network. Vulnerabilities from third party software are addressed as soon as the validation of recommended patches is completed. Motorola will also provide reports outlining updates made for your team's review and awareness. Patch transfers are transparent to the end user. After the patches are transferred, a report is sent out to inform our customers which machines they will need to reboot the appropriate devices to enable the new patches and antivirus definitions.

Reboot Support Delivery of SUS/RSUS

This optional enhancement provides support for rebooting impacted servers and workstations after the patches have been downloaded/pushed and installed. Once installation is complete, Motorola will deploy trained technicians to reboot servers and workstations at the customer locations.

ON-SITE Delivery of SUS

For convenience, a trained technician will be contacted to provide the complete patching service. At the customer location, the technician will download patches, perform the required installation services and coordinate the rebooting of servers and dispatch ops.

2.0 Scope

Security Update Service supports the currently shipping Motorola ASTRO System Release (SR) and strives to support 4 releases prior. Motorola reserves the right to adjust which releases are supported as business conditions dictate. Contact your Customer Service Manager for the latest supported releases.

SUS is available for any L or M core system in a supported release.

Systems that have non-standard configurations that have not been certified by Motorola Systems Integration and Testing (SIT) are specifically excluded from this Service unless otherwise agreed in writing by Motorola. Service does not include pre-tested intrusion detection system (IDS) updates for IDS solutions. Certain consoles, MOTOBRIDGE, MARVLIS, Symbol Equipment, AirDefense Equipment, AVL, and Radio Site Security products are also excluded. Motorola will determine, in its sole discretion, the third party software that is supported as a part of this offering.

Antivirus updates - Antivirus updates are released weekly. The target release for these updates is by close of business each Tuesday. While the release often occurs early, this is the time and date committed to by vetting.

Windows - Updates are downloaded on Microsoft Patch Tuesday (2nd Tuesday of the month). Updates are incorporated, tested and vetted in the Windows Motopatch disk over the next few weeks. The target release is by the last day of the month.

Windows 3rd Party updates - for Adobe Reader and Adobe Flash are included on the standard Motopatch for Windows disk and follow the Windows patching schedule.

RHEL - Security updates are downloaded the last week of the first month of the quarter. Updates include any updates that are available at that time. We then prepare, test and vet the RHEL 5, and RHEL 6, Motopatch disks and target to release the disks by the last day of the quarter.

VMware - Security updates are downloaded the last week of the first month of the quarter for ESXi. These updates are downloaded from HP directly. The updates are incorporated into the Motopatch for ESXi disk. We then prepare, test and vet the ESXi Motopatch and target to release the disk by the last day of the quarter.

Solaris 10* - Security updates are downloaded around the 15th of the 1st month of the quarter. This is when updates are released by Oracle. The Solaris 10 patch bundle is downloaded and used to prepare, test and vet the Solaris 10 Motopatch disk . The target release for the disk is by the last day of the quarter. We no longer patch Solaris 10 as this product has gone end of life for MSI. * EOL by MSI - only supported on 7.13 CPH RHEL and Solaris

Oracle 11g* - Security updates are downloaded the last week of the first month of the quarter. Whatever updates are available at that time are used. The disk is then prepared, tested and vetted. The Motopatch for Oracle 11gR1 and 11gR2 disks target to release by the last day of the quarter. *7.13 and prior releases thru 2017

PostgreSQL* - Security updates are downloaded the last week of the first month of the quarter. Whatever updates that are available at that time are used. The disk is then prepared, tested and vetted. The Motopatch for PostgreSQL disk target release is by the last day of the quarter. *7.14 and later major releases

McAfee Patch Updates - Security patches are downloaded from McAfee the last week of the first month of the quarter. Whatever updates that are available at that time are used. The disk is then prepared, tested and vetted. The Motopatch for McAfee disk target release is by the last day of the quarter.

DOT HILL DAS Firmware disk - Security patches are downloaded from DOT HILL the last week of the first month of the quarter. Whatever updates that are available at that time are used. The disk is then prepared, tested and vetted. The disk target release is by the last day of the quarter.

Backport – CPT provides the latest STIG updates in January of each calendar year. These STIG updates are applied to our test systems and after testing, released to our customers as our IA Backport Disk. Scheduled release dates are typically the end of the first quarter.

3.0 Motorola has the following responsibilities:

3.1 Obtain relevant 3rd party security updates as made available and supported from the OEM's. This includes antivirus definition, OEM vendor available/supported operating systems patches, VMWare patches, database patches, and selected other 3rd party patches.covered by SUS. Motorola does not control when these updates are released, but current release schedules are listed for reference:

McAfee Antivirus definitions– Weekly

Microsoft PC and Server OS patches – Monthly

Solaris, RHEL OS, VMware hypervisor patches – Quarterly

Other 3rd party patches - Quarterly

3.2 Each assessment will consist of no less than 36 hours of examination time to evaluate the impact each update has on the system.

3.3 Testing of updates to verify whether they degrade or compromise system functionality on a dedicated ASTRO test system with standard supported configurations.

3.4 Address any issues identified during testing by working with Motorola selected commercial supplier and/or Motorola product development engineering team. If a solution for the identified issues cannot be found, the patch will not be posted on Motorola's site.

3.5 Pre-test STIG recommended remediation when applicable.

3.6 Release all tested updates to Motorola's secure extranet site.

3.7 Include documentation for installation, recommended configuration changes, and identified issues and remediation for each update release.

3.8 Include printable labels for customers who download the updates to CD's.

3.9 Notify customer of update releases by email.

3.10 A supported SUS ASTRO release matrix will be kept on the extranet site for reference.

4.0 The Customer has the following responsibilities:

4.1 Provide Motorola with pre-defined information prior to contract start date necessary to complete a Customer Support Plan (CSP).

4.2 Submit changes in any information supplied in the Customer Support Plan (CSP) to the Customer Support Manager (CSM).

4.3 Provide means for accessing pre-tested files (Access to the extranet website).

4.4 Deploy pre-tested files to the customer system as instructed in the "Read Me" text provided.

4.5 Implement recommended remediation(s) on customer system, as determined necessary by customer.

4.6 Upgrade system to a supported system release as necessary to continue service.

4.7 Adhere closely to the System Support Center (SSC) troubleshooting guidelines provided upon system acquisition. A failure to follow SSC guidelines may cause the customer and Motorola unnecessary or overly burdensome remediation efforts. In such case, Motorola reserves the right to charge an additional service fee for the remediation effort.

4.8 Comply with the terms of the applicable license agreement between the customer and the non-Motorola software copyright owner.

5.0 Disclaimer:

Motorola disclaims any and all warranties with respect to pre-tested antivirus definitions, database security updates, hypervisor patches, operating system software patches, intrusion detection sensor signature files, or other 3rd party files, express or implied. Further, Motorola disclaims any warranty concerning the non-Motorola software and does not guarantee that customer's system will be error-free or immune to security breaches as a result of these services.

2.10.16 PREVENTIVE MAINTENANCE

The terms and conditions of this Statement of Work (SOW) are an integral part of Motorola's Service Agreement or other applicable agreement to which it is attached and made a part thereof by this reference.

System Preventative Maintenance will provide an operational test and alignment, on the customer's infrastructure equipment (infrastructure or fixed network equipment only) to ensure the Infrastructure meets specifications, as set forth in the applicable attached Exhibit(s), all of which are hereby incorporated by this reference.

1.0 Scope

System Preventive Maintenance will be performed during standard business hours (unless otherwise agreed to in writing). If the system or Customer requirements dictate this service must occur outside of standard business hours, Motorola will provide an additional quotation. Customer is responsible for any charges associated with unusual access requirements or expenses.

2.0 Geographic Availability

Preventive Maintenance is available to any customer regardless of their geographic location.

3.0 Inclusions

Preventive Maintenance service will be delivered on Motorola sold infrastructure including integrated 3rd party products per the level of service as defined in **Table 1**.

4.0 Limitations and Exclusions

Unless specifically called out in Table 1, the following activities are outside the scope of the Preventive Maintenance service, but are optional services that are available to Preventive Maintenance customers at an additional cost:

1.1.1 Emergency on-site visits required to resolve technical issues.
1.1.2 Third party support for equipment not sold by Motorola as part of the original system.
1.1.3 System installations, upgrades, and expansions.
1.1.4 Customer training.
1.1.5 Hardware repair and/or exchange.
1.1.6 Network security services.
1.1.7 Network transport.
1.1.8 Information Assurance.
1.1.9 Motorola services not included in this statement of work.
1.1.10 Any maintenance required as a result of a virus or unwanted intrusion is excluded if the system is not protected against these security threats by Motorola's Pre-tested Security Update Service when applicable.

1.5 MOTOROLA HAS THE FOLLOWING RESPONSIBILITIES:

1.6 Notify the customer of any possible system downtime needed to perform this service.

1.6.1 Advise customer of any issue that requires immediate attention.

1.6.2 Maintain communication with the customer as needed until completion ("resolution" implies a problem is being fixed) of the Preventive Maintenance.

1.6.3 Determine, in its sole discretion, when a case requires more than the Preventive Maintenance services described in this SOW and notify customer of an alternative course of action.

1.6.4 Provide customer with a report documenting system performance against expected parameters along with recommended actions. Time allotment TBD.

1.6.5 Provide trained and qualified personnel with proper security clearance required to complete Preventive Maintenance service.

1.7 THE CUSTOMER HAS THE FOLLOWING RESPONSIBILITIES:

1.8 Provide preferred schedule for Preventative Maintenance to Motorola.

1.9 Authorize and acknowledge any scheduled system downtime.

1.10 Maintain periodic backup of databases, software applications, and firmware.

1.11 Establish and maintain a suitable environment (heat, light, and power) for the equipment location and provide Motorola full, free, and safe access to the equipment so that Motorola may provide services. All sites shall be accessible by standard service vehicles.

1.11.1 Submit changes in any information supplied in the Customer Support Plan (CSP) to the Customer Support Manager (CSM).

1.11.2 Provide site escorts in a timely manner if required.

1.11.3 Provide Motorola with requirements necessary for access to secure facilities.

TABLE 1

PM Tasks

	Preventive Maintenance
RF Site	
Visual Inspection (Cabling, Equipment, Fans, Indicators)- Inspect stations/components for normal operation	x
Clean fans and equipment - Use antistatic vacuum to clean cooling pathways	x
Site frequency standard check- Check lights and indicators for A/B receivers if used.	x
Regulatory Compliance (License, ERP, Frequency, Deviation) - Check station for regulatory compliance. Update station logs	x
Effective Receiver Sensitivity (ERS) - Check effective receiver sensitivity and operation for each channel.	x
Line level validation (analog only) - Check inbound and outbound audio levels	x
Voice Call Check - Voice test each channel radio to radio and radio to console. If site uses Dynamic Dual Mode (DDM), then test both TDMA and FDMA operation."	x
Site control channel redundancy (Trunking) - Roll control channel, test, and roll back.	x
Full repeater optimization (tune repeater to manufacturer) - Optimize stations	x

	Preventive Maintenance
Dispatch Site	
Visual Inspection (Cabling, Equipment, Fans, Indicators) Inspect and report discrepancies with pictures	x
Voice Call Check - Voice test each channel console to radio and radio to console. Voice test all dispatch resources	x
Check and Clean CPU, Displays, Fans, and Keyboards. Dust and vacuum workstation hardware & cabling	x
IP Network Settings - Verify IP address & settings against as built documents and report discrepancies	x
Test Motorola supplied Peripherals - Foot Switches, Headsets, Headset Jacks, Mics, and Speakers. Inspect and report discrepancies with pictures	x
Defragment Hard Drive, reboot CPU. Use standard Microsoft utilities & reboot CPU. Report any errors.	x
Perform Hard Drive back up.	x
Test Audio Input & Output Levels (Consolette & Centracom) ** Measure, verify from baseline, and document TX & RX line levels.	x

	Preventive Maintenance
Master Site	
Visual Inspection (Cabling, Equipment, Fans, Indicators) - Verify Red LED's and/or other alarm indications	x
Server diagnostics - Perform recommended diagnostics based on server type.	x
Network Management Operational check - Review UEM events and transport medium types (microwave/leased Telco, etc.)	x
Verify Motorola and 3rd party Security Patches. Monthly/Quarterly dependant on 3rd party vendor. May be covered through a SOC/NOC/NMO service contract.	x
Roll to Redundant switches (pre-approved by customer) Test redundancy in CWR devices.	x
Roll to Redundant Zone Controller (pre-approved by customer) Test ZC1 to ZC2, back to ZC1	x
Complete backup of databases; SZ database (BAR), Centracom CDM database (legacy), etc.	x

	Standard Preventive Maintenance
Batteries (non-UPS)	
Visual Inspection (condition of cells/cabling) - Verify no corrosion, physical connections, dirt/dust etc.	x
UPS	
Visual inspection (condition, cabling)' Verify corrosion, physical connections, dirt/dust.	x
Generator	
Visual Inspection; Verify, check panel housing, cracks, rust and weathering. Physical connections, corrosion, dirt/dust, etc.	x
Verify operation (no switchover); Check, verify running of Generator, ease of start or difficult. Is generator "throttling" or running smooth. Any loud unusual noise? Etc.	x
Other maintenance (oil change, fuel filter); Check/adjust voltages, current and meter readings. Verify software version. Check and change all fluids, filters, belts, etc. Perform full operational checks and confirm proper operation of motor and sensors..	x

	Standard Preventive Maintenance
Facilities	
Visual Inspection - Confirm location coordinates and document any physical structure changes from previous as build documentation. Take digital pictures of site, date and archive.	x
Visual Security Verification (fences, site locks, access), Confirm and document security or access features (basic integrity and any changes).	x
Pest Control. Document and report any signs of pest intrusion.	x
Backhaul (Microwave, T1/E1, DSL, etc.)	
Visual Inspection (transmit/receive equipment, cabling). Ground level inspection only. Take Digital pictures of inspection and highlight problems or defects.	x
Check Receive Signal Levels. Check and compare to as built levels. Report any out of tolerance readings.	x
Tx Power output and Rx Sensitivity checks. Check and document. Perform alignment if required and report any adjustments made.	x
Tower	
Tower visual inspection (verify registration posted). Ground level inspection only. Check tower lighting controller. Check that antennas are plumb.	x

	Standard Preventive Maintenance
Grounding/Earthing	
Visual Inspection. Visually inspect and confirm tower, building, and equipment grounding and document any changes from as built. Document with digital pictures.	x
HVAC	
Visual and operational inspection. Visually inspect and confirm HVAC operation and controls are operational. Measure equipment area temperature. Document any problems with pictures.	x

** 3rd party parts not included*

*** ST custom quote*

****Based on system configuration & level of service selected*

EXHIBIT D
MAINTENANCE SERVICE TERMS AND CONDITIONS

Motorola Solutions, Inc. ("Contractor") and the City and County of Denver (the "City" or "Customer") hereby agree as follows:

Section 1 APPLICABILITY

These Maintenance Service Terms and Conditions apply to service contracts whereby Contractor will provide to the City either maintenance, support, or other services under a Contractor Service Agreement.

Section 2 DEFINITIONS AND INTERPRETATION

2.1. "Agreement" means these Maintenance Service Terms and Conditions; the cover page for the Maintenance Service Agreement or the Installation Agreement, as applicable; and any other attachments, all of which are incorporated herein by this reference. In interpreting this Agreement and resolving any ambiguities, these Maintenance Service Terms and Conditions take precedence over any cover page, and the cover page takes precedence over any attachments, unless the cover page or attachment states otherwise.

2.2. "Equipment" means the equipment that is specified in the attachments or is subsequently added to this Agreement.

2.3. "Services" means those installation, maintenance, support, training, and other services described in this Agreement.

Section 3 ACCEPTANCE

The City accepts these Maintenance Service Terms and Conditions and agrees to pay the prices set forth in the Agreement. This Agreement becomes binding only when accepted in writing by Contractor. The term of this Agreement begins on the "Start Date" indicated in this Agreement.

Section 4 SCOPE OF SERVICES

4.1. Contractor will provide the Services described in this Agreement or in a more detailed statement of work or other document attached to this Agreement. At the City's request, Contractor may also provide additional services at Contractor's then-applicable rates for the services.

4.2. If Contractor is providing Services for Equipment, Contractor parts or parts of equal quality will be used; the Equipment will be serviced at levels set forth in the manufacturer's product manuals; and routine service procedures that are prescribed by Contractor will be followed.

4.3. If the City purchases from Contractor additional equipment that becomes part of the same system as the initial Equipment, the additional equipment may be added to this Agreement and will be billed at the applicable rates after the warranty for that additional equipment expires.

4.4. All Equipment must be in good working order on the Start Date or when additional equipment is added to the Agreement. Upon reasonable request by Contractor, City will provide a complete serial and model number list of the Equipment. The City must promptly notify Contractor in writing when any Equipment is lost, damaged, stolen or taken out of service. The City's obligation to pay Service fees for this Equipment will terminate at the end of the month in which Contractor receives the written notice.

4.5. City must specifically identify any Equipment that is labeled intrinsically safe for use in hazardous environments.

4.6. If Equipment cannot, in Contractor's reasonable opinion, be properly or economically serviced for any reason, Contractor may modify the scope of Services related to that Equipment; remove that Equipment from the Agreement; or increase the price to Service that Equipment.

4.7. City must promptly notify Contractor of any Equipment failure. Contractor will respond to the City's notification in a manner consistent with the level of Service purchased as indicated in this Agreement.

Section 5 EXCLUDED SERVICES

5.1. Service excludes the repair or replacement of Equipment that has become defective or damaged from use in other than the normal, customary, intended, and authorized manner; use not in compliance with applicable industry standards; excessive wear and tear; or accident, liquids, power surges, neglect, acts of God or other force majeure events.

5.2. Unless specifically included in this Agreement, Service excludes items that are consumed in the normal operation of the Equipment, such as batteries or magnetic tapes.; upgrading or reprogramming Equipment; accessories, belt clips, battery chargers, custom or special products, modified units, or software; and repair or maintenance of any transmission line, antenna, microwave equipment, tower or tower lighting, duplexer, combiner, or multicoupler. Contractor has no obligations for any transmission medium, such as telephone lines, computer networks, the internet or the worldwide web, or for Equipment malfunction caused by the transmission medium.

Section 6 TIME AND PLACE OF SERVICE

Service will be provided at the location specified in this Agreement. When Contractor performs service at City's location, City will provide Contractor, at no charge, a non-hazardous work environment with adequate shelter, heat, light, and power and with full and free access to the Equipment. Waivers of liability from Contractor or its subcontractors will not be imposed as a site access requirement. The City will provide all information pertaining to the hardware and software elements of any system with which the Equipment is interfacing so that Contractor may perform its Services. Unless otherwise stated in this Agreement, the hours of Service will be 8:30 a.m. to 4:30 p.m., local time, excluding weekends and holidays. Unless otherwise stated in this Agreement, the price for the Services exclude any charges or expenses associated with helicopter or other unusual access requirements; if these charges or expenses are reasonably incurred by Contractor in rendering the Services, the City agrees to reimburse Contractor for those charges and expenses.

Section 7 CITY CONTACT

The City will provide Contractor with designated points of contact (list of names and phone numbers) that will be available twenty-four (24) hours per day, seven (7) days per week, and an escalation procedure to enable City's personnel to maintain contact, as needed, with Contractor.

Section 8 WARRANTY

Contractor warrants that its post-warranty maintenance Services under this Agreement will be free of defects in materials and workmanship for a period of ninety (90) days from the date the performance of the Services are completed. In the event of a breach of this warranty, the City's sole remedy is to require Contractor to re-perform the non-conforming Service or to refund, on a pro-rata basis, the fees paid for the non-conforming Service. Concerning the post-warranty Services, CONTRACTOR DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Section 9 FCC LICENSES AND OTHER AUTHORIZATIONS

For services provided under this Exhibit D, the City is solely responsible for obtaining licenses or other authorizations required by the Federal Communications Commission or any other federal, state, or local government agency and for complying with all rules and regulations required by governmental agencies. Neither Contractor nor any of its employees is an agent or representative of City in any governmental matters.

Section 10 MATERIALS, TOOLS AND EQUIPMENT

All tools, equipment, dies, gauges, models, drawings or other materials paid for or furnished by Contractor for the purpose of this Agreement will be and remain the sole property of Contractor. The City will safeguard all such property while it is in the City's custody or control, be liable for any loss or damage to this property, and return it to Contractor upon request. This property will be held by City for Contractor's use without charge and may be removed from the City's premises by Contractor at any time without restriction.

EXHIBIT E
SYSTEM ACCEPTANCE CERTIFICATE

Customer Name: _____

Project Name: _____

This System Acceptance Certificate memorializes the occurrence of System Acceptance. Motorola and Customer acknowledge that:

1. The Acceptance Tests set forth in the Acceptance Test Plan have been successfully completed.

2. The System is accepted.

Customer Representative:	Motorola Representative:
Signature: _____	Signature: _____
Print Name: _____	Print Name: _____
Title: _____	Title: _____
Date: _____	Date: _____

FINAL PROJECT ACCEPTANCE:
Motorola has provided and Customer has received all deliverables, and Motorola has performed all other work required for Final Project Acceptance.

Customer Representative:	Motorola Representative:
Signature: _____	Signature: _____
Print Name: _____	Print Name: _____
Title: _____	Title: _____
Date: _____	Date: _____

CITY AND COUNTY OF DENVER

PRICING FOR ONGOING PURCHASES

P25 PUBLIC SAFETY RADIO SYSTEM REPLACEMENT PROJECT NOVEMBER 20, 2017

MOTOROLA SOLUTIONS

City & County of Denver Ongoing Purchase and Maintenance – Committed Pricing and Discounts

The tables below show the committed pricing or percentage discounts for CCD purchases of equipment and services through the term of the contract. As noted, the APX tiers specified in the proposal will be available to CCD through the term of the contract at the proposed contract pricing.

Future Purchases under Contract- Pricing Discount %	
System Segment	**% Discount off List Price**
Motorola Infrastructure Components	30%
3rd Party Infrastructure Components	10%
APX Subscriber Tiered Packages per RFP	As proposed per table B.11 in the Pricing Forms
APX Subscriber Family- Non-Tier Package	35%
APX Subscriber Accessories	30%
MCC Console Family	25%
MCC Console Accessories	25%

Future Services	
Description	**Discounted Price**
Project Management- Manday	$1,494.50
Engineering Manday	$1,494.50
System Technologist Manday	$1,494.50
Programming Portables per Unit	$47.45
Programming Mobiles per Unit	$47.45
Installation of Mobile (Dash Mount)	$207.35

MOTOROLA

The tables below show the committed pricing for ongoing maintenance and the System Upgrade Agreement (SUA) through the term of the contract. This pricing in the two tables below is subject to change if there are additions to the system or the scope of what is being covered after the signing of this contract.

Ongoing Maintenance					
Description	Network Monitoring	Dispatch Service	Infrastructure Repair	Security Update Service	Technical Support
Extended Warranty for Year 2	$ 40,709.06	$ 18,244.64	$ 175,622.00	$ 88,247.00	$ 56,947.84
Extended Warranty for Year 3	$ 41,930.34	$ 18,791.98	$ 180,890.66	$ 90,894.41	$ 58,656.27
Extended Warranty for Year 4	$ 43,188.25	$ 19,355.74	$ 186,317.38	$ 93,621.24	$ 60,415.96
Extended Warranty for Year 5	$ 44,483.89	$ 19,936.42	$ 191,906.90	$ 96,429.88	$ 62,228.44
Extended Warranty for Year 6	$ 45,818.41	$ 20,534.51	$ 197,664.11	$ 99,322.78	$ 64,095.29
Extended Warranty for Year 7	$ 47,192.96	$ 21,150.54	$ 203,594.03	$ 102,302.46	$ 66,018.15
Extended Warranty for Year 8	$ 48,608.75	$ 21,785.06	$ 209,701.85	$ 105,371.53	$ 67,998.69
Extended Warranty for Year 9	$ 50,067.01	$ 22,438.61	$ 215,992.91	$ 108,532.68	$ 70,038.66
Extended Warranty for Year 10	$ 51,569.02	$ 23,111.77	$ 222,472.70	$ 111,788.66	$ 72,139.81
Extended Warranty for Year 11	$ 53,116.10	$ 23,805.12	$ 229,146.88	$ 115,142.32	$ 74,304.01
Extended Warranty for Year 12	$ 54,709.58	$ 24,519.28	$ 236,021.28	$ 118,596.59	$ 76,533.13
Extended Warranty for Year 13	$ 56,350.87	$ 25,254.85	$ 243,101.92	$ 122,154.49	$ 78,829.12
Extended Warranty for Year 14	$ 58,041.39	$ 26,012.50	$ 250,394.98	$ 125,819.12	$ 81,194.00
Extended Warranty for Year 15	$ 59,782.63	$ 26,792.87	$ 257,906.83	$ 129,593.69	$ 83,629.82

Software Support & Upgrades (System Upgrade Agreement)	
Description	Network Monitoring
Extended Warranty for Year 2	
Extended Warranty for Year 3	
Extended Warranty for Year 4	
Extended Warranty for Year 5	$ 606,356.00
Extended Warranty for Year 6	
Extended Warranty for Year 7	
Extended Warranty for Year 8	
Extended Warranty for Year 9	
Extended Warranty for Year 10	$ 641,897.28
Extended Warranty for Year 11	
Extended Warranty for Year 12	
Extended Warranty for Year 13	
Extended Warranty for Year 14	
Extended Warranty for Year 15	

EXHIBIT G
CITY AND COUNTY OF DENVER
DEPARTMENT OF PUBLIC WORKS
«Division»

PERFORMANCE AND PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned _____, a corporation organized and existing under and by virtue of the laws of the State of _____, hereafter referred to as the "Contractor", and _____, a corporation organized and existing under and by virtue of the laws of the State of _____, and authorized to transact business in the State of Colorado, as Surety, are held and firmly bound unto the CITY AND COUNTY OF DENVER, a municipal corporation of the State of Colorado, hereinafter referred to as the "City", in the penal sum of _____ Dollars ($_____), lawful money of the United States of America, for the payment of which sum, well and truly to be made, we bind ourselves and our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents;

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH THAT:

WHEREAS, the above bounden Contractor has on the _____ day of _____, 20__, entered into a written contract with the aforesaid City for furnishing all labor and tools, supplies, equipment, superintendence, materials and everything necessary for and required to do, perform and complete the construction of **CONTRACT NO. «CONTRACT_NO» «PROJECT_NAME»,** Denver, Colorado, and has bound itself to complete the project within the time or times specified or pay liquidated damages, all as designated, defined and described in the said Contract and Conditions thereof, and in accordance with the Plans and Technical Specifications therefore, a copy of said Contract being made a part hereof;

NOW, THEREFORE, if the said Contractor shall and will, in all particulars well and truly and faithfully observe, perform and abide by each and every Covenant, Condition and part of said Contract, and the Conditions, Technical Specifications, Plans, and other Contract Documents thereto attached, or by reference made a part thereof and any alterations in and additions thereto, according to the true intent and meaning in such case, then this obligation shall be and become null and void; otherwise, it shall remain in full force and effect;

PROVIDED FURTHER, that if the said Contractor shall satisfy all claims and demands incurred by the Contractor in the performance of said Contract, and shall fully indemnify and save harmless the City from all damages, claims, demands, expense and charge of every kind (including claims of patent infringement) arising from any act, omission, or neglect of said Contractor, its agents, or employees with relation to said work; and shall fully reimburse and repay to the City all costs, damages, and expenses which it may incur in making good any default based upon the failure of the Contractor to fulfill its obligation to furnish maintenance, repairs or replacements for the full guarantee period provided in the Contract Documents, then this obligation shall be null and void; otherwise it shall remain in full force and effect;

PROVIDED FURTHER, that if said Contractor shall at all times promptly make payments of all amounts lawfully due to all persons supplying or furnishing it or its subcontractors with labor and materials, rental machinery, tools or equipment used or performed in the prosecution of work provided for in the above Contract and that if the Contractor will indemnify and save harmless the City for the extent of any and all payments in connection with the carrying out of such Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect;

PROVIDED FURTHER, that if the said Contractor fails to duly pay for any labor, materials, team hire, sustenance, provisions, provender, gasoline, lubricating oils, fuel oils, grease, coal, or any other supplies or materials used or consumed by said Contractor or its subcontractors in performance of the work contracted to be done, or fails to pay any person who supplies rental machinery, tools or equipment, all amounts due as the result of the use of such machinery, tools or equipment in the prosecution of the work, the Surety will pay the same in any amount not exceeding the amount of this obligation, together with interest as provided by law;

PROVIDED FURTHER, that the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract, or to contracts with others in connection with this project, or the work to be performed thereunder, or the Technical Specifications and Plans accompanying the same, shall in any way affect its obligation on this bond and it does hereby waive notice of any change, extension of time, alteration or addition to the terms of the Contract, or contracts, or to the work, or to the Technical Specifications and Plans.

IN WITNESS WHEREOF, said Contractor and said Surety have executed these presents as of this _____ day of _____, 20__.

_____
Contractor

Attest:

By:_____
President

_____
Secretary

_____
Surety

By:_____
Attorney-In-Fact

(Accompany this bond with Attorney-in-Fact's authority from the Surety to execute bond, certified to include the date of the bond).

APPROVED AS TO FORM:
Attorney for the City and County of Denver

By:_____
Assistant City Attorney

APPROVED FOR THE CITY AND COUNTY OF DENVER

By: _____
MAYOR

By: _____
MANAGER OF PUBLIC WORKS