

## LICENSE AGREEMENT

**THIS LICENSE AGREEMENT** (“Agreement”) is made, effective as of the date set forth in section 2.01(a) below (“Effective Date”), by and between the **CITY AND COUNTY OF DENVER, a municipal corporation** (“City”), and **T-MOBILE WEST CORPORATION**, a Delaware Limited Liability Company authorized to conduct business in Colorado, whose principal office is located at 12920 SE 38<sup>th</sup> Street, Bellevue, Washington 98006 (“Licensee”).

### DEFINITIONS

All capitalized terms or phrases in this Agreement, except for proper names, shall have the meanings as set forth below:

**A.** Agreement means this License Agreement during the Term or Term Extension of the Agreement.

**B.** ADA means federal Americans with Disabilities Act and any other federal or state laws requiring access for the disabled to public accommodations.

**C.** Applicable Law means all federal, state, and local laws applicable in the context of the specific matter addressed in this Agreement, including but not limited to: 1) the constitutions, laws, and rules and regulations of the United States of America and the State of Colorado; 2) the City Charter, the Denver Revised Municipal Code, and building, fire, electrical, plumbing and other applicable codes, as they may be amended from time to time; 3) rules and regulations, including any standards and specifications, promulgated or amended by the Denver Department of Safety and the Denver Fire Department; 4) any rules and regulations promulgated or amended by other City departments and agencies applicable to this Agreement; 5) executive orders issued by the Mayor; 6) any court order, judgment, or decree or any appellate decision applicable to this Agreement; 7) any federal, state, or local administrative decision or order applicable to this Agreement; 8) any anti-discrimination laws; and 9) the requirements of the ADA.

**D.** Cancellation means the revocation of the License and the termination or cancellation of the Agreement, including mutual termination by the parties, in the manner specified in this Agreement.

**E.** City means the City and County of Denver as represented by the Denver Fire Department and its Fire Chief.

**F.** City Representative means the Fire Chief’s designee(s) who will oversee and direct all activities of Licensee under this Agreement. The City Representative(s) may be employees or contractors of the Denver Fire Department, Denver’s Technology Services, the Electronic Engineering Bureau of the Department of Safety, and/or Denver’s Division of Real Estate. Contact information for the City Representative and the assigned responsibilities, if there is more than one City Representative, shall be provided to Licensee upon execution of this Agreement. The City may identify, change, add or delete City Representative(s) by written notice to Licensee.

**G.** City System means all existing and future communication and other electronic facilities,

equipment and instrumentation and related infrastructure and utility connections that the City requires for the operation of the Fire Station or the provision of emergency services from the Fire Station, including, but not limited to, public safety channels, radio system or other electronic means of sending, receiving, processing and recording information and data for public safety purposes.

**H.** DRMC means the Denver Revised Municipal Code as it may be amended from time to time.

**I.** Effective Date means the date this Agreement goes into effect, as specified in section 2.01(a) below.

**J.** Emergency means an occurrence or incident that presents an imminent threat of widespread or severe damage, injury, or loss of life or property resulting from any natural cause or cause of human origin, including but not limited to fire, explosion, flood, earthquake, wind, storm, structural failure, hazardous substance, environmental contamination, civil disturbance, vandalism, or breach of security.

**K.** FCC means the Federal Communications Commission.

**L.** Fire Chief means the head of the Denver Fire Department.

**M.** Fire Station means the specific fire station operated by the Denver Fire Department to which this Agreement applies, as specified in section 1.01(a).

**N.** Interference Study means a site and technical interference study, **Exhibit D**, field tests or other activities or investigations related to the resolution of RF Interference that may be associated with the Licensed System as specified in section 5.02.

**O.** License means the license granted as specified in section 1.01(a) which is exclusive only to the extent specified in this Agreement and which is restricted and revocable as specified in this Agreement. No property or leasehold interest or right is granted by the License.

**P.** Licensed Area means the location at the Fire Station where Licensee is authorized to install and operate the Licensed System, as specified in section 1.01(a).

**Q.** Licensed System means the radio frequency equipment and wireless communication facility, and related equipment, infrastructure and utility communications authorized by the City and installed and operated by Licensee within the Licensed Area of the Fire Station, as specified in section 1.01(a).

**R.** Licensee means the legal entity to which the License is granted under and in accordance with this Agreement, as identified in opening paragraph of this Agreement. To the extent that Licensee retains contractors or consultants to perform any of Licensee's rights and obligations under the Agreement, Licensee shall also mean those contractors and consultants.

**S.** License Fee means the compensation to be paid by Licensee to the City for the use of the Licensed Area and the operation of the Licensed System at the Fire Station as specified in section 3.01.

**T.** Minimum Technical Standards mean those standards set forth in **Exhibit C** as these Minimum Technical Standards may be updated from time-to-time, as needed, to address the state-of-the-art.

**U.** Party means either the City or Licensee, as appropriate in the context, and Parties means both the City and Licensee.

**V.** Permitted Use means the uses (subject to restrictions) as specified in section 1.02, which Licensee may make of the Licensed Area in the installation and operation of the Licensed System.

**W.** RF (Radio Frequency) Interference means any emission, radiation or induction from or associated with the Licensed System that affects the functioning of or degrades, obstructs, or interrupts radio or other wireless communications being made by the City or other authorized parties to or from the Fire Station or the operation of any communication system located at the Fire Station.

**X.** Point of Contact means the Chief Deputy for the Technical Services Division of the Denver Fire Department, or the Chief Deputy's designated representative, during regular business hours of the Denver Fire Department and the Denver Fire Department's non-emergency Dispatch for Licensee's urgent need for access after regular business hours of the Denver Fire Department.

**Y.** Term means the duration of the Agreement running from the Effective Date of the Agreement, as specified in section 2.01(a).

**Z.** Term Extension means any approved amendment to the Agreement allowing the duration of the Agreement for another five-year period subject to any new or changed terms or conditions, as specified in section 2.02.

**AA.** Tower means the communication structure or structures authorized by the City on which the Licensed System and the City System are located, as specified in 1.01(b).

## **SECTION 1 LICENSE; PERMITTED USE; and ACCESS**

### **1.01 Grant of License.**

(a) City owns property located within the City and County of Denver, State of Colorado, known as Fire Station #20, which is located at 501 Knox Court, Denver, Colorado 80204 ("Fire Station"). City hereby grants a License to Licensee for the use of certain designated areas at the Fire Station as depicted on **Exhibit A** (the "Licensed Area") for the installation and operation by Licensee of the Licensed System, as the Licensed System is technically described in **Exhibit B**. The Licensed System shall be situated within the Licensed Area and shall be located in relation to the City System, if any, as depicted in **Exhibit A**. The Licensed Area shall not include the City System. Any proposed change to the Licensed Area depicted in **Exhibit A** shall require an amendment to this Agreement.

(b) T-Mobile was granted a license under a previous agreement, Contract Control

#RC55026, dated March 20, 2007 (“2007 License Agreement”). That license expired by the terms of the agreement as of February 29, 2020. The Parties acknowledge and agree that except for payments due and owing for the time period described under Section 3.01(b), the terms and conditions of this Agreement shall apply for the Term set forth Section 2.01.

(c) As a condition of the grant of the License, Licensee shall construct and install, at its sole cost and expense, one (1) cellular antenna installed on an existing Fire Station tower, as described and at the location specified in **Exhibit A**, for shared use by the City and Licensee. The Licensed Area shall not include the City System.

## **1.02 Permitted Use/Restrictions.**

(a) The Licensed Area at the Fire Station shall be used for the installation, maintenance, alteration, repair, replacement, operation, and removal of the Licensed System within the Licensed Area, in accordance with this Agreement (“Permitted Use”). The Licensed System shall be owned by Licensee. Except as expressly provided in this Agreement, the City may not disturb or modify the Licensed System without the prior written permission of Licensee.

(b) Licensee may access the Fire Station site, use the Licensed Area, and install and operate the Licensed System only as set forth in this Agreement. The Permitted Use does not authorize any activity that would conflict or interfere with the public health, safety or welfare purpose or operation of the Fire Station or City System. Such prohibited conflict or interference includes RF Interference as set forth in this Agreement and **Exhibit D**. Licensee shall likewise take every reasonable measure to promptly and effectively avoid or remedy any emergency situation within its control that could adversely impact the Fire Station, the City System, the Licensed Area, or the Licensed System.

## **1.03 Access.**

(a) Provided that Licensee gives at least forty-eight (48) hours prior notice to the Point of Contact, Licensee has the reasonable right of access, ingress to and egress from the Licensed Area during regular business hours for Licensee’s employees, contractors and agents, including suppliers of materials and furnishers of service (collectively “Licensee’s Personnel”).

(b) In the event of an urgent situation where Licensee needs prompt access to the Licensed System during or outside of regular business hours, which shall be deemed to include any failure of Licensed System or any portion thereof, Licensee shall communicate with the Point of Contact to arrange for access by Licensee’s Personnel.

(c) With respect to all access to the Fire Station, Licensee’s Personnel must present legally sufficient identification, preferably in the form of a badge with picture ID issued by Licensee; will be subject to escort by Fire Department staff and search and inspection of items brought onto the Fire Station site; and will comply with all restrictions and security protocols set by the Fire Chief and the direction of the City Representative. All equipment, vehicles, machinery and other materials brought onto the Fire Station site must be necessary for the work authorized to be performed.

(d) Should Licensee require access into a secure area of the Fire Station which may

require prior approval or escort, then the permission of the City Representative must be obtained and any security protocols must be strictly observed by Licensee.

(e) The exercise of access by Licensee or Licensee's personnel shall not conflict or interfere with the operations of the Fire Station or the City System and may not block access at or the use of the Fire Station nor be in violation of the ADA. In addition, the exercise of access shall not conflict or interfere with the City System unless prior written permission is obtained from the City Representative.

(f) Any particular access on the Fire Station site may, at any time, temporarily or permanently, be closed, so long as an alternative means of access is made available to Licensee within a reasonable time. During the duration of any state of Emergency declared by the President of the United States, the Governor of the State of Colorado, or the Mayor of the City and County of Denver, access may be denied for security and public safety reasons. Licensee hereby releases and discharges the City from any and all claims, demands or causes of action which Licensee may now, or at any time hereafter, have against the City, arising or alleged to arise out of the closing of any point of access on the Fire Station site or the temporary unavailability of access to a Fire Station site.

## **SECTION 2 TERM and TERM EXTENSION**

### **2.01 Term.**

The Term of this Agreement shall be effective as of March 1, 2020 (the "Effective Date"), and shall expire on February 28, 2025, unless Licensee terminates the Agreement upon sixty (60) days written notice.

### **2.02 Term Extension.**

Licensee may exercise two (2) options to renew the License for one additional five-year period at the end of the term. Licensee shall provide notice to the City of its intent to exercise the renewal option by no later than sixty (60) days before the end of a Term. All terms and conditions shall remain in effect in accordance with this Agreement during the renewal period, including the percentage fee increase under Section 3.01, unless otherwise modified by mutual written agreement. Modifications, if any, must be set forth in an amendment to this Agreement and processed for approval in the same manner as the Agreement.

## **SECTION 3 LICENSE FEE**

### **3.01 License Fee.**

(a) Licensee agrees to pay City a monthly License Fee of **Three Thousand Five Hundred Dollars and Zero Cents (\$3,500.00)**, payable in equal monthly installments beginning on the Effective Date, and continuing on the first day of each month thereafter for the Term of the Agreement and any Term renewal. The License Fee shall increase three percent (3%) each year,

with the increased License Fee taking effect on the anniversary of the Effective Date of this Agreement each year.

(b) The difference in rent actually paid by T-Mobile and rent due under Section 3.01(a) for the period beginning with March 1, 2020 through full execution of this lease shall be due upon Licensee's execution of this Agreement.

(c) Any License Fee paid to the City shall not be refundable in the event of Cancellation, as provided in this Agreement.

### **3.02 Place and Manner of Payments.**

All sums payable to City, including the License Fee and other costs and expenses incurred by the City and reimbursable by Licensee under this Agreement, shall be made payable, without notice, to the "Manager of Finance for the City and County of Denver" and delivered to:

City and County of Denver  
Division of Real Estate  
201 West Colfax Avenue, Dept. 1010  
Denver, Colorado 80202

All payments shall be made in legal tender of the United States. Any payment not made to City accrues interest at the lesser of (i) 18% per annum, or (ii) the maximum interest rate allowed under law, commencing on the fifth (5<sup>th</sup>) calendar day after the date such amount is due and owing until paid to City. Licensee agrees to pay any charges, fees, or costs incurred by the City for collection of unpaid License Fees or other unpaid costs and expenses of Licensee specified in this Agreement, including reasonable attorney's fees.

## **SECTION 4 DESIGN, CONSTRUCTION AND INSTALLATION**

### **4.01 General.**

(a) On or after the Effective Date of this Agreement, Licensee shall, at its sole cost and expense, install within the Licensed Area, the Licensed System in accordance with **Exhibit A** and **Exhibit B** (unless changes are authorized under section 4.02), and in accordance with the terms and conditions of this Agreement.

(b) The Licensed System shall in all respects be designed and installed in accordance with Applicable Law, and pursuant to any required building permit and zoning permit to be obtained by Licensee from the City, and according to requirements or design guidelines of the Denver's Technology Services division, the Denver Department of Safety and the Denver Fire Department.

(c) The implementation of the design and installation of the Licensed System, as described and depicted in **Exhibit A** and **Exhibit B**, as well as any changes, elaborations or additions to the design, construction and installation of the Licensed System beyond those described and depicted in **Exhibit A** and **Exhibit B** shall be subject to the oversight and approval of the City

Representative as well as any other approvals required in this Agreement.

#### **4.02 Plans and Specifications.**

(a) Prior to any installation of any portion of the Licensed System, four (4) copies of complete and accurate plans and specifications for the Licensed System must be submitted to the City Representative for review. These plans and specifications must include complete specifications of transmitter power, operating frequencies, filter passband and rejection characteristics, antenna model numbers and radiation patterns (both horizontal and vertical plane patterns), antenna height and location, and placement of utilities servicing the Licensed System.

(b) Licensee shall cooperate with the City Representative in the review of the plans and specifications and shall make any reasonable modifications required by the City Representative. Upon completion of the review and any required modifications, the City Representative, in consultation with the Fire Chief, will approve the plans and specifications.

(c) To the extent that the approved plans and specifications are different from the information contained in **Exhibit A** or **Exhibit B**, Licensee shall prepare, to the reasonable satisfaction of the City Representative and without modifying the Licensed Area depicted in **Exhibit A**, new exhibits reflecting such changes, and the changed exhibits will replace and supersede the corresponding exhibits attached to this Agreement.

(d) Installation work shall not commence, nor shall continue, until Licensee has established to the City Representative's reasonable satisfaction that the work will proceed in conformance with the approved plans and specifications and that all Applicable Law has been or will be fully and appropriately satisfied.

#### **4.03 Installation.**

(a) Licensee is responsible for undertaking all measures necessary and appropriate under Applicable Law to protect the health and safety of the public, City employees, and Licensee's employees and contractors and to lawfully conduct the work associated with the installation. Prior to the commencement of installation, Licensee or its contractor shall obtain and pay for all required permits, licenses and approvals. Good and workmanlike standards of design, construction and installation shall be required in connection with all such work.

(b) To the extent that building codes or other City requirements mandate that modifications be made to the roof or other infrastructure of the Fire Station as part of the installation, Licensee shall be required to include those modifications in its **Exhibit A** plans (unless changes are authorized under section 4.02) and to make such modifications, at its sole cost and expense and subject to prior written approval of such modifications by the City Representative and the City Representative's oversight of the modifications as they are being made. The City is not obligated to make any modifications to the Fire Station, including the Licensed Area, to support the installation.

(c) Licensee shall include in Licensee's contract(s) with its consultants and contractors provisions whereby such consultants and contractors shall defend and hold harmless the City from all costs, liens, damages and expenses related to the design, construction and installation work.

(d) Licensee shall be responsible for obtaining utility locates prior to starting any authorized digging on City property. If damage should occur to any existing underground utilities or other underground facilities on City property, whether or not a utility locate was obtained, Licensee shall immediately report the damage to the City Representative and shall take all actions and incur all costs and expenses necessary to repair the damage in a manner satisfactory to the City Representative.

(e) Upon completion of the installation, Licensee shall timely furnish to the City Representative with documented evidence of payment, contractor's affidavits and full and final waivers of all liens for labor, services, or materials.

(f) Equipment shall be located in designated locations as depicted on **Exhibit A** and **Exhibit B** within the Licensed Area. The temporary placement of any equipment or materials outside of the Licensed Area shall require the prior written approval of the City Representative. No equipment or materials shall be placed so as to block access at or use of the Fire Station or in violation of the ADA.

(g) Licensee is responsible for acquiring land lines required for the installation and operation of the Licensed System. The installation of land lines at the Fire Station shall be subject to the prior written approval of the City Representative. Licensee shall be solely responsible for paying any fees, charges, surcharges, taxes, assessments, and similar costs and expenses associated with the land lines.

(h) With respect to utilities, Licensee shall comply with section 5.07 and the installation requirements of this section 4.03.

(i) The City is not responsible for the Licensed System or Licensee's other authorized installations. Licensee shall be responsible for securing the Licensed System and Licensee's other authorized installations and keeping them in good working order.

## **SECTION 5 USE AND OPERATION**

### **5.01 Authorized Frequencies.**

In the operation of the Licensed System, Licensee is authorized to operate in the FCC-licensed radio bands and frequencies (and no others) set forth in **Exhibit C-1**. Operation in any unlicensed radio band (as defined by the FCC) or any radio band used by a City System is prohibited.

### **5.02 RF (Radio Frequency) Interference.**

(a) Licensee acknowledges that City's unimpeded use and operation of the Fire Station is critical to the health, safety and welfare of the City and County of Denver and its inhabitants. Licensee shall use its best efforts, at all times, to avoid any RF Interference or interference of any kind with the operation or use of the Fire Station and the City System as set forth in this Agreement and **Exhibit D**. Licensee shall diligently work to prevent and, in the event of failure to do so, immediately correct radio frequency interference to the City System and any component elements, including the City's

WiFi system, and to cooperate with, and comply with the directions from, the City Representative assigned to deal with RF Interference matters. To help achieve this goal, Licensee shall comply with the following:

(a) Licensee agrees to comply with all federal, state, local, or other government regulations applicable to Licensee and its activities operating or using the Licensed System, including, but not limited to, regulations and standards published by the FCC.

(b) Upon written request by the City Representative, Licensee agrees to conduct an Interference Study prior to commencing operations and/or during the entire Term or Term Extension of this Agreement, and to furnish the City Representative with the results of the Site Study and to include it as part of Licensee's System Plans and Specifications. If Licensee should fail within a period specified by the City Representative to undertake or complete an Interference Study, the City may arrange for such an Interference Study and Licensee shall reimburse the City for the cost and expense of conducting and preparing the Interference Study.

(c) Licensee agrees to comply with the most recent edition of the Minimum Technical Standards, with the current Minimum Technical Standards attached hereto as **Exhibit C-2**.

(d) In order to prevent interference, Licensee shall maintain and repair, at no cost to the City, the Licensed System, in order to comply with FCC rules and the reasonable requirements of the City Representative. If this maintenance should necessitate changing out or replacing existing antennas, the requirements of section 5.04 shall be applicable.

(e) If authorized to make changes, Licensee shall notify the City Representative of the specific changes to associated RF equipment, transmit and receive frequencies, transmitter output power, antenna configurations, and effective radiated power before making the changes. An Interference Study shall be conducted by Licensee, as directed by the City Representative and at Licensee's sole cost and expense, prior to any proposed frequency changes. The requirements of section 5.04 shall be applicable to the changes addressed herein.

(f) To extent there are more than one licensee operating at the Fire Station, Licensees are encouraged to resolve potential or real interference problems amongst themselves. Licensee agrees to cooperate fully with City and other licensees to diagnose and correct interference problems. Such cooperation may require Licensee to temporarily reduce or shut down transmit power to help diagnose problems.

(g) When the City Representative, based on inquiry and evaluation, becomes aware of a potential or existing interference problem caused directly or indirectly, wholly or partially, by the Licensed System, the City may require Licensee to reimburse City for the cost of an Interference Study to include radio frequency measurements. The purpose of this Interference Study is to identify the problem and determine if the problem is caused directly or indirectly, wholly or partially, by the Licensed System. This Interference Study shall be conducted by a consulting engineer selected by the Fire Chief after consultation with Licensee and the City Representative. In the event there are additional licensees operating at the Fire Station, Licensee shall pay for a pro rata share of the costs of the Interference Study, unless Licensee is determined to be solely responsible for the

interference, in which case Licensee shall pay all costs and expenses. Pro rata share shall be determined by dividing the costs by the number of non-City licensees operating at the Fire Station.

(h) When necessary to correct interference problems, as determined by the Chief in the Chief's reasonable discretion, Licensee agrees, at its sole cost and expense, to install cavity-type bandpass filters, notch filters, isolators, or other state-of-the-art equipment. These equipment items are in addition to the minimum equipment of the Minimum Technical Standards. The minimum equipment items shall be installed regardless.

(i) Licensee shall ensure that its frequencies used for the operation of the Licensed System do not interfere with any operation of the Fire Station, including without limitation interference with public safety or the City System. Licensee shall provide documentation of the frequencies that it is authorized to use and is using for the Licensed System. Licensee shall not occupy any frequencies that they are not using for the purposes of blocking other licensees from operating. Licensee shall be responsible for conducting an RF scan to verify there will be no interference with other systems. This shall occur prior to Licensee turning on the Licensed System and shall be documented by a third-party vendor and submitted to the City Representative. Once City Representative has reviewed this documentation, the City Representative will give notice to Licensee that it can turn on its Licensed System. If the City Representative is not satisfied with the details of the study, the City Representative will give notification to Licensee as to what needs to be remedied before notice to proceed will be given.

(j) If Licensee's equipment or operations cause RF Interference, as determined by the Fire Chief in the Fire Chief's reasonable discretion, including without limitation interference with the City System, and if the interference is not eliminated within ten (10) days after written notice from the Fire Chief, then City may, at Licensee's sole cost and expense, temporarily turn off the power to the Licensed System. The City Representative shall contact Licensee at the time the Licensed System needs to be deactivated so Licensee can facilitate the effort to deactivate the Licensed System, isolate any interference, and turn the Licensed System back on with minimal interruption. Licensee, at its sole cost and expense and subject to the requirements of section 5.06, shall (i) have the right to make such repairs, maintenance, replacements or adjustments to the Licensed System as may be reasonably necessary to prevent such interference, and (ii) have the right to conduct intermittent tests of the Licensed System at times mutually agreeable to the City Representative to determine if the Licensed System will continue to cause such interference.

(k) The City requires that Licensee operate its Licensed System with no interference to other licensees' systems. Any unresolved disputes regarding the cause or resolution of specific interference problems or complaints must be evaluated by an independent third party selected by the Fire Chief who is competent to evaluate the potential causes of the interference and the measures required for its resolution. If it is determined that interference to the equipment, frequencies or channels of Licensee or other licensees operating at the Fire Station is a result of the non-compliance of those facilities with the Minimum Technical Standards, it shall be the responsibility of Licensee or other licensees to resolve the interference in accordance with the Minimum Technical Standards. If the interference continues when these facilities are brought into compliance with the Minimum Technical Standards, then it shall be Licensee's responsibility to take whatever measures are necessary to resolve the interference promptly and effectively or disengage the operation of the Licensed System until the interference is resolved to the satisfaction of the City Representative.

### **5.03 Operational Test Procedures.**

The following test procedures shall be approved by City prior to or during, whichever is applicable, Licensee's operation of the Licensed System.

- (a) Perform a desktop interference study to include all frequencies to be used by Licensee to ensure no interference is likely from intermodulation products or out-of-band emissions.
- (b) Verify the results of the Interference Study by conducting appropriate measurements of the installed systems.
- (c) If problems are found, make recommendations for additional filtering, channel changes, greater antenna separation, or other fixes, as necessary.

### **5.04 Changes to Licensed System.**

(a) Licensee shall provide prior written notice to the Fire Chief of any proposed change in radio cabinets, transmitter power, frequencies, filters, number of antennae, antenna locations, antenna height, antenna orientation, or related aspects of the Licensed System. Any proposed new, or proposed changes to, antennae, antenna mounts or mounting hardware, or structural changes to the Fire Station or tower, require that Professional Engineer stamped structural drawings be provided for review and approval. All reviews of proposed changes shall be subject to such process as prescribed by the Fire Chief and undertaken by the City Representative.

(b) Any proposed changes which are significant (as determined by the Fire Chief) will require a review of the current lease rate and may result in an additional License Fee being charged to Licensee and possible other changes to the terms and conditions of the Agreement. These changes, along with any addition, relocation or replacement of antennae or other equipment outside the Licensed Property, shall require an amendment to the Agreement which must be approved in the same manner as this Agreement. Changes or occupation or use of areas outside of the Licensed Property which are not authorized as provided herein will be considered to be in breach of this Agreement.

(c) All such changes shall be subject to the Minimum Technical Standards and the installation and operational conditions set forth in this Agreement. The approval form must be attached to the scope of work and stamped structural drawings sheets (not separate). All contractors, subcontractors and vendors must have a copy of the signed approval sheets to present to the officer in charge of the Fire Station, before any work may begin.

### **5.05 Repairs and Maintenance; Removal.**

(a) The maintenance, care, repair, alteration, enhancement or replacement of the Licensed System or infrastructure within the Licensed Area shall be made by Licensee at its sole cost and expense. Licensee covenants and agrees during the Term or Term Extension of this Agreement, after the installation of the Licensed System and occupancy of the Licensed Area, that Licensee:

(1) shall keep the System in good order and condition, and will make all necessary and appropriate repairs or changes thereof if approved as required in section 5.04 above;

(2) shall not permit rubbish, debris, waste materials or anything unsightly or detrimental to health, or likely to create a fire or explosion hazard, or conducive to deterioration, to remain in any part of the Licensed Area or the Fire Station or to be disposed of improperly;

(3) shall at all times maintain the Licensed System in accordance with Applicable Law, the Minimum Technical Standards, FCC requirements, and manufacturer's specifications;

(4) shall promptly repair any and all damage to, among other things, the structures, equipment and surrounding property at the Fire Station which result from Licensee's installation and operation of its Licensed System including, but not limited to, any leaks or physical damage as a result of roof penetrations or other physical penetrations or structural damage to the building or structures, including the significant reduction in the useful life of buildings or structures or any parts thereof, caused by the Licensed System or its operation and/or other workmen and maintenance and repair activities involving the Licensed System;

(5) shall store tools, test equipment and work materials only in areas at the Fire Station approved by the City Representative; and

(6) shall restore any damage resulting from roof or other building penetrations and actions or omissions of the License in the Licensed Area or at the Fire Station so that the damaged property is restored to original condition.

(b) Removal of the Licensed System by Licensee may only occur only upon expiration of the Agreement or Cancellation, as provided by this Agreement or as part of the process of a replacement of the Licensed System as authorized under this Agreement.

(c) If Licensee should be of the opinion that repair, alteration or replacement of the tower is needed ("Alteration"), Licensee shall submit in writing a request to the Fire Chief explaining the perceived need for the Alteration. The Fire Chief shall determine whether such Alteration is warranted and, if so, who should make and pay for or the Alteration or how the cost of the Alteration is to be shared. Any obligation of the City to perform the work shall be strictly contingent upon approvals, including contracts, required by Applicable Law and obtaining all funding needed for the Alteration. If Licensee proposes to make and pay for the Alterations, it should provide plans and a budget with the request submitted to the Fire Chief.

#### **5.06 Right to Enter, Inspect and Make Repairs and Improvements.**

(a) The City and its authorized officers, employees, agents, contractors, subcontractors and other representatives shall have the right (at such times as may be reasonable under the circumstances and with as little interruption of Licensee's operations as is reasonably practicable) to access Licensee's equipment for the following purposes:

(1) to inspect such equipment at reasonable intervals during regular business hours (or at any time in case of Emergency or urgent need to protect the City System) to determine

whether Licensee has complied and is complying with the terms and conditions of this Agreement;

(2) to perform maintenance and make repairs and replacements in cases where Licensee is obligated but has failed to do so, after the City has given Licensee reasonable notice so to do, in which event Licensee shall reimburse the City for the reasonable cost thereof within thirty (30) days of Licensee's receipt of City's invoice accompanied by reasonable substantiation of the costs incurred. The City shall have the right to seek recovery of the cost of the maintenance or repair by any judicial remedy available should Licensee fail to pay the cost of the repair. Under no circumstances will City attempt to repair or alter in any way Licensee's operational equipment such as base station radios, other electronic equipment, alarm systems, antennas, coaxial cable, DAS, UPS, etc.; however, this restriction shall not limit the City in performing inspections and repairs and protecting the City System and the Fire Station as provided in this Agreement.

(b) The City reserves the right at all times to take any action it deems necessary, in its sole discretion, to repair, maintain, alter, expand, or improve the City System and the Fire Station and the improvements thereon in connection with their use and operation. The City agrees to give reasonable advance notice of any such activities to Licensee and to reasonably cooperate with Licensee to carry out such activities with a minimum amount of interference to Licensee's use of the Licensed Area. Licensee agrees to cooperate with the City respect to such repairs, maintenance, alterations, expansions, or improvements and to accommodate such work to the extent the City deems necessary and at Licensee's sole expense.

#### **5.07 Utilities.**

(a) Licensee shall be responsible for arranging for all utility services needed for the Licensed System, including separately metered electrical service, and for paying for all service, connection, taxes, fees, surcharges and other charges associated with or resulting from the utility services for the Licensed System. Licensee shall be responsible to install all utility service locations in compliance with all applicable laws, codes and regulations and subject to the requirements of section 5.04 above and the installation requirements of section 4.03 above.

(b) Licensee shall be responsible for providing and properly maintaining and replacing, subject to the requirements of section 5.04 above and the installation requirements of section 4.03 above, an independent ventilation, heating and air conditioning system for those portions of the Licensed System, if any, that are expressly required by the manufacturer of the System to maintain manufacturer's warranties based upon Licensee's installation of the Licensed System at the Fire Station.

#### **5.08 Interruption of Utility Services.**

(a) Licensee agrees that City shall not be liable for failure of any utility services to be supplied to the Licensed System or for any interruption of utility services to the Licensed System caused by third parties.

(b) The City reserves the right to temporarily interrupt utility services at such time as may be necessary by reason of accident, unavailability of employees, repairs, alterations or improvements or whenever by reason of *force majeure*, including any state of Emergency declared

by the President of the United States, the Governor of the State of Colorado, or the Mayor of the City and County of Denver for which such interruption is reasonable for security and public safety reasons. The City shall not be liable for operational or business losses or for damages to persons or property due to such interruptions. Nor shall such interruptions in any way be construed as cause for abatement of the License Fee, unless caused by the demonstrated gross negligence or intentional misconduct of the City or its agents, contractors or employees.

(c) No backup power supplies shall be placed within the Licensed Area or elsewhere on City property without the prior, written approval of the City Representative and after obtaining any required permits, licenses or approvals for such backup power supplies.

## **SECTION 6**

### **INSURANCE; INDEMNITY and DEFENSE; GOVERNMENTAL IMMUNITY; LIMITS ON LIABILITY; and TAXES, LICENSES, LIENS AND FEES**

#### **6.01 Insurance.**

(a) General Conditions: Licensee 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. Licensee 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. Each policy shall contain a valid provision or endorsement requiring notification to the City in the event any of the required policies is canceled or non-renewed before the expiration date thereof. Such written notice shall be sent to the parties identified in the Notices section of this Agreement and to Denver Risk Management, 201 West Colfax Avenue, Dept. 1105, Denver, Colorado 80202 and shall reference the City contract number listed on the signature page of this Agreement. Said notice shall be sent thirty (30) days prior to such cancellation or non-renewal unless due to non-payment of premiums for which notice shall be sent ten (10) days prior. If such written notice is unavailable from the insurer, Licensee shall provide written notice of cancellation, non-renewal and any reduction in coverage to the parties identified in the Notices section and to Denver Risk Management, 201 West Colfax Avenue, Dept. 1105, Denver, Colorado 80202 by certified mail, return receipt requested within three (3) business days of such notice by its insurer(s) and referencing the City's contract number. Licensee shall be responsible for the payment of any deductible or self-insured retention which all coverages secured by Licensee contain. The insurance coverages specified in this Agreement are the minimum requirements, and these requirements do not lessen or limit the liability of Licensee. Licensee 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: Licensee shall provide a copy of this Agreement to its insurance agent or broker. Licensee may not commence work or uses relating to the Agreement prior to placement of coverage. Licensee certifies that the certificate of insurance attached as **Exhibit E**, preferably an ACORD certificate, provided by Licensee complies with all insurance requirements of this Agreement. The City requests that the City's contract number be referenced on the certificate of insurance. 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 Licensee's breach of this Agreement or of any of the City's rights or remedies under this Agreement. In the event of a claim arising out of this Agreement, the Denver Risk Management Office may require additional proof of insurance, including but not limited to policies and endorsements.

(c) Additional Insureds: For Commercial General Liability and Business Auto Liability, Licensee and its contractor's insurer(s), if there are any contractors, shall include the City and County of Denver, its elected and appointed officials, employees and volunteers as additional insured.

(d) Waiver of Subrogation: For all required coverages, Licensee's insurer shall waive subrogation rights against the City.

(e) Subcontractors: All subcontractors and subconsultants (including independent contractors, suppliers or other entities providing goods or services under this Agreement) shall be subject to all of the requirements herein and shall procure and maintain the same coverages required of Licensee. Licensee shall include all such subcontractors and subconsultants as additional insured under its policies (with the exception of Workers' Compensation) or shall ensure that all such subcontractors and subconsultants maintain the required coverages. Licensee agrees to provide proof of insurance for all such subcontractors and subconsultants upon request by City.

(f) Workers' Compensation/Employer's Liability Insurance: Licensee 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 accident for each bodily injury claim, \$100,000 per accident for each bodily injury caused by disease claim, and \$500,000 aggregate for all bodily injuries caused by disease claims.

(g) Commercial General Liability: Licensee shall maintain a Commercial General Liability insurance policy with combined single limits of \$1,000,000 per occurrence for bodily injury and property damage including contractual liability, \$2,000,000 for each personal and advertising injury claim, \$2,000,000 products and completed operations aggregate, and \$2,000,000 general aggregate.

(h) Business Automobile Liability: Licensee shall maintain limits of \$1,000,000 combined single limit for bodily injury and property damage applicable to all owned, nonowned and hired vehicles operating on City property and elsewhere for work under this Agreement.

(i) Additional Provisions:

(1) 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 outside the limits of liability;
- (ii) A severability of interests or separation of insureds (insured v. insured exclusion); and
- (iii) A provision that coverage is primary and non-contributory with

other coverage or self-insurance maintained by the City.

(2) For claims-made coverage, if any, 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.

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

(j) Failure to comply with the requirements of this section 6.01 shall be legal grounds under this Agreement for work by Licensee at the Fire Station to be ordered to cease or to be restricted, as deemed appropriate by the Fire Chief or the Denver Risk Management Office, until compliance is achieved and any unpaid claims are resolved to the reasonable satisfaction of the City Representative and the Denver Risk Management Office. These insurance obligations shall survive the expiration of the Agreement and Cancellation.

## **6.02 Indemnification & Defense.**

(a) Licensee hereby agrees to defend, indemnify, and hold harmless City, its appointed and elected officials, agents and employees against all liabilities, claims, judgments, suits or demands for damages to persons or property arising out of, resulting from, or relating to regarding the use and occupancy of, and activities and operations on, the Fire Station site by Licensee (including its officers, employees, representatives, suppliers, contractors, subcontractors and agents) 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 City. This indemnity shall be interpreted in the broadest possible manner to indemnify City for any acts or omissions of Licensee (including its officers, employees, representatives, suppliers, contractors, subcontractors and agents) 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) Licensee'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 an action has been filed in court on the Claim. Licensee's duty to defend and indemnify the City shall arise even if City is the only party sued and/or it is alleged that City's negligence or willful misconduct was the sole cause of the alleged damages.

(c) Licensee will defend any and all Claims which may be brought or threatened against City and will pay on behalf of City any 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 Licensee under the terms of this indemnification obligation. Licensee shall obtain, at its own expense, any additional insurance that it deems necessary for City's protection.

(e) This indemnification and defense obligation shall survive the expiration of this Agreement and Cancellation.

### **6.03 Colorado Governmental Immunity Act.**

Licensee understands and agrees that 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., and any related statutory protections against liability.

### **6.04 Limitation on Liability.**

Licensee agrees that no liability shall attach to the City for any damages or losses incurred or claimed by Licensee or any other person or party on account of the installation, construction or operation of the Licensed System by Licensee. Licensee agrees that it shall not in any way seek damages or make any claims against the City for any interference or delay caused by construction in adjacent areas, other businesses or operations, including without limitation damages or losses in the nature of delay damages, lost labor productivity, and impact damages.

### **6.05 Environmental Requirements.**

(a) Licensee and its contractor(s) and subcontractor(s) shall obtain all federal, state, and local environmental permits necessary for the work to be performed and shall comply with all applicable federal, state, and local environmental permit requirements applicable to the work. Licensee and its contractor(s) and subcontractor(s) shall comply with all applicable local, state, and federal environmental guidelines, rules, regulations, statutes, laws, and orders applicable to the work (collectively, "Environmental Requirements"), including but not limited to Environmental Requirements regarding the storage, use, transportation, and disposal of Hazardous Materials and regarding releases or threatened releases of Hazardous Materials to the environment.

(b) The term "Hazardous Materials" shall mean asbestos, asbestos-contaminated soils, and asbestos-containing materials, special wastes, polychlorinated biphenyls (PCBs), any petroleum products, natural gas, radioactive source material, pesticides, any hazardous waste as defined at 42 U.S.C. § 6903(5) of the Solid Waste Disposal Act, any hazardous substance as defined at 42 U.S.C. § 9601(14) of the Comprehensive Environmental Response, Compensation and Liability Act, and chemical substance as defined at 15 U.S.C. § 2602(2) of the Toxic Substances Control Act, and any guidelines issued and rules or regulations promulgated pursuant to such statutes, or any other applicable federal or state statute.

(c) No Hazardous Materials shall be brought onto, or stored on, the Fire Station site without the prior, written approval of the City Representative and, if required by the City Representative, the prior, written approval of the Denver Department of Environmental Health and/or the Colorado Department of Public Health and Environment.

(d) The obligations of Licensee set out in this section 6.04 shall survive the expiration of the Agreement and Cancellation.

#### **6.05 Taxes, Licenses, Liens and Fees.**

(a) Licensee agrees to promptly pay all taxes, excises, license fees and permit fees of whatever nature applicable to its operations hereunder and to take out and keep current all municipal, state or federal licenses required for the conduct of its business or operations under this Agreement and further agrees not to permit any of said taxes, excises, license fees or permit fees to become delinquent.

(b) Licensee also agrees not to permit any mechanic's or materialman's or any other lien to become attached or be foreclosed upon the Fire Station or the tower, or improvements thereto, or any part or parcel thereof, by reason of any work or labor performed or materials furnished by any mechanic or materialman for Licensee, as contractors or subcontractors.

(c) Licensee further agrees to promptly pay when due all bills, debts and obligations incurred by it in connection with its operations hereunder, and not to permit the same to become delinquent and to suffer no lien, mortgage, judgment or execution to be filed against the Fire Station, the tower, the City System, the Licensed System, or related improvements, which may in any way impair the rights of the City under this Agreement or to the City's property.

(d) The obligations of Licensee set out in this section 6.05 shall survive the expiration of the Agreement and Cancellation.

#### **6.06 No Waiver.**

No failure of the City to insist upon the strict performance of a term, covenant or agreement contained in this Agreement shall be deemed or taken to be a waiver by the City of any succeeding failure to perform or any breach or default.

## **SECTION 7 CITY RIGHTS**

#### **7.01 City's Rights.**

(a) City shall retain all the rights to the use, occupancy and ownership of the tower; and such use, occupancy and ownership by the City shall be the primary use of the Fire Station and shall not be interfered with by the exercise of the rights granted hereunder during the Term or Term Extension of the Agreement, except to the extent interference shall be a result of Licensee's reasonable uses and actions in the installation, inspection, maintenance, alteration, repair, replacement, operation and removal of the Licensed System as authorized under this Agreement; provided, however, that Licensee shall be liable to the City for any damage to improvements that may result from such installation, inspection, maintenance, alteration, repair, replacement, operation and

removal.

(b) If the City desires Licensee to leave in place any modifications made by Licensee to the tower and so states in a written notice to Licensee, then Licensee shall leave such modifications in place without compensation from or to the City. If Licensee is required to remove the modifications and does not restore damage resulting from said removal and thereby causing the City to have to undertake the restoration, then Licensee shall promptly reimburse the City for the work.

(c) The City specifically reserves for itself, other lessees, licensees and assignees of City, all rights which do not materially and adversely interfere with Licensee's exercise of its License under this Agreement; provided, however, the City will not materially and adversely interfere with, and will not knowingly permit or allow other licensees to materially and adversely interfere with, the rights of Licensee under the terms of this Agreement except to the extent expressly provided in this Agreement.

(d) Upon expiration of the Agreement or Cancellation or on the date specified in any demand for possession by the City after any default by Licensee (after any applicable notice and cure periods), Licensee covenants and agrees to surrender possession of the Licensed Area and all other parts of the Fire Station site to the City in the same condition as when first occupied, ordinary wear and tear excepted but subject to the repair and restoration requirements provided in this Agreement.

(e) Licensee shall remove, at its sole cost, upon expiration of the Agreement or Cancellation, the Licensed System and all of Licensee's personal property within thirty (30) calendar days after expiration or Cancellation, as applicable. If such removal should damage the or Tower, Licensee agrees, at its sole cost, to immediately repair such damage in a good and workmanlike manner and to put the property in the same condition as it would have been if the Licensed System had not been installed, reasonable wear and tear excepted but subject to the repair and restoration requirements provided in this Agreement. If Licensee fails to remove the Licensed System and Licensee's personal property within thirty (30) calendar days after the expiration of this Agreement or Cancellation, as applicable, the City, at its option, may remove, store and/or dispose of same and retain any proceeds therefrom, and further is entitled to recover any cost incurred by the City in removing same and in restoring the Tower.

(f) If Licensee holds over after the expiration of this Agreement or Cancellation, and so long as the Licensed System is still situated on the Fire Station site (even if it has been disconnected), Licensee shall pay to City a holdover fee equal to 250% of the then total License Fee prorated from the effective expiration or Cancellation date, whichever is applicable, to the date the Licensed System is properly and completely removed from the property. Nothing herein shall be construed to give Licensee the right to hold over at any time, and the City may exercise any and all remedies at law or in equity to recover possession of the Property, as well as any damages caused by Licensee.

**SECTION 8**  
**LOSS OF AND LIABILITIES**  
**PERTAINING TO THE LICENSED SYSTEM**

### **8.01 Damage or Destruction and Restoration.**

In case of damage or loss of all or any portion of the Licensed System or the Tower, Licensee will give prompt notice thereof to the City; and, except as otherwise provided herein, Licensee shall promptly commence and complete with due diligence (subject to delays beyond its control), the restoration of the Licensed System or the Tower as nearly as reasonably practicable to the value and condition thereof immediately prior to such damage or destruction. In the event of such damage or destruction, Licensee shall be entitled to use or receive reimbursement from the proceeds of all property insurance policy or policies held by Licensee for the Licensed System or by the City for the Tower and shall be obligated to provide any additional moneys necessary for such restoration. The License Fee payable under section 3.01 shall continue to be due and owing.

### **8.02 Licensee's Election Not to Restore Damaged Licensed System.**

In case of the damage or destruction of all or any part of the Licensed System, Licensee, within ninety (90) days thereafter, may elect not to restore or replace the Licensed System, and this Agreement shall be terminated. Licensee must notify the City within said 90 days of the damage or destruction to all or any part of the Licensed System of its intentions not to restore or replace the Licensed System and shall pay the City, in full, six (6) months of payments for the License Fee under section 3.01 from the date that the notice not to restore or replace is provided to the City. Licensee shall promptly proceed to remove the Licensed System from the Licensed Property and to repair and restore the Tower in accordance with Section 4 and section 7.01 and as otherwise provided in this Agreement within thirty (30) days after Licensee elects not to restore or replace the Licensed System. If Licensee should fail to repair or restore the Tower as required, the City may restore the Tower, at Licensee's cost and expense, as nearly as reasonably practicable to the value and condition thereof prior to the damage or destruction, and Licensee shall be obligated to timely and fully reimburse the City for the costs and expenses of such repairs and restoration. The obligations of Licensee under this section 8.02 shall survive the expiration of this Agreement and Cancellation.

## **SECTION 9 DEFAULT; REMEDIES; and DISPUTES**

### **9.01 Default.**

Licensee shall be in substantial default under this Agreement if Licensee:

(a) Fails to timely pay to the City on the fifth (5<sup>th</sup>) calendar day after the date License Fee or any other payments are due and owing under this Agreement; provided, however, default shall not occur until the fifth (5<sup>th</sup>) calendar day after written notice is provided by the City to Licensee; or

(b) Becomes insolvent, or takes the benefit of any present or future insolvency or bankruptcy statute, or makes a general assignment for the benefit of creditors, or consents to the appointment of a receiver, trustee or liquidator of any or substantially all of its property; or

(c) Transfers its interest under this Agreement, unless such transfer is specifically authorized pursuant to section 10.01; or

(d) Fails to submit or fails to timely submit complete and accurate plans and specifications, bonds, proof of insurance and other submittals as required by the express terms of this Agreement, and such failure continues for a period of fifteen (15) calendar days after Licensee has received written notice from the City of such failure; or

(e) Abandons, deserts or vacates the Licensed System or Licensed Area; or

(f) Suffers any materialmen's or mechanic's lien or attachment to be filed against the Licensed System, the City System, the Tower, or the Fire Station because of any act or omission of Licensee, and such lien or attachment is not discharged or contested by Licensee in good faith by proper legal proceedings within thirty (30) calendar days after Licensee's receipt of written notice thereof from City; or

(g) Fails to keep, perform and observe any other promise, covenant or agreement set forth in this Agreement and such failure continues for a period of more than thirty (30) calendar days after delivery by City of a written notice of such breach or default, except where a shorter period is specified herein, or where fulfillment of its obligation requires activity over a period of time and Licensee within thirty (30) days of Licensee notice Licensee commences in good faith to perform whatever may be required to correct its failure to perform and continues such performance without interruption except for causes beyond its control (which must be documented in a written notice to the City); or

(h) Gives its permission to any person to use for any illegal or unauthorized purpose any portion of the City's property made available to Licensee for its use under this Agreement.

(i) 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, kickbacks, collusive bidding, bid-rigging, antitrust, fraud, undue influence, theft, racketeering, extortion or any offense of a similar nature, in connection with the Licensee's business or operations in the State of Colorado.

## **9.02 Remedies.**

If Licensee substantially defaults in any of the covenants, terms and conditions herein and such default is not cured within any applicable notice and cure periods, the City may exercise any one or more of the following remedies:

(a) The City may elect to allow this Agreement to continue in full force and effect and to enforce all of City's rights and remedies hereunder, including without limitation the right to collect compensation as it becomes due together with interest or recover any damages or losses resulting from the action or inaction of Licensee.

(b) The City may engage in Cancellation and repossess the Licensed Area, without liability for so doing and without having to comply with any eviction process under state law, upon

giving thirty (30) calendar days written notice to Licensee of the intended Cancellation, at the end of which time all the rights hereunder of Licensee shall terminate, unless the default shall have been cured as prescribed in section 9.01 or elsewhere in this Agreement. Licensee shall be liable to the City for all amounts owing to the City or any other party with respect to Licensee's operations at the Fire Station or under this Agreement.

(c) The remedies provided in this Agreement shall be cumulative and shall in no way affect any other remedy available to the City under law or equity. The obligations of Licensee under this section 9.02 shall survive the expiration of the Agreement and Cancellation.

### **9.03 Dispute Resolution.**

The Parties agree to work diligently together and in good faith, using reasonable efforts to resolve any unforeseen issues and disputes and to expeditiously take such actions as are necessary and appropriate to perform the duties and obligations of this Agreement. Any dispute between the City and Licensee, including whether a default by Licensee is substantial or has been timely and effectively cured, shall be taken to administrative hearing, pursuant to the procedure established by Section 56-106, DRMC. For the purpose of that procedure, the City official rendering a final determination shall be the Executive Director of the Denver Department of Safety.

## **SECTION 10 MISCELLANEOUS PROVISIONS**

### **10.01 Assignments.**

(a) Licensee shall not assign or otherwise transfer its interest in this Agreement, in whole or in part, or otherwise transfer any rights or interest in or to the License granted under this Agreement, without the prior written consent of the Fire Chief, which consent can be given or denied in Fire Chief's sole discretion, and subject to approval, under section 10.16 below, of an amendment to this Agreement authorizing the assignment. The Fire Chief may require any proposed assignee to demonstrate that it is appropriately licensed and authorized to provide the same services as Licensee and has the ability to perform the terms and conditions of this Agreement including any financial obligations under this Agreement.

(b) Notwithstanding the foregoing, Licensee may assign this Agreement, and the License granted herein, in whole, to any business entity which is parent, subsidiary, affiliate of Licensee, or to any party that acquires all or substantially all of Licensee's radio spectrum assets in the Denver market area, by reason of a merger, acquisition or other business reorganization. The burden shall be on Licensee to demonstrate, to the satisfaction of the Fire Chief, that any proposed assignment qualifies under this sub-section 10.01(b).

(c) The License granted under this Agreement may not be sold under any circumstances. Any contract entered by Licensee to sell or convey the License granted herein shall not be binding on the City and shall be grounds for terminating the Agreement, at the discretion of the Fire Chief.

(d) Under no circumstances shall Licensee be authorized to allow any other licensee or

sub-licensee to co-locate or operate any system at the Fire Station or the Tower.

#### **10.02 Fair Dealing; Further Assurances.**

(a) In all cases where the consent or approval of one Party is required before the other may act, or where the agreement or cooperation of the Parties is separately or mutually required as a legal or practical matter, then in that event the Parties agree that each will act in a fair and reasonable manner with a view to carrying out the intents and goals of this Agreement as the same are set forth herein, subject to the terms hereof.

(b) From time to time, upon the request of a Party, the other Party agrees to make, execute and deliver or cause to be made, executed and delivered to the requesting Party any and all further instruments, certificates and documents consistent with the provisions of this Agreement as may, in the reasonable opinion of the requesting Party, be necessary or desirable in order to effectuate, complete or perfect the rights of said Party under this Agreement, provided said requesting Party is currently in full compliance with the provisions of this Agreement and has tendered or offered to tender any reciprocal instruments, certificates and documents to which the other Party is entitled under the Agreement.

#### **10.03 Bond Ordinance.**

This Agreement and the rights granted or conveyed hereby are in all respects subject and subordinate to any and all City bond ordinances related to the Fire Station and to any other bond ordinances which should amend, supplement or replace such bond ordinances.

#### **10.04 Financial Interests.**

Except for financial interests authorized by the City in accordance with the City Charter and ordinances, any financial interests created in, or used to secure financing and payment for the costs of, any work performed or improvements made under this Agreement, including but not limited to any bonds, certificates of participation, purchase agreements, and Uniform Commercial Code filings, shall expressly exclude from such debt or financial security contained in such financial instrument(s) any title, rights and interests held by the City in the property subject to this Agreement. The terms and conditions of this Agreement must be expressly recognized in any such financial instrument(s) created or entered by or on behalf of Licensee, which must specifically acknowledge and affirm that any financial interests created by the financial instrument(s) are subordinate to this Agreement and may not encumber the City's title, rights and interests in the subject property or under this Agreement.

#### **10.05 Appropriation.**

Notwithstanding any provision of this Agreement to the contrary, the rights and obligations of the City under this Agreement are contingent upon all funds necessary for work or expenditures contemplated under this Agreement being budgeted, appropriated and otherwise made available by the City. The Parties acknowledge that this Agreement is not intended to create a multiple-fiscal year direct or indirect debt or financial obligation of the City, except to the extent that capital improvement funds that are lawfully appropriated can be lawfully carried over to subsequent years.

#### **10.06 Contracting or Subcontracting.**

Any work that is allowed to be contracted or subcontracted under this Agreement shall be subject, by the terms of the contract or subcontract, to every provision of this Agreement. Compliance with this provision shall be the responsibility of the Party who arranged the contract or authorized the subcontract. Except as otherwise expressly stated in this Agreement, no Party shall be liable or have a financial obligation to or for any contractor, subcontractor, supplier, or other person or entity with which the other Party contracts or has a contractual arrangement.

#### **10.07 Third Parties.**

This Agreement does not, and shall not be deemed or construed to, confer upon or grant to any third party or parties any right to claim damages or to bring any suit, action or other proceeding against either the City or Licensee because of any breach hereof or because of any of the terms, covenants, agreements and conditions herein.

#### **10.08 Force Majeure.**

Neither Party hereto shall be liable to the other for any failure, delay or interruption in the performance of any of the terms, covenants or conditions of this Agreement due to causes beyond the reasonable control of that Party, including without limitation strikes, boycotts, labor disputes, embargoes, shortages of materials, acts of God, acts of the public enemy, acts of superior governmental authority, severe weather conditions, fire, floods, riots, rebellion, sabotage or any other circumstance for which such Party is not responsible or which is not in its power to control, but in no event shall this section be construed so as to allow Licensee to reduce or abate its obligation to pay the License Fee prescribed in this Agreement.

#### **10.09 No Discrimination in Employment.**

In connection with the performance of this Agreement, the Parties agree not to refuse to hire, discharge, promote or demote, or to discriminate in matters of compensation against any person otherwise qualified, solely because of race, color, religion, national origin, gender, gender identity or gender expression, age, military status, sexual orientation, gender variance, marital status, or physical or mental disability; and the Parties further agree to insert the foregoing provision in all approved contracts and subcontracts hereunder.

#### **10.10 Conflict of Interest.**

The Parties agree that no official, officer or employee of the City shall have any personal or beneficial interest whatsoever in the services or property described herein, and Licensee further agrees not to hire or contract for services any official, officer or employee of the City or any other person which would be in violation of the Denver Revised Municipal Code Chapter 2, Article IV, Code of Ethics, or Denver City Charter provisions 1.2.9 and 1.2.12.

#### **10.11 Applicable Law; Authority; Venue; Enforcement; and Claims.**

(a) The Parties agree to comply with all Applicable Law in existence as of the Effective Date of this Agreement or as may be subsequently enacted or adopted and become applicable.

(b) This Agreement shall be construed and enforced in accordance with the laws of the United States, the State of Colorado, and the applicable provisions of the Charter and Revised Municipal Code of the City and County of Denver.

(c) Venue for any legal action relating to this Agreement shall lie in the District Court in and for the City and County of Denver.

(d) The Parties agree that this Agreement may be enforced in law or in equity for specific performance, injunctive, or other appropriate relief, including actual damages (notwithstanding Cancellation), as may be available according to the laws and statutes of the State of Colorado; provided, however, the Parties agree to and hereby release any claims for incidental, consequential, or punitive damages; provided, further, no provision of this Agreement may be enforced by the creation or recording of any type of lien against real property owned by the City, nor may any foreclosure process be utilized to recover any moneys owed by the City to Licensee. It is specifically understood that, by executing this Agreement, each Party commits itself to perform pursuant to these terms and conditions contained in this Agreement, and that any failure to comply which results in any recoverable damages shall not cause, by itself, the revocation or termination of any rights or obligations under this Agreement.

(e) Nothing in this section 10.11 shall be construed as a waiver, release, reduction or modification of any insurance, bond, indemnification or other liability obligations of Licensee or Licensee's design professional, contractor or sub-contractor expressly provided for in this Agreement.

(f) No official, officer, director, agent, or employee of either Party shall be charged personally or held contractually liable to the other Party or its officials, officers, directors, agents, or employees under any term or condition of this Agreement or for any breach, default, or violation under this Agreement.

(g) In the event that any claim, demand, suit, or action is made or brought in writing by any person or entity against one of the Parties related in any way to this Agreement, the Party in receipt of same shall promptly notify and provide a copy of said claim, demand, suit, or action to the other Party.

#### **10.12 Use, Possession or Sale of Alcohol or Drugs; Smoking Policy.**

(a) Licensee and its officers, agents, employees, and contractors shall cooperate and comply with the provisions of the City and County of Denver's policy or order or any successor policy or order concerning the use, possession or sale of alcohol or drugs on City property.

(b) Licensee and its officers, agents, employees, and contractors shall cooperate and comply with the provisions of the City's policy or order prohibiting smoking in buildings and certain facilities, and Licensee agrees it will take reasonable action to prohibit smoking by its employees in

the public areas of the Fire Station.

**10.13 Notices.**

All legal and administrative notices hereunder shall be given in writing to the following by hand delivery or by certified mail, return receipt requested.

To the City:

Fire Chief of the Denver Fire Department  
City and County of Denver  
745 West Colfax Avenue  
Denver, CO 80204

City Attorney's Office  
City and County of Denver  
1437 Bannock Street, Room 353  
Denver, Colorado 80202

To Licensee:

T-Mobile USA, Inc.  
12920 SE 38<sup>th</sup> Street  
Bellevue, Washington 98006  
Attn: Property Management/DN03634A

All proposed amendments to the Agreement, letter approvals for proposed actions by Licensee, proposed changes to the exhibits, and any document or affidavit seeking the signature of the Fire Chief or the Executive Director of Safety, shall be provided to both the Fire Chief and the City Attorney's Office. Licensee and City shall designate local contact personnel for operational and otherwise day-to-day business communications which may be made by telephone or email. Any changes to this contact information shall be provided immediately once known.

**10.14 Examination of Records.**

Licensee agrees that any duly authorized representative of the City, including the City Auditor or his representative, until the expiration of three (3) years after expiration of this Agreement or Cancellation, shall have access to and the right to examine any directly pertinent books, documents, papers and records of Licensee related to this Agreement.

**10.15 Parties' Obligation Regarding Confidential Information.**

The Parties agree that issues governing the use and disclosure of Confidential Information, as defined below, provided to or made available to the City by Licensee will be governed by the following provisions:

(a) As used herein, the term “Confidential Information” means all information, of any nature and in any form, regardless of when given, that (i) is disclosed or provided by or through Licensee to the City pursuant to performance of this Agreement; and (ii) has been clearly marked or indicated in writing as being confidential by Licensee; provided, that no part of this Agreement or the exhibits attached to this Agreement shall be deemed to contain Confidential Information. Information falling within this definition shall be treated by the City as confidential proprietary information of Licensee pursuant to the provisions of the Colorado Open Records Act and under any rule of court. Information not so marked or indicated will not be so considered.

(b) Except as expressly provided in this Agreement or as otherwise mandated by the Colorado Open Records Act or other applicable law, the City will not disclose Confidential Information to anyone other than individuals designated by the Fire Chief, including the City Representative, without the prior written consent of Licensee. The City will not use, or permit others to use, Confidential Information for any purpose other than actions incidental to the performance and enforcement of this Agreement between the City and Licensee, including but not limited to auditing of records of Licensee by the City Auditor and/or other representatives of the City. The City will take all reasonable measures to avoid disclosure, dissemination or unauthorized use of Confidential Information, including, at a minimum, those measures that it takes to protect its own Confidential Information of a similar nature.

(c) The Parties recognize that the mere marking of a document as “Confidential” does not render it conclusively confidential under the Colorado Open Records Act. Consequently, in the event that the City is served with an Open Records Request or subpoena from any third party requesting all or part of any Confidential Information as defined herein, the City shall give timely notice to Licensee of such request or subpoena within the time parameters of the Colorado Open Records Act or of any applicable court rule. In that event, Licensee agrees upon receipt of actual notice from the City of such Open Records Request or subpoena to immediately undertake, at its own cost and expense, to defend such Confidential Information from disclosure pursuant to the Colorado Open Records Act or applicable court rule and shall defend, save and hold harmless and indemnify the City and its agents and employees with respect to such issues.

(d) Licensee shall not at any time or in any manner, either directly or indirectly, divulge, disclose or communicate to any person, firm or corporation in any manner whatsoever any information concerning any matters which are not subject to public disclosure, including without limitation the trade secrets of businesses or entities doing business with the City, security measures utilized by the City, and other privileged or confidential information.

#### **10.16 Entire Agreement; Amendment.**

The Parties acknowledge and agree that the provisions contained herein, including all exhibits attached hereto, constitute the entire agreement and that all representations made by any officer, agent or employee of the respective Parties unless included herein are null and void and of no effect. No alterations, amendments, changes or modifications, unless expressly reserved to the City herein, shall be valid unless executed by an instrument in writing by all the Parties with the same formality as this Agreement.

### **10.17 Severability.**

If any term or provision of this Agreement is held by a court of law (following all legal rights of appeal or the expiration of time therefore) to be illegal or unenforceable or in conflict with any law of the State of Colorado or the City Charter or City ordinance, the validity of the remaining portions or provisions shall not be affected, and the rights and obligations of the Parties shall be construed and enforced as if the Agreement did not contain the particular term or provision held to be invalid; provided, however, if the invalidated term or provision was a critical or material consideration of either Party in entering this Agreement, the Parties shall work together, in good faith, to come up with an amendment to this Agreement that substantially satisfies the previously intended consideration while being in compliance with Applicable Law and the judgment of the court. Judicial invalidation of the License Fee, in whole or part, shall result in a failure of consideration and termination of this Agreement.

### **10.18 Time of Essence.**

The Parties agree that in the performance of the terms and requirements of this Agreement by Licensee and the City, time is of the essence.

### **10.19 Section Headings.**

The section headings herein are for convenience in reference only and are not intended to define or limit the scope of any provision of this Agreement.

### **10.20 Approval and Execution of Agreement.**

This Agreement is expressly subject to and shall not be or become effective or binding on the City until City Council approval, if required by Charter, is obtained and the Agreement is fully executed by all required City signatories and all required Licensee signatories.

### **10.21 Authority.**

Each Party represents and warrants that it has taken all actions that are necessary or that are required by its applicable law to legally authorize the undersigned signatories to execute this Agreement on behalf of the Party and to bind the Party to its terms. The person(s) executing this Agreement on behalf of each Party warrants that he/she/they have full authorization to execute this Agreement. The City shall have the right, in its discretion, to either temporarily suspend or permanently terminate the Agreement if there is any valid dispute as to the legal authority of Licensee or the person signing this Agreement on behalf of Licensee to enter into this Agreement.

### **10.22 Electronic Signatures and Electronic Records.**

Licensee 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.

**Contract Control Number:**  
**Contractor Name:**

FINAN-202053847-00  
T-MOBILE WEST LLC

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:**

Attorney for the City and County of Denver

By:

By:

\_\_\_\_\_

\_\_\_\_\_

By:

\_\_\_\_\_

**Contract Control Number:**  
**Contractor Name:**

FINAN-202053847-00  
T-MOBILE WEST LLC

By:           *Please see next page for signature*          

Name: \_\_\_\_\_  
(please print)

Title: \_\_\_\_\_  
(please print)

ATTEST: [if required]

By: \_\_\_\_\_

Name: \_\_\_\_\_  
(please print)

Title: \_\_\_\_\_  
(please print)

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the Effective Date.

**LICENSOR:**

**CITY AND COUNTY OF DENVER,**  
a municipal corporation

By: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

**LICENSEE:**

**T-MOBILE WEST LLC,**  
a Delaware limited liability company

By: DocuSigned by:  
*Ana Hemmert* \_\_\_\_\_  
243A10E7066D412...

Name: Ana Hemmert

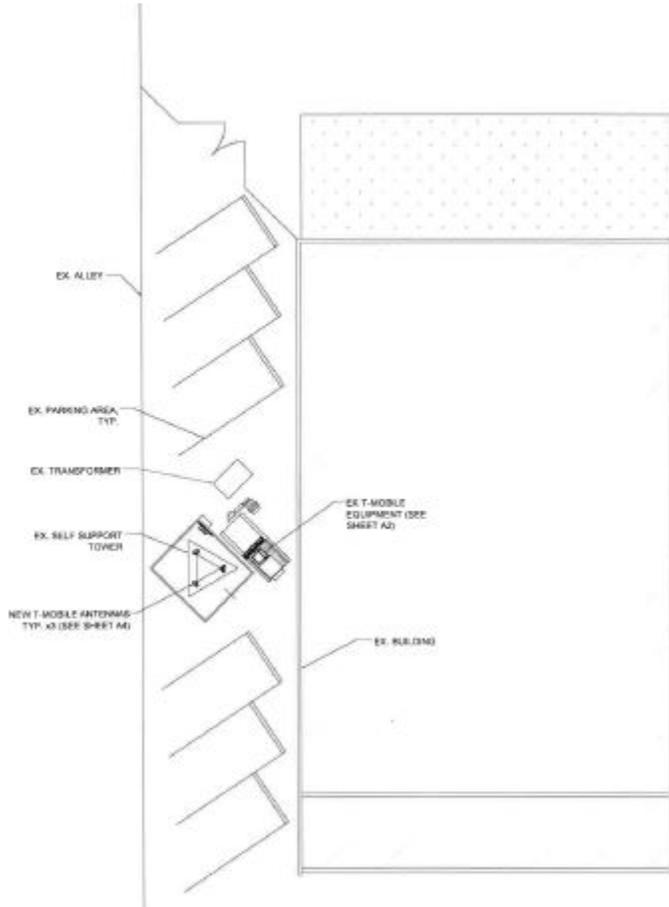
Title: Director Technology Procurement

Date: 11/18/2020



*Kelly Dunham* 11/5/2020  
T-Mobile Contract Attorney, as to form

# EXHIBIT A – LICENSED AREA





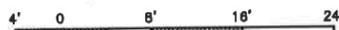


1 T-MOBILE EQUIPMENT PHOTO

SCALE: N.T.S.

**NOTE:**

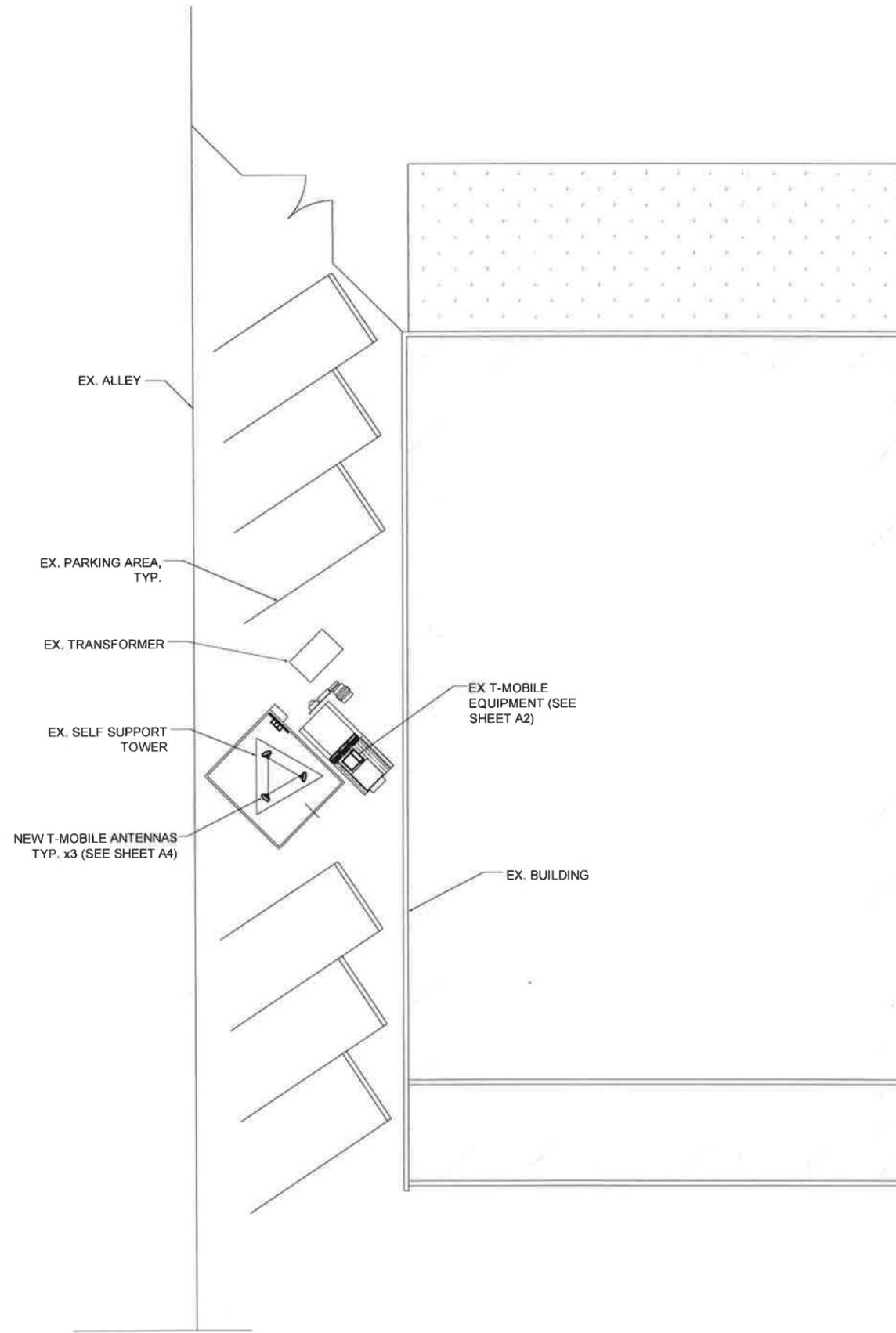
VERIFY PASSING STRUCTURAL ANALYSIS  
PRIOR TO COMMENCING ANY WORK.



SCALE: 1/8" = 1'-0"

2 SITE PLAN

SCALE: 1/8" = 1'-0"



PROJECT INFORMATION:

SITE NAME:  
DENVER FIRE STATION #20

SITE ID:  
DN03108E

501 KNOX CT  
DENVER, CO 80204  
DENVER COUNTY

Rev:	Date:	Description:	By:
1	09/08/14	PRELIMINARY	TJ
2	09/09/14	REVISION 1	KCS
3	9/12/14	REVISION 2	KS
4	10/29/14	CONSTRUCTION	SL

PLANS PREPARED BY:



16360 TABLE MOUNTAIN PARKWAY  
GOLDEN, CO 80403  
303.993.3293  
WWW.CENTERLINESOLUTIONS.COM

LICENSURE NO:



DRAWN BY: CHK BY: APV BY:

KCS SL KS

Sheet Title:

SITE PLAN

Sheet Number:

A1

PROJECT INFORMATION:

SITE NAME:  
**DENVER FIRE STATION #20**  
SITE ID:  
**DN03108E**

501 KNOX CT  
DENVER, CO 80204  
DENVER COUNTY

Rev:	Date:	Description:	By:
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3	9/12/14	REVISION 2	KS
4	10/29/14	CONSTRUCTION	SL

PLANS PREPARED BY:

**CENTERLINE SOLUTIONS**  
*Advancing Wireless Networks*

16360 TABLE MOUNTAIN PARKWAY  
GOLDEN, CO 80403  
303.993.3293  
WWW.CENTERLINESOLUTIONS.COM

LICENSURE NO:



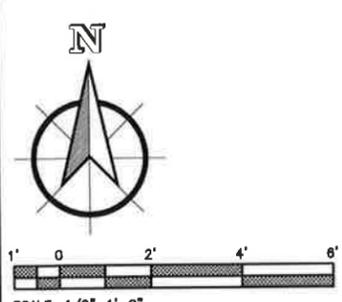
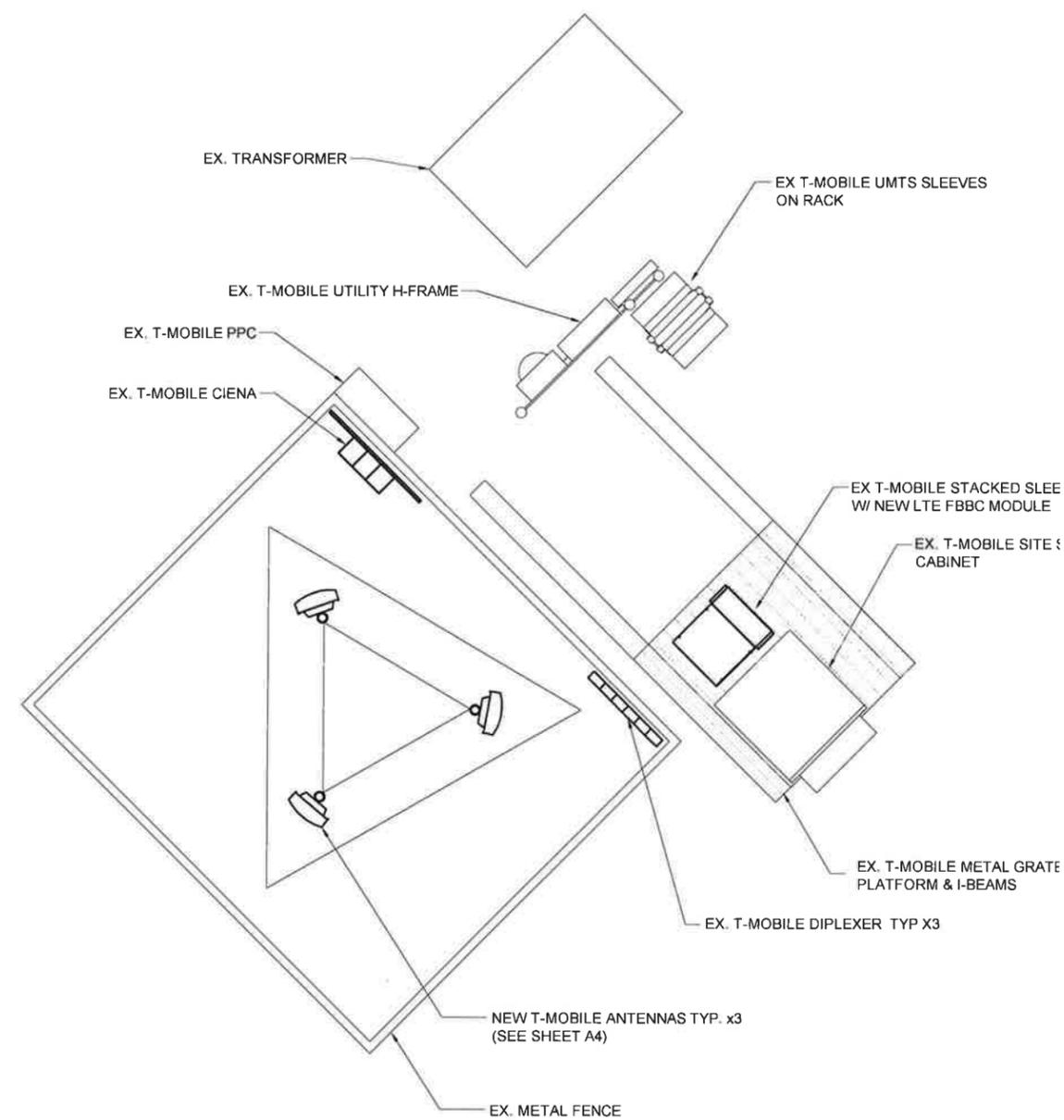
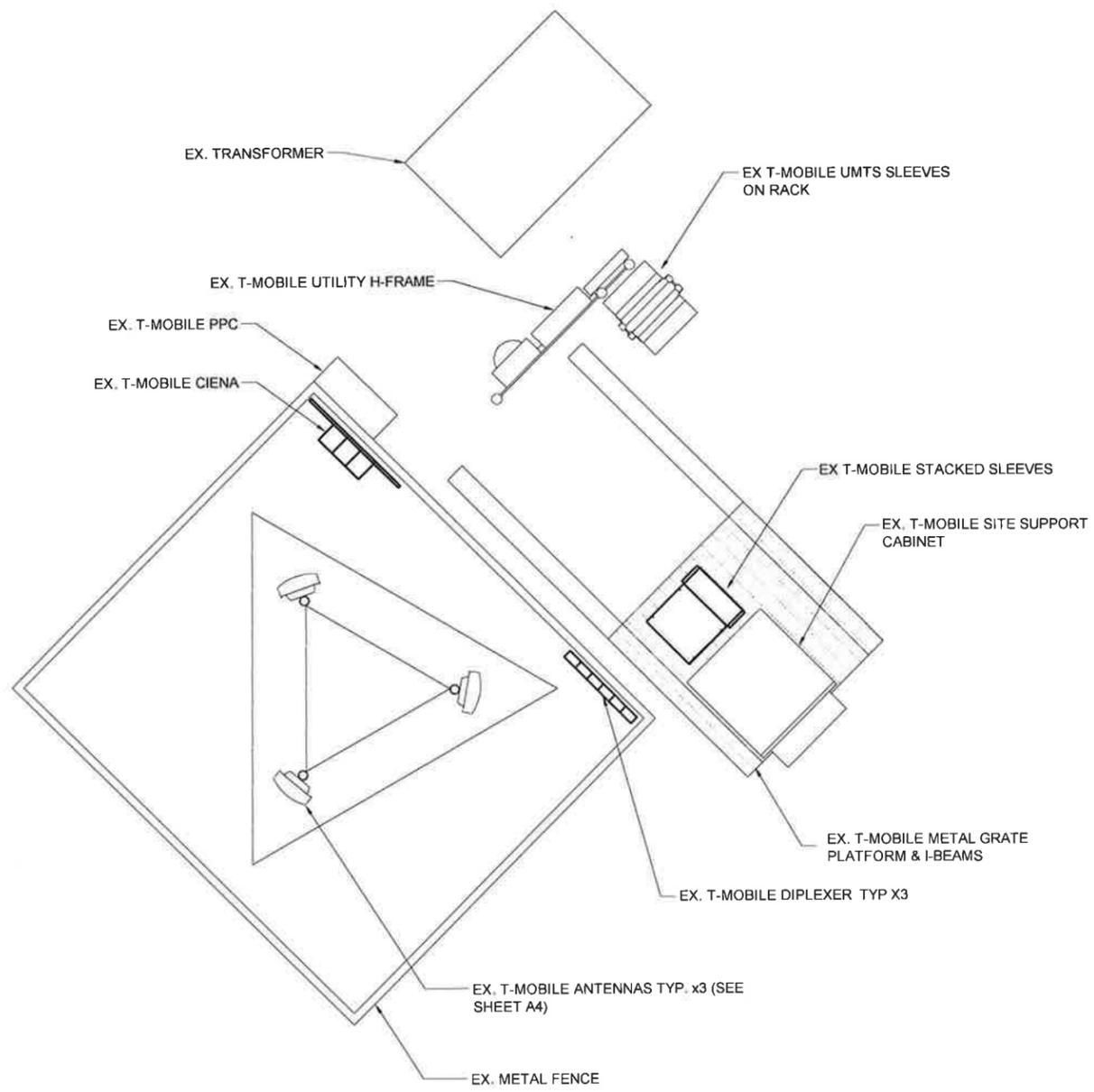
DRAWN BY:	CHK BY:	APV BY:
KCS	SL	KS

Sheet Title:

**EXISTING & NEW  
EQUIPMENT  
LAYOUTS**

Sheet Number:

**A2**



1 EXISTING EQUIPMENT LAYOUT  
SCALE: 1/2" = 1'-0"

2 NEW EQUIPMENT LAYOUT  
SCALE: 1/2" = 1'-0"

PROJECT INFORMATION:

SITE NAME:  
**DENVER FIRE STATION #20**  
SITE ID:  
**DN03108E**

501 KNOX CT  
DENVER, CO 80204  
DENVER COUNTY

Rev:	Date:	Description:	By:
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3	9/12/14	REVISION 2	KS
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PLANS PREPARED BY:



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LICENSURE NO:



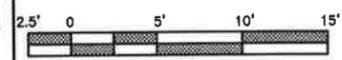
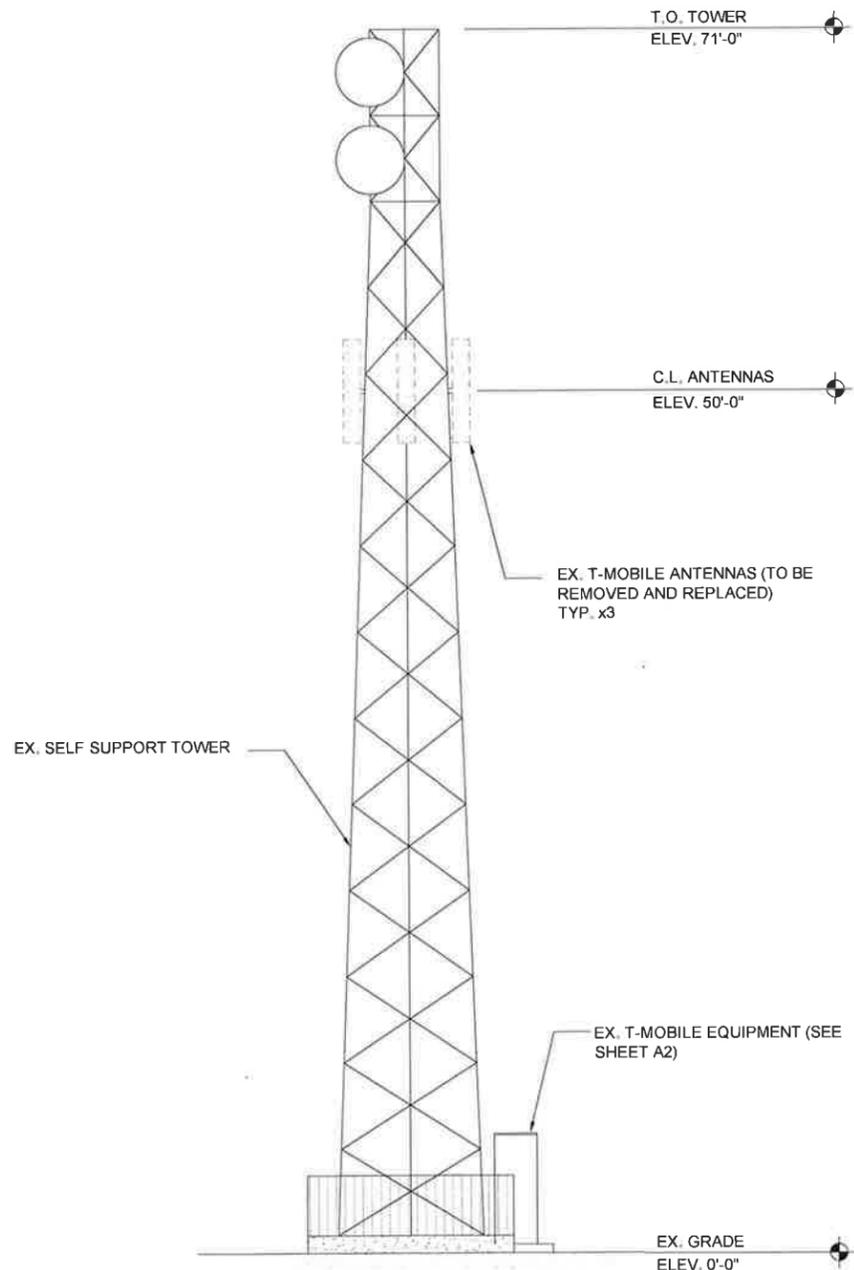
DRAWN BY:	CHK BY:	APV BY:
KCS	SL	KS

Sheet Title:

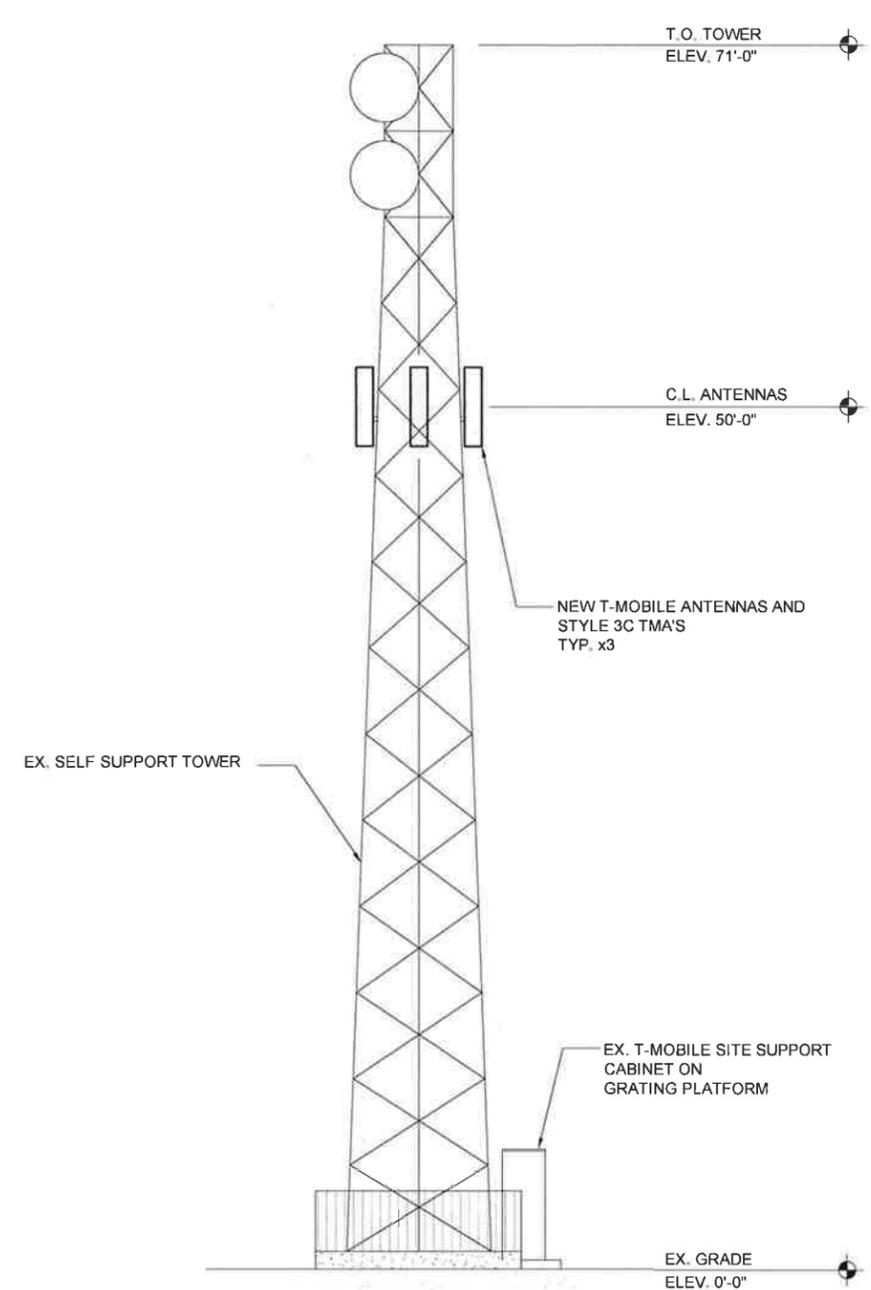
**EXISTING & NEW  
ELEVATIONS**

Sheet Number:

**A3.1**



SCALE: 3/16" = 1'-0"  
**1 | EXISTING ELEVATION**



**2 | NEW ELEVATION**  
SCALE: 3/16" = 1'-0"

PROJECT INFORMATION:

SITE NAME:  
**DENVER FIRE STATION #20**  
SITE ID:  
**DN03108E**

501 KNOX CT  
DENVER, CO 80204  
DENVER COUNTY

Rev:	Date:	Description:	By:
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4	10/29/14	CONSTRUCTION	SL

PLANS PREPARED BY:



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GOLDEN, CO 80403  
303.993.3293  
WWW.CENTERLINESOLUTIONS.COM

LICENSURE NO:



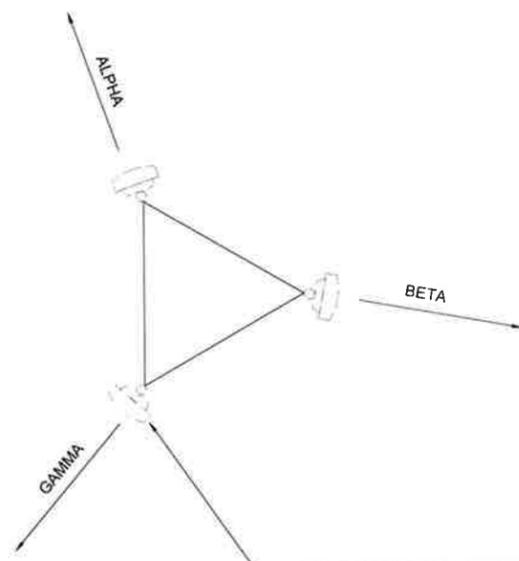
DRAWN BY: KCS  
CHK BY: SL  
APV BY: KS

Sheet Title:

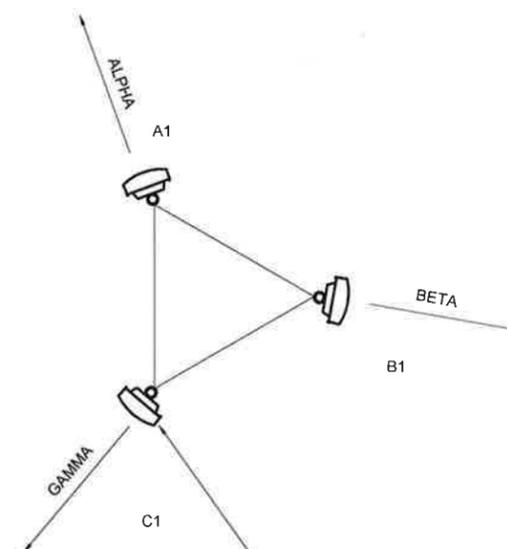
**EXISTING & NEW  
ANTENNA LAYOUTS  
& NOTES**

Sheet Number:

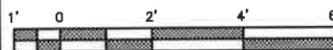
**A4**



EX. T-MOBILE ANTENNAS AND TMA'S TO BE REMOVED AND REPLACED ((2) STYLE 4 TMA'S TO REMAIN PER SECTOR)



(3) NEW T-MOBILE ANTENNAS AND STYLE 3C AND 4 TMA'S



SCALE: 1/2" = 1'-0"

**1 EXISTING ANTENNA LAYOUT**

SCALE: 1/2" = 1'-0"



**2 NEW ANTENNA LAYOUT**

SCALE: 1/2" = 1'-0"



**3 ANTENNA PHOTO**

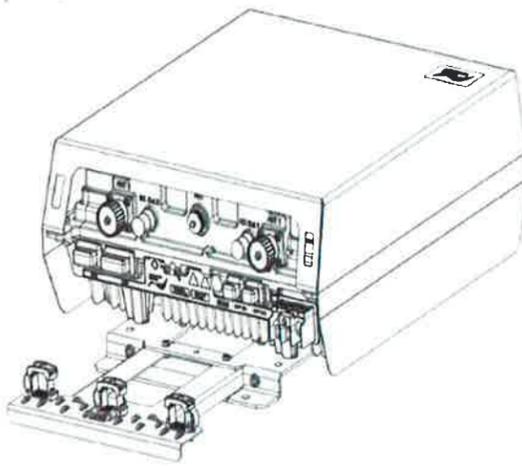
SCALE: N.T.S.

NOTE:  
SEE SHEET T1 FOR RFDS DATE

SECTOR	POS.	TECHNOLOGY	ANTENNA			MECH. TILT	ELECT. TILT	FEED LINE TYPE
			AZM.*	C.L.	MANUFACTURE - MODEL #			
ALPHA	A1	PCS UMTS/ AWS UMTS, LTE 700 & LTE AWS/GSM PCS	340°	50'-0"	ANDREW - SBNHH - 1D65A	0	4	EX. (4) 7/8" COAX
BETA	B1	PCS UMTS/ AWS UMTS, LTE 700 & LTE AWS/GSM PCS	100°	50'-0"	ANDREW - SBNHH - 1D65A	0	8	EX. (4) 7/8" COAX
GAMMA	C1	PCS UMTS/ AWS UMTS, LTE 700 & LTE AWS/GSM PCS	220°	50'-0"	ANDREW - SBNHH - 1D65A	0	4	EX. (4) 7/8" COAX

**4 RF SCHEDULE**

SCALE: N.T.S.



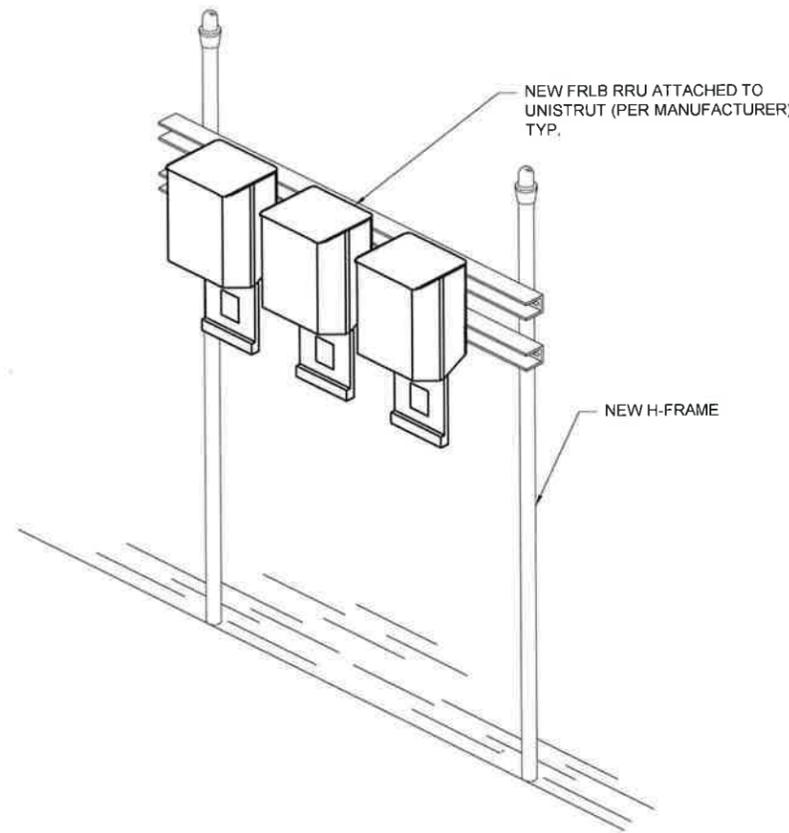
CHARACTERISTIC	FRLB CAPABILITY
RF MODULE TYPE	RRH, 1 UNIT PER SECTOR (LIKE FRIG)
MIMO	2x2
IBW	16 MHz UL/DL
LTE BW	10x10 IS MAX SUPPORTED CONFIG
POWER	2x30 W
MAX CONSUMPTION	321 W
SYSTEM MODULE COMPATIBILITY	FSMF, FSME

DIMENSION	VALUE
HEIGHT	15.75 INCHES
WIDTH	15.75 INCHES
DEPTH	5.9 INCHES
WEIGHT	59.52 LBS

SUPPORT	SOFTWARE SUPPORT
BAND 12 LTE FRLB/FSMF	RL40
BAND 4/ BAND 12 CA	RL60 ON TOP
BAND 2/ BAND 12 CA	RL70 (DUAL BAND IN RL60 ON TOP)

### 1 RRU SPECIFICATIONS (FRLB)

SCALE: N.T.S.

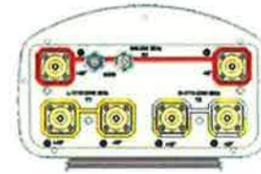


### 2 RRU MOUNTING DETAIL

SCALE: N.T.S.

## Product Specifications

COMMSCOPE®



Andrew Solutions  
SBNHH-1D65A

Andrew® DualPol® Tri-band Teletilt® SmartBeam® Antenna, 1 x 698-896 MHz and 2 x 1710-2360 MHz, 65° horizontal beamwidth, RET compatible

- Three DualPol® antennas under one radome
- Interleaved dipole technology providing for attractive, low wind load mechanical package

### Electrical Specifications

Frequency Band, MHz	698-806	806-896	1710-1880	1850-1990	1920-2180	2300-2360
Gain, dBi	13.0	12.8	15.8	16.7	16.8	17.0
Beamwidth, Horizontal, degrees	66	62	71	64	62	61
Beamwidth, Vertical, degrees	17.9	16.1	7.2	6.7	6.3	5.4
Beam Tilt, degrees	0-18	0-18	0-10	0-10	0-10	0-10
USLS, typical, dB	15	15	15	15	15	15
Front-to-Back Ratio, Copolarization 180° ± 20°, dB	27	25	32	33	26	27
CPR at Boresight, dB	15	15	15	15	15	15
CPR at Sector, dB	12	8	13	12	9	7
Isolation, dB	27	27	28	28	28	29
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR   Return Loss, dB	1.5:1   14.0	1.5:1   14.0	1.5:1   14.0	1.5:1   14.0	1.5:1   14.0	1.5:1   14.0
PIM, 3rd Order, 2 x 20 W, dBc	-150	-150	-150	-150	-150	-150
Input Power per Port, maximum, watts	400	400	350	350	350	350
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm					
Lightning Protection	dc Ground					

### Mechanical Specifications

Color   Radome Material	Light gray   Fiberglass, UV resistant
Connector Interface   Location   Quantity	7-16 DIN Female   Bottom   6
Wind Loading, maximum	441.0 N @ 150 km/h 99.1 lbf @ 150 km/h
Wind Speed, maximum	241.4 km/h   150.0 mph

### Dimensions

Depth	181.0 mm   7.1 in
Length	1397.00 mm   55.00 in
Width	301.00 mm   11.85 in
Net Weight	18.56 kg   40.92 lb

### Remote Electrical Tilt (RET) Information

Annual Failure Rate, maximum	0.01%
Power Consumption, during motor movements, maximum	11.0 W
Power Consumption, idle state, maximum	2.0 W
Power Input	10-30 V
Protocol	3GPP/AISG 2.0 Multi-RET

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page 1 of 4  
April 12, 2013

### 3 ANTENNA SPECIFICATIONS

SCALE: N.T.S.

T-Mobile®

2323 DELGANY STREET  
DENVER, CO 80216

PROJECT INFORMATION:

SITE NAME:  
DENVER FIRE STATION #20

SITE ID:  
DN03108E

501 KNOX CT  
DENVER, CO 80204  
DENVER COUNTY

Rev: Date: Description: By:

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4	10/29/14	CONSTRUCTION	SL

PLANS PREPARED BY:

**CENTERLINE**  
SOLUTIONS  
Advancing Wireless Networks

16360 TABLE MOUNTAIN PARKWAY  
GOLDEN, CO 80403  
303.993.3293  
WWW.CENTERLINESOLUTIONS.COM

LICENSURE NO:



DRAWN BY: CHK BY: APV BY:

KCS SL KS

Sheet Title:

EQUIPMENT  
DETAILS

Sheet Number:

A5

**GENERAL CONSTRUCTION NOTES**

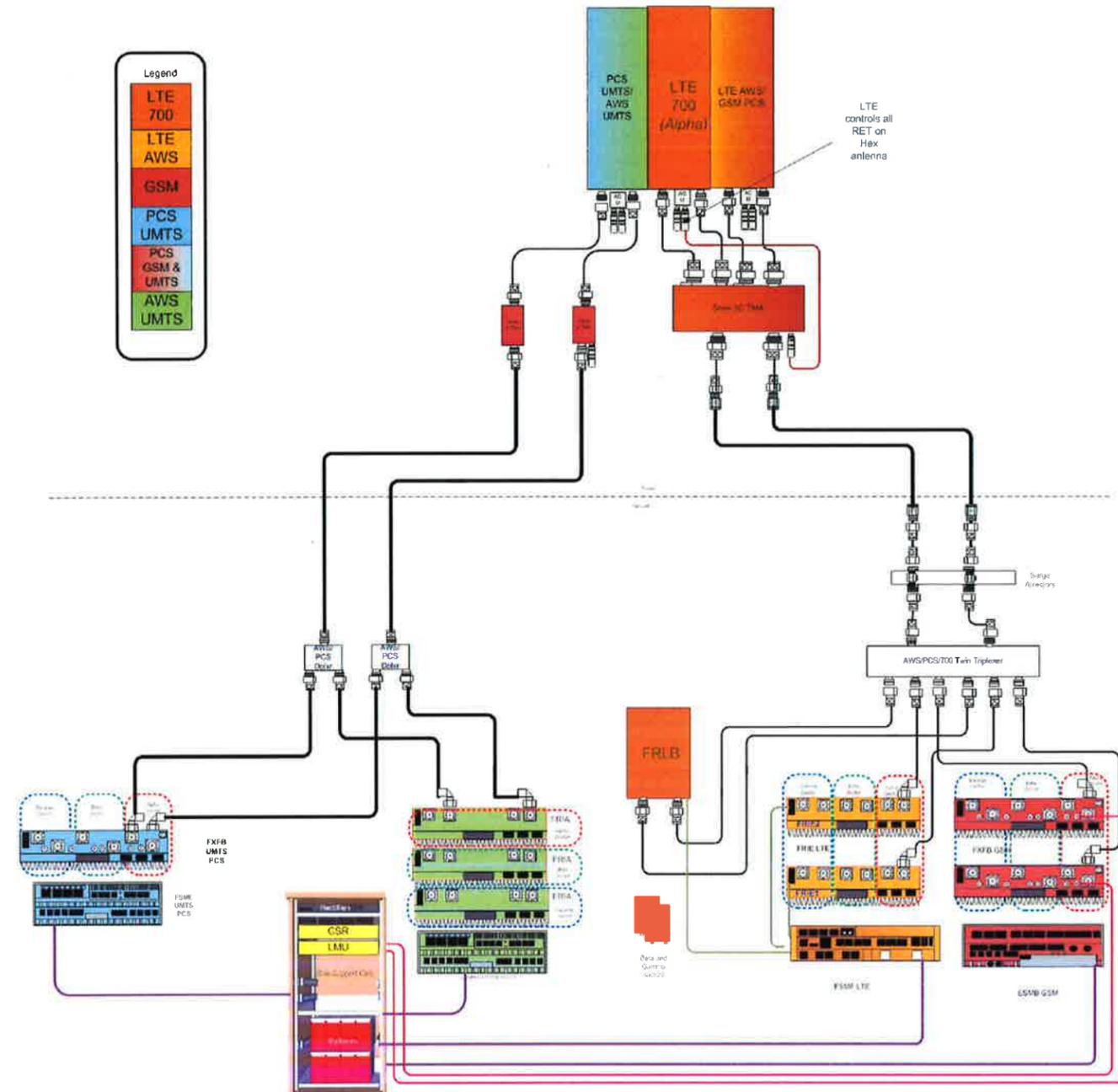
- THE FACILITY IS AN UNOCCUPIED WIRELESS FACILITY.
- PLANS ARE NOT TO BE SCALED AND ARE INTENDED TO BE A DIAGRAMMATIC OUTLINE ONLY, UNLESS NOTED OTHERWISE. THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, APPURTENANCES AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED ON THE DRAWINGS.
- PRIOR TO THE SUBMISSION OF BIDS, THE CONTRACTORS SHALL VISIT THE JOB SITE AND BE RESPONSIBLE FOR ALL CONTRACT DOCUMENTS, FIELD CONDITIONS AND DIMENSIONS, AND CONFIRMING THAT THE WORK MAY BE ACCOMPLISHED AS SHOWN PRIOR TO PROCEEDING WITH CONSTRUCTION. ANY DISCREPANCIES ARE TO BE BROUGHT TO THE ATTENTION OF THE IMPLEMENTATION ENGINEER AND ARCHITECT/ENGINEER PRIOR TO PROCEEDING WITH THE WORK.
- THE CONTRACTOR SHALL RECEIVE, IN WRITING, AUTHORIZATION TO PROCEED BEFORE STARTING WORK ON ANY ITEM NOT CLEARLY DEFINED OR IDENTIFIED BY THE CONTRACT DOCUMENTS.
- CONTRACTOR SHALL CONTACT LOCAL DIGGERS HOTLINE 48 HOURS PRIOR TO PROCEEDING WITH ANY EXCAVATION, SITE WORK OR CONSTRUCTION.
- THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY INDICATED OTHERWISE OR WHERE LOCAL CODES OR REGULATIONS TAKE PRECEDENCE.
- ALL WORK PERFORMED AND MATERIALS INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS AND ORDINANCES. CONTRACTOR SHALL GIVE ALL NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY REGARDING THE PERFORMANCE OF THE WORK. MECHANICAL AND ELECTRICAL SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS, AND LOCAL AND STATE JURISDICTIONAL CODES, ORDINANCES AND APPLICABLE REGULATIONS.
- THE GENERAL CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK, USING THE BEST SKILLS AND ATTENTION. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES AND FOR COORDINATING ALL PORTIONS OF THE WORK UNDER THE CONTRACT INCLUDING CONTACT AND COORDINATION WITH THE CONSTRUCTION FIELD ENGINEER AND WITH THE LANDLORD'S AUTHORIZED REPRESENTATIVE.
- DETAILS ARE INTENDED TO SHOW END RESULT OF DESIGN. MINOR MODIFICATIONS MAY BE REQUIRED TO SUIT JOB DIMENSIONS OR CONDITIONS, AND SUCH MODIFICATIONS SHALL BE INCLUDED AS PART OF THE WORK.
- REPRESENTATIONS OF TRUE NORTH, OTHER THAN THOSE FOUND ON THE PLOT OF SURVEY DRAWING, SHALL NOT BE USED TO IDENTIFY OR ESTABLISH THE BEARING OF TRUE NORTH AT THE SITE. THE CONTRACTOR SHALL RELY SOLELY ON THE PLOT OF SURVEY DRAWING AND ANY SURVEYOR'S MARKINGS AT THE SITE FOR THE ESTABLISHMENT OF TRUE NORTH, AND SHALL NOTIFY THE ARCHITECT/ENGINEER PRIOR TO PROCEEDING WITH THE WORK IF ANY DISCREPANCY IS FOUND BETWEEN THE VARIOUS ELEMENTS OF THE WORKING DRAWINGS AND THE TRUE NORTH ORIENTATION AS DEPICTED ON THE PLAT OF SURVEY. THE CONTRACTOR SHALL ASSUME SOLE LIABILITY FOR ANY FAILURE TO NOTIFY THE ARCHITECT/ENGINEER.

**STRUCTURAL NOTES**

- GENERAL CONDITIONS
  - DESIGN AND CONSTRUCTION OF ALL WORK SHALL CONFORM TO THE APPROVED EDITION OF THE IBC EDITION AND ALL OTHER APPLICABLE STATE CODES, ORDINANCES, AND REGULATIONS. IN CASE OF CONFLICT BETWEEN THE CODES, STANDARDS, AND REGULATIONS. SPECIFICATIONS, GENERAL NOTES AND/OR MANUFACTURER'S REQUIREMENTS. USE THE MOST STRINGENT PROVISION.
  - IT IS THE EXPRESS INTENT OF THE PARTIES INVOLVED IN THIS PROJECT THAT THE CONTRACTOR OR SUBCONTRACTOR OR INDEPENDENT CONTRACTOR OR THEIR RESPECTIVE EMPLOYEES SHALL EXCULPATE THE ARCHITECT, THE ENGINEER, THE CONSTRUCTION MANAGER, THE OWNER, AND THEIR AGENTS, FROM ANY LIABILITY WHATSOEVER AND HOLD THEM HARMLESS AGAINST LOSS, DAMAGES, LIABILITY OR ANY EXPENSE ARISING IN ANY MATTER FROM THE WRONGFUL OR NEGLIGENT ACT, OR FAILURE TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, OR THE CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES OR FAILURE TO CONFORM TO THE STATE SCAFFOLDING ACT IN CONNECTION WITH THE WORK.
  - DO NOT SCALE DRAWINGS.
  - VERIFY ALL EQUIPMENT MOUNTING DIMENSIONS PER MANUFACTURER DRAWINGS.
  - SUBMIT ONE SEPIA AND TWO PRINTS OF ALL STRUCTURAL SHOP DRAWINGS. MARKED UP SEPIA SHALL BE RETURNED.
- STEEL
  - MEET OR EXCEED THE FOLLOWING CODES & STANDARDS (LATEST EDITION) EXCEPT AS NOTED:
    - STRUCTURAL STEEL...AISC SPECIFICATION & CODE OF STANDARD PRACTICE
    - SHAPES AND PLATES...ASTM A572
    - PLATES BENT OR COLD FORMED...ASTM A 283, GRADE C
    - PIPES...ASTM A 53, GRADE B
    - STRUCTURAL SHEETS, HOT ROLLED...ASTM A 510
    - COLD FORMED STEEL TUBING...ASTM A 500 GRADE B
    - BOLTS, NUTS & WASHERS FOR ANCHOR BOLTS AND SECONDARY CONNECTIONS...ASTM A307
    - ALL STEEL SHALL BE HOT-DIPPED GALVANIZED.
  - WELDS...AWS E 70XX  
EXCEPTION IS TAKEN TO AISC CODE OF STANDARD PRACTICE PARAGRAPH 4.2.1 REGARDING OWNERS AND FABRICATOR'S RESPONSIBILITY FOR CONNECTION DESIGN AND DETAILING IS THE CONTRACTORS RESPONSIBILITY. ENGINEER'S REVIEW OF SHOP DRAWINGS IS FOR GENERAL CONSIDERATIONS ONLY AND DOES NOT CONSTITUTE AN ACCEPTANCE OF THESE RESPONSIBILITIES BY THE OWNER AND/OR ENGINEER.
- STANDARDS FOR ALL CONCRETE WORK
  - ALL CONCRETE WORK SHALL CONFORM WITH ACI. 318 OR LATEST. DETAIL REINFORCING IN CONFORMANCE WITH ACI. SP86 LATEST.
  - NO SPLICES OF REINFORCEMENT SHALL BE MADE EXCEPT AS DETAILED OR AUTHORIZED BY THE STRUCTURAL ENGINEER. LAP SPLICES WHERE PERMITTED SHALL BE A MINIMUM OF 30 BAR DIAMETERS.
  - PROVIDE ALL ACCESSORIES NECESSARY TO SUPPORT REINFORCING AT POSITIONS SHOW ON DRAWINGS.
  - WIRE FABRIC REINFORCEMENT MUST LAP ONE FULL MESH AT SIDE AND END LAPS SHALL BE TIED TOGETHER.
  - CURE AFTER FINISHING CONCRETE. KEEP MOIST FOR 7 DAYS AFTER POURING.
  - COMPACT STRUCTURAL FILL 95% PROCTOR DENSITY PRIOR TO PLACING CONCRETE UNDER SLABS.
  - 1/4" CHAMFER ON ALL CORNERS AND EDGES.
  - ALL CONCRETE SHALL BE PORTLAND, TYPE 1 CEMENT WITH A MINIMUM OF 28 DAY STRENGTH OF 3000 PSI., 4" SLUMP AND A MINIMUM AIR ENTRAPMENT OF 4%.
  - ALL REINFORCING STEEL SHALL BE GRADE 60. ALL REINFORCING MESH SHALL CONFORM TO ASTM A 185.

**Configuration 703B GTSh\_4 Lines  
(FRLB Ground triplexed with a Hexport for 700/PCS/AWS)**

(Antenna & cabling of one sector shown for clarity)  
Drawing Date: 8/1/2014



2323 DELGANY STREET  
DENVER, CO 80216

**PROJECT INFORMATION:**

SITE NAME:  
**DENVER FIRE STATION #20**  
SITE ID:  
**DN03108E**

501 KNOX CT  
DENVER, CO 80204  
DENVER COUNTY

Rev:	Date:	Description:	By:
1	09/08/14	PRELIMINARY	TJ
2	09/09/14	REVISION 1	KCS
3	9/12/14	REVISION 2	KS
4	10/29/14	CONSTRUCTION	SL

**PLANS PREPARED BY:**

**CENTERLINE SOLUTIONS**  
Advancing Wireless Networks  
16360 TABLE MOUNTAIN PARKWAY  
GOLDEN, CO 80403  
303.993.3293  
WWW.CENTERLINESOLUTIONS.COM

**LICENSURE NO.:**



DRAWN BY:	CHK BY:	APV BY:
KCS	SL	KS

**Sheet Title:**

**GENERAL NOTES  
AND  
PLUMBING DIAGRAM**

**Sheet Number:**

**GN1**

## EXHIBIT C-1

### T-MOBILE AUTHORIZED FREQUENCIES – DFD STATION #20

- PCS B3B4B5: Tx = 1950 –1965 MHz, Rx = 1870 – 1885 MHz
- PCS C4C5G: Tx = 1980 –1995 MHz, Rx = 1900 – 1915 MHz
- AWS A1A2: Tx = 2110 – 2120 MHz, Rx = 1710 – 1720 MHz
- AWS F1F2: Tx = 2145 – 2155 MHz, Rx = 1745 – 1755 MHz
- 700 A: Tx = 728 - 734 MHz, Rx = 698 – 704 MHz
- 600 B\_C\_D Tx= 622-637 MHz, Rx= 668-683 MHz
- 2500 A4\_B2\_B3\_B4\_C1\_C2\_C3\_C4\_D1\_D2\_D3\_D4\_E1\_E4\_F4\_G4\_J\_K\_BRS2 Tx/Rx= 2528-2628 MHz

## **Exhibit C-2 Minimum Technical Standards**

Note: Some standards may not apply to your facility due to frequency of operation or type of service.

### **1.0 General**

1.1 Posting of Information. The following information shall be posted on or near your cabinet:

Copy of FCC license (if applicable)

Equipment Identification Card with the following information:

Transmit and receive frequencies (or frequency bands in case of wireless operators)

Type of service

Authorized output power & ERP

Antenna model number

Transmission line model number and type

Name of licensee

Contact information for responsible person (name, phone, email)

Unidentified equipment shall be considered unauthorized and may be red tagged and removed after 30 days.

1.2 Installations at City Fire Stations. The City may require that the Tenant (Licensee) upgrade City radio equipment to ensure interference-free coexistence. Specifically, there is a problem with installing an isolator on the existing 900 MHz Alligator Model 1888 MAS transceiver used at most City fire stations. The isolator must be installed only on the transmit line, but the transceiver uses a duplexed (switched) output whereby both the transmitter and the receiver share the same antenna line. Similarly, separate cavity filters are required for the receiver and transmitter, but it is not possible to install both on a single duplexed line. For this reason, the City usually directs that the Alligator Model 1888 be replaced with a Model 1800 Master unit with separate transmit and receive antenna ports. A duplexer cavity filter should be used to combine transmit and receive into the existing antenna. Contact the City's Technical Representative for recommended vendors for these components.

1.3 Changes. Notify the City's Technical Representative immediately of any changes to frequencies, antennas or other equipment configuration. Obtain City's approval prior to making those changes as required by the Lease (License). Approved changes shall be shown on an updated Equipment ID Card.

### **2.0 Mobile Wireless Services**

2.1 Land Mobile Radio Filter and Isolator Requirements. For land mobile radio (LMR), as a

minimum, each transmitter shall employ a dual stage isolator followed by a single cavity bandpass filter. All transmitters shall have built-in or external harmonic (low pass) filters. The low pass filter must be a true low pass filter, not a notch filter tuned to just one or two harmonic frequencies. Harmonic rejection shall be at least 60 dB at the second harmonic and at least 50 dB at the third harmonic. The following minimum isolator and bandpass cavity filter specifications apply:

30-50 MHz

Isolators - None required.

TX cavity - minimum of 20 dB rejection at + 0.5 MHz

72-76 MHz

Isolators - Minimum of 25 dB

TX cavity - minimum of 20 dB rejection at + 0.5 MHz

138-174, 216-222 MHz

Dual Stage Isolators - minimum of 60 dB

TX cavity - minimum of 20 dB rejection at + 1.5 MHz

406-512 MHz

Dual Stage Isolators - minimum of 60 dB

TX cavity - minimum of 20 dB rejection at + 3.5 MHz

698-941 MHz (excluding airphone)

Dual Stage Isolators - minimum of 60 dB

Tx cavity - minimum of 20 dB rejection at + 6 MHz

Explanation. The bandpass filter and lowpass filter must follow the isolator because ferrite isolators are nonlinear and can create harmonics. Please note that most bandpass cavity filters will pass odd harmonics of the tuned frequency, so an external lowpass filter following the isolator is also required. Transmitter combiners will be considered on a case-by-case basis. Please provide all combiner technical information to the City's Technical Representative.

2.2 Airphone (849-851 MHz transmit, 894-896 MHz receive)

Transmitter out-of-band emissions shall not cause harmful interference to cellular base station receivers (824-849 MHz). Tenant (Licensee) shall submit plans, including bandpass filter response curves, to the City's Technical Representative for approval prior to installation. Tenant (Licensee) shall install adequate receiver bandpass filtering to preclude receiver desensitization or receiver intermodulation caused indirectly by cellular base stations on the site.

2.3 LMR Duplexers. Notch duplexers are not adequate. The duplexer must also have a bandpass characteristic to ensure other transmit signals do not enter the transmitter or over drive the receiver. This is especially important for VHF repeaters which are vulnerable to FM broadcast signals and other closely-spaced VHF transmitters.

2.4 Personal Wireless Services. These services include, but are not limited to the 698-806, 806-869, 1710-1755, 1850-2000, 2110-2155, 2500-2600 MHz bands (excluding 700 and 800 MHz public safety bands). Because the wireless provider is assumed to have exclusive use of a band of frequencies, out-of-band emissions are expected to be attenuated significantly by the manufacturer's standard combiners, duplexers and cross-band couplers. Ferrite isolators may not be required. Submit your plans to the City's Technical Representative for approval.

2.5 Unlicensed Band (License-Free) Radios. Unlicensed band radios and shared-band services, including, but not limited to those operating in the 902-928 MHz, 2.4-2.4835 GHz, 3.5 GHz, 4.9 GHz (public safety only) and 5 GHz bands are not allowed unless specifically authorized in the Tenant's (Licensee's) Lease (License). When authorized, Tenant (Licensee) shall not change operating frequencies without first getting approval from City. License-free radios are notorious for their poor quality in a harsh RF environment and specific make, model and technical specifications must be provided to the City's Technical Representative for approval. Additional protective devices, shielded CAT 6 cable and shielded NEMA cases may be required before such devices can be installed on the tower.

2.6 Receivers. The site may have relatively high radio frequency (RF) levels in all mobile radio bands. Your receiver amplifier must be robust to work in this environment. Ensure the receiver has good intermodulation (IM) rejection and high 1 dB compression point. If interference is encountered and we find the receiver is not performing up to the standards exhibited by state-of-the-art equipment, the City may require receiver improvements or upgrades before requiring changes to other tenant (licensee) equipment or configurations. This requirement applies to both new and existing tenants (licensees).

Filters are required for mobile radio receivers. Single receivers must employ a minimum of a single 7" diameter (or equivalent) cavity bandpass filter with a rejection curve corresponding to 1 dB insertion loss or better. Additional filter isolation may be required in special cases. Receiver multicouplers must use a bandpass filter (preselector) prior to the multicoupler amplifier.

2.7 Antennas. Select antennas designed to minimize passive intermodulation generation. Note that antennas that pass intermodulation tests at the factory may not provide good intermodulation rejection after years of exposure to heat, cold, vibration from wind, and humidity. Only new antennas are allowed for new installations. Select antennas specifically designed to reject intermodulation over the life of the antenna. Unless the antenna is a duplex configuration, transmit and receive antennas should be separated vertically on the tower. If the tower is owned by the City, the City will designate antenna locations. Antennas must be DC grounded to the tower for lightning protection.

2.8 Transmission Lines. Coaxial cable should be grounded at the top and the bottom of the run with an Andrew ground kit or equivalent. Ensure that ground conductors run straight down with no sharp bends because bends will increase the impedance of the grounding conductor. We also require that the line be marked so we can identify it later. We suggest bands of colored electrical tape at the bottom, middle and top of the run (similar to a resistor color code). Install a Huber-Suhner (or equivalent) coaxial surge arrestor at the bulkhead. All exterior transmission lines

must be solid outer conductors. If possible, receive and transmit lines should be separated by at least one foot from cabinet to antenna.

2.9 Connectors. Connectors are often sources of RF leakage and passive intermodulation. UHF connectors (PL259) are not allowed on connections external to the radio cabinet. Type “N” connectors are allowed below 512 MHz. 7/16 DIN connectors should be used at 698 MHz and above and are required above 1.7 GHz. Connectors using dissimilar metal contacts or ferrous materials (e.g., nickel plating) are not allowed. The preferred connector uses a silver plated body with gold plated inner conductor. Brass bodies and silver or brass inner conductors are also allowed.

2.10 Additional Protective Devices May Be Required. The specifications above are minimum requirements. Additional protective devices may be required based upon evaluation of the following information:

- Theoretical TX mixes, particularly second and third order
- Antenna location and type
- Combiner/multicoupler configurations
- Transmitter specifications
- Receiver specifications
- Historical problems
- Transmitter to transmitter isolation
- Transmitter to antenna isolation
- Transmitter to receiver isolation
- Calculated and measured level of IM products
- Transmitter output power
- Transmitter ERP
- Spectrum analyzer measurements
- VSWR measurements
- Existing cavity selectivity
- Antenna to antenna proximity

### **3.0 FM & IBOC Broadcast (Part 73, ERP > 1 kW)**

3.1 FM Broadcast Transmitters. FM and IBOC Broadcast transmitters will be either combined with other stations into a common antenna or stand-alone. If combined, the combiner design shall be approved by the City's Technical Representative. If stand-alone, the transmitter shall employ a bandpass cavity filter with the following minimum performance specifications:

3.1.1. Rejection. The bandpass filter shall provide the following minimum rejection for Class C, C0 and C1 stations:

From Center +/-	Minimum Rejection
800 kHz	22 dB
1 MHz	28 dB

1.2 MHz	32 dB
1.4 MHz	38 dB
1.6 MHz	43 dB

Note that four cavities are required to meet this specification. Class C2 and C3 stations may use three-cavity filters. These filter requirements also apply to stations with FM & IBOC combined outputs. A stand alone IBOC transmitter and antenna shall comply with the following requirements: IBOC ERP greater than 5,000 Watts: 4 cavity filter (see rejection above), IBOC ERP less than or equal to 5,000 Watts: 3 cavity filter.

3.1.2 Gain Flatness. +/-0.5 dB from +/-200 kHz from center frequency.

3.1.3. Group Delay Flatness. No greater than +/- 150 nanoseconds (symmetrical) in +/- 200 kHz (I.e., minimum to maximum delay difference shall be no greater than 300 nanoseconds in the band  $f_c - 200$  kHz to  $f_c + 200$  kHz).

3.1.4. VSWR. No greater than 1.1:1 in +/- 200 kHz (assuming filter is terminated in perfect 50 ohm load).

3.1.5. Insertion Loss. No greater than 0.3 dB in +/- 200 kHz.

The transmitter should comply with current FCC rules regarding out-of-band emissions at transmitter output (before the bandpass cavity filter). The external filter is required to provide further rejection of out-of-band emissions to ensure electromagnetic compatibility with other users on the site.

3.2 FM Broadcast Antennas. FM Broadcast antennas mounted below 250' AGL (center of radiation) shall employ short element spacing to reduce downward radiation and ensure compliance with CFR 47, Parts 1.1307-1.1310. This requirement does not apply to stations that employ a single element antenna. Examples of short element spacing are a 6 bay antenna with half-wavelength spacing or an 8 bay antenna with 3/4 wavelength spacing. Submit a plot of predicted power density versus distance at ground level for City's Technical Representative approval.

#### **4.0 Full-Power Television**

4.1 Full-power television transmitters shall include band pass and low pass filters.

4.2 For television transmitters, measured out-of-band emissions (including harmonics) greater than 3 MHz from the respective channel edge shall be more than 80 dB below the measured power over the entire channel. Both measurements shall use a 6 MHz measurement bandwidth.

#### **5.0 Low Power Television (analog and digital)**

5.1 Low Power Television (LPTV) transmitters and television translators must have low pass

filters that attenuate all harmonics and spurious products at least 80 dB below the power measured at the carrier frequency. To facilitate measurements of spurious products, each LPTV and translator transmitter shall have installed a line section and appropriate directional coupler element. For routine use, the line section may employ a standard DC element and be connected to a wattmeter capable of measuring forward and reflected power. In addition, the Tenant (Licensee) shall own or have access to an RF load capable of dissipating the full power of the transmitter for troubleshooting purposes.

## **6.0 Grounding, Bonding and Shielding**

6.1 Shielding. RF interference can get directly into the electronics of a receiver or transmitter. Cabinet shielding must be in place and maintained to the manufacturer's specifications. Do not leave cabinet doors open because open cabinet doors defeat the shielding.

6.2 Grounding. Equipment grounding and bonding should be accomplished in accordance with Mil Std 188-124, Military Handbook 419 and Motorola R56. Contact the City's Technical Representative for guidance on grounding and bonding at your particular facility.

## **7.0 Site Work**

7.1 Tower Work Insurance and Experience Requirements. All tower riggers or installers of antennas, transmission lines, cabinets, wiring or similar hardware or apparatus must meet the minimum basic requirements of the City. These will include, but not be limited to, the following:

- The rigging company must have a current Certificate of Insurance on file with the City. The certificate will include, but not be limited to the following:

1. General Comprehensive & Liability: \$5,000,000
2. Vehicle Liability: \$1,000,000
3. Workman's Compensation Insurance (By Statute)

- Demonstrated experience on similar tower types and similar work activity on similar towers within the past two years with a list of at least two recent clients or professional references with actual knowledge of experience and necessary qualifications, or in lieu thereof; previous working relationship with the City and known by the City's personnel.

City reserves the right, at its sole discretion, to reject the use of any person or tower rigging company on City-owned towers or properties.

7.2 Work Standards. The installation of any and all materials on the tower and in the accompanying shelter must be pre-authorized and approved by the City's Technical Representative. The following guidelines will be strictly enforced:

7.2.1 Equipment or cabinets mounted on platforms will be constructed of galvanized or

stainless steel and will be securely attached to the tower members or platforms with J-bolts, U-bolts or similar clamping devices which do not penetrate tower members or any part of the galvanized coating. All mounting hardware must be hot-dipped galvanized or stainless steel (NOT PLATED). All mounting nuts, bolts, washers or similar must be Grade 5 or better.

7.2.2 Antennas and the mounting thereof must be approved in advance of installation. Data in reference to antenna type, weight, wind loading, gain, bandwidth and mounting details must be provided to the City's Technical Representative and may not be modified or replaced without expressed written permission of City. Installation of antennas on City-owned towers may require a new structural study at the Tenant (Licensee)'s expense.

7.2.3 Transmission lines and hardware must be approved in advance of installation by the City's Technical Representative and must be specified as to manufacturer, size and type and shown on the City's New Tenant Questionnaire. All the mounting hardware must be of appropriate type and design to support the transmission lines with strain-reliefs installed at the manufacturer's recommended intervals. Under no circumstances will stainless steel automotive-type hose clamps be used to secure transmission lines or cables to tower members. Where not previously designated, all lines will be positioned on the tower to minimize wind loading and provide a minimum of obstruction to climbing or removal/replacement of other lines. Each line will be mounted independently of other lines on the tower. Cable trays, waveguide entrances, tower ladders, elevator rails and other similar members are to be kept clear of all cables on the tower. Stainless steel lashing ties are acceptable for use on the tower but are not to be used as strain reliefs.

7.2.4 Antenna jumper cables or cables to/from crossband couplers or similar devices on the tower will be kept to minimum required lengths and will be made of solid shield outer conductor cables with outer jackets capable of withstanding severe weather and ultraviolet rays. All such cable types must be pre-approved by the City.

7.2.5 UNDER NO CIRCUMSTANCES –

- will welding or drilling of tower members be allowed;
- will modifications to the tower, bridge, building entrance fittings or similar be permitted;
- will transmission line splices (a pair of connectors at other than the top or bottom of the run on the tower) be permitted except by prior approval or necessitated by damage only repairable by splicing;
- will any tampering, retuning, rerouting or other modifications be permitted to equipment owned by City or other tenants.

7.2.6 All installations will be performed in accordance with good engineering practice and within the guidelines of this document. Any deviation from these minimum requirements and technical standards must be approved in writing prior to installation or modification.

7.3 Removal of Unused Antennas and Lines. Tenant (Licensee) shall remove all unused antennas, transmission lines and associated mounting hardware from City's tower within 90 days of the date an antenna is no longer in service.

7.4 NO PRESENT INSTALLATION WILL BE "GRANDFATHERED" and must conform to these work standards within a reasonable time period to be determined by the City's Technical Representative. Periodic inspections may be performed to ensure that all installations meet technical standards.

## **8.0 Shelters**

8.1 Cable Dressing Inside Building or Shelter. All wiring and cables within a given rack will be properly dressed and/or bundled with cable ties with excess cut close to the barbs. Twisted wire, tape, rope, twine, phone wire and similar bits of debris usually available on site ARE NOT ACCEPTABLE substitutes for proper securing hardware. All inter-rack cables and wiring must be properly routed and utilize the cable trays provided even if between adjacent racks. Overhead cables and RF lines must be easily removed or reworked within the cable trays. Proper care must be taken to ensure that new cables added to the trays are not stressed or intertwined with existing cables. OVERHEAD CABLES MAY NOT CROSS PERPENDICULARS OR BE SUSPENDED IN MID AIR WITHOUT SUPPORTS. NO SUPPORTS MAY BE INSTALLED WITHOUT PRIOR APPROVAL. All long cable runs must be properly identified at each end indicating the opposite cable end address. All cabling within the building must be cut to proper length except phasing harnesses, where required.

## **9.0 Towers**

9.1 Tenant (Licensee) may not erect new towers without the City's prior written consent, which may be granted or denied in City's sole discretion, and towers that are approved may only be constructed after plans for the tower have been approved by the City and by the zoning authority.

9.2 New towers shall comply with TIA-222-G or the most recent edition adopted by the local zoning authority. Changes to an existing tower, including addition or replacement of antennas requires that TIA-222-G or the most recent edition be used. Tenant (Licensee)-owned towers that present an immediate safety hazard shall be corrected by Tenant (Licensee) regardless of the status of the current lease or the particular edition of TIA-222 in use at the time of tower construction. Installation of antennas on City-owned towers may require a new structural study at the Tenant (Licensee)'s expense.

## **10.0 Permits**

10.1 Tenant (Licensee) shall comply with all local and Federal regulations. Tenant (Licensee) is responsible for acquiring all applicable permits, including, but not limited to FCC construction permits and building permits. Tenant (Licensee) is also responsible for performing any required studies, including RF exposure and RF interference studies required by the FCC, local

government, and City. Tenant (Licensee) shall furnish all applicable permits, studies, and approvals to the City for approval before starting any construction, including antenna installation.

## **11.0 Radio Frequency Safety**

11.1 The engineering, design, configuration, installation, and maintenance of high power (> 1 kW ERP) radio facilities on the site shall be accomplished in a manner that minimizes downward radiation. Changes to proposed systems may be directed by City to comply with this objective.

11.2 Everyone on the site shall follow these guidelines:

- All personnel entering the site must be authorized
- Obey all posted signs
- Assume all antennas are active unless proven otherwise
- Before working on an antenna, notify the owner and disable the transmitter
- Use a radio frequency (RF) personal monitor when working near antennas
- Never operate transmitters without shields

11.3 Power densities on towers can be much higher than at ground level. For this reason, tower climbers should request power reductions from high-power tenants and carry RF personal monitors when climbing towers. The City's Technical Representative can tell you which transmitters should be turned down before climbing the tower.

11.4 Federal Government guidelines regarding human exposure to radio frequency energy are found in the Code of Federal Regulations (CFR) Title 47, Parts 1.1307-1.1310.



Figure 1 - Warning Sign to be Posted at Base of Tower  
(Available from Tessco, Holaday, Narda and other Sources)

# EXHIBIT D-Prohibited Interference

## CO-LOCATION INTERFERENCE ANALYSIS REPORT

**CCD DFD Station 20**

**March 2, 2015**

---

**Prepared By:**

Centerline Solutions  
16360 Table Mountain Parkway  
Golden, Colorado 80403

Engineer: Bruce B. Blais, PE

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## 1.0 Executive Summary

This report presents a radio frequency interference (RFI) analysis which was performed on the Denver Fire Station 20 site. The RFI analysis consists of transmitter noise, receiver desensitization, intermodulation, harmonic and transmitter spurious output interference. The report consists of Sections that provide details of the communications site, antenna systems, operational frequencies and each interference analysis mode.

A summary of the interference analysis results is depicted in the following Table.

Interference Analysis Mode	Type Mix	Status	Summary	Worst-Case Margin (dB)
Transmitter Noise	N/A	Passed	No Interference was predicted	22.9
Receiver Desensitization	N/A	Passed	No Interference was predicted	54.9
Transmitter Intermodulation	1 Tx	Passed	No Interference was predicted	N/A
Transmitter Intermodulation	2 Tx	Passed	No Interference was predicted	N/A
Transmitter Intermodulation	3 Tx	Passed	No Interference was predicted	N/A
Transmitter Intermodulation	4 Tx	Passed	No Interference was predicted	N/A
Transmitter Intermodulation	5 Tx	Passed	No Interference was predicted	N/A
Receiver Intermodulation	1 Tx	Passed	No Interference was predicted	N/A
Receiver Intermodulation	2 Tx	Passed	No Interference was predicted	N/A
Receiver Intermodulation	3 Tx	Passed	No Interference was predicted	N/A
Receiver Intermodulation	4 Tx	Passed	No Interference was predicted	N/A
Receiver Intermodulation	5 Tx	Passed	No Interference was predicted	N/A
Transmitter Harmonics	N/A	Passed	No Interference was predicted	N/A
Transmitter Spurious Output	N/A	Passed	No Interference was predicted	N/A
Interference Level Summing - C/(I+N)	N/A	Passed	No Interference was predicted	N/A
Wideband IM Spectral Analysis	N/A	Potential	1896 Potential IM Hit(s)	46%

The analysis was performed with the setup options depicted in the Table below.

Analysis	Description
Receiver Performance	Receiver sensitivity threshold plus 6/12 dB margin
Receiver Bandwidth	Receiver Dependent
Antenna Patterns Considered	Yes
Measured Antenna Isolation Data	No
Filters/Multicouplers Considered	Yes
Number of Simultaneous Transmitters Mixed	5
Highest Intermodulation Order Tested	5
Condense Intermodulation Hit Quantity	Yes - 1000/Order
TX IM Bandwidth Multiplication	Yes
Tx/Rx Systems Excluded	None
Site File Name	CCD_DFD_FS20.dta
Report File Name	CCD_DFD_FS20.docx
ComSitePro Software Version	8.1.18

## 2.0 Site Description

The communication systems located at this site are described in this section as well as the configuration of the antenna systems.

The site parameters are:

**Site Name:** Denver Fire Station 20  
**Owner:** City & County of Denver  
**Site Description:** T-Mobile Collocation at Fire Station 20  
**Address:** 501 Knox Ct., Denver, CO 80204  
**Latitude:** 39:43:29.2 N  
**Longitude:** 105:01:58.9 W  
**Elevation:** 5338  
**Notes:**

### 2.1 Communications Systems

System	Provider	Technology	Frequency Band
1	Denver Public Safety	800 MHz Trunking	806 - 896 MHz - Land Mobile
2	Denver RMRS	FM Land Mobile	806 - 896 MHz - Land Mobile
3	Denver Data Radio	FM Land Mobile	806 - 896 MHz - Land Mobile
4	Denver Conventional	FM Land Mobile	806 - 896 MHz - Land Mobile
5	Denver Public Utilities	FM Land Mobile	806 - 896 MHz - Land Mobile
6	Denver P25	FM Land Mobile	806 - 896 MHz - Land Mobile
7	DFD Repeater	FM Land Mobile	806 - 896 MHz - Land Mobile
8	Denver VocAlarm	Wireless Data Access	901/930/940 MHz - Narrowband PCS
9	T-Mobile 2100 UMTS	UMTS	2110 - 2200 MHz - AWS
10	T-Mobile GSM-1900	GSM-1900	1710 - 1990 MHz - PCS
12	T-Mobile 2100 LTE	LTE	2110 - 2200 MHz - AWS
13	T-Mobile 700 LTE	LTE	746 - 806 MHz - 700 MHz Band
14	T-Mobile 700 LTE	LTE	746 - 806 MHz - 700 MHz Band
15	T-Mobile UMTS-1900	W-CDMA	1710 - 1990 MHz - PCS

2.2 Antenna Systems

Ant #	Mfg	Antenna Model	Gain (dB d)	Hgt (ft)	Orient (deg)	Sector	Ant Use	Transmission Line Type	Line Loss (/100')	Line Length (ft)
1	Decibel	ASP-954	0	6	0		Tx/Rx	RG-8/U	2	8
2	Decibel	ASP-954	0	6	0		Tx/Rx	RG-8/U	2	8
3	Decibel	ASP-954	0	6	0		Tx/Rx	RG-8/U	2	6
4	Decibel	ASP-954	0	6	0		Tx/Rx	RG-8/U	2	6
5	Decibel	ASP-954	0	6	0		Tx/Rx	RG-8/U	2	6
6	Decibel	ASP-954	0	6	0		Tx/Rx	RG-8/U	2	6
7	Decibel	ASP-954	0	6	0		Tx/Rx	RG-8/U	2	6
8	Sinclair	SRL406 890-960	10	65	20		Dplx	7/8 in. Foam	1.31	95
9	CommScope	SBNH-1D6565A_00DT_2130	14.5	50	340	A	Dplx	1-5/8 in. Foam	1.4	80
10	CommScope	SBNH-1D6565A_00DT_2130	14.5	50	100	B	Dplx	1-5/8 in. Foam	1.4	80
11	CommScope	SBNH-1D6565A_00DT_2130	14.5	50	220	C	Dplx	1-5/8 in. Foam	1.4	80
12	CommScope	SBNH-1D6565A_00DT_1920	14.5	50	340	A	Dplx	1-5/8 in. Foam	1.2	80
13	CommScope	SBNH-1D6565A_00DT_1920	14.5	50	100	B	Dplx	1-5/8 in. Foam	1.2	80
14	CommScope	SBNH-1D6565A_00DT_1920	14.5	50	220	C	Dplx	1-5/8 in. Foam	1.2	80
18	CommScope	SBNH-1D6565A_00DT_2130	18.7	50	340	A	Dplx	1-5/8 in. Foam	1.4	80
19	CommScope	SBNH-1D6565A_00DT_2130	18.7	50	100	B	Dplx	1-5/8 in. Foam	1.4	80
20	CommScope	SBNH-1D6565A_00DT_2130	18.7	50	220	C	Dplx	1-5/8 in. Foam	1.4	80
21	CommScope	SBNH-1D6565A_00DT_0725	11.3	50	340	A	Dplx	1/2 in. Foam	1.7	80
22	CommScope	SBNH-1D6565A_00DT_0725	11.3	50	100	B	Dplx	1/2 in. Foam	1.7	80
23	CommScope	SBNH-1D6565A_00DT_0725	11.3	50	220	C	Dplx	1/2 in. Foam	1.7	80
24	CommScope	SBNH-1D6565A_00DT_0725	11.3	50	220		Dplx	1/2 in. Foam	1.7	80
25	CommScope	SBNH-1D6565A_00DT_1920	14.5	50	340	A	Dplx	1-5/8 in. Foam	1.2	88
26	CommScope	SBNH-1D6565A_00DT_1920	14.5	50	100	B	Dplx	1-5/8 in. Foam	1.2	88
27	CommScope	SBNH-1D6565A_00DT_1920	14.5	50	220	C	Dplx	1-5/8 in. Foam	1.2	88

### 3.0 Transmitter Frequencies

Freq #	Ant #	Provider	Model	Technology	Channel Label	ID	Frequency	Power (Watts)	BW (KHz)
1	1	Denver Public Safety	Other	Other		A	854.987500	8	16
2	1	Denver Public Safety	Other	Other		B	855.487500	8	16
3	1	Denver Public Safety	Other	Other		C	855.987500	8	16
4	1	Denver Public Safety	Other	Other		D	856.487500	8	16
5	1	Denver Public Safety	Other	Other		E	857.237500	8	16
6	1	Denver Public Safety	Other	Other		F	857.737500	8	16
7	1	Denver Public Safety	Other	Other		G	858.487500	8	16
8	1	Denver Public Safety	Other	Other		H	859.237500	8	16
9	1	Denver Public Safety	Other	Other		I	859.737500	8	16
10	1	Denver Public Safety	Other	Other		J	854.437500	8	16
11	1	Denver Public Safety	Other	Other		K	855.237500	8	16
12	1	Denver Public Safety	Other	Other		L	855.737500	8	16
13	1	Denver Public Safety	Other	Other		M	856.237500	8	16
14	1	Denver Public Safety	Other	Other		N	856.737500	8	16
15	1	Denver Public Safety	Other	Other		O	857.487500	8	16
16	1	Denver Public Safety	Other	Other		P	858.237500	8	16
17	1	Denver Public Safety	Other	Other		Q	858.737500	8	16
18	1	Denver Public Safety	Other	Other		R	859.487500	8	16
19	1	Denver Public Safety	Other	Other		S	854.062500	8	16
20	1	Denver Public Safety	Other	Other		T	854.562500	8	16
21	2	Denver RMRS	Other	Other		AO	858.087500	8	16
22	2	Denver RMRS	Other	Other		AP	858.337500	8	16
23	2	Denver RMRS	Other	Other		AQ	859.087500	8	16
24	2	Denver RMRS	Other	Other		AR	859.637500	8	16
25	3	Denver Data Radio	Other	Other		AS	855.912500	8	16
26	3	Denver Data Radio	Other	Other		AT	856.787500	8	16
27	3	Denver Data Radio	Other	Other		AU	855.687500	8	16
28	3	Denver Data Radio	Other	Other		AV	851.187500	8	16
29	3	Denver Data Radio	Other	Other		AW	851.887500	8	16
30	3	Denver Data Radio	Other	Other		AX	854.237500	8	16
31	4	Denver Conventional	Other	Other		AY	851.012500	8	16
32	4	Denver Conventional	Other	Other		AZ	851.512500	8	16
33	4	Denver Conventional	Other	Other		BA	852.012500	8	16
34	4	Denver Conventional	Other	Other		BB	852.512500	8	16
35	4	Denver Conventional	Other	Other		BC	853.012500	8	16
36	4	Denver Conventional	Other	Other		BD	853.787500	8	16
37	5	Denver Public Utilities	Other	Other		BE	858.462500	8	16
38	5	Denver Public Utilities	Other	Other		BF	859.212500	8	16
39	5	Denver Public Utilities	Other	Other		BG	859.462500	8	16
40	5	Denver Public Utilities	Other	Other		BH	856.637500	8	16
41	5	Denver Public Utilities	Other	Other		BI	856.137500	8	16
42	5	Denver Public Utilities	Other	Other		BJ	855.462500	8	16
43	5	Denver Public Utilities	Other	Other		BK	856.212500	8	16
44	5	Denver Public Utilities	Other	Other		BL	856.712500	8	16
45	5	Denver Public Utilities	Other	Other		BM	857.462500	8	16
46	5	Denver Public Utilities	Other	Other		BN	858.212500	8	16
47	5	Denver Public Utilities	Other	Other		BO	859.712500	8	16
48	5	Denver Public Utilities	Other	Other		BP	859.262500	8	16
49	5	Denver Public Utilities	Other	Other		BQ	859.712500	8	16
50	5	Denver Public Utilities	Other	Other		BR	854.587500	8	16
51	5	Denver Public Utilities	Other	Other		BS	857.137500	8	16
52	6	Denver P25	Other	Other		BT	851.562500	8	16
53	6	Denver P25	Other	Other		BU	852.375000	8	16
54	6	Denver P25	Other	Other		BV	852.775000	8	16
55	6	Denver P25	Other	Other		BW	853.150000	8	16
56	6	Denver P25	Other	Other		BX	853.275000	8	16
57	6	Denver P25	Other	Other		BY	853.425000	8	16

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58	6	Denver P25	Other	Other		BZ	853.725000	8	16
59	6	Denver P25	Other	Other		CA	853.862500	8	16
60	6	Denver P25	Other	Other		CB	857.062500	8	16
61	6	Denver P25	Other	Other		CC	858.137500	8	16
62	6	Denver P25	Other	Other		CD	859.612500	8	16
63	6	Denver P25	Other	Other		CE	852.125000	8	16
64	7	DFD Repeater	Other	Other		CF	853.087500	8	16
65	7	DFD Repeater	Other	Other		CG	852.862500	8	16
66	7	DFD Repeater	Other	Other		CH	853.325000	8	16
67	8	Denver VocAlarm	Generic	Wireless Data Access		CI	928.756250	3	25
68	8	Denver VocAlarm	Generic	Wireless Data Access		CJ	928.837500	3	25
69	9	T-Mobile 2100 UMTS	Ericsson	W-CDMA	2350	CK	2150.000000	40	5000
70	10	T-Mobile 2100 UMTS	Ericsson	W-CDMA	2350	CL	2150.000000	40	5000
71	11	T-Mobile 2100 UMTS	Ericsson	W-CDMA	2350	CM	2150.000000	40	5000
72	12	T-Mobile GSM-1900	Other	GSM-1900	Chan 656	CQ	1959.000000	30	200
73	12	T-Mobile GSM-1900	Other	GSM-1900	Chan 656	CR	1959.000000	30	200
74	12	T-Mobile GSM-1900	Other	GSM-1900	Chan 656	CS	1959.000000	30	200
75	13	T-Mobile GSM-1900	Other	GSM-1900	Chan 663	CT	1960.400000	30	200
76	13	T-Mobile GSM-1900	Other	GSM-1900	Chan 663	CU	1960.400000	30	200
77	13	T-Mobile GSM-1900	Other	GSM-1900	Chan 663	CV	1960.400000	30	200
78	14	T-Mobile GSM-1900	Other	GSM-1900	Chan 680	CW	1963.800000	30	200
79	14	T-Mobile GSM-1900	Other	GSM-1900	Chan 680	CX	1963.800000	30	200
80	14	T-Mobile GSM-1900	Other	GSM-1900	Chan 680	CY	1963.800000	30	200
81	18	T-Mobile 2100 LTE	Ericsson	W-CDMA	Chan 2001	DF	2115.100000	40	10000
82	19	T-Mobile 2100 LTE	Ericsson	W-CDMA	Chan 2001	DG	2115.100000	40	10000
83	20	T-Mobile 2100 LTE	Ericsson	W-CDMA	Chan 2001	DH	2115.100000	40	10000
84	21	T-Mobile 700 LTE	Generic	FM Land Mobile	Chan 5035	DI	731.500000	20	10000
85	22	T-Mobile 700 LTE	Generic	FM Land Mobile	Chan 5035	DJ	731.500000	20	10000
86	24	T-Mobile 700 LTE	Generic	FM Land Mobile	Chan 5035	DK	731.500000	20	10000
87	25	T-Mobile UMTS-1900	Other	GSM-1900	636	DL	1955.000000	40	3850
88	26	T-Mobile UMTS-1900	Other	GSM-1900	512	DM	1952.500000	40	3850
89	27	T-Mobile UMTS-1900	Other	GSM-1900	512	DN	1952.500000	20	200

### 4.0 Receiver Frequencies

Freq #	Ant #	Provider	Model	Technology	Channel Label	ID	Frequency	Sen (dBm )	BW (KHz)
1	1	Denver Public Safety	Other	Other		A	809.987500	-120	25
2	1	Denver Public Safety	Other	Other		B	810.487500	-120	25
3	1	Denver Public Safety	Other	Other		C	810.987500	-120	25
4	1	Denver Public Safety	Other	Other		D	811.487500	-120	25
5	1	Denver Public Safety	Other	Other		E	812.237500	-120	25
6	1	Denver Public Safety	Other	Other		F	812.737500	-120	25
7	1	Denver Public Safety	Other	Other		G	813.487500	-120	25
8	1	Denver Public Safety	Other	Other		H	814.237500	-120	25
9	1	Denver Public Safety	Other	Other		I	814.737500	-120	25
10	1	Denver Public Safety	Other	Other		J	809.437500	-120	25
11	1	Denver Public Safety	Other	Other		K	810.237500	-120	25
12	1	Denver Public Safety	Other	Other		L	810.737500	-120	25
13	1	Denver Public Safety	Other	Other		M	811.237500	-120	25
14	1	Denver Public Safety	Other	Other		N	811.737500	-120	25
15	1	Denver Public Safety	Other	Other		O	812.487500	-120	25
16	1	Denver Public Safety	Other	Other		P	813.237500	-120	25
17	1	Denver Public Safety	Other	Other		Q	813.737500	-120	25
18	1	Denver Public Safety	Other	Other		R	814.487500	-120	25
19	1	Denver Public Safety	Other	Other		S	809.062500	-120	25
20	1	Denver Public Safety	Other	Other		T	809.562500	-120	25
21	2	Denver RMRS	Other	Other		AO	813.087500	-120	25
22	2	Denver RMRS	Other	Other		AP	813.337500	-120	25
23	2	Denver RMRS	Other	Other		AQ	814.087500	-120	25
24	2	Denver RMRS	Other	Other		AR	814.637500	-120	25
25	3	Denver Data Radio	Other	Other		AS	810.912500	-120	25
26	3	Denver Data Radio	Other	Other		AT	811.787500	-120	25
27	3	Denver Data Radio	Other	Other		AU	810.687500	-120	25
28	3	Denver Data Radio	Other	Other		AV	806.187500	-120	25
29	3	Denver Data Radio	Other	Other		AW	806.887500	-120	25
30	3	Denver Data Radio	Other	Other		AX	809.237500	-120	25
31	4	Denver Conventional	Other	Other		AY	806.012500	-116	25
32	4	Denver Conventional	Other	Other		AZ	806.512500	-116	25
33	4	Denver Conventional	Other	Other		BA	807.012500	-116	25
34	4	Denver Conventional	Other	Other		BB	807.512500	-116	25
35	4	Denver Conventional	Other	Other		BC	808.012500	-116	25
36	4	Denver Conventional	Other	Other		BD	808.787500	-116	25
37	5	Denver Public Utilities	Other	Other		BE	813.462500	-120	25
38	5	Denver Public Utilities	Other	Other		BF	814.212500	-120	25
39	5	Denver Public Utilities	Other	Other		BG	814.462500	-120	25
40	5	Denver Public Utilities	Other	Other		BH	811.637500	-120	25
41	5	Denver Public Utilities	Other	Other		BI	811.137500	-120	25
42	5	Denver Public Utilities	Other	Other		BJ	810.462500	-120	25
43	5	Denver Public Utilities	Other	Other		BK	811.212500	-120	25
44	5	Denver Public Utilities	Other	Other		BL	811.712500	-120	25
45	5	Denver Public Utilities	Other	Other		BM	812.462500	-120	25
46	5	Denver Public Utilities	Other	Other		BN	813.212500	-120	25
47	5	Denver Public Utilities	Other	Other		BO	813.717500	-120	25
48	5	Denver Public Utilities	Other	Other		BP	814.262500	-120	25
49	5	Denver Public Utilities	Other	Other		BQ	814.712500	-120	25
50	5	Denver Public Utilities	Other	Other		BR	809.587500	-120	25
51	5	Denver Public Utilities	Other	Other		BS	812.137500	-120	25
52	6	Denver P25	Other	Other		BT	806.562500	-120	25
53	6	Denver P25	Other	Other		BU	807.375000	-120	25
54	6	Denver P25	Other	Other		BV	807.775000	-120	25
55	6	Denver P25	Other	Other		BW	808.150000	-120	25
56	6	Denver P25	Other	Other		BX	808.275000	-120	25
57	6	Denver P25	Other	Other		BY	808.425000	-120	25
58	6	Denver P25	Other	Other		BZ	808.725000	-120	25
59	6	Denver P25	Other	Other		CA	808.862500	-120	25

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60	6	Denver P25	Other	Other		CB	812.062500	-120	25
61	6	Denver P25	Other	Other		CC	813.137500	-120	25
62	6	Denver P25	Other	Other		CD	814.612500	-120	25
63	6	Denver P25	Other	Other		CE	807.125000	-120	25
64	7	DFD Repeater	Other	Other		CF	808.087500	-120	25
65	7	DFD Repeater	Other	Other		CG	807.862500	-120	25
66	7	DFD Repeater	Other	Other		CH	808.325000	-120	25
67	8	Denver VocAlarm	Generic	Wireless Data Access		CI	952.756250	-100	25
68	8	Denver VocAlarm	Generic	Wireless Data Access		CJ	952.837500	-100	25
69	9	T-Mobile 2100 UMTS	Ericsson	W-CDMA	2350	CK	1750.000000	-110	5000
70	10	T-Mobile 2100 UMTS	Ericsson	W-CDMA	2350	CL	1750.000000	-110	5000
71	11	T-Mobile 2100 UMTS	Ericsson	W-CDMA	2350	CM	1750.000000	-110	5000
72	12	T-Mobile GSM-1900	Other	GSM-1900	Chan 656	CQ	1879.000000	-110	200
73	12	T-Mobile GSM-1900	Other	GSM-1900	Chan 656	CR	1879.000000	-110	200
74	12	T-Mobile GSM-1900	Other	GSM-1900	Chan 656	CS	1879.000000	-110	200
75	13	T-Mobile GSM-1900	Other	GSM-1900	Chan 663	CT	1888.400000	-110	200
76	13	T-Mobile GSM-1900	Other	GSM-1900	Chan 660	CU	1880.400000	-110	200
77	13	T-Mobile GSM-1900	Other	GSM-1900	Chan 663	CV	1880.400000	-110	200
78	14	T-Mobile GSM-1900	Other	GSM-1900	Chan 680	CW	1883.800000	-110	200
79	14	T-Mobile GSM-1900	Other	GSM-1900	Chan 668	CX	1883.800000	-110	200
80	14	T-Mobile GSM-1900	Other	GSM-1900	Chan 680	CY	1883.800000	-110	200
81	18	T-Mobile 2100 LTE	Ericsson	W-CDMA	Chan 2001	DF	1715.100000	-110	10000
82	19	T-Mobile 2100 LTE	Ericsson	W-CDMA	Chan 2001	DG	1715.100000	-110	10000
83	20	T-Mobile 2100 LTE	Ericsson	W-CDMA	Chan 2001	DH	1715.100000	-110	10000
84	21	T-Mobile 700 LTE	Generic	FM Land Mobile	Chan 5035	DI	701.500000	-116	10000
85	22	T-Mobile 700 LTE	Generic	FM Land Mobile	Chan 5035	DJ	701.500000	-116	10000
86	24	T-Mobile 700 LTE	Generic	FM Land Mobile	Chan 5035	DK	701.500000	-116	10000
87	25	T-Mobile UMTS-1900	Other	GSM-1900	636	DL	1872.500000	-110	3850
88	26	T-Mobile UMTS-1900	Other	GSM-1900	9784	DM	1876.800000	-110	3850
89	27	T-Mobile UMTS-1900	Other	GSM-1900	512	DN	1872.500000	-110	3840

## 5.0 Transmitter Noise Analysis

Transmitter noise interference occurs because a transmitter radiates energy on its operating frequency as well as frequencies above and below the assigned frequency. The energy that is radiated above and below the assigned frequency is known as sideband noise energy and extends for several megahertz on either side of the operating frequency. This undesired noise energy can fall within the passband of a nearby receiver even if the receiver's operating frequency is several megahertz away. The transmitter noise appears as "on-channel" noise interference and cannot be filtered out at the receiver. It is on the receiver's operating frequency and competes with the desired signal, which in effect, degrades the operational performance.

The analysis predicts each transmitter's noise signal level present at the input of each receiver. It takes into account the transmitter's noise characteristics, frequency separation, power output, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in both systems. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required, if any, to prevent receiver performance degradation caused by transmitter noise interference. The Table below depicts the results of this analysis. For each receiver, the transmitter that has the worst-case impact is displayed. The Signal Margin represents the margin in dB, before the receiver's performance is degraded. A negative number indicates that the performance is degraded and the value indicates how much additional isolation is required to prevent receiver performance degradation.

Receiver Provider	Receive Channel	Receive Frequency (MHz)	Transmitter Provider	Transmit Channel	Transmit Frequency (MHz)	Attn Required (dB)	Attn Provided (dB)	Signal Margin (dB)
None								

No transmitter noise interference problems were predicted.

## 6.0 Receiver Desensitization Analysis

Receiver desensitization interference occurs when an undesired signal from a nearby "off-frequency" transmitter is sufficiently close to a receiver's operating frequency. The signal may get through the RF selectivity of the receiver. If this undesired signal is of sufficient amplitude, the receiver's critical voltage and current levels are altered and the performance of the receiver is degraded at its operating frequency. The gain of the receiver is reduced, thereby reducing the performance of the receiver.

A transmitter can be operating several megahertz away from the receiver frequency and/or its antenna can be located several thousand feet from the receiver's antenna and still cause interference.

The analysis predicts each transmitter's signal level present at the input of each receiver. It takes into account the transmitter's power output, frequency separation, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in both systems. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required, if any, to prevent receiver performance degradation caused by receiver desensitization interference. The Table below depicts the results of this analysis. For each receiver, the transmitter that has the worst-case impact is displayed. The Signal Margin represents the margin in dB, before the receiver's performance is degraded. A negative number indicates that the performance is degraded and the value indicates how much additional isolation is required to prevent receiver performance degradation.

Receiver Provider	Receive Channel	Receive Frequency (MHz)	Transmitter Provider	Transmit Channel	Transmit Frequency (MHz)	Attn Required (dB)	Attn Provided (dB)	Signal Margin (dB)
None								

No receiver desensitization interference problems were predicted.

## 7.0 Intermodulation Interference Analysis

There are three basic categories of Intermodulation (IM) interference. They are receiver produced, transmitter produced, and "other" radiated IM. Transmitter produced IM is the result of one or more transmitters impressing a signal in the non-linear final output stage circuitry of another transmitter, usually via antenna coupling. The IM product frequency is then re-radiated from the transmitter's antenna. Receiver produced IM is the result of two or more transmitter signals mixing in a receiver RF amplifier or mixer stage when operating in a non-linear range.

"Other" radiated IM is the result of transmitter signals mixing in other non-linear junctions. These junctions are usually metallic, such as rusty bolts on a tower, dissimilar metallic junctions, or other non-linear metallic junctions in the area. IM products can also be caused by non-linearity in the transmission system such as antenna, transmission line, or connectors.

Communication sites with co-located transmitters, usually have RF coupling between each transmitter and antenna system. This results in the signals of each transmitter entering the nonlinear final output (PA) circuitry of the other transmitters. When intermodulation (IM) products are created in the output circuitry and they fall within the passband of the final amplifier, the IM products are re-radiated and may interfere with receivers at the same site or at other nearby sites. Additionally, these strong transmitter signals may directly enter a receiver and drive the RF amplifier into a nonlinear operation, or if not filtered effectively by the receiver input circuitry, these signals could mix in the nonlinear circuitry of the receiver front-end or mixer, creating IM products directly in the receiver.

The frequencies of IM products are derived from mathematical formulae. IM products are classified by their "order" (2nd, 3rd, 4th, ...Nth). Some of the more common forms of mixing are illustrated in the following examples. Note that The "A", "B", and "C" designations are the mixing frequencies. The numerical number assigned to the letter designation indicates the harmonic relationship of the frequency. Thus, 2A means the 2nd harmonic of frequency A.

<u>Order</u>	<u>Mixing Formulae</u>
First	A=B, A=C, etc.
Second	A ± B, A ± C, etc.
Third	A + B - C, A ± 2B, 2A ± B, etc.
Fourth	A ± 3B, 2A ± 2B, 3A ± B, etc.
Fifth	A ± 4B, 2A ± 3B, 3A ± 2B, 4A ± B, etc.
Sixth	A ± 3B ± 2C, 2A ± 2B ± 2C, 3A ± 2B ± C, etc.
Seventh	A ± 6B, 2A ± 5B, 3A ± 4B, 4A ± 3B, 5A ± 2B, etc.
Eighth	A ± 7B, 2A ± 6B, 3A ± 5B, 4A ± 4B, 5A ± 3B, 6A ± 2B, etc.
Ninth	A ± 8B, 2A ± 7B, 3A ± 6B, 4A ± 5B, 5A ± 4B, 6A ± 3B, etc.

The above IM product formulae are just a few of the many possible combinations. When there are four frequencies involved at one time, the mixing possibilities increase tremendously. Not all of the mixing possibilities are significant in creating interference signals. Some fall "out-of-band" of the receiver and the higher order IM products are usually weaker in signal strength.

### 7.1 Transmitter Generated Intermodulation Analysis

Intermodulation in transmitters occurs when a signal from another transmitter is impressed on the nonlinear final output stage circuitry, usually via antenna coupling. The power level of the IM product is determined by the power level of the incoming extraneous signal from another transmitter and by a conversion loss factor. The conversion loss factor takes into account the mixing efficiency of the transmitter's final output stage. Conversion loss differs with transmitter design, adjustment, frequency separation of the source signals, and with the order of the IM product.

The analysis calculates all possible IM product frequencies that could potentially interfere with receivers at the communications site based on each receiver's individual bandwidth. It then predicts each IM signal level present at the input of each affected receiver. For each IM frequency, the analysis considers all possible sources of IM generation in the transmitters. For example, if there are four transmitters involve, the analysis will calculate the IM signal level that would be generated in each transmitter. For this example, that would be four possible mixing conditions.

The analysis takes into account the transmitter's power output, modulation bandwidth, conversion losses, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in each system. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required to prevent receiver performance degradation for each IM interference signal that occurs. Receivers experiencing transmitter generated intermodulation interference are depicted in the following Table.

Tx 1 Source Mix Tx		Tx 2 Source		TX 3 Source		Tx 4 Source		Tx 5 Source		Intermod Hit		Affected Receiver		Attn Need
ID	Freq (MHz)	ID	Freq (MHz)	ID	Freq (MHz)	ID	Freq (MHz)	ID	Freq (MHz)	Freq (MHz)	Ord	ID	Freq (MHz)	
None														

No transmitter generated intermodulation interference problems were predicted.

## 7.2 Receiver Generated Intermodulation Analysis

Within a receiver, when two or more strong off-channel signals enter and mix in the receiver and one of the IM product frequencies created coincides with the receiver operating frequency, potential interference results. This internal IM mixing process takes place in the receiver's RF amplifier when it operates in a nonlinear range and/or in the first mixer, which, of course, has been designed to operate as a nonlinear device.

Receivers have a similar conversion loss type factor and receiver performance is commonly described in terms of conversion loss with respect to the 2A - B type products. Here, conversion loss is the ratio of a specified level of A and B to the level of the resulting IM product, when the product is viewed as an equivalent on-channel signal. Receiver conversion loss varies with input levels, AGC action, and product order.

The analysis calculates all possible IM product frequencies that could potentially interfere with receivers at the communications site based on each receiver's individual bandwidth. It then predicts each IM signal level present at the input of each affected receiver. For each IM frequency, the analysis considers that the IM signal is generated directly in the receiver.

The analysis takes into account the transmitter's power output, modulation bandwidth, conversion losses, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in each system. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required to prevent receiver performance degradation for each IM interference signal that occurs. Receivers experiencing receiver generated intermodulation interference are depicted in the following Table.

Tx 1 Source		Tx 2 Source		TX 3 Source		Tx 4 Source		Tx 5 Source		Intermod Hit		Affected Receiver		Attn Need
ID	Freq (MHz)	Freq (MHz)	Ord	ID	Freq (MHz)									
None														

No receiver generated intermodulation interference problems were predicted.

## 8.0 Transmitter Harmonic Output Interference Analysis

Transmitter harmonic interference is due to non-linear characteristics in a transmitter. The harmonics are typically created due to frequency multipliers and the non-linear design of the final output stage of the transmitter. If the harmonic signal falls within the passband of a nearby receiver and the signal level is of sufficient amplitude, it can degrade the performance of the receiver.

The analysis takes into account the transmitter’s harmonic characteristics, output level, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in each system. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required to prevent receiver performance degradation for any harmonics that fall within a receiver’s passband. Receivers experiencing transmitter harmonic interference are depicted in the following Table.

Transmitter		Harmonic		Affected Receiver		Attn Needed
ID	Frequency (MHz)	Frequency (MHz)	Order	ID	Frequency (MHz)	
None						

No transmitter generated harmonic interference problems were predicted.

### 9.0 Transmitter Spurious Output Interference Analysis

Transmitter spurious output interference can be attributed to many different factors in a transmitter. The generation of spurious frequencies could be due to non-linear characteristics in a transmitter or possibly the physical placement of components and unwanted coupling. If a spurious signal falls within the passband of a nearby receiver and the signal level is of sufficient amplitude, it can degrade the performance of the receiver.

The analysis takes into account a transmitter’s spurious output specification, output levels, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in each system. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required to prevent receiver performance degradation for any transmitter spurious signals that fall within a receiver’s passband. Receivers experiencing transmitter spurious output interference are depicted in the following Table.

Transmitter		Affected Receiver		Attn Needed
ID	Frequency (MHz)	ID	Frequency (MHz)	
None				

No transmitter generated spurious interference problems were predicted.

## 10.0 Interference Power Level Summing Analysis

This section of the report provides a summary of all interference power levels associated with each individual receiver at the site. This includes the sum of IM, transmitter wideband noise and receiver desensitization power levels. The carrier-to-noise (C/I + N) ratio for each receiver is based on the aggregate of interference power levels.

A negative (C/I + N) ratio indicates that the performance of the receiver is degraded and the value indicates how much additional isolation is required to prevent receiver performance degradation.

Even though the individual interference modes described above are not reported in other report sections, this analysis represents a worst-case interference scenario in which all transmitters at the site are simultaneously activated. However, the probability of this interference occurrence could be low since it depends on the utilization of the transmitters involved in the interference generation.

The following Table presents this data.

Receiver		Interference Power Level (dBw)				
Channel Label	Freq (MHz)	Tx Noise	Rx Desense	IM Power	Aggregate	C / (I+N)
None						

## 11.0 Wideband Spectral Intermodulation Interference Analysis

Considering the spectral components of a wideband carrier, a methodology is utilized to slice the wideband transmitter frequency into narrow band sub-channels. For example, a transmitter operating on 1931.2500 MHz with a bandwidth of 1.25 MHz could be subdivided into fifty (50) 25 KHz channels.

Based on the assumptions of ideal transmitter and receiver cutoff frequencies, it is possible that slicing a wideband carrier in the frequency domain into equally spaced sub-channels, produces IM hits within the pass-band of a narrowband receiver where a conventional IM analysis does not. This slicing method is prone to produce many additional IM hits especially, when IM bandwidth multiplication is enabled during the analysis.

During the IM analysis, transmitter frequencies are automatically sliced with a bandwidth greater than the user specified minimum bandwidth. IM “Hits” produced with this methodology are not utilized for IM signal level analysis. However, the center operating frequency of each wideband transmitter will remain at the full bandwidth of the channel and is included in the IM signal analysis.

This analysis was performed with carrier slicing activation for carrier channels with a bandwidth greater than 30 KHz and a slice quantity of 50 slices per carrier. A summary of the results is depicted in the Table below. Note that any 1st Order IM Hits are due to direct harmonic relationships.

Channel Label	Receiver		Quantity of IM Hits/Order					
	Freq (MHz)	BW (KHz)	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	Total
	809.987500	25	0	0	0	0	0	0
	810.487500	25	0	0	0	0	0	0
	810.987500	25	0	0	0	0	0	0
	811.487500	25	0	0	0	0	0	0
	812.237500	25	0	0	0	0	0	0
	812.737500	25	0	0	0	0	0	0
	813.487500	25	0	0	0	0	0	0
	814.237500	25	0	0	0	0	0	0
	814.737500	25	0	0	0	0	0	0
	809.437500	25	0	0	0	0	0	0
	810.237500	25	0	0	0	0	0	0
	810.737500	25	0	0	0	0	0	0
	811.237500	25	0	0	0	0	0	0
	811.737500	25	0	0	0	0	0	0
	812.487500	25	0	0	0	0	0	0
	813.237500	25	0	0	0	0	0	0
	813.737500	25	0	0	0	0	0	0
	814.487500	25	0	0	0	0	0	0
	809.062500	25	0	0	0	0	0	0
	809.562500	25	0	0	0	0	0	0
	813.087500	25	0	0	0	0	0	0
	813.337500	25	0	0	0	0	0	0
	814.087500	25	0	0	0	0	0	0
	814.637500	25	0	0	0	0	0	0

	810.912500	25	0	0	0	0	0	0
	811.787500	25	0	0	0	0	0	0
	810.687500	25	0	0	0	0	0	0
	806.187500	25	0	0	0	0	0	0
	806.887500	25	0	0	0	0	0	0
	809.237500	25	0	0	0	0	0	0
	806.012500	25	0	0	0	0	0	0
	806.512500	25	0	0	0	0	0	0
	807.012500	25	0	0	0	0	0	0
	807.512500	25	0	0	0	0	0	0
	808.012500	25	0	0	0	0	0	0
	808.787500	25	0	0	0	0	0	0
	813.462500	25	0	0	0	0	0	0
	814.212500	25	0	0	0	0	0	0
	814.462500	25	0	0	0	0	0	0
	811.637500	25	0	0	0	0	0	0
	811.137500	25	0	0	0	0	0	0
	810.462500	25	0	0	0	0	0	0
	811.212500	25	0	0	0	0	0	0
	811.712500	25	0	0	0	0	0	0
	812.462500	25	0	0	0	0	0	0
	813.212500	25	0	0	0	0	0	0
	813.717500	25	0	0	0	0	0	0
	814.262500	25	0	0	0	0	0	0
	814.712500	25	0	0	0	0	0	0
	809.587500	25	0	0	0	0	0	0
	812.137500	25	0	0	0	0	0	0
	806.562500	25	0	0	0	0	0	0
	807.375000	25	0	0	0	0	0	0
	807.775000	25	0	0	0	0	0	0
	808.150000	25	0	0	0	0	0	0
	808.275000	25	0	0	0	0	0	0
	808.425000	25	0	0	0	0	0	0
	808.725000	25	0	0	0	0	0	0
	808.862500	25	0	0	0	0	0	0
	812.062500	25	0	0	0	0	0	0
	813.137500	25	0	0	0	0	0	0
	814.612500	25	0	0	0	0	0	0
	807.125000	25	0	0	0	0	0	0
	808.087500	25	0	0	0	0	0	0
	807.862500	25	0	0	0	0	0	0
	808.325000	25	0	0	0	0	0	0
	952.756250	25	0	0	0	0	0	0
	952.837500	25	0	0	0	0	0	0
2350	1750.000000	5000	143	175	0	0	0	318
2350	1750.000000	5000	143	175	0	0	0	318
2350	1750.000000	5000	143	175	0	0	0	318
Chan 656	1879.000000	200	0	0	0	0	0	0
Chan 656	1879.000000	200	0	0	0	0	0	0

Chan 656	1879.000000	200	0	0	0	0	0	0
Chan 663	1888.400000	200	0	0	0	0	0	0
Chan 660	1880.400000	200	0	0	0	0	0	0
Chan 663	1880.400000	200	0	0	0	0	0	0
Chan 680	1883.800000	200	0	0	0	0	0	0
Chan 668	1883.800000	200	0	0	0	0	0	0
Chan 680	1883.800000	200	0	0	0	0	0	0
Chan 2001	1715.100000	10000	0	304	0	0	0	304
Chan 2001	1715.100000	10000	0	304	0	0	0	304
Chan 2001	1715.100000	10000	0	304	0	0	0	304
Chan 5035	701.500000	10000	108	105	0	0	0	213
Chan 5035	701.500000	10000	108	105	0	0	0	213
Chan 5035	701.500000	10000	108	105	0	0	0	213
636	1872.500000	3850	0	0	0	0	0	0
9784	1876.800000	3850	0	0	0	0	0	0
512	1872.500000	3840	0	0	0	0	0	0

# EXHIBIT E



# CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

5/1/2021

4/27/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

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	<b>INSURER(S) AFFORDING COVERAGE</b>		<b>NAIC #</b>
<b>INSURED</b> 1358772 T-Mobile US, Inc. Its Subsidiaries and Affiliates 12920 SE 38th Street Bellevue WA 98006	<b>INSURER A:</b> XL Insurance America, Inc.		24554
	<b>INSURER B:</b> Greenwich Insurance Company		22322
	<b>INSURER C:</b> National Union Fire Ins Co Pitts. PA		19445
	<b>INSURER D:</b>		
	<b>INSURER E:</b>		
<b>INSURER F:</b>			

**COVERAGES** TMOBI **CERTIFICATE NUMBER:** 15614325 **REVISION NUMBER:** XXXXXXXX

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INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
B	<input checked="" type="checkbox"/> <b>COMMERCIAL GENERAL LIABILITY</b> <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR  GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input checked="" type="checkbox"/> LOC <input type="checkbox"/> OTHER:	Y	Y	RGD5000259-09	5/1/2020	5/1/2021	EACH OCCURRENCE \$ 1,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 1,000,000 MED EXP (Any one person) \$ 25,000 PERSONAL & ADV INJURY \$ 1,000,000 GENERAL AGGREGATE \$ 2,000,000 PRODUCTS - COMP/OP AGG \$ 2,000,000 \$
B	<input checked="" type="checkbox"/> <b>AUTOMOBILE LIABILITY</b> <input checked="" type="checkbox"/> ANY AUTO <input type="checkbox"/> OWNED AUTOS ONLY <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> HIRED AUTOS ONLY <input type="checkbox"/> NON-OWNED AUTOS ONLY	Y	Y	RAD5000257-09	5/1/2020	5/1/2021	COMBINED SINGLE LIMIT (Ea accident) \$ 2,000,000 BODILY INJURY (Per person) \$ XXXXXXXX BODILY INJURY (Per accident) \$ XXXXXXXX PROPERTY DAMAGE (Per accident) \$ XXXXXXXX \$ XXXXXXXX
C C C	<input checked="" type="checkbox"/> <b>UMBRELLA LIAB</b> <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> <b>EXCESS LIAB</b> <input type="checkbox"/> CLAIMS-MADE <input type="checkbox"/> DED <input checked="" type="checkbox"/> RETENTION \$ 25,000	Y	N	51569656 SIR applies per policy terms & conditions	5/1/2020	5/1/2021	EACH OCCURRENCE \$ 5,000,000 AGGREGATE \$ 5,000,000 \$ XXXXXXXX
A A	<b>WORKERS COMPENSATION AND EMPLOYERS' LIABILITY</b> ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N N	N/A	RWD5000301-08 AOS RWR5000302-08 WI	5/1/2020 5/1/2020	5/1/2021 5/1/2021	<input checked="" type="checkbox"/> PER STATUTE <input type="checkbox"/> OTH-ER E.L. EACH ACCIDENT \$ 1,000,000 E.L. DISEASE - EA EMPLOYEE \$ 1,000,000 E.L. DISEASE - POLICY LIMIT \$ 1,000,000

**DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)**

The Certificate Holder and other entities defined by written contract, statute, permit application or written agreement are additional insureds on a primary and non-contributory basis under general liability and are additional insured under automobile liability as required by written contract. Waiver of Subrogation applies under general liability and automobile liability as required by written contract. \*\*See Attached Endorsements\*\* DN03108E - 501 Knox Court, Denver, CO 80204  
 DN03433C - 4306 S. Wolff Street, Denver, CO 80236 DN03753A - 700 14th Street, Denver, CO 80202 DN03634A - 4800 Himalaya Way, Denver, CO 80249

**CERTIFICATE HOLDER****CANCELLATION** See Attachments

15614325

City and County of Denver, its Elected and Appointed Officials, Employees and Volunteers  
 700 14th Street  
 Denver CO 80202

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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City and County of Denver, its Elected and Appointed Officials,  
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700 14th Street  
Denver CO 80202

To whom it may concern:

In our continuing effort to provide timely certificate delivery, Lockton Companies is transitioning to paperless delivery of Certificates of Insurance.

To ensure electronic delivery for future renewals of this certificate, we need your email address. Please contact us via one of the methods below, referencing Certificate ID 15614325.

- Email: [STL-edelivery@lockton.com](mailto:STL-edelivery@lockton.com)
- Phone: (866) 728-5657 (toll-free)

If you received this certificate through an internet link where the current certificate is viewable, we have your email and no further action is needed.

In the event your mailing address has changed, will change in the future, or you no longer require this certificate, please let us know using one of the methods above.

***The above inbox is for providing e-Delivery email addresses for next year's renewal certificates ONLY.*** Your information will be input within 90 days.

Thank you for your cooperation and willingness in reducing our environmental footprint.

Lockton Companies

**ENDORSEMENT # 021**

This endorsement, effective 12:01 a.m., 5/1/2020, forms a part of  
Policy No.RGD5000259-09 issued to T-Mobile US, Inc.  
by Greenwich Insurance Company

**THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.  
WASHINGTON - CANCELLATION NOTIFICATION**

**TO OTHERS ENDORSEMENT**

In the event coverage is cancelled for any statutorily permitted reason, other than nonpayment of premium, advanced written notice will be mailed or delivered to person(s) or entity(ies) according to the notification schedule shown below:

Name of Person(s) or Entity(ies)	Mailing Address:	Number of Days Advanced Notice of Cancellation
Per the most current schedule of Certificate Holders maintained by Lockton Companies and furnished to AXA XL Insurance on a monthly basis		30

In the event of cancellation for nonpayment of premium, ten (10) days notice will be given.

All other terms and conditions of the Policy remain unchanged.

**ENDORSEMENT # 004**

This endorsement, effective 12:01 a.m., 5/1/2020 forms a part of  
Policy No. RAD5000257-09 issued to T-MOBILE US, INC.  
by Greenwich Insurance Company

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.  
**WASHINGTON - CANCELLATION NOTIFICATION**

**TO OTHERS ENDORSEMENT**

In the event coverage is cancelled for any statutorily permitted reason, other than nonpayment of premium, advanced written notice will be mailed or delivered to person(s) or entity(ies) according to the notification schedule shown below:

Name of Person(s) or Entity(ies)	Mailing Address:	Number of Days Advanced Notice of Cancellation
Per the most current schedule of Certificate Holders maintained by Lockton Companies and furnished to AXA XL Insurance on a monthly basis		30

In the event of cancellation for nonpayment of premium, ten (10) days notice will be given.  
All other terms and conditions of the Policy remain unchanged.