THIRD AMENDMENT TO LICENSE AGREEMENT

THIS THIRD AMENDMENT TO LICENSE AGREEMENT ("Third Amendment") is made and entered by and between the **CITY AND COUNTY OF DENVER**, a municipal corporation of the State of Colorado (the "City"), and **NEW CINGULAR WIRELESS PCS, LLC**, a Delaware limited liability company authorized to do business in the State of Colorado, with an address of 575 Morosgo Drive NE, Atlanta, GA 30324, hereinafter referred to as (the "Company") collectively referred to as (the "Parties").

WITNESSETH:

WHEREAS, the Parties entered into an Agreement dated April 22, 2002, an Amendatory Agreement on October 16, 2012, and a Second Amendment to License Agreement dated April 16, 2018, to provide use of the licensed property for communications equipment (the "Agreement"); and

WHEREAS, the Parties wish to amend the Agreement to allow installation of new equipment as set out on Attachments A and B, and increase the License Fees paid by the Company; and

NOW, THEREFORE, in consideration of the premises and the mutual covenants and obligations herein set forth, the Parties agree as follows:

The recitals set out above are fully incorporated herein.

1. The Article 4.01 of the Agreement entitled "License Fees" of the schedule is hereby amended to read as follows and the monthly fee for the amended Term is set out below:

"**4.01 License Fees**.

The Company has paid the License Fees for the original Lease and the First Amendment. The Company agrees to pay the City an additional amount of Five Hundred Dollars per month for a total monthly fee of Four Thousand Three Hundred Ninety-One and 50/100 Dollars ($4,391.50) per month for the remainder of the Second Additional Extension Term effective March 1, 2019 through May 31, 2022. The total contract amount is EIGHT HUNDRED ONE THOUSAND EIGHTEEN AND 66/100 DOLLARS ($801,018.66).

2. In addition to the other Equipment permitted in the Agreement, the City consents to the installation and operation of additional antennas, associated cables and equipment as

more completely described on attached Attachment A ("New Equipment"). City's execution of this Third Amendment will signify City's approval of Attachment A. Hereafter, the term "Equipment" as defined in the Agreement will include the New Equipment described in Attachment A to this Third Amendment.

3. This Third Amendment may be executed in two (2) counterparts, each of which shall be deemed to be an original, and all of which, taken together, shall constitute one and the same instrument.

4. Except as expressly set forth in this Third Amendment, the Agreement otherwise is unmodified and remains in full force and effect.

ATTACHMENT A Architectural Drawings and Equipment Specifications
ATTACHMENT B – RF Letter

[SIGNATURE PAGE FOLLOWS]

Contract Control Number: FINAN-RC1Y028-03

Contractor Name: New Cingular Wireless PCS, 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: FINAN-RC1Y028-03

Contractor Name: New Cingular Wireless PCS, LLC

By: Becky John. Haney

Name: Becky John. Haney
(please print)

Title: Area Manager
(please print)

ATTEST: [if required]

By: _____

Name: _____
(please print)

Title: _____
(please print)

ATTACHMENT 1

MODIFICATION REQUEST
AT&T Capitol Hill Site

303 West Colfax Avenue

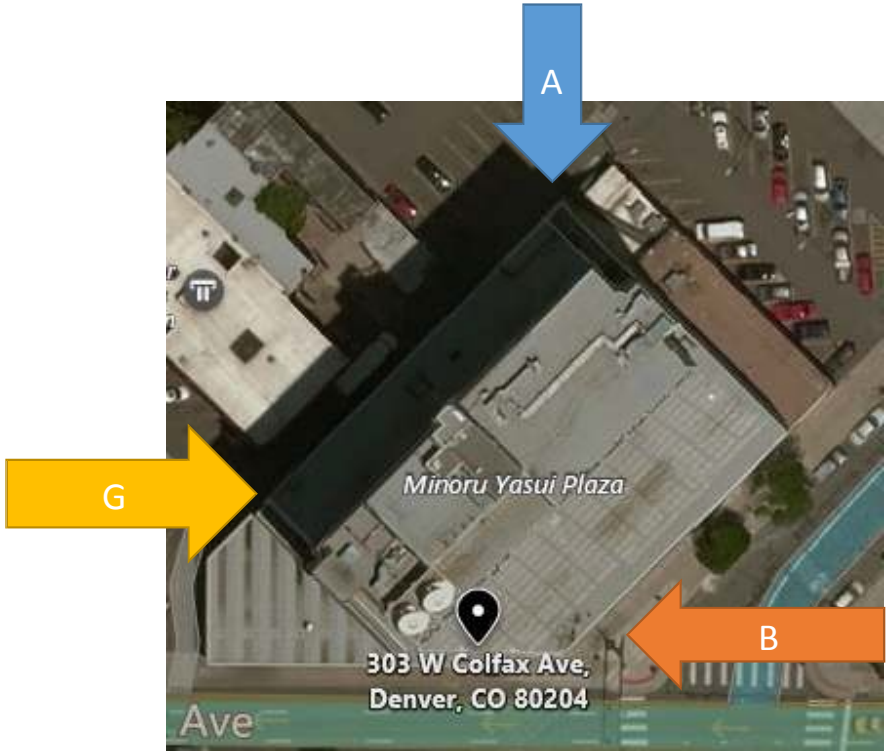
Modification APPROVAL PENDING

Requested approval – July 2018

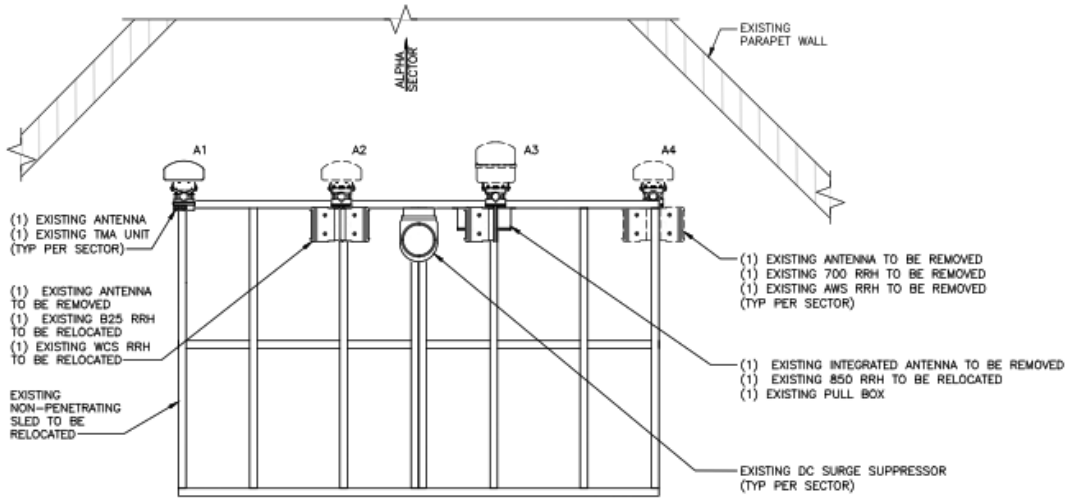
1 Project – 6C – Sector Split Project

Summary of 6C / Sector Split Project

- Remove and replace 3 antennas on the Alpha Sector
- Remove and replace 2 antennas on the Beta and Gamma Sectors
- Install new and additional sled at Alpha Sector (for total of 2 sleds at this location – for loading to support **3 FirstNet Antennas**)
- Removing and replacing 6 RRHs
- Adding 5 new RRHs and 4 surge suppressors
- All cabling to be done in existing cable tray
- Equipment modifications in equipment room


A
G
B
Minoru Yasui Plaza
303 W Colfax Ave,
Denver, CO 80204
Ave

Alpha Sector – Existing Configuration

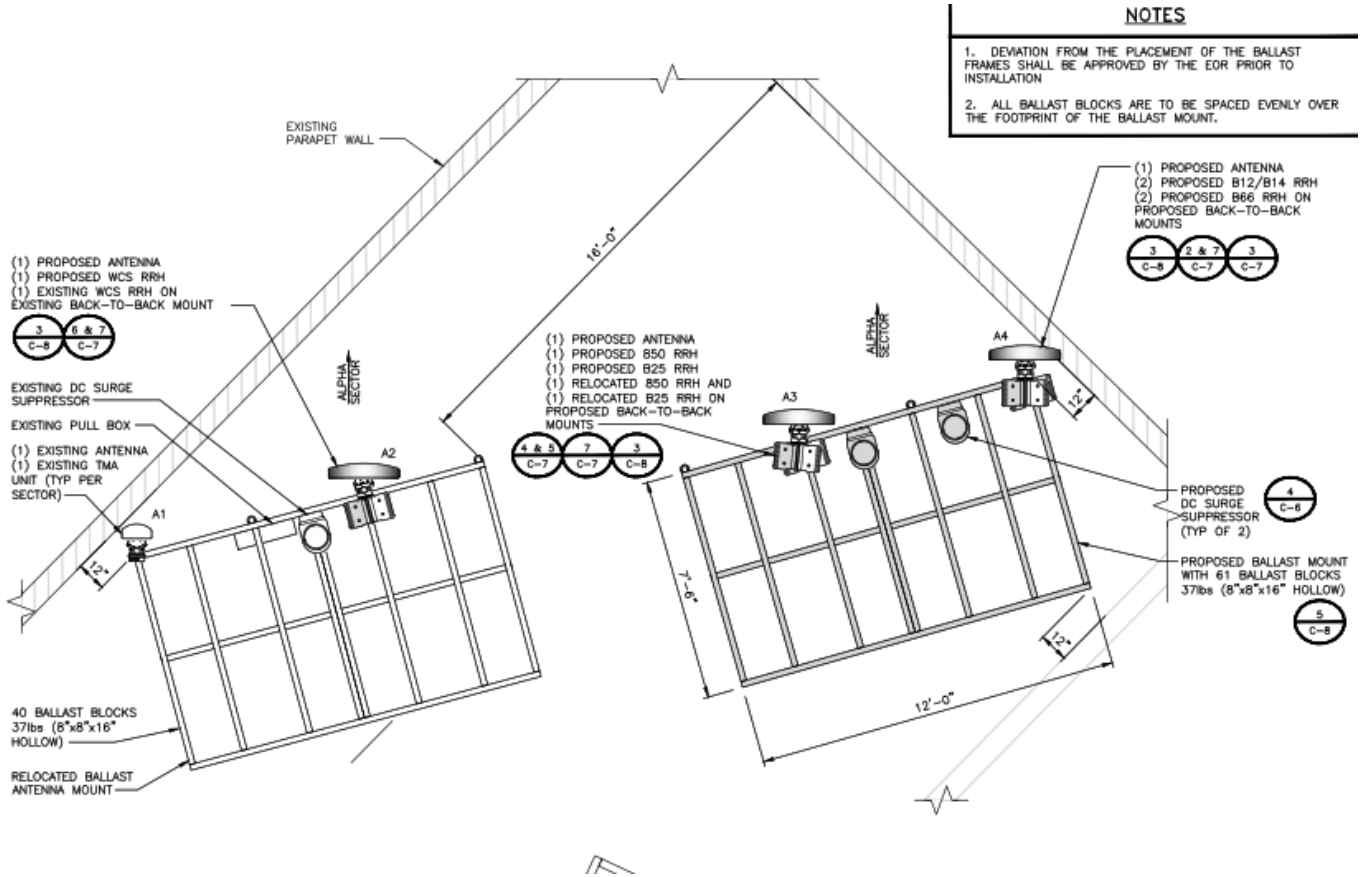


ALPHA SECTOR

Alpha Sector – Proposed

- **3 New First Net Antennas**
- 1 New Sled
- 7 New RRHs (remove and replace 2 and add 5 new ones)
- 2 New Surge Suppressors

2 sleds needed for loading if FirstNet Antennas and helps with horizontal separation which is better for signal quality



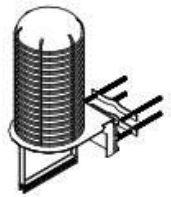
Equipment Specifications

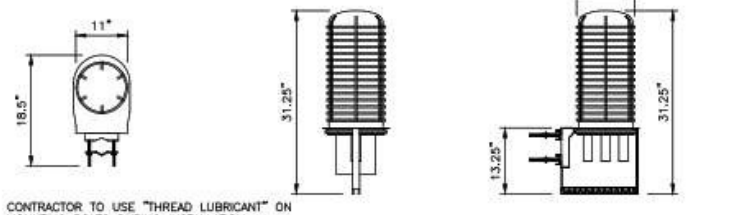
Remote Radio Heads (RRHs)

ALCATEL–LUCENT B25 RRH4x30W+4T4R OR RRH2x60W+2T4R	
WIDTH	11.97" (304 mm)
DEPTH	7.18" (182 mm)
HEIGHT	21.2" (538 mm)
WEIGHT	52.8 LBS (24 Kg)

Surge Suppressors

RAYCAP DC6–48–60–18–EV	
DIMENSIONS, WxDxH	11"x31.25"
NOMINAL OPERATING VOLTAGE	48 VDC
NOMINAL DISCHARGE CURRENT	20 kA 8/20 μs
MAXIMUM DISCHARGE CURRENT	60 kA 8/20 μs
MAXIMUM CONTINUOUS OPERATING VOLTAGE	75 VDC
VOLTAGE PROTECTION RATING	600 V
WIND LOADING	150 MPH SUSTAINED (105.7 LBS) 195 MPH GUST (213.6 LBS)
TOTAL WEIGHT	32.8 LBS

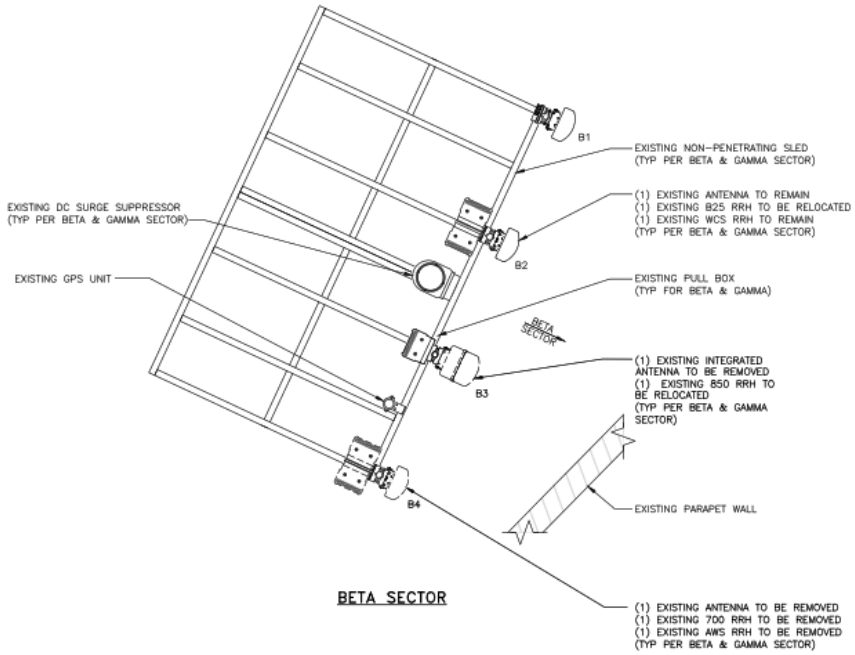




CONTRACTOR TO USE "THREAD LUBRICANT" ON MOUNTING BOLTS DURING INSTALLATION

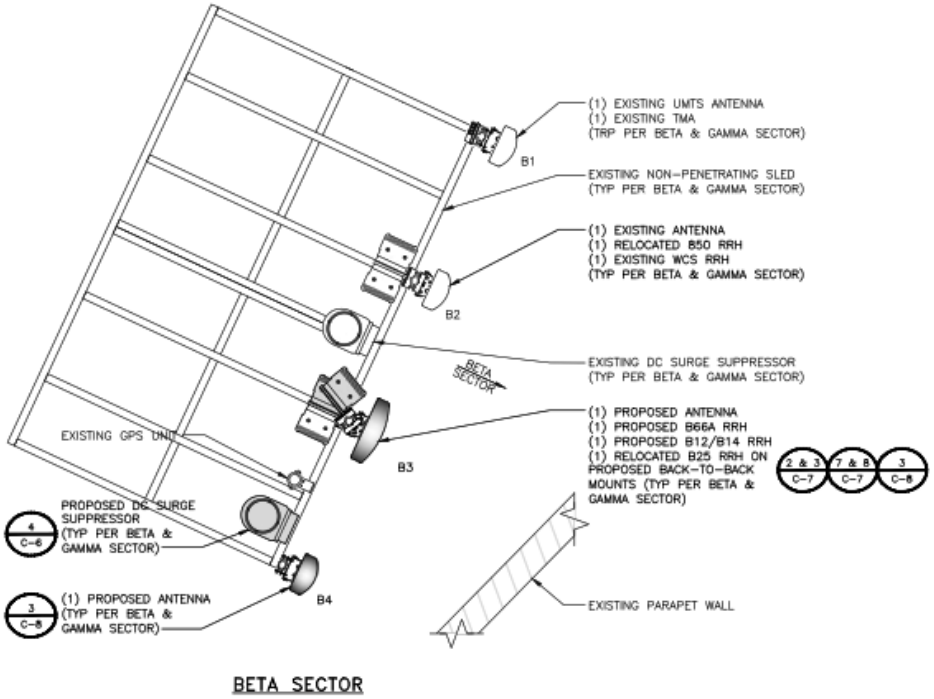
DC SURGE SUPPRESSOR DETAIL | NO SCALE | 4

Beta Sector – Existing Configuration

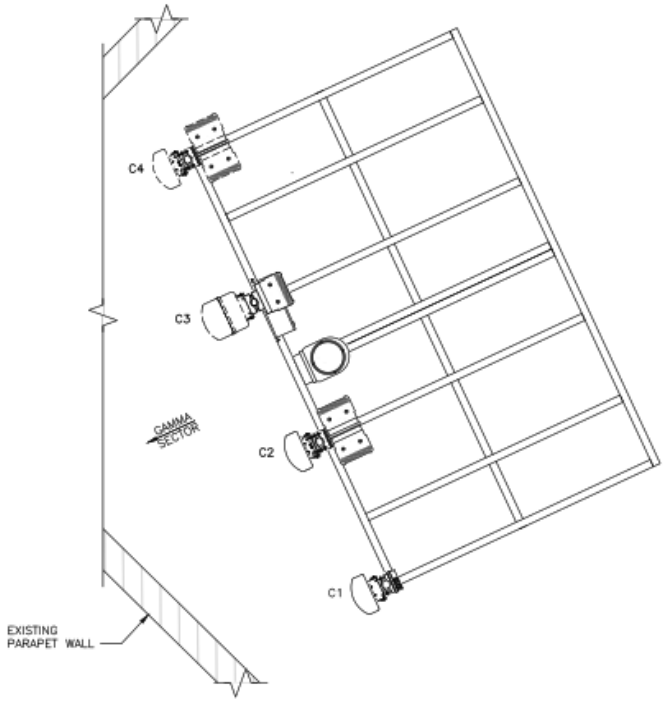


Beta Sector – Proposed

1 – New First Net Antenna
1 – New Antenna
1 – New Surge Suppressor
2 – New RRHs



Gamma Sector – Existing



GAMMA SECTOR

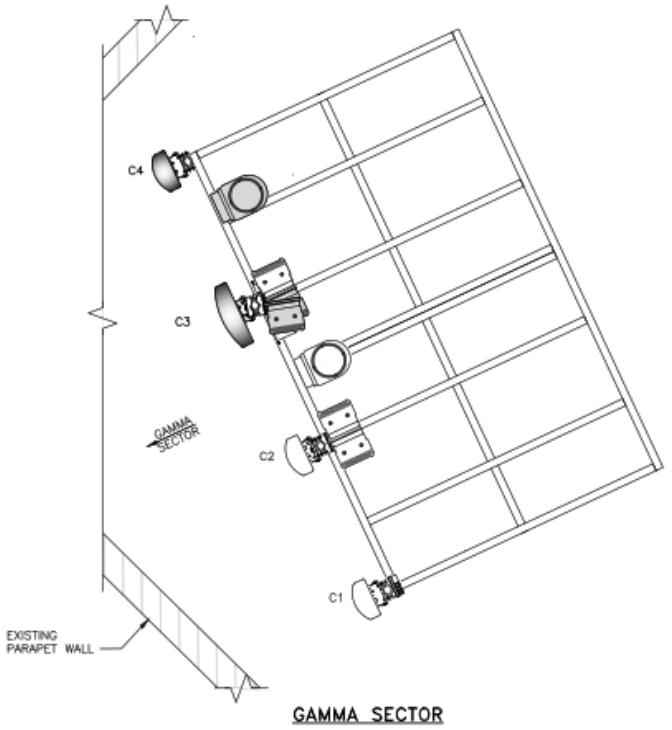
Gamma Sector – Proposed

1 – New FirstNet Antenna

1 – New Antenna

1 – New Surge Suppressor

2 – New RRHs



FIRSTNET

WHAT

The First Resonder Network *Authority*

Build, operate and maintain the first high-speed, nationwide wireless broadband network dedicated to public safety

WHY

Born from recommendations by the 9/11 Commission

End the history of public safety communications challenges to help keep our communities and emergency responders safer

ATTACHMENT B

RADIO FREQUENCY INTERFERENCE ANALYSIS REPORT

B&V on behalf of AT&T

Site ID: 10101152 (MRUTH026184)
Site Name: CAPITOL HILL

November 13, 2018

Klaus Bender, P.E.
Registered Professional Engineer
State of Colorado Reg. No. 40496
Date Signed: November 14, 2018

Prepared By:
Sitesafe, LLC
8618 Westwood Center Drive, Suite 315
Vienna, VA 22182 U.S.A.
(703) 276-1100
Engineer: Klaus Bender, P.E.
Report Created By:
Report Reviewed By:

No Harmful Interference is predicted as a result of AT&T's proposed modification affecting the existing operations on this structure and the Public Safety systems operating in the vicinity of the site.

Table of Contents

1.0 Executive Summary

This report presents a radio frequency interference (RFI) analysis which was performed on the 10101152 (MRUTH026184) - Capitol Hill 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	41.9
Receiver Desensitization	N/A	Passed	No Interference was predicted	35.3
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	N/A	No Analysis performed	N/A

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

Analysis	Description
Receiver Performance	Receiver Sensitivity Threshold
Receiver Bandwidth	Receiver Dependent
Antenna Patterns Considered	No (Worst Case)
Measured Antenna Isolation Data	No
Filters/Multicouplers Considered	Yes
Number of Simultaneous Transmitters Mixed	5
Highest Intermodulation Order Tested	7
Condense Intermodulation Hit Quantity	Yes - 1000/Order
TX IM Bandwidth Multiplication	Yes
Tx/Rx Systems Excluded	None
Site File Name	10101152 (MRUTH026184) - CAPITOL HILL.dta
Report File Name	10101152 (MRUTH026184) - CAPITOL HILL.docx
WirelessSiteRFI Software Version	10.0.10

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: 10101152 (MRUTH026184) - Capitol Hill
Owner: AT&T
Site Description: Rooftop = 60' (AGL)
Address: 303 West Colfax, Denver, CO 80265
Latitude: 39:44:25.24 N
Longitude: 104:59:29.49 W
Elevation: 5392' (AMSL)
Notes: AT&T is adding the 700 MHz band on sector antennas

2.1 Communications Systems

System	Provider	Technology	Frequency Band
1	AT&T	UMTS	1710 - 1990 MHz - PCS
2	AT&T	UMTS	806 - 896 MHz - Cellular
3	AT&T	LTE	2345-2360 MHz - WCS
4	AT&T	LTE	2345-2360 MHz - WCS
5	AT&T(proposed)	LTE	746 - 806 MHz - 700 MHz Band
6	AT&T(proposed)	LTE	746 - 806 MHz - 700 MHz Band
7	AT&T(proposed)	LTE	746 - 806 MHz - 700 MHz Band
8	AT&T(proposed)	LTE	746 - 806 MHz - 700 MHz Band
9	AT&T	LTE	1850 - 1995 MHz - PCS
10	AT&T	LTE	1850 - 1995 MHz - PCS
11	AT&T	LTE	1850 - 1995 MHz - PCS
12	AT&T	LTE	1850 - 1995 MHz - PCS
13	AT&T	LTE	806 - 896 MHz - Cellular
14	AT&T	LTE	806 - 896 MHz - Cellular
15	AT&T	LTE	2110 - 2200 MHz - AWS
16	AT&T	LTE	2110 - 2200 MHz - AWS
17	AT&T	LTE	2110 - 2200 MHz - AWS
18	KNNR200 - DENVER, CITY AND COUNTY OF	FM Land Mobile	806 - 896 MHz - Land Mobile
19	KNNR200 - DENVER, CITY AND COUNTY OF	FM Land Mobile	806 - 896 MHz - Land Mobile
20	KNNR200 - DENVER, CITY AND COUNTY OF	FM Land Mobile	806 - 896 MHz - Land Mobile
21	SkyTel Spectrum LLC	FM Land Mobile	901/930/940 MHz - Narrowband PCS
22	WQEQ952DENVER, CITY AND COUNTY OF	FM Land Mobile	150 - 174 MHz - Land Mobile
23	WQJY881 - DENVER, CITY AND COUNTY OF	FM Land Mobile	420 - 470 MHz - Land Mobile

2.2 Antenna Systems

Ant #	Mfg	Antenna Model	Gain (dBd)	Hgt (ft)	Orient (deg)	Sec-tor	Ant Use	Transmission Line Type	Line Loss (/100')	Line Length (ft)
1	Powerwave	7750	15.2	69	0	A	Dplx	7/8 in. Foam	1.8	99
2	Powerwave	7750	15.2	69	115	B	Dplx	7/8 in. Foam	1.8	99
3	Powerwave	7750	15.2	69	245	C	Dplx	7/8 in. Foam	1.8	99
4	Powerwave	7750	12.5	69	0	A	Dplx	7/8 in. Foam	1.31	99
5	Powerwave	7750	12.5	69	115	B	Dplx	7/8 in. Foam	1.31	99
6	Powerwave	7750	12.5	69	245	C	Dplx	7/8 in. Foam	1.16	99
7	CCI	BSA-M65R-BUU-H6 (L-Beam)	15.85	69	335	A	Dplx	Fiber	0.001	99
8	Commscope	RV4PX310R-V2	15.73	69	115	B	Dplx	Fiber	0.001	99
9	Commscope	RV4PX310R	15.73	69	245	C	Dplx	Fiber	0.001	99
10	CCI	BSA-M65R-BUU-H6 (R-Beam)	15.85	69	25	A	Dplx	Fiber	0.001	99
11	CCI	BSA-M65R-BUU-H6 (L-Beam)	14.25	69	335	A	Dplx	Fiber	0.001	99
12	Commscope	NNH4-65C-R6_700 MHz	12.76	69	115	B	Dplx	Fiber	0.001	99
13	Commscope	NNH4-65C-R6_700 MHz	12.76	69	245	C	Dplx	Fiber	0.001	99
14	CCI	BSA-M65R-BUU-H6 (L-Beam)	14.25	69	335	A	Dplx	Fiber	0.001	99
15	Kathrein	800-10766	13.72	69	115	B	Dplx	Fiber	0.001	99
16	Kathrein	800-10766	13.72	69	245	C	Dplx	Fiber	0.001	99
17	CCI	BSA-M65R-BUU-H6 (R-Beam)	14.25	69	25	A	Dplx	Fiber	0.001	99
18	CCI	BSA-M65R-BUU-H6 (R-Beam)	14.25	69	25	A	Dplx	Fiber	0.001	99
19	CCI	BSA-M65R-BUU-H6 (L-Beam)	15.84	69	335	A	Dplx	Fiber	0.001	99
20	Commscope	NNH4-65C-R6	15.44	69	115	B	Dplx	Fiber	0.001	99
21	Commscope	NNH4-65C-R6	15.44	69	245	C	Dplx	Fiber	0.001	99
22	CCI	BSA-M65R-BUU-H6 (R-Beam)	15.85	69	25	A	Dplx	Fiber	0.001	99
23	CCI	BSA-M65R-BUU-H6 (L-Beam)	15.84	69	335	A	Dplx	Fiber	0.001	99
24	Commscope	NNH4-65C-R6	15.44	69	115	B	Dplx	Fiber	0.001	99
25	Commscope	NNH4-65C-R6	15.44	69	245	C	Dplx	Fiber	0.001	99
26	CCI	BSA-M65R-BUU-H6 (R-Beam)	15.85	69	25	A	Dplx	Fiber	0.001	99
27	CCI	BSA-M65R-BUU-H6 (L-Beam)	15.15	69	335	A	Dplx	Fiber	0.001	99
28	Commscope	RV4PX310R-V2	14.32	69	115	B	Dplx	Fiber	0.001	99
29	Commscope	RV4PX310R-V2	14.32	69	245	C	Dplx	Fiber	0.001	99
30	CCI	BSA-M65R-BUU-H6 (R-Beam)	15.15	69	25	A	Dplx	Fiber	0.001	99
31	CCI	BSA-M65R-BUU-H6 (L-Beam)	16.25	69	335	A	Dplx	Fiber	0.001	99
32	Commscope	NNH4-65C-R6	15.15	69	115	B	Dplx	Fiber	0.001	99
33	Commscope	NNH4-65C-R6	15.15	69	245	C	Dplx	Fiber	0.001	99
34	CCI	BSA-M65R-BUU-H6 (R-Beam)	16.25	69	25	A	Dplx	Fiber	0.001	99
35	Kathrein	800-10766	15.75	69	245		Dplx	Fiber	0.001	99
36	Other	Generic	0	71	0		Tx	1/2 in. Foam	0.85	101
37	Other	Generic	0	71	0		Tx	1/2 in. Foam	0.85	101
38	Other	Generic	0	71	0		Rx	1/2 in. Foam	0.85	101
39	Other	Generic	0	129	0		Tx	1/2 in. Foam	0.85	99
40	Other	Generic	0	129	0		Tx/Rx	1-5/8 in. Foam	0.28	99
41	Other	Generic	0	69	0		Dplx	1-5/8 in. Foam	0.28	31

3.0 Transmitter Frequencies

Freq #	Ant #	Provider	Model	Technology	Channel Label	ID	Frequency	Power (Watts)	BW (KHz)
1	1	AT&T	Powerwave	UMTS		A	1977.500000	16	5000
2	2	AT&T	Powerwave	UMTS		B	1977.500000	16	5000
3	3	AT&T	Powerwave	UMTS		C	1977.500000	16	5000
4	4	AT&T	Powerwave	UMTS		D	876.800000	50	5000
5	5	AT&T	Powerwave	UMTS		E	876.800000	50	5000
6	6	AT&T	Powerwave	UMTS		F	876.800000	50	5000
7	9	AT&T	Ericsson	LTE		G	2355.000000	40	10000
8	8	AT&T	Ericsson	LTE		H	2355.000000	40	10000
9	7	AT&T	Ericsson	LTE		I	2355.000000	40	10000
10	10	AT&T	Ericsson	LTE		J	2355.000000	40	10000
11	11	AT&T	Ericsson	LTE		K	739.000000	40	10000
12	12	AT&T	Ericsson	LTE		L	739.000000	40	10000
13	13	AT&T	Ericsson	LTE		M	739.000000	40	10000
14	14	AT&T (proposed)	Ericsson	LTE		N	739.000000	40	10000
15	15	AT&T (proposed)	Ericsson	LTE		O	739.000000	40	10000
16	16	AT&T (proposed)	Ericsson	LTE		P	739.000000	40	10000
17	17	AT&T	Ericsson	LTE		Q	739.000000	40	10000
18	18	AT&T (proposed)	Ericsson	LTE		R	739.000000	40	10000
19	19	AT&T	Ericsson	LTE		S	1940.000000	30	20000
20	20	AT&T	Ericsson	LTE		T	1940.000000	30	20000
21	21	AT&T	Ericsson	LTE		U	1940.000000	30	20000
22	22	AT&T	Ericsson	LTE		V	1940.000000	30	20000
23	23	AT&T	Ericsson	LTE		W	1977.500000	30	1250
24	24	AT&T	Ericsson	LTE		X	1977.500000	30	1250
25	25	AT&T	Ericsson	LTE		Y	1977.500000	30	1250
26	26	AT&T	Ericsson	LTE		Z	1977.500000	30	1250
27	27	AT&T	Ericsson	LTE		AA	871.500000	60	5000
28	28	AT&T	Ericsson	LTE		AB	871.500000	60	5000
29	29	AT&T	Ericsson	LTE		AC	871.500000	60	5000
30	30	AT&T	Ericsson	LTE		AD	871.500000	60	5000
31	31	AT&T	Ericsson	LTE		AE	2137.500000	45	15000
32	32	AT&T	Ericsson	LTE		AF	2137.500000	45	15000
33	33	AT&T	Ericsson	LTE		AG	2137.500000	45	15000
34	34	AT&T	Ericsson	LTE		AH	2137.500000	45	15000
35	35	AT&T	Ericsson	LTE		HO	2137.500000	45	15000
36	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		HP	806.5625	100	20
37	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		HQ	807.1250	100	20
38	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		HR	807.3750	100	20
39	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		HS	807.7750	100	20
40	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		HT	808.1500	100	20
41	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		HU	808.2750	100	20
42	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		HV	808.4250	100	20
43	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		HW	808.7250	100	20
44	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		HX	808.8625	100	20
45	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		HY	809.0625	100	20
46	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		HZ	809.4375	100	20
47	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IA	809.5625	100	20
48	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IB	809.5875	100	20

49	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IC	809.9875	100	20
50	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		ID	810.2375	100	20
51	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IE	810.4625	100	20
52	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IF	810.4875	100	20
53	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IG	810.7375	100	20
54	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IH	810.9875	100	20
55	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		II	811.1375	100	20
56	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IJ	811.2125	100	20
57	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IK	811.2375	100	20
58	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IL	811.4875	100	20
59	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IM	811.6375	100	20
60	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IN	811.7125	100	20
61	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IO	811.7375	100	20
62	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IP	812.0625	100	20
63	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IQ	812.1375	100	20
64	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IR	812.2375	100	20
65	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IS	812.4625	100	20
66	36	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IT	812.4875	100	20
67	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IU	812.7375	100	20
68	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IV	813.1375	100	20
69	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IW	813.2125	100	20
70	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IX	813.2375	100	20
71	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IY	813.4625	100	20
72	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		IZ	813.4875	100	20
73	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JA	813.7175	100	20
74	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JB	813.7375	100	20
75	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JC	814.2125	100	20
76	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JD	814.2375	100	20
77	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JE	814.2625	100	20
78	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JF	814.4625	100	20
79	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JG	814.4875	100	20
80	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JH	814.6125	100	20
81	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JI	814.7125	100	20
82	37	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JJ	814.7375	100	20

83	39	SkyTel Spectrum LLC	Other	FM Land Mobile		LF	940.225000	3500	25
84	40	WQEQ952DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		LG	155.955000	100	15
85	41	WQJY881 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		LH	463.662500	4	11.2
86	41	WQJY881 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		LI	467.112500	4	11.2
87	41	WQJY881 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		LJ	468.225000	4	11.2
88	41	WQJY881 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		LK	469.787500	4	11.2

4.0 Receiver Frequencies

Freq #	Ant #	Provider	Model	Technology	Channel Label	ID	Frequency	Sen (dBm)	BW (KHz)
1	1	AT&T	Powerwave	UMTS		A	1897.500000	-110	5000
2	2	AT&T	Powerwave	UMTS		B	1897.500000	-110	5000
3	3	AT&T	Powerwave	UMTS		C	1897.500000	-110	5000
4	4	AT&T	Powerwave	UMTS		D	831.800000	-119	5000
5	5	AT&T	Powerwave	UMTS		E	831.800000	-119	5000
6	6	AT&T	Powerwave	UMTS		F	831.800000	-119	5000
7	9	AT&T	Ericsson	LTE		G	2355.000000	-102	10000
8	8	AT&T	Ericsson	LTE		H	2355.000000	-102	10000
9	7	AT&T	Ericsson	LTE		I	2355.000000	-102	10000
10	10	AT&T	Ericsson	LTE		J	2355.000000	-102	10000
11	11	AT&T	Ericsson	LTE		K	709.000000	-102	10000
12	12	AT&T	Ericsson	LTE		L	709.000000	-102	10000
13	13	AT&T	Ericsson	LTE		M	709.000000	-102	10000
14	14	AT&T (proposed)	Ericsson	LTE		N	709.000000	-102	10000
15	15	AT&T (proposed)	Ericsson	LTE		O	709.000000	-102	10000
16	16	AT&T (proposed)	Ericsson	LTE		P	709.000000	-102	10000
17	17	AT&T	Ericsson	LTE		Q	709.000000	-102	10000
18	18	AT&T (proposed)	Ericsson	LTE		R	709.000000	-102	10000
19	19	AT&T	Ericsson	LTE		S	1860.000000	-102	20000
20	20	AT&T	Ericsson	LTE		T	1860.000000	-102	20000
21	21	AT&T	Ericsson	LTE		U	1860.000000	-102	20000
22	22	AT&T	Ericsson	LTE		V	1860.000000	-102	20000
23	23	AT&T	Ericsson	LTE		W	1897.500000	-102	5000
24	24	AT&T	Ericsson	LTE		X	1897.500000	-102	5000
25	25	AT&T	Ericsson	LTE		Y	1897.500000	-102	5000
26	26	AT&T	Ericsson	LTE		Z	1897.500000	-102	20000
27	27	AT&T	Ericsson	LTE		AA	826.500000	-102	5000
28	28	AT&T	Ericsson	LTE		AB	826.500000	-102	5000
29	29	AT&T	Ericsson	LTE		AC	826.500000	-102	5000
30	30	AT&T	Ericsson	LTE		AD	826.500000	-102	5000
31	31	AT&T	Ericsson	LTE		AE	1737.500000	-102	15000
32	32	AT&T	Ericsson	LTE		AF	1737.500000	-102	15000
33	33	AT&T	Ericsson	LTE		AG	1737.500000	-102	15000
34	34	AT&T	Ericsson	LTE		AH	1737.500000	-102	15000
35	35	AT&T	Ericsson	LTE		HO	1737.500000	-102	15000
36	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JK	761.5625	-116	20
37	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JL	762.1250	-116	20
38	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JM	762.3750	-116	20
39	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JN	762.7750	-116	20
40	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JO	763.1500	-116	20
41	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JP	763.2750	-116	20
42	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JQ	763.4250	-116	20
43	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JR	763.7250	-116	20
44	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JS	763.8625	-116	20
45	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JT	764.0625	-116	20
46	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JU	764.4375	-116	20
47	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JV	764.5625	-116	20
48	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JW	764.5875	-116	20

49	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JX	764.9875	-116	20
50	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JY	765.2375	-116	20
51	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		JZ	765.4625	-116	20
52	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KA	765.4875	-116	20
53	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KB	765.7375	-116	20
54	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KC	765.9875	-116	20
55	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KD	766.1375	-116	20
56	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KE	766.2125	-116	20
57	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KF	766.2375	-116	20
58	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KG	766.4875	-116	20
59	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KH	766.6375	-116	20
60	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KI	766.7125	-116	20
61	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KJ	766.7375	-116	20
62	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KK	767.0625	-116	20
63	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KL	767.1375	-116	20
64	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KM	767.2375	-116	20
65	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KN	767.4625	-116	20
66	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KO	767.4875	-116	20
67	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KP	767.7375	-116	20
68	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KQ	768.1375	-116	20
69	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KR	768.2125	-116	20
70	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KS	768.2375	-116	20
71	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KT	768.4625	-116	20
72	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KU	768.4875	-116	20
73	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KV	768.7175	-116	20
74	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KW	768.7375	-116	20
75	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KX	769.2125	-116	20
76	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KY	769.2375	-116	20
77	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		KZ	769.2625	-116	20
78	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		LA	769.4625	-116	20
79	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		LB	769.4875	-116	20
80	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		LC	769.6125	-116	20
81	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		LD	769.7125	-116	20
82	38	KNNR200 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		LE	769.7375	-116	20

83	40	WQEQ952DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		LG	155.955000	-110	15
84	41	WQJY881 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		LH	463.662500	-116	11.2
85	41	WQJY881 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		LI	467.112500	-116	11.2
86	41	WQJY881 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		LJ	468.225000	-116	11.2
87	41	WQJY881 - DENVER, CITY AND COUNTY OF	Other	FM Land Mobile		LK	469.787500	-116	11.2

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.

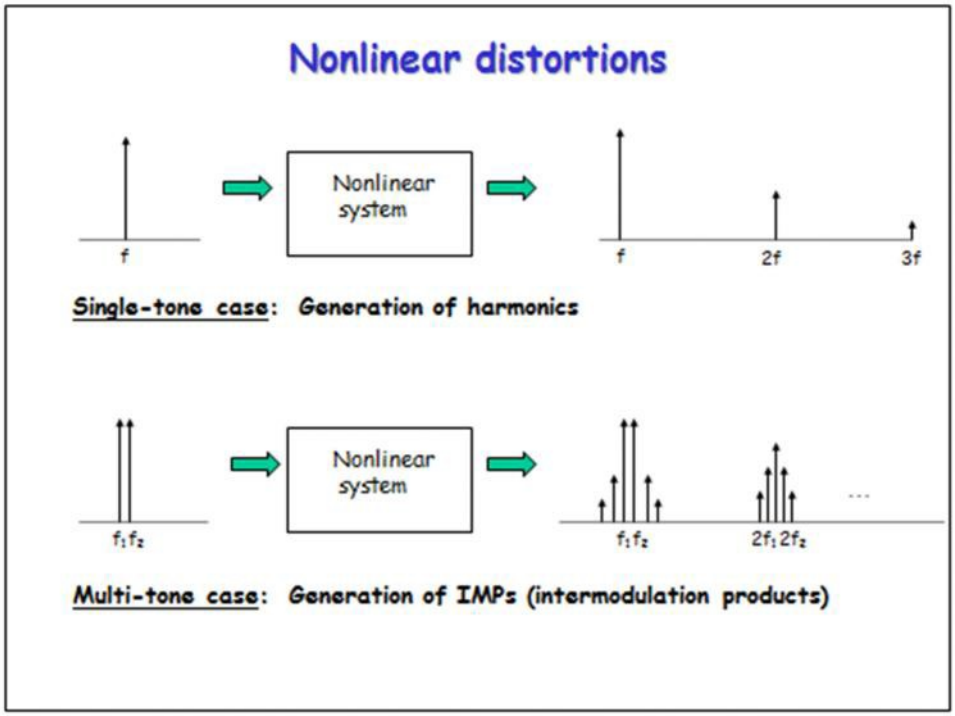
7.0 Intermodulation Interference Analysis

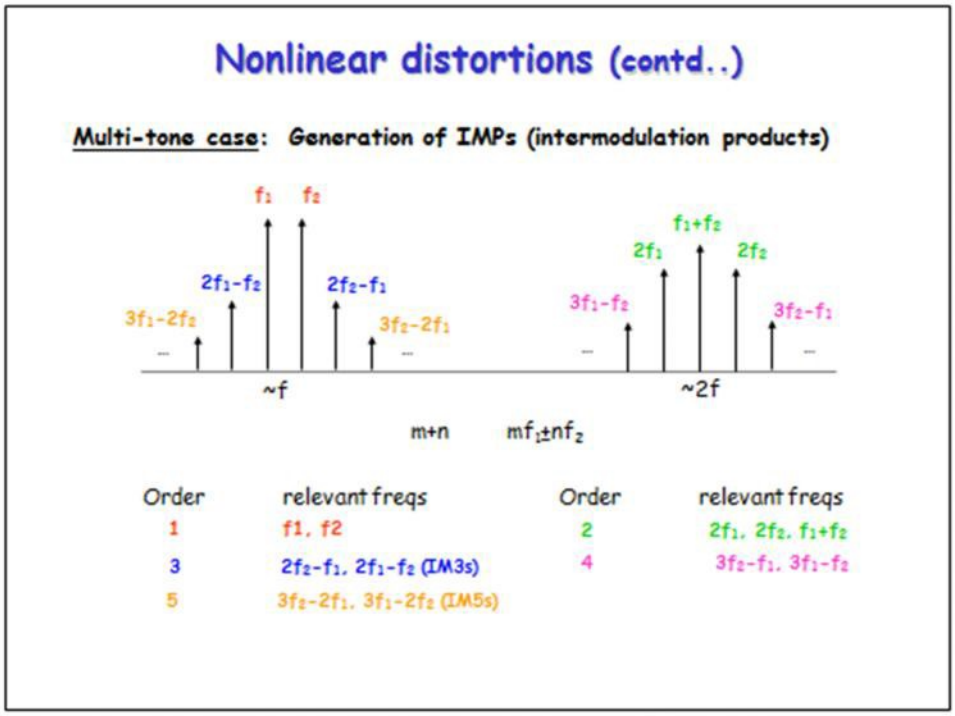
There are three basic categories of Intermodulation (IM) interference. They are receiver produced, transmitter produced, and "other" radiated IM. Transmitter produced IM is the result of one or more transmitters impressing a signal in the non-linear final output stage circuitry of another transmitter, 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 mixing are known as nonlinear distortions. The images below depict how these IM products are derived when passing through a nonlinear junction/system.





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)	ID	Freq (MHz)	ID	Freq (MHz)	ID	Freq (MHz)	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 simulation of Intermodulation (IM) interference, transmitter wideband noise and receiver desensitization interference occurring on each individual receiver when all transmitters at the site are active at the same instance in time. Even though individual interference modes may not be reported in other report sections, this summing analysis represents a worst-case interference scenario.

However, the probability of this interference occurrence for an individual receiver could be low since it depends on the utilization of the transmitters involved in the interference generation.

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 could possibly be degraded by the value shown.

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 Discussion and Recommendations

Public Safety system operated by the City of Denver at 210 West Colfax Avenue was included in this analysis as required. The City of Denver repeater antenna was modeled worse case at AT&T's antennas level of 69 feet. The City of Denver Public Safety antenna was included in this analysis at a distance of 250 feet and bearing of 90 degrees.

Conclusion: There is no indication that the proposed modification by AT&T will cause interference to the existing operations on this structure and Public Safety systems operating in the vicinity of the site.

12.0 Professional Certification

Engineering Statement Re:

Potential for Interference to Existing Services

At

10101152 (MRUTH026184)-CAPITOL HILL, for B&V on behalf AT&T

My signature on this study hereby certifies and affirms:

That I am employed by Sitesafe, LLC which provides engineering services to clients in the Radio Communications field; and

That I have examined the technical information supplied by B&V on behalf AT&T and their representatives relating to their intention to install antennas, transmitters and associated technical equipment on an existing communication site, on an existing tower/structure, currently identified as 10101152 (MRUTH026184)-CAPITOL HILL; and

That the technical equipment to be installed by AT&T represents the state of the art and that it has been carefully designed to preclude the possibility of interference to other services, including the transmission and reception of broadcast AM, FM, and Television and other communications services, such as police, fire, utility and other public safety and public service facilities as well as private communications installations, such as cordless telephones, and Citizen's Band and Radio Amateur stations; and

That the equipment to be installed by AT&T, meets or exceeds all Federal Communications Commission emission requirements to avoid interfering with other services and home/business equipment; and

That frequency information provided by B&V on behalf AT&T concerning existing installations on this structure has been examined to estimate the potential for interference to existing and proposed operations, resulting from the introduction of the AT&T's operation; and

That this examination involved the computation of intermodulation products, transmitter harmonics, receiver desensitization, and transmitter spurious emissions produced by the combination of frequencies associated with existing services known to currently operate at the 10101152 (MRUTH026184)-CAPITOL HILL site, and these frequencies, which could be used by others at the 10101152 (MRUTH026184)-CAPITOL HILL site

That intermodulation products were computed (as a minimum) for the fundamental (f_0), second ($2\ f_0$) thru seventh ($7\ f_0$) harmonic components of frequencies at this site; and

That predicted products were not found to potentially cause intermodulation to AT&T's proposed operations or to the other licenses currently operating at the 10101152 (MRUTH026184)-CAPITOL HILL site; and

That no additional isolation needs to be provided between antennas in the horizontal and vertical planes, and the attenuation along the nadir and zenith associated with vertical plane radiation patterns; and

That after examination the levels of RF energy present at the 10101152 (MRUTH026184)-CAPITOL HILL site, receiver sensitivity will not be degraded by either the existing or AT&T's proposed operations; and

That, if interference were to occur as a result of AT&T's operations, AT&T's would be expected to recognize its responsibility to act promptly to take steps necessary to correct the interference, including, but not limited to, filtering and frequency coordination; and

In summary, it is stated here that there is not an indication that the installation being proposed by AT&T's will create interference to their own operations, or the operations of any of the services currently operating at the 10101152 (MRUTH026184)-CAPITOL HILL site. Even in the event that, upon installation of AT&T's equipment, interference was determined to exist and to be the actual interference source, frequency coordination and filtering would be AT&T's primary corrective course of action, and should successfully eliminate the problem.

Certain generic technical assumptions regarding power settings, filtering, and equipment characteristics were made in preparing this analysis,
as this technical information was not made available by the client.

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