



December 2nd 2019

Comprehensive Engineering Statement

The applicant proposes the following minor changes:

- 1.) Change – RCAMSL from 282.1 meters to 284.6.meters AMSL, calculate new HAAT
- 2.) Change the directional antenna to a non-directional antenna

No other changes are proposed

The stations coordinates and ERP will remain the same:

Coordinates: N. Lat. 46° 36' 27.80", NAD 83

W. Long. 90° 50' 13.70"

ERP: 24.5 kW

HAAT: 74.9 m, COR 87 m AG

AMSL: 284.6 m

ASRN: 1035230 – Tower height 91.1 m AG

Antenna: Shively 6810-6 circularly polarized half-wave

Attachments: include contour-to-contour maps and FCC style FMOVER tables

Contour-to-contour channel study, showing no contour overlap received or caused

60 dBu Coverage Map and table of HAATs and contour distances

Emissions environment study

Environmental: proposal is for a 6 bay, FCC type 1, half-wave, circularly polarized Shively with its center at 87 meters above ground within a controlled fenced in area. Using the Commission's calculation technics found in the FM Model program we note that the antenna produces 0.0118 $\mu\text{W}.\text{cm}^2$ at the base of the tower and the highest amount of 3.82 $\mu\text{W}.\text{cm}^2$ or 0.0018 percent at a location 54 meters from the tower base. See attachment. The applicant will lower power or go off the air to protect workers on or off the tower from emissions exceeding that allowed (1,000 $\mu\text{W}.\text{cm}^2$). At this time, the applicant is the only source of R.F emissions on the tower. Consequently, the applicant will meet the Commission's standards regarding protecting workers and the public from emissions in excess of the maximum.

Doug Vernier, Telecommunication Consultants
V-Soft Communications

WUWS Contour-to-Contour Interference Table
Board Of Regents Of The University Of Wisconsin

CH# 215C3 - 90.9 MHz, Pwr= 24.5 kW, HAAT= 74.9 M, COR= 284.6 M
Average Protected F(50-50)= 34.18 km
Omni-directional

DISPLAY DATES
DATA 11-15-19
SEARCH 11-15-19

REFERENCE
46 36 27.80 N.
90 50 13.69 W.

CH CITY	CALL	TYPE STATE	ANT	AZI <--	DI ST FILE #	LAT LNG	PWR(kW) HAAT(M)	INT(km) COR(M)	PRO(km) LICENSEE	*IN* (Overlap in km)	*OUT*
215C3 WUWS Ashland		LIC _____ WI _____		0.0 0.0	0.00 BLED20110712ABU	46 36 27.80 90 50 13.69	24.500 71	282	---Reference---		Board Of Regents Of The Un
215D W215CG Duluth		LIC _____ MN _____		282.1 101.2	99.72 BLFT20160119ADQ	46 47 20.00 92 07 05.00	0.099	59.0 504	18.6	10.1	-21.7* Minnesota Public Radio
215C0 WHRM Wausau		LIC _____ WI _____		154.2 335.1	207.56 BLED20031023AAF	44 55 13.90 89 41 28.40	82.000 329	171.9 715	73.1	3.3	27.3 State Of Wisconsin - Educa
214C2 WTIP Grand Marais		LIC _____ MN _____		15.8 196.2	134.32 BMLED20140730ADF	47 46 08.60 90 20 49.40	25.000 178	90.2 528	61.7	4.9	12.4 Cook County Community Radi
217D W217CG Ironwood		LIC D_____ MI _____		107.9 288.4	53.97 BLFT20161007AAZ	46 27 23.80 90 09 59.60	0.070	0.3 506	7.4	18.0	41.5 West Central Michigan Medi
215C2 WIRR Viroqua-Hi bbi ng		LIC _____ MN _____		304.5 123.1	177.53 BLED19850827KC	47 29 45.70 92 47 05.60	21.000 168	123.6 615	48.9	23.2	28.3 Minnesota Public Radio
217C1 KUWS Superior		LIC _____ WI _____		282.2 101.2	99.45 BLED19910122KA	46 47 20.70 92 06 51.60	83.000 197	9.9 501	71.8	59.0	24.8 Board Of Regents, Universi
212C1 WHBM Park Falls		LIC _____ WI _____		149.3 329.7	85.46 BLED20100802ATY	45 56 42.80 90 16 22.60	35.000 217	6.4 689	55.5	46.4	26.6 State Of Wisconsin - Educa
216C1 WGGL-FM Houghton		LIC _____ MI _____		72.9 254.5	169.75 BMLED20150330ADF	47 02 10.70 88 41 43.50	100.000 262	97.8 564	66.2	33.1	43.1 Minnesota Public Radio
213C3 KDNH Duluth		LIC _____ MN _____		282.2 101.2	99.45 BLED20010305AAE	46 47 20.80 92 06 51.70	2.000 222	2.8 524	38.8	66.1	57.9 University Of Northwestern
269C2 KLDJ« Duluth		LIC _____ MN _____		282.0 101.1	100.34 BLH20150423ABC	46 47 15.00 92 07 22.00	18.500 249	101.1 556	37.0	16.5R	83.8M Townsquare Media Duluth Li
217C3 WGBT Tomahawk		LIC _____ WI _____		152.5 333.0	130.59 BLED20140527ABA	45 33 48.80 90 03 40.50	22.000 25	2.2 513	22.0	95.8	105.3 Radio 74 Internationale
216C0 KNOW-FM Minneapolis-St. Pau		LIC _____ MN _____		226.9 45.2	247.62 BLED20110907AFB	45 03 43.90 93 08 21.80	100.000 389	116.5 663	78.5	96.5	121.1 Minnesota Public Radio

Terrain database is NGDC 30 SEC, R= 73.215 qualifying spacings or FCC minimum Spacings in KM, M= Margin in KM
In & Out distances between contours are shown at closest points. Reference zone= - Zone 2, Co to 3rd adjacent.
All separation margins (if shown) include rounding. Call signs with strikeout need not be protected.
Ant Column: (D= DA Standard, Z= DA 73.215, N= Not DA 73.215, _= Omni), Polarization (C,H,V,E), Beamtilt(Y,N,X)
"*"affixed to 'IN' or 'OUT' values = site inside restricted contour.
« = Station meets FCC minimum distance spacing for its class.
Reference station has protected zone issue: Canada

HOW TO READ THE FM COMPUTER PRINT-OUT

The computer printout should be self-explanatory for the most part. The parameters of the station being checked, (reference station) are printed in the heading. Contour distances are in kilometers and are predicted using the Commission's TVFMINT FORTRAN subroutine. When interference contour distances are less than 16 kilometers the F(50-50) tables are used. If signal contour distances are less than 1.6 km the free-space equation is used.

The column listed "IN " is the difference in kilometers between of the reference station's protected contour and the data file station's interference contour at the closest point between the contours. (All distances are derived by the method detailed in Sec. 73.208 of the Rules and Regulations as amended in Docket 80-90.) Therefore, "IN" column is a measure of incoming interference. Negative distances in this column indicate the presence of contour overlap. Listed antenna heights and power are those given in the FCC database. The column labeled "OUT " shows the greatest distance in kilometers of overlap or smallest of clearance between the reference station's interference contour and the database station's protected contour. Negative distance figures in this column indicate outgoing contour overlap.

Under the "AZI" column, the first row of numbers indicate the True North bearings from the reference station toward the database stations, while the numbers in the second row indicate the reverse bearings from the database stations to the reference station.

The columns labeled "INT" and "PRO" contain the distance in kilometers of the appropriate interference contour and the protected contour of a data base station.

For I.F. relationships, some channel-six TV relationships and relationships with commercial channel stations providing clearance the minimum spacings values the "IN" and "OUT" columns can change their significance. The letter "R" stands for the minimum **required** distance in kilometers, while the letter "M" in the next column follows the **available clear space** (or lack of it) in kilometers. Minimum separation distances when displayed are taken from Sec 73.207 of the rules as amended. Canadian and Mexican separation distances, U/D ratios and protected contour values are from the US/Mexican Working Agreement and the US/Canada Working Agreement".

The call letters of stations meeting the minimum separation distances under the rules will be flagged by the characters "<<" appended to the right-hand side of the call sign. The "^" character appended to the call sign means the station has been "max-classed" according to the provisions of section 73.525 of the Rules.

The first three letters of the "TYPE" column identify the current FCC status of the stations. The fourth letter will be a "D" if the facility is directional. "Z" indicates a 73.215 directional. An "N" indicates it is a 73.215 station that operates with an omni-directional antenna. The fifth letter will be an E, H or V depending on the type of antenna polarization. The sixth letter will be a "Y" if the antenna uses beam tilt or an "X" if the commission is not sure, otherwise it will be an "N" or left blank.

Translator relationships with LPTV/Translators are calculated using the 62 dBu protected and the F(50-10) interference contour, as defined in section 74.1205 of the Rules.

WUWS vs WHRM, contour-to-contour
Board Of Regents Of The University Of Wisconsin

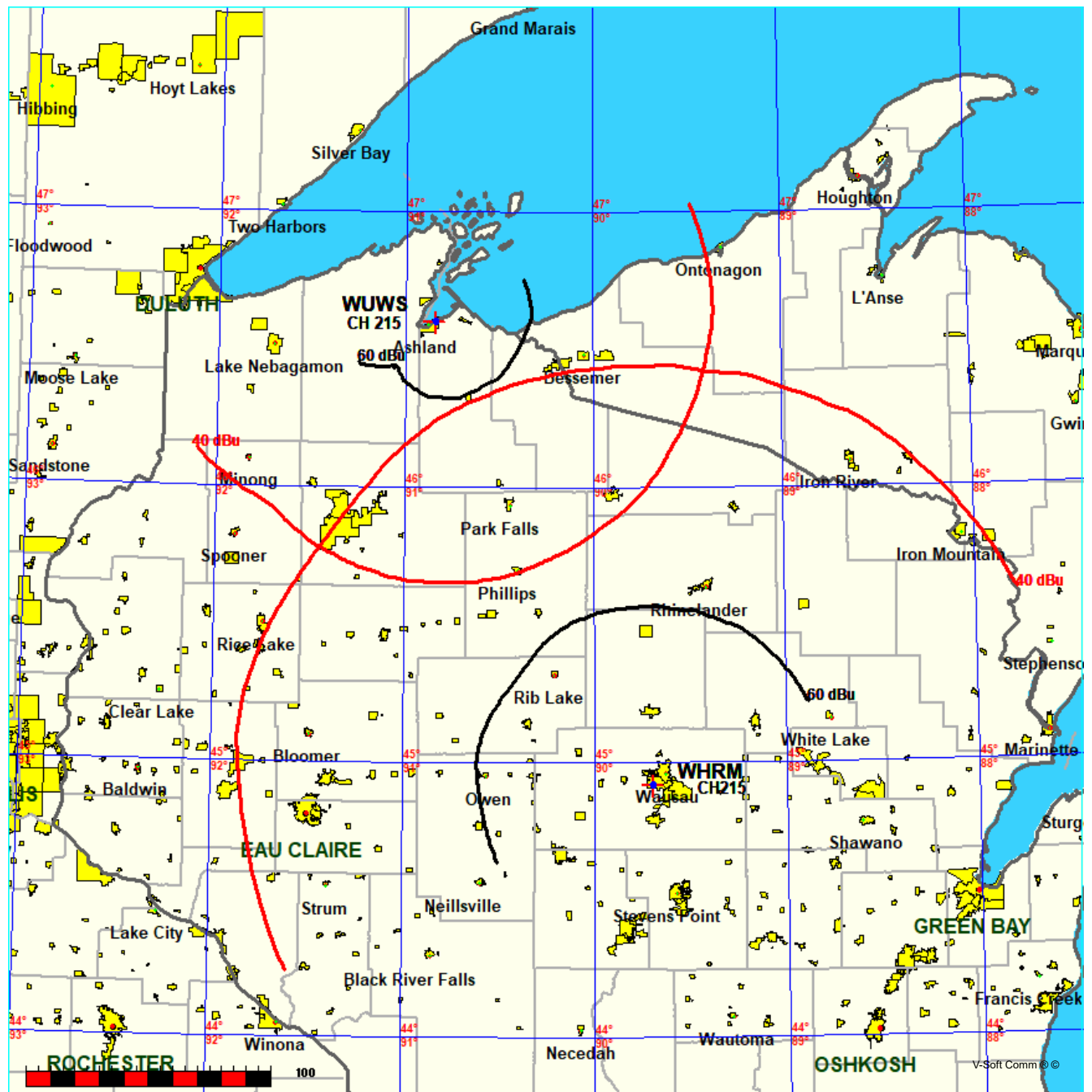
FMCommander Single Allocation Study - 12-02-2019 - NGDC 30 SEC
WUWS's Overlaps (In= 3.27 km, Out= 27.28 km)

WUWS CH 215 C3

Lat= 46 36 27.80, Lng= 90 50 13.69
24.5 kW 74.9 m HAAT, 284.6 m COR
Prot.= 60 dBu, Intef.= 40 dBu

WHRM CH 215 C0 BLED20031023AAF

Lat= 44 55 13.90, Lng= 89 41 28.40
82.0 kW 329 m HAAT, 715 m COR
Prot.= 60 dBu, Intef.= 40 dBu



12-02-2019

Terrain Data: NGDC 30 SEC

FMOver Analysis

WUWS

WHRM BLED20031023AAF

Channel = 215C3
 Max ERP = 24.5 kW
 RCAMSL = 284.6 m
 N. Lat. 46 36 27.80
 W. Lng. 90 50 13.69
 Protected
 60 dBu

Channel = 215C0
 Max ERP = 82 kW
 RCAMSL = 715 m
 N. Lat. 44 55 13.90
 W. Lng. 89 41 28.40
 Interfering
 40 dBu

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)	IX (km)
094.0	024.5000	0090.8	037.3	344.8	082.0000	0329.0	191.8	36.08	
095.0	024.5000	0089.6	037.1	344.7	082.0000	0329.1	191.3	36.17	
096.0	024.5000	0088.6	036.9	344.5	082.0000	0329.2	190.7	36.28	
097.0	024.5000	0087.9	036.8	344.4	082.0000	0329.3	190.2	36.38	
098.0	024.5000	0087.0	036.6	344.3	082.0000	0329.5	189.7	36.48	
099.0	024.5000	0086.1	036.4	344.2	082.0000	0329.7	189.2	36.58	
100.0	024.5000	0085.3	036.3	344.0	082.0000	0329.9	188.7	36.68	
101.0	024.5000	0084.5	036.1	343.9	082.0000	0330.1	188.2	36.77	
102.0	024.5000	0083.9	036.0	343.8	082.0000	0330.3	187.7	36.87	
103.0	024.5000	0083.4	035.9	343.7	082.0000	0330.6	187.2	36.97	
104.0	024.5000	0083.2	035.9	343.6	082.0000	0330.8	186.7	37.07	
105.0	024.5000	0082.9	035.8	343.4	082.0000	0331.0	186.2	37.18	
106.0	024.5000	0082.6	035.8	343.3	082.0000	0331.3	185.7	37.28	
107.0	024.5000	0082.2	035.7	343.2	082.0000	0331.6	185.2	37.37	
108.0	024.5000	0081.4	035.5	343.0	082.0000	0331.9	184.8	37.46	
109.0	024.5000	0080.6	035.4	342.9	082.0000	0332.2	184.4	37.54	
110.0	024.5000	0079.9	035.2	342.7	082.0000	0332.6	184.0	37.63	
111.0	024.5000	0079.3	035.1	342.6	082.0000	0332.9	183.6	37.71	
112.0	024.5000	0079.1	035.1	342.5	082.0000	0333.2	183.1	37.80	
113.0	024.5000	0078.9	035.0	342.3	082.0000	0333.4	182.7	37.89	
114.0	024.5000	0078.6	035.0	342.2	082.0000	0333.7	182.3	37.97	
115.0	024.5000	0078.1	034.9	342.0	082.0000	0333.9	181.9	38.05	
116.0	024.5000	0077.5	034.7	341.9	082.0000	0334.1	181.6	38.12	
117.0	024.5000	0076.9	034.6	341.7	082.0000	0334.2	181.2	38.18	
118.0	024.5000	0076.4	034.5	341.5	082.0000	0334.3	180.9	38.25	
119.0	024.5000	0076.3	034.5	341.4	082.0000	0334.4	180.5	38.33	
120.0	024.5000	0076.5	034.5	341.2	082.0000	0334.5	180.1	38.41	
121.0	024.5000	0076.8	034.6	341.1	082.0000	0334.5	179.6	38.49	
122.0	024.5000	0077.1	034.6	341.0	082.0000	0334.5	179.2	38.57	
123.0	024.5000	0077.2	034.7	340.8	082.0000	0334.5	178.8	38.64	
124.0	024.5000	0077.0	034.6	340.7	082.0000	0334.5	178.5	38.70	
125.0	024.5000	0076.7	034.6	340.5	082.0000	0334.5	178.2	38.75	
126.0	024.5000	0076.4	034.5	340.3	082.0000	0334.5	177.9	38.81	
127.0	024.5000	0076.3	034.5	340.2	082.0000	0334.4	177.6	38.86	
128.0	024.5000	0076.6	034.5	340.0	082.0000	0334.4	177.3	38.93	
129.0	024.5000	0077.1	034.6	339.8	082.0000	0334.4	176.8	39.00	

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
130.0	024.5000	0077.6	034.7	339.7	082.0000	0334.4	176.5	39.07
131.0	024.5000	0077.6	034.8	339.5	082.0000	0334.4	176.2	39.13
132.0	024.5000	0077.0	034.6	339.3	082.0000	0334.4	176.0	39.16
133.0	024.5000	0076.2	034.5	339.1	082.0000	0334.5	175.9	39.18
134.0	024.5000	0075.3	034.3	338.9	082.0000	0334.5	175.8	39.19
135.0	024.5000	0074.3	034.1	338.7	082.0000	0334.6	175.8	39.20
136.0	024.5000	0073.2	033.8	338.5	082.0000	0334.7	175.8	39.21
137.0	024.5000	0072.1	033.6	338.3	082.0000	0334.7	175.8	39.20
138.0	024.5000	0071.2	033.4	338.1	082.0000	0334.8	175.8	39.21
139.0	024.5000	0070.4	033.2	337.9	082.0000	0334.9	175.7	39.21
140.0	024.5000	0069.7	033.0	337.7	082.0000	0335.0	175.7	39.22
141.0	024.5000	0069.0	032.9	337.5	082.0000	0335.0	175.7	39.23
142.0	024.5000	0068.6	032.8	337.3	082.0000	0335.2	175.6	39.24
143.0	024.5000	0068.4	032.8	337.1	082.0000	0335.3	175.5	39.26
144.0	024.5000	0068.3	032.8	337.0	082.0000	0335.5	175.4	39.28
145.0	024.5000	0068.1	032.7	336.8	082.0000	0335.6	175.4	39.30
146.0	024.5000	0067.9	032.7	336.6	082.0000	0335.8	175.3	39.32
147.0	024.5000	0067.8	032.6	336.4	082.0000	0336.0	175.2	39.33
148.0	024.5000	0067.9	032.7	336.2	082.0000	0336.2	175.1	39.35
149.0	024.5000	0068.0	032.7	336.0	082.0000	0336.4	175.0	39.38
150.0	024.5000	0067.9	032.7	335.8	082.0000	0336.6	175.0	39.38
151.0	024.5000	0067.4	032.6	335.7	082.0000	0336.8	175.1	39.38
152.0	024.5000	0066.8	032.4	335.5	082.0000	0337.0	175.2	39.37
153.0	024.5000	0066.4	032.3	335.3	082.0000	0337.2	175.2	39.36
154.0	024.5000	0066.3	032.3	335.1	082.0000	0337.3	175.3	39.36
155.0	024.5000	0066.4	032.3	334.9	082.0000	0337.5	175.2	39.37
156.0	024.5000	0066.7	032.4	334.7	082.0000	0337.7	175.2	39.38
157.0	024.5000	0067.0	032.5	334.5	082.0000	0337.9	175.1	39.39
158.0	024.5000	0067.1	032.5	334.4	082.0000	0338.0	175.2	39.39
159.0	024.5000	0066.9	032.4	334.2	082.0000	0338.2	175.3	39.38
160.0	024.5000	0067.1	032.5	334.0	082.0000	0338.3	175.3	39.38
161.0	024.5000	0067.8	032.6	333.8	082.0000	0338.5	175.2	39.40
162.0	024.5000	0068.5	032.8	333.6	082.0000	0338.6	175.1	39.41
163.0	024.5000	0068.8	032.9	333.4	082.0000	0338.7	175.2	39.41
164.0	024.5000	0068.4	032.8	333.2	082.0000	0338.8	175.4	39.38
165.0	024.5000	0067.5	032.6	333.1	082.0000	0338.9	175.7	39.32
166.0	024.5000	0066.7	032.4	332.9	082.0000	0339.0	176.0	39.27
167.0	024.5000	0066.3	032.3	332.7	082.0000	0339.0	176.2	39.23
168.0	024.5000	0065.9	032.2	332.6	082.0000	0339.1	176.4	39.18
169.0	024.5000	0065.5	032.1	332.4	082.0000	0339.1	176.7	39.14
170.0	024.5000	0065.4	032.1	332.2	082.0000	0339.1	176.9	39.10
171.0	024.5000	0065.3	032.1	332.1	082.0000	0339.1	177.1	39.07
172.0	024.5000	0064.9	032.0	331.9	082.0000	0339.1	177.4	39.01
173.0	024.5000	0064.0	031.8	331.8	082.0000	0339.2	177.8	38.95
174.0	024.5000	0063.1	031.6	331.6	082.0000	0339.2	178.2	38.87
175.0	024.5000	0062.3	031.4	331.5	082.0000	0339.2	178.6	38.80
176.0	024.5000	0061.9	031.3	331.3	082.0000	0339.3	178.9	38.74
177.0	024.5000	0061.5	031.2	331.2	082.0000	0339.4	179.2	38.69
178.0	024.5000	0061.2	031.2	331.0	082.0000	0339.4	179.5	38.63
179.0	024.5000	0060.9	031.1	330.9	082.0000	0339.5	179.8	38.57
180.0	024.5000	0060.5	031.0	330.8	082.0000	0339.5	180.1	38.51

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
181.0	024.5000	0060.1	030.9	330.6	082.0000	0339.5	180.5	38.44
182.0	024.5000	0059.8	030.9	330.5	082.0000	0339.6	180.8	38.38
183.0	024.5000	0060.0	030.9	330.3	082.0000	0339.6	181.1	38.33
184.0	024.5000	0060.1	030.9	330.2	082.0000	0339.6	181.4	38.28
185.0	024.5000	0060.4	031.0	330.0	082.0000	0339.6	181.6	38.23
186.0	024.5000	0060.2	030.9	329.9	082.0000	0339.6	182.0	38.16
187.0	024.5000	0059.8	030.9	329.8	082.0000	0339.5	182.4	38.09
188.0	024.5000	0059.1	030.7	329.7	082.0000	0339.5	182.8	38.00
189.0	024.5000	0058.5	030.6	329.6	082.0000	0339.4	183.3	37.91
190.0	024.5000	0058.0	030.4	329.5	082.0000	0339.4	183.7	37.83
191.0	024.5000	0057.3	030.3	329.4	082.0000	0339.3	184.2	37.73
192.0	024.5000	0056.5	030.1	329.3	082.0000	0339.2	184.7	37.64
193.0	024.5000	0055.2	029.8	329.3	082.0000	0339.2	185.3	37.52
194.0	024.5000	0054.1	029.5	329.2	082.0000	0339.1	185.9	37.41
195.0	024.5000	0053.4	029.3	329.2	082.0000	0339.0	186.4	37.32
196.0	024.5000	0053.2	029.2	329.1	082.0000	0338.9	186.8	37.24
197.0	024.5000	0053.1	029.2	329.0	082.0000	0338.8	187.2	37.16
198.0	024.5000	0053.0	029.2	328.9	082.0000	0338.7	187.6	37.08
199.0	024.5000	0052.6	029.1	328.8	082.0000	0338.6	188.0	36.99
200.0	024.5000	0051.8	028.9	328.8	082.0000	0338.5	188.6	36.89
201.0	024.5000	0050.9	028.6	328.7	082.0000	0338.5	189.1	36.79
202.0	024.5000	0050.2	028.5	328.7	082.0000	0338.4	189.6	36.69
203.0	024.5000	0049.7	028.3	328.6	082.0000	0338.3	190.1	36.60
204.0	024.5000	0049.3	028.2	328.6	082.0000	0338.2	190.6	36.51
205.0	024.5000	0048.9	028.1	328.5	082.0000	0338.1	191.0	36.42
206.0	024.5000	0048.4	028.0	328.5	082.0000	0338.1	191.5	36.33
207.0	024.5000	0048.0	027.9	328.4	082.0000	0338.0	192.0	36.24
208.0	024.5000	0047.9	027.8	328.4	082.0000	0337.9	192.4	36.16
209.0	024.5000	0047.8	027.8	328.3	082.0000	0337.8	192.9	36.07
210.0	024.5000	0047.2	027.6	328.3	082.0000	0337.7	193.4	35.98
211.0	024.5000	0045.8	027.2	328.3	082.0000	0337.8	194.0	35.87
212.0	024.5000	0044.4	026.8	328.4	082.0000	0337.9	194.6	35.77
213.0	024.5000	0043.4	026.6	328.4	082.0000	0337.9	195.1	35.67

12-02-2019

Terrain Data: NGDC 30 SEC

FMOver Analysis

WHRM BLED20031023AAF

WUWS

Channel = 215C0

Max ERP = 82 kW

RCAMSL = 715 m

N. Lat. 44 55 13.90

W. Lng. 89 41 28.40

Protected

60 dBu

Channel = 215C3

Max ERP = 24.5 kW

RCAMSL = 284.6 m

N. Lat. 46 36 27.80

W. Lng. 90 50 13.69

Interfering

40 dBu

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)	IX (km)
275.0	082.0000	0335.1	073.0	174.5	024.5000	0062.6	182.4	26.05	
276.0	082.0000	0338.2	073.2	174.5	024.5000	0062.6	181.2	26.29	
277.0	082.0000	0340.1	073.3	174.5	024.5000	0062.6	179.9	26.53	
278.0	082.0000	0340.5	073.4	174.4	024.5000	0062.7	178.6	26.77	
279.0	082.0000	0340.5	073.4	174.3	024.5000	0062.8	177.4	27.00	
280.0	082.0000	0340.6	073.4	174.2	024.5000	0062.9	176.1	27.24	
281.0	082.0000	0340.7	073.4	174.1	024.5000	0063.0	174.9	27.47	
282.0	082.0000	0340.6	073.4	174.0	024.5000	0063.1	173.7	27.71	
283.0	082.0000	0340.2	073.3	173.8	024.5000	0063.2	172.5	27.94	
284.0	082.0000	0339.2	073.3	173.7	024.5000	0063.4	171.3	28.17	
285.0	082.0000	0337.9	073.2	173.5	024.5000	0063.6	170.1	28.39	
286.0	082.0000	0336.6	073.1	173.3	024.5000	0063.8	168.9	28.61	
287.0	082.0000	0335.2	073.0	173.1	024.5000	0063.9	167.8	28.83	
288.0	082.0000	0333.8	072.9	172.9	024.5000	0064.1	166.7	29.05	
289.0	082.0000	0332.5	072.8	172.7	024.5000	0064.3	165.6	29.26	
290.0	082.0000	0331.4	072.7	172.5	024.5000	0064.5	164.5	29.48	
291.0	082.0000	0330.1	072.6	172.2	024.5000	0064.7	163.4	29.68	
292.0	082.0000	0328.7	072.5	172.0	024.5000	0064.9	162.3	29.89	
293.0	082.0000	0326.7	072.4	171.7	024.5000	0065.0	161.3	30.09	
294.0	082.0000	0324.5	072.2	171.4	024.5000	0065.1	160.3	30.27	
295.0	082.0000	0322.2	072.0	171.2	024.5000	0065.2	159.3	30.46	
296.0	082.0000	0319.7	071.8	170.8	024.5000	0065.3	158.4	30.63	
297.0	082.0000	0317.4	071.7	170.5	024.5000	0065.4	157.5	30.80	
298.0	082.0000	0315.5	071.5	170.2	024.5000	0065.4	156.5	30.97	
299.0	082.0000	0314.1	071.4	169.9	024.5000	0065.4	155.6	31.13	
300.0	082.0000	0313.0	071.3	169.6	024.5000	0065.4	154.7	31.29	
301.0	082.0000	0311.4	071.2	169.3	024.5000	0065.4	153.8	31.45	
302.0	082.0000	0309.5	071.1	168.9	024.5000	0065.5	153.0	31.60	
303.0	082.0000	0307.5	070.9	168.6	024.5000	0065.6	152.2	31.75	
304.0	082.0000	0305.7	070.8	168.2	024.5000	0065.8	151.4	31.89	
305.0	082.0000	0304.2	070.7	167.8	024.5000	0066.0	150.6	32.04	
306.0	082.0000	0303.2	070.6	167.5	024.5000	0066.1	149.8	32.18	
307.0	082.0000	0302.7	070.6	167.1	024.5000	0066.3	149.0	32.33	

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
308.0	082.0000	0302.6	070.6	166.7	024.5000	0066.4	148.2	32.47
309.0	082.0000	0303.1	070.6	166.4	024.5000	0066.5	147.4	32.62
310.0	082.0000	0304.0	070.7	166.0	024.5000	0066.7	146.6	32.77
311.0	082.0000	0305.2	070.8	165.6	024.5000	0067.0	145.8	32.92
312.0	082.0000	0306.6	070.9	165.3	024.5000	0067.3	145.0	33.08
313.0	082.0000	0307.9	071.0	164.9	024.5000	0067.6	144.3	33.23
314.0	082.0000	0309.0	071.1	164.5	024.5000	0068.0	143.5	33.37
315.0	082.0000	0310.4	071.2	164.1	024.5000	0068.3	142.8	33.52
316.0	082.0000	0312.4	071.3	163.7	024.5000	0068.6	142.1	33.67
317.0	082.0000	0315.2	071.5	163.3	024.5000	0068.8	141.3	33.82
318.0	082.0000	0318.4	071.8	162.8	024.5000	0068.8	140.6	33.96
319.0	082.0000	0321.4	072.0	162.4	024.5000	0068.7	139.8	34.09
320.0	082.0000	0323.9	072.2	162.0	024.5000	0068.5	139.2	34.21
321.0	082.0000	0326.2	072.3	161.5	024.5000	0068.2	138.5	34.32
322.0	082.0000	0328.7	072.5	161.1	024.5000	0067.8	137.9	34.42
323.0	082.0000	0331.0	072.7	160.6	024.5000	0067.4	137.3	34.52
324.0	082.0000	0332.6	072.8	160.1	024.5000	0067.1	136.8	34.60
325.0	082.0000	0333.8	072.9	159.6	024.5000	0067.0	136.4	34.68
326.0	082.0000	0334.7	072.9	159.1	024.5000	0066.9	136.0	34.75
327.0	082.0000	0335.7	073.0	158.6	024.5000	0067.0	135.7	34.82
328.0	082.0000	0337.3	073.1	158.0	024.5000	0067.1	135.3	34.89
329.0	082.0000	0338.8	073.2	157.5	024.5000	0067.1	134.9	34.96
330.0	082.0000	0339.6	073.3	157.0	024.5000	0067.0	134.7	35.00
331.0	082.0000	0339.4	073.3	156.4	024.5000	0066.9	134.6	35.02
332.0	082.0000	0339.1	073.3	155.9	024.5000	0066.7	134.5	35.04
333.0	082.0000	0338.9	073.3	155.4	024.5000	0066.5	134.4	35.04
334.0	082.0000	0338.3	073.2	154.8	024.5000	0066.4	134.4	35.04
335.0	082.0000	0337.4	073.1	154.3	024.5000	0066.3	134.4	35.03
336.0	082.0000	0336.4	073.1	153.7	024.5000	0066.3	134.5	35.01
337.0	082.0000	0335.4	073.0	153.2	024.5000	0066.4	134.6	34.99
338.0	082.0000	0334.8	073.0	152.6	024.5000	0066.5	134.8	34.98
339.0	082.0000	0334.5	072.9	152.1	024.5000	0066.8	134.9	34.96
340.0	082.0000	0334.4	072.9	151.6	024.5000	0067.1	135.1	34.94
341.0	082.0000	0334.5	072.9	151.0	024.5000	0067.4	135.2	34.92
342.0	082.0000	0333.9	072.9	150.5	024.5000	0067.7	135.5	34.88
343.0	082.0000	0332.0	072.7	150.0	024.5000	0067.9	135.9	34.81
344.0	082.0000	0329.9	072.6	149.5	024.5000	0068.0	136.3	34.73
345.0	082.0000	0328.9	072.5	149.0	024.5000	0068.0	136.7	34.66
346.0	082.0000	0328.6	072.5	148.5	024.5000	0068.0	137.1	34.59
347.0	082.0000	0328.4	072.5	148.0	024.5000	0067.9	137.5	34.51
348.0	082.0000	0327.9	072.4	147.5	024.5000	0067.9	137.9	34.42
349.0	082.0000	0327.0	072.4	147.0	024.5000	0067.8	138.4	34.33
350.0	082.0000	0325.1	072.2	146.5	024.5000	0067.8	139.0	34.22
351.0	082.0000	0323.1	072.1	146.1	024.5000	0067.9	139.7	34.10
352.0	082.0000	0321.3	072.0	145.6	024.5000	0068.0	140.3	33.98
353.0	082.0000	0321.1	071.9	145.2	024.5000	0068.1	140.9	33.88
354.0	082.0000	0321.2	072.0	144.7	024.5000	0068.2	141.5	33.77
355.0	082.0000	0321.3	072.0	144.3	024.5000	0068.3	142.1	33.66
356.0	082.0000	0320.1	071.9	143.9	024.5000	0068.3	142.8	33.53
357.0	082.0000	0318.9	071.8	143.5	024.5000	0068.4	143.5	33.39
358.0	082.0000	0318.4	071.7	143.1	024.5000	0068.4	144.2	33.26

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
359.0	082.0000	0317.7	071.7	142.7	024.5000	0068.4	145.0	33.12
000.0	082.0000	0317.7	071.7	142.3	024.5000	0068.5	145.7	32.99
001.0	082.0000	0319.2	071.8	141.8	024.5000	0068.6	146.4	32.87
002.0	082.0000	0320.8	071.9	141.4	024.5000	0068.8	147.1	32.75
003.0	082.0000	0320.6	071.9	141.1	024.5000	0069.0	147.9	32.61
004.0	082.0000	0317.9	071.7	140.8	024.5000	0069.1	148.9	32.45
005.0	082.0000	0315.3	071.5	140.5	024.5000	0069.3	149.9	32.28
006.0	082.0000	0313.4	071.4	140.2	024.5000	0069.5	150.9	32.12
007.0	082.0000	0312.4	071.3	139.8	024.5000	0069.8	151.8	31.96
008.0	082.0000	0312.5	071.3	139.5	024.5000	0070.0	152.7	31.81
009.0	082.0000	0313.6	071.4	139.2	024.5000	0070.2	153.6	31.67
010.0	082.0000	0315.9	071.6	138.8	024.5000	0070.5	154.4	31.53
011.0	082.0000	0319.6	071.8	138.5	024.5000	0070.8	155.2	31.40
012.0	082.0000	0322.6	072.1	138.1	024.5000	0071.1	156.1	31.26
013.0	082.0000	0323.8	072.1	137.8	024.5000	0071.3	157.1	31.10
014.0	082.0000	0324.1	072.2	137.6	024.5000	0071.5	158.1	30.92
015.0	082.0000	0322.9	072.1	137.3	024.5000	0071.7	159.2	30.74
016.0	082.0000	0320.0	071.9	137.2	024.5000	0071.9	160.3	30.53
017.0	082.0000	0317.5	071.7	137.0	024.5000	0072.1	161.5	30.32
018.0	082.0000	0317.3	071.7	136.8	024.5000	0072.3	162.6	30.13
019.0	082.0000	0317.7	071.7	136.5	024.5000	0072.5	163.7	29.93
020.0	082.0000	0317.9	071.7	136.3	024.5000	0072.8	164.8	29.74
021.0	082.0000	0319.0	071.8	136.1	024.5000	0073.1	165.9	29.55
022.0	082.0000	0320.0	071.9	135.9	024.5000	0073.3	167.0	29.36
023.0	082.0000	0320.7	071.9	135.7	024.5000	0073.5	168.1	29.16
024.0	082.0000	0321.2	072.0	135.5	024.5000	0073.7	169.2	28.96
025.0	082.0000	0321.9	072.0	135.4	024.5000	0073.9	170.4	28.75
026.0	082.0000	0323.6	072.1	135.2	024.5000	0074.1	171.5	28.55
027.0	082.0000	0326.5	072.3	135.0	024.5000	0074.4	172.6	28.35
028.0	082.0000	0329.4	072.6	134.8	024.5000	0074.6	173.8	28.15
029.0	082.0000	0330.9	072.7	134.6	024.5000	0074.7	174.9	27.94
030.0	082.0000	0330.9	072.7	134.5	024.5000	0074.8	176.2	27.72
031.0	082.0000	0330.3	072.6	134.4	024.5000	0074.9	177.4	27.50
032.0	082.0000	0329.5	072.6	134.3	024.5000	0075.0	178.7	27.27
033.0	082.0000	0328.7	072.5	134.3	024.5000	0075.1	179.9	27.04
034.0	082.0000	0328.0	072.5	134.2	024.5000	0075.1	181.1	26.81

WUWS vs WTIP, contour-to-contour
Board Of Regents Of The University Of Wisconsin

FMCommander Single Allocation Study - 12-02-2019 - NGDC 30 SEC
WUWS's Overlaps (In= 4.9 km, Out= 12.38 km)

WUWS CH 215 C3

Lat= 46 36 27.80, Lng= 90 50 13.69

24.5 kW 74.9 m HAAT, 284.6 m COR

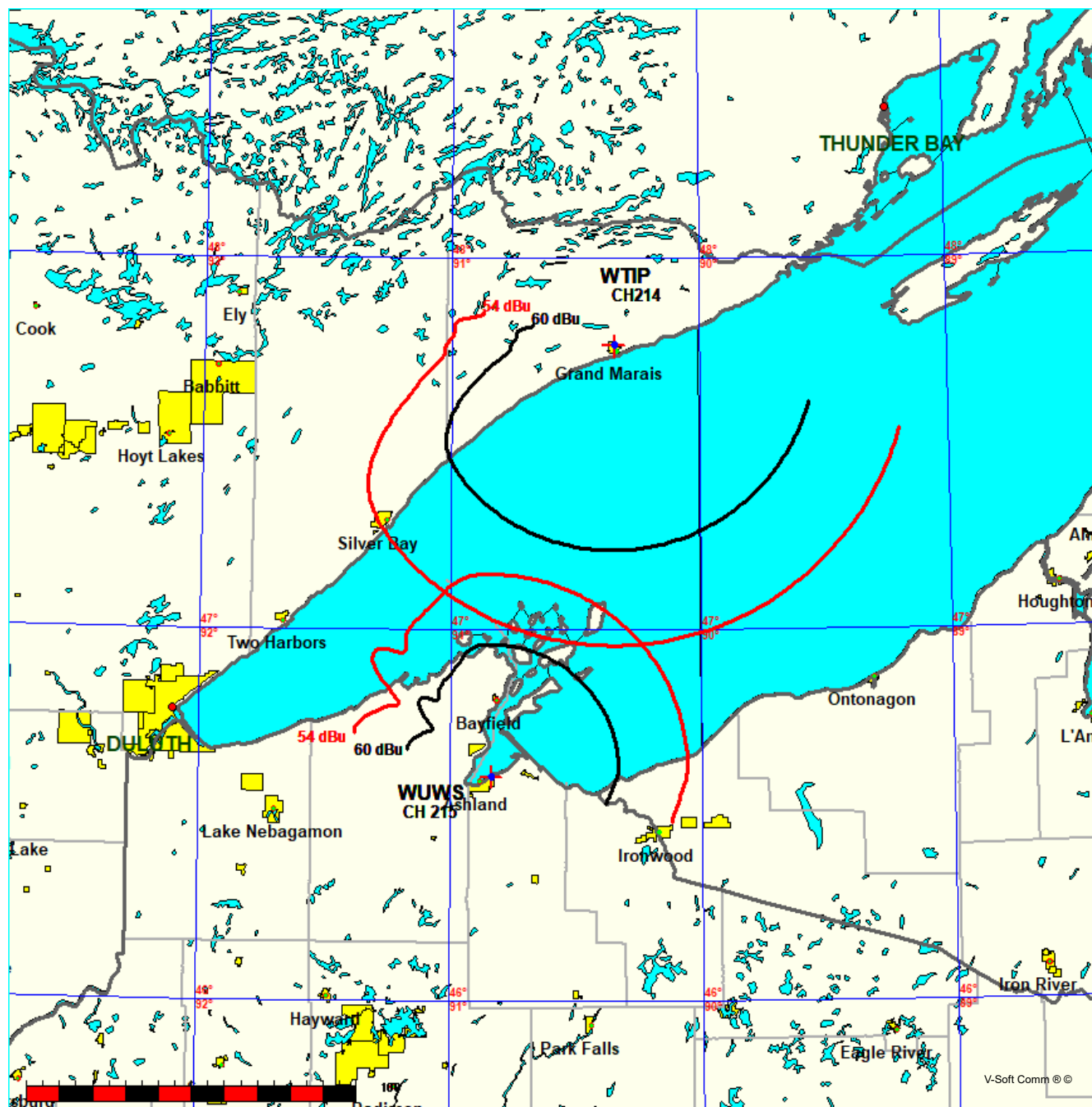
Prot.= 60 dBu, Intef.= 54 dBu

WTIP CH 214 C2 BMLED20140730ADF

Lat= 47 46 08.60, Lng= 90 20 49.40

25.0 kW 178 m HAAT, 528 m COR

Prot.= 60 dBu, Intef.= 54 dBu



12-02-2019

Terrain Data: NGDC 30 SEC

FMOver Analysis

WUWS

WTIP BMLED20140730ADF

Channel = 215C3
 Max ERP = 24.5 kW
 RCAMSL = 284.6 m
 N. Lat. 46 36 27.80
 W. Lng. 90 50 13.69
 Protected
 60 dBu

Channel = 214C2
 Max ERP = 25 kW
 RCAMSL = 528 m
 N. Lat. 47 46 08.60
 W. Lng. 90 20 49.40
 Interfering
 54 dBu

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)	IX (km)
316.0	024.5000	0062.8	031.5	209.1	025.0000	0344.5	121.6	45.26	
317.0	024.5000	0062.9	031.5	209.1	025.0000	0344.5	121.0	45.39	
318.0	024.5000	0061.8	031.3	208.9	025.0000	0344.5	120.6	45.50	
319.0	024.5000	0059.5	030.8	208.6	025.0000	0344.5	120.3	45.58	
320.0	024.5000	0056.7	030.1	208.2	025.0000	0344.6	120.0	45.64	
321.0	024.5000	0054.0	029.4	207.8	025.0000	0344.6	119.8	45.69	
322.0	024.5000	0051.3	028.7	207.4	025.0000	0344.6	119.6	45.74	
323.0	024.5000	0048.9	028.1	207.0	025.0000	0344.7	119.5	45.78	
324.0	024.5000	0047.5	027.7	206.7	025.0000	0344.7	119.2	45.84	
325.0	024.5000	0048.1	027.9	206.7	025.0000	0344.7	118.7	45.96	
326.0	024.5000	0050.5	028.5	206.8	025.0000	0344.7	117.9	46.15	
327.0	024.5000	0053.6	029.3	207.1	025.0000	0344.7	117.1	46.35	
328.0	024.5000	0056.2	030.0	207.2	025.0000	0344.6	116.3	46.55	
329.0	024.5000	0058.4	030.5	207.3	025.0000	0344.6	115.6	46.73	
330.0	024.5000	0060.0	030.9	207.3	025.0000	0344.6	114.9	46.89	
331.0	024.5000	0061.3	031.2	207.3	025.0000	0344.6	114.3	47.04	
332.0	024.5000	0062.7	031.5	207.2	025.0000	0344.6	113.7	47.20	
333.0	024.5000	0063.9	031.8	207.2	025.0000	0344.6	113.1	47.36	
334.0	024.5000	0064.7	031.9	207.1	025.0000	0344.7	112.6	47.50	
335.0	024.5000	0065.1	032.0	207.0	025.0000	0344.7	112.1	47.63	
336.0	024.5000	0066.0	032.2	206.8	025.0000	0344.7	111.5	47.77	
337.0	024.5000	0067.5	032.6	206.8	025.0000	0344.7	110.8	47.95	
338.0	024.5000	0069.1	032.9	206.7	025.0000	0344.7	110.2	48.12	
339.0	024.5000	0070.6	033.3	206.7	025.0000	0344.7	109.5	48.30	
340.0	024.5000	0072.1	033.6	206.6	025.0000	0344.7	108.9	48.48	
341.0	024.5000	0073.7	033.9	206.5	025.0000	0344.7	108.2	48.66	
342.0	024.5000	0075.3	034.3	206.4	025.0000	0344.7	107.6	48.84	
343.0	024.5000	0077.7	034.8	206.3	025.0000	0344.7	106.8	49.05	
344.0	024.5000	0080.3	035.3	206.3	025.0000	0344.7	106.0	49.28	
345.0	024.5000	0083.1	035.9	206.2	025.0000	0344.7	105.1	49.52	
346.0	024.5000	0086.2	036.5	206.2	025.0000	0344.7	104.3	49.77	
347.0	024.5000	0089.2	037.0	206.1	025.0000	0344.7	103.4	50.01	
348.0	024.5000	0091.5	037.4	206.0	025.0000	0344.7	102.7	50.22	
349.0	024.5000	0093.5	037.8	205.8	025.0000	0344.7	102.0	50.42	
350.0	024.5000	0095.3	038.1	205.6	025.0000	0344.8	101.4	50.61	
351.0	024.5000	0097.2	038.4	205.4	025.0000	0344.8	100.7	50.80	

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
352.0	024.5000	0099.0	038.7	205.2	025.0000	0344.8	100.1	50.98
353.0	024.5000	0100.2	039.0	204.9	025.0000	0344.8	099.6	51.14
354.0	024.5000	0101.3	039.1	204.6	025.0000	0344.8	099.1	51.29
355.0	024.5000	0101.6	039.2	204.3	025.0000	0344.8	098.7	51.41
356.0	024.5000	0101.6	039.2	203.9	025.0000	0344.8	098.4	51.50
357.0	024.5000	0101.6	039.2	203.6	025.0000	0344.9	098.1	51.60
358.0	024.5000	0101.6	039.2	203.2	025.0000	0344.9	097.8	51.68
359.0	024.5000	0101.6	039.2	202.9	025.0000	0344.9	097.5	51.77
000.0	024.5000	0101.6	039.2	202.5	025.0000	0344.9	097.2	51.85
001.0	024.5000	0101.6	039.2	202.1	025.0000	0344.9	097.0	51.92
002.0	024.5000	0101.6	039.2	201.7	025.0000	0344.9	096.7	51.99
003.0	024.5000	0101.6	039.2	201.4	025.0000	0344.9	096.5	52.06
004.0	024.5000	0101.6	039.2	201.0	025.0000	0344.9	096.3	52.12
005.0	024.5000	0101.6	039.2	200.6	025.0000	0344.9	096.1	52.18
006.0	024.5000	0101.6	039.2	200.2	025.0000	0345.0	095.9	52.23
007.0	024.5000	0101.6	039.2	199.8	025.0000	0345.0	095.8	52.28
008.0	024.5000	0101.6	039.2	199.4	025.0000	0345.0	095.7	52.32
009.0	024.5000	0101.6	039.2	199.0	025.0000	0345.0	095.5	52.36
010.0	024.5000	0101.6	039.2	198.6	025.0000	0345.0	095.4	52.39
011.0	024.5000	0101.6	039.2	198.2	025.0000	0345.0	095.3	52.42
012.0	024.5000	0101.6	039.2	197.8	025.0000	0345.0	095.3	52.44
013.0	024.5000	0101.6	039.2	197.3	025.0000	0345.0	095.2	52.45
014.0	024.5000	0101.6	039.2	196.9	025.0000	0345.0	095.2	52.47
015.0	024.5000	0101.6	039.2	196.5	025.0000	0345.0	095.1	52.47
016.0	024.5000	0101.6	039.2	196.1	025.0000	0345.0	095.1	52.47
017.0	024.5000	0101.6	039.2	195.7	025.0000	0345.0	095.2	52.47
018.0	024.5000	0101.6	039.2	195.3	025.0000	0345.0	095.2	52.46
019.0	024.5000	0101.6	039.2	194.9	025.0000	0345.0	095.2	52.45
020.0	024.5000	0101.6	039.2	194.5	025.0000	0345.0	095.3	52.43
021.0	024.5000	0101.6	039.2	194.1	025.0000	0345.0	095.4	52.41
022.0	024.5000	0101.6	039.2	193.7	025.0000	0345.0	095.5	52.38
023.0	024.5000	0101.6	039.2	193.2	025.0000	0345.0	095.6	52.34
024.0	024.5000	0101.6	039.2	192.8	025.0000	0345.0	095.7	52.30
025.0	024.5000	0101.6	039.2	192.4	025.0000	0345.0	095.8	52.26
026.0	024.5000	0101.6	039.2	192.0	025.0000	0345.0	096.0	52.21
027.0	024.5000	0101.6	039.2	191.7	025.0000	0345.0	096.2	52.16
028.0	024.5000	0101.6	039.2	191.3	025.0000	0345.0	096.4	52.10
029.0	024.5000	0101.6	039.2	190.9	025.0000	0345.0	096.6	52.04
030.0	024.5000	0101.6	039.2	190.5	025.0000	0345.0	096.8	51.97
031.0	024.5000	0101.6	039.2	190.1	025.0000	0345.0	097.0	51.90
032.0	024.5000	0101.6	039.2	189.7	025.0000	0345.0	097.3	51.82
033.0	024.5000	0101.6	039.2	189.4	025.0000	0345.0	097.6	51.74
034.0	024.5000	0101.6	039.2	189.0	025.0000	0345.0	097.9	51.66
035.0	024.5000	0101.6	039.2	188.6	025.0000	0345.0	098.2	51.57
036.0	024.5000	0101.6	039.2	188.3	025.0000	0345.0	098.5	51.47
037.0	024.5000	0101.6	039.2	187.9	025.0000	0345.0	098.8	51.38
038.0	024.5000	0101.6	039.2	187.6	025.0000	0345.0	099.1	51.27
039.0	024.5000	0101.6	039.2	187.3	025.0000	0345.0	099.5	51.17
040.0	024.5000	0101.6	039.2	186.9	025.0000	0345.0	099.9	51.06
041.0	024.5000	0101.6	039.2	186.6	025.0000	0345.0	100.3	50.95
042.0	024.5000	0101.6	039.2	186.3	025.0000	0345.0	100.7	50.83

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
043.0	024.5000	0101.6	039.2	186.0	025.0000	0345.0	101.1	50.71
044.0	024.5000	0101.6	039.2	185.7	025.0000	0345.0	101.5	50.59
045.0	024.5000	0101.6	039.2	185.4	025.0000	0345.0	101.9	50.46
046.0	024.5000	0101.6	039.2	185.1	025.0000	0345.0	102.4	50.33
047.0	024.5000	0101.6	039.2	184.8	025.0000	0345.0	102.8	50.20
048.0	024.5000	0101.6	039.2	184.5	025.0000	0345.0	103.3	50.06
049.0	024.5000	0101.6	039.2	184.3	025.0000	0345.0	103.8	49.92
050.0	024.5000	0101.6	039.2	184.0	025.0000	0345.0	104.3	49.78
051.0	024.5000	0101.6	039.2	183.7	025.0000	0345.0	104.8	49.64
052.0	024.5000	0101.6	039.2	183.5	025.0000	0345.0	105.3	49.49
053.0	024.5000	0101.6	039.2	183.2	025.0000	0345.0	105.8	49.35
054.0	024.5000	0101.6	039.2	183.0	025.0000	0345.0	106.3	49.20
055.0	024.5000	0101.6	039.2	182.8	025.0000	0345.0	106.9	49.05
056.0	024.5000	0101.6	039.2	182.6	025.0000	0345.0	107.4	48.89
057.0	024.5000	0101.6	039.2	182.4	025.0000	0345.0	108.0	48.74
058.0	024.5000	0101.6	039.2	182.2	025.0000	0345.0	108.5	48.58
059.0	024.5000	0101.6	039.2	182.0	025.0000	0345.0	109.1	48.43
060.0	024.5000	0101.5	039.2	181.8	025.0000	0345.0	109.7	48.27
061.0	024.5000	0101.5	039.2	181.6	025.0000	0345.0	110.3	48.11
062.0	024.5000	0101.5	039.2	181.4	025.0000	0345.0	110.9	47.95
063.0	024.5000	0101.4	039.2	181.3	025.0000	0345.0	111.5	47.79
064.0	024.5000	0101.3	039.1	181.1	025.0000	0345.0	112.1	47.63
065.0	024.5000	0101.2	039.1	181.0	025.0000	0345.0	112.7	47.47
066.0	024.5000	0101.1	039.1	180.8	025.0000	0345.0	113.3	47.31
067.0	024.5000	0100.9	039.1	180.7	025.0000	0345.0	114.0	47.15
068.0	024.5000	0100.8	039.0	180.6	025.0000	0345.0	114.6	46.99
069.0	024.5000	0100.6	039.0	180.5	025.0000	0345.0	115.2	46.83
070.0	024.5000	0100.4	039.0	180.4	025.0000	0345.0	115.9	46.67
071.0	024.5000	0100.3	039.0	180.3	025.0000	0345.0	116.5	46.50
072.0	024.5000	0100.1	038.9	180.2	025.0000	0345.0	117.2	46.34
073.0	024.5000	0100.0	038.9	180.1	025.0000	0345.0	117.9	46.18
074.0	024.5000	0099.9	038.9	180.0	025.0000	0345.0	118.5	46.02
075.0	024.5000	0099.8	038.9	179.9	025.0000	0345.0	119.2	45.86

12-02-2019

Terrain Data: NGDC 30 SEC

FMOver Analysis

WTIP BMLED20140730ADF

WUWS

Channel = 214C2

Max ERP = 25 kW

RCAMSL = 528 m

N. Lat. 47 46 08.60

W. Lng. 90 20 49.40

Protected

60 dBu

Channel = 215C3

Max ERP = 24.5 kW

RCAMSL = 284.6 m

N. Lat. 46 36 27.80

W. Lng. 90 50 13.69

Interfering

54 dBu

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)	IX (km)
136.0	025.0000	0345.0	061.7	043.2	024.5000	0101.6	116.6	39.43	
137.0	025.0000	0345.0	061.7	043.1	024.5000	0101.6	115.6	39.62	
138.0	025.0000	0345.0	061.7	043.1	024.5000	0101.6	114.5	39.81	
139.0	025.0000	0345.0	061.7	043.0	024.5000	0101.6	113.4	40.00	
140.0	025.0000	0345.0	061.7	043.0	024.5000	0101.6	112.4	40.20	
141.0	025.0000	0345.0	061.7	042.9	024.5000	0101.6	111.3	40.40	
142.0	025.0000	0345.0	061.7	042.8	024.5000	0101.6	110.2	40.60	
143.0	025.0000	0345.0	061.7	042.7	024.5000	0101.6	109.2	40.81	
144.0	025.0000	0345.0	061.7	042.6	024.5000	0101.6	108.1	41.02	
145.0	025.0000	0345.0	061.7	042.5	024.5000	0101.6	107.0	41.23	
146.0	025.0000	0345.0	061.7	042.4	024.5000	0101.6	106.0	41.44	
147.0	025.0000	0345.0	061.7	042.3	024.5000	0101.6	104.9	41.66	
148.0	025.0000	0345.0	061.7	042.1	024.5000	0101.6	103.9	41.88	
149.0	025.0000	0345.0	061.7	041.9	024.5000	0101.6	102.9	42.11	
150.0	025.0000	0345.0	061.7	041.8	024.5000	0101.6	101.8	42.34	
151.0	025.0000	0345.0	061.7	041.6	024.5000	0101.6	100.8	42.57	
152.0	025.0000	0345.0	061.7	041.4	024.5000	0101.6	099.8	42.80	
153.0	025.0000	0345.0	061.7	041.1	024.5000	0101.6	098.8	43.03	
154.0	025.0000	0345.0	061.7	040.9	024.5000	0101.6	097.8	43.27	
155.0	025.0000	0345.0	061.7	040.6	024.5000	0101.6	096.8	43.51	
156.0	025.0000	0345.0	061.7	040.4	024.5000	0101.6	095.8	43.75	
157.0	025.0000	0345.0	061.7	040.1	024.5000	0101.6	094.9	44.00	
158.0	025.0000	0345.0	061.7	039.8	024.5000	0101.6	093.9	44.24	
159.0	025.0000	0345.0	061.7	039.5	024.5000	0101.6	093.0	44.49	
160.0	025.0000	0345.0	061.7	039.1	024.5000	0101.6	092.0	44.73	
161.0	025.0000	0345.0	061.7	038.8	024.5000	0101.6	091.1	44.98	
162.0	025.0000	0345.0	061.7	038.4	024.5000	0101.6	090.2	45.22	
163.0	025.0000	0345.0	061.7	038.0	024.5000	0101.6	089.3	45.46	
164.0	025.0000	0345.0	061.7	037.6	024.5000	0101.6	088.4	45.70	
165.0	025.0000	0345.0	061.7	037.2	024.5000	0101.6	087.6	45.94	
166.0	025.0000	0345.0	061.7	036.8	024.5000	0101.6	086.7	46.17	
167.0	025.0000	0345.0	061.7	036.3	024.5000	0101.6	085.9	46.40	
168.0	025.0000	0345.0	061.7	035.9	024.5000	0101.6	085.1	46.63	

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
169.0	025.0000	0345.0	061.7	035.4	024.5000	0101.6	084.3	46.85
170.0	025.0000	0345.0	061.7	034.9	024.5000	0101.6	083.5	47.07
171.0	025.0000	0345.0	061.7	034.3	024.5000	0101.6	082.7	47.28
172.0	025.0000	0345.0	061.7	033.8	024.5000	0101.6	082.0	47.48
173.0	025.0000	0345.0	061.7	033.2	024.5000	0101.6	081.3	47.68
174.0	025.0000	0345.0	061.7	032.6	024.5000	0101.6	080.6	47.87
175.0	025.0000	0345.0	061.7	032.0	024.5000	0101.6	079.9	48.06
176.0	025.0000	0345.0	061.7	031.4	024.5000	0101.6	079.3	48.24
177.0	025.0000	0345.0	061.7	030.8	024.5000	0101.6	078.7	48.42
178.0	025.0000	0345.0	061.7	030.1	024.5000	0101.6	078.1	48.58
179.0	025.0000	0345.0	061.7	029.4	024.5000	0101.6	077.5	48.74
180.0	025.0000	0345.0	061.7	028.7	024.5000	0101.6	077.0	48.90
181.0	025.0000	0345.0	061.7	028.0	024.5000	0101.6	076.5	49.04
182.0	025.0000	0345.0	061.7	027.3	024.5000	0101.6	076.0	49.18
183.0	025.0000	0345.0	061.7	026.6	024.5000	0101.6	075.6	49.31
184.0	025.0000	0345.0	061.7	025.8	024.5000	0101.6	075.1	49.43
185.0	025.0000	0345.0	061.7	025.0	024.5000	0101.6	074.7	49.54
186.0	025.0000	0345.0	061.7	024.3	024.5000	0101.6	074.4	49.64
187.0	025.0000	0345.0	061.7	023.5	024.5000	0101.6	074.1	49.74
188.0	025.0000	0345.0	061.7	022.7	024.5000	0101.6	073.8	49.82
189.0	025.0000	0345.0	061.7	021.8	024.5000	0101.6	073.5	49.90
190.0	025.0000	0345.0	061.7	021.0	024.5000	0101.6	073.3	49.97
191.0	025.0000	0345.0	061.7	020.2	024.5000	0101.6	073.1	50.02
192.0	025.0000	0345.0	061.7	019.4	024.5000	0101.6	072.9	50.07
193.0	025.0000	0345.0	061.7	018.5	024.5000	0101.6	072.8	50.11
194.0	025.0000	0345.0	061.7	017.7	024.5000	0101.6	072.7	50.13
195.0	025.0000	0345.0	061.7	016.8	024.5000	0101.6	072.6	50.15
196.0	025.0000	0345.0	061.7	016.0	024.5000	0101.6	072.6	50.16
197.0	025.0000	0345.0	061.7	015.1	024.5000	0101.6	072.6	50.16
198.0	025.0000	0345.0	061.7	014.3	024.5000	0101.6	072.7	50.14
199.0	025.0000	0345.0	061.7	013.4	024.5000	0101.6	072.7	50.12
200.0	025.0000	0345.0	061.7	012.6	024.5000	0101.6	072.9	50.08
201.0	025.0000	0344.9	061.7	011.8	024.5000	0101.6	073.0	50.04
202.0	025.0000	0344.9	061.7	010.9	024.5000	0101.6	073.2	49.99
203.0	025.0000	0344.9	061.7	010.1	024.5000	0101.6	073.4	49.92
204.0	025.0000	0344.8	061.7	009.3	024.5000	0101.6	073.7	49.85
205.0	025.0000	0344.8	061.7	008.5	024.5000	0101.6	074.0	49.77
206.0	025.0000	0344.7	061.7	007.7	024.5000	0101.6	074.3	49.67
207.0	025.0000	0344.7	061.7	006.9	024.5000	0101.6	074.6	49.57
208.0	025.0000	0344.6	061.7	006.1	024.5000	0101.6	075.0	49.46
209.0	025.0000	0344.5	061.7	005.4	024.5000	0101.6	075.4	49.34
210.0	025.0000	0344.3	061.7	004.6	024.5000	0101.6	075.9	49.21
211.0	025.0000	0344.2	061.7	003.9	024.5000	0101.6	076.4	49.08
212.0	025.0000	0344.0	061.6	003.2	024.5000	0101.6	076.9	48.93
213.0	025.0000	0343.7	061.6	002.5	024.5000	0101.6	077.4	48.78
214.0	025.0000	0343.5	061.6	001.8	024.5000	0101.6	078.0	48.62
215.0	025.0000	0343.2	061.6	001.2	024.5000	0101.6	078.6	48.45
216.0	025.0000	0342.8	061.6	000.5	024.5000	0101.6	079.2	48.27
217.0	025.0000	0342.4	061.5	359.9	024.5000	0101.6	079.9	48.09
218.0	025.0000	0341.9	061.5	359.3	024.5000	0101.6	080.5	47.90
219.0	025.0000	0341.5	061.5	358.8	024.5000	0101.6	081.2	47.70

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
220.0	025.0000	0341.0	061.4	358.2	024.5000	0101.6	082.0	47.50
221.0	025.0000	0340.5	061.4	357.7	024.5000	0101.6	082.7	47.29
222.0	025.0000	0340.0	061.4	357.1	024.5000	0101.6	083.5	47.07
223.0	025.0000	0339.5	061.3	356.6	024.5000	0101.6	084.3	46.86
224.0	025.0000	0339.0	061.3	356.2	024.5000	0101.6	085.1	46.63
225.0	025.0000	0338.4	061.3	355.7	024.5000	0101.6	085.9	46.40
226.0	025.0000	0337.8	061.2	355.3	024.5000	0101.6	086.7	46.17
227.0	025.0000	0337.1	061.2	354.9	024.5000	0101.6	087.6	45.93
228.0	025.0000	0336.3	061.1	354.5	024.5000	0101.6	088.5	45.69
229.0	025.0000	0335.5	061.1	354.1	024.5000	0101.4	089.4	45.44
230.0	025.0000	0334.5	061.0	353.7	024.5000	0101.1	090.3	45.18
231.0	025.0000	0333.3	060.9	353.4	024.5000	0100.7	091.2	44.91
232.0	025.0000	0332.0	060.8	353.1	024.5000	0100.4	092.2	44.64
233.0	025.0000	0330.4	060.7	352.8	024.5000	0100.0	093.1	44.38
234.0	025.0000	0328.4	060.6	352.6	024.5000	0099.7	094.1	44.11
235.0	025.0000	0325.9	060.4	352.4	024.5000	0099.5	095.1	43.84
236.0	025.0000	0322.7	060.2	352.2	024.5000	0099.2	096.2	43.58
237.0	025.0000	0318.8	059.9	352.1	024.5000	0099.1	097.2	43.31
238.0	025.0000	0314.2	059.6	352.0	024.5000	0098.9	098.3	43.05
239.0	025.0000	0308.8	059.2	351.9	024.5000	0098.9	099.4	42.79
240.0	025.0000	0302.4	058.8	351.9	024.5000	0098.9	100.5	42.53
241.0	025.0000	0294.8	058.2	352.0	024.5000	0099.0	101.7	42.28
242.0	025.0000	0285.2	057.6	352.2	024.5000	0099.2	102.8	42.03
243.0	025.0000	0273.5	056.7	352.4	024.5000	0099.5	104.1	41.77
244.0	025.0000	0260.6	055.8	352.7	024.5000	0099.9	105.3	41.53
245.0	025.0000	0247.3	054.8	353.0	024.5000	0100.3	106.5	41.29
246.0	025.0000	0234.6	053.9	353.4	024.5000	0100.6	107.7	41.06
247.0	025.0000	0222.2	052.9	353.7	024.5000	0101.0	108.9	40.84
248.0	025.0000	0209.9	051.9	354.1	024.5000	0101.4	110.1	40.62
249.0	025.0000	0197.5	050.9	354.4	024.5000	0101.5	111.2	40.41
250.0	025.0000	0185.1	049.9	354.8	024.5000	0101.6	112.3	40.20
251.0	025.0000	0173.3	048.8	355.2	024.5000	0101.6	113.4	40.00
252.0	025.0000	0162.4	047.6	355.7	024.5000	0101.6	114.6	39.80
253.0	025.0000	0152.0	046.3	356.3	024.5000	0101.6	115.7	39.60
254.0	025.0000	0142.2	045.0	356.8	024.5000	0101.6	116.7	39.41
255.0	025.0000	0131.9	043.6	357.4	024.5000	0101.6	117.8	39.22

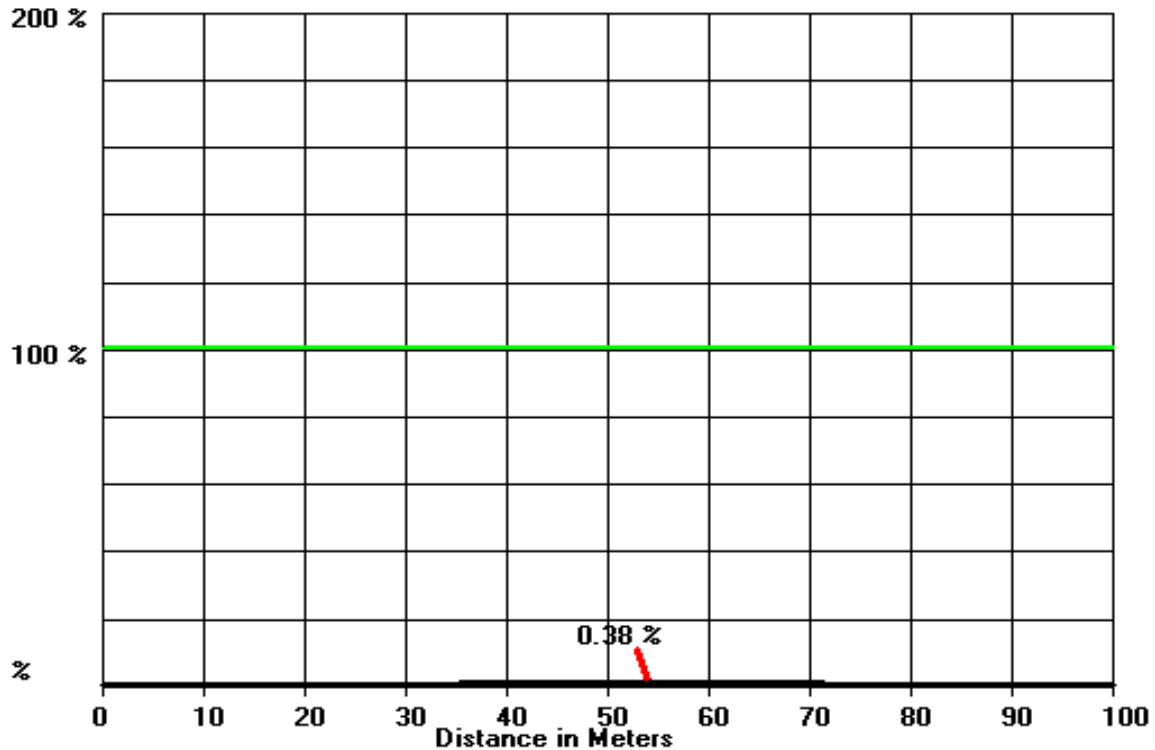
N. Lat. = 46 36 27.8 W. Lng. = 90 50 13.7
HAAT and Distance to Contour,
FCC, FM 2-10 Mi, 51 pts Method - NGDC 30 SEC

Distance and HAATs to 60 dBu contours

Azi.	AV EL	HAAT	ERP kW	dBk	Field	60-F5
000	183.0	101.6	24.5000	13.89	1.000	39.18
045	183.0	101.6	24.5000	13.89	1.000	39.18
090	188.0	96.6	24.5000	13.89	1.000	38.34
135	210.3	74.3	24.5000	13.89	1.000	34.06
180	224.1	60.5	24.5000	13.89	1.000	31.01
225	242.9	41.7	24.5000	13.89	1.000	26.05
270	223.2	61.4	24.5000	13.89	1.000	31.21
315	223.1	61.5	24.5000	13.89	1.000	31.23

Ave El= 209.70 M HAAT= 74.90 M AMSL= 284.6

EPA Type 1: Ring-stub or any unknown, 6 Bays, Spac= 0.5, H=24.5 kW, V=24.5 kW, 85 M At



HORZ. DISTANCE FROM FM RADIATOR VS POWER DENSITY (Microwatt/Square cm)
 Dist(Meters) PD (H) PD (V) Total(uW/cm2) Percent Max.(1000)

Dist(Meters)	PD (H)	PD (V)	Total(uW/cm2)	Percent Max.(1000)
0	0.00	0.01	0.01	0.0
1	0.00	0.01	0.01	0.0
2	0.00	0.01	0.01	0.0
3	0.00	0.01	0.01	0.0
4	0.00	0.01	0.01	0.0
5	0.00	0.01	0.01	0.0
6	0.00	0.01	0.01	0.0
7	0.00	0.01	0.02	0.0
8	0.00	0.02	0.02	0.0
9	0.00	0.02	0.02	0.0
10	0.01	0.02	0.03	0.0
11	0.01	0.03	0.04	0.0
12	0.01	0.04	0.05	0.0
13	0.01	0.05	0.06	0.0
14	0.02	0.06	0.08	0.0
15	0.02	0.08	0.10	0.0
16	0.03	0.10	0.13	0.0
17	0.03	0.13	0.16	0.0
18	0.04	0.15	0.19	0.0
19	0.05	0.19	0.23	0.0
20	0.06	0.22	0.28	0.0
21	0.07	0.27	0.34	0.0
22	0.08	0.31	0.40	0.0
23	0.10	0.37	0.46	0.0
24	0.11	0.43	0.54	0.1
25	0.13	0.49	0.62	0.1

Dist (Meters)	PD (H)	PD (V)	Total (uW/cm2)	Percent Max.
26	0.15	0.56	0.71	0.1
27	0.18	0.63	0.81	0.1
28	0.20	0.71	0.91	0.1
29	0.23	0.80	1.03	0.1
30	0.25	0.89	1.14	0.1
31	0.28	0.99	1.27	0.1
32	0.31	1.09	1.41	0.1
33	0.35	1.20	1.55	0.2
34	0.38	1.31	1.69	0.2
35	0.42	1.43	1.84	0.2
36	0.45	1.55	2.00	0.2
37	0.49	1.67	2.15	0.2
38	0.53	1.79	2.31	0.2
39	0.56	1.90	2.46	0.2
40	0.60	2.01	2.61	0.3
41	0.64	2.11	2.75	0.3
42	0.68	2.20	2.88	0.3
43	0.72	2.30	3.01	0.3
44	0.75	2.38	3.13	0.3
45	0.79	2.46	3.25	0.3
46	0.82	2.53	3.35	0.3
47	0.85	2.60	3.45	0.3
48	0.88	2.65	3.53	0.4
49	0.90	2.71	3.61	0.4
50	0.91	2.77	3.68	0.4
51	0.93	2.81	3.74	0.4
52	0.94	2.84	3.78	0.4
53	0.95	2.86	3.81	0.4
54	0.95	2.87	3.82	0.4
55	0.95	2.87	3.82	0.4
56	0.94	2.86	3.80	0.4
57	0.94	2.83	3.77	0.4
58	0.93	2.80	3.73	0.4
59	0.91	2.74	3.65	0.4
60	0.90	2.67	3.57	0.4
61	0.88	2.59	3.47	0.3
62	0.86	2.50	3.36	0.3
63	0.83	2.40	3.24	0.3
64	0.80	2.30	3.11	0.3
65	0.77	2.20	2.97	0.3
66	0.74	2.09	2.83	0.3
67	0.71	1.97	2.68	0.3
68	0.67	1.86	2.53	0.3
69	0.63	1.74	2.37	0.2
70	0.59	1.62	2.22	0.2
71	0.56	1.50	2.06	0.2
72	0.52	1.38	1.90	0.2
73	0.48	1.27	1.75	0.2
74	0.44	1.15	1.59	0.2
75	0.40	1.04	1.44	0.1
76	0.37	0.93	1.30	0.1
77	0.33	0.83	1.16	0.1

Dist (Meters)	PD (H)	PD (V)	Total (uW/cm2)	Percent Max.
78	0.29	0.73	1.02	0.1
79	0.26	0.64	0.89	0.1
80	0.22	0.55	0.77	0.1
81	0.19	0.47	0.66	0.1
82	0.16	0.39	0.55	0.1
83	0.13	0.32	0.46	0.0
84	0.11	0.26	0.37	0.0
85	0.09	0.20	0.29	0.0
86	0.07	0.15	0.22	0.0
87	0.05	0.11	0.16	0.0
88	0.03	0.08	0.11	0.0
89	0.02	0.05	0.07	0.0
90	0.01	0.03	0.04	0.0
91	0.01	0.01	0.02	0.0
92	0.00	0.01	0.01	0.0
93	0.00	0.00	0.01	0.0
94	0.00	0.01	0.01	0.0
95	0.01	0.02	0.03	0.0
96	0.02	0.03	0.05	0.0
97	0.03	0.05	0.08	0.0
98	0.04	0.08	0.12	0.0
99	0.06	0.11	0.16	0.0
100	0.07	0.14	0.21	0.0