



Strategies for

FM Translators & Boosters The Broadcasters Clinic

V **Doug Vernier**
401 Main Street, Suite 213
Cedar Falls, Iowa 50613

Telecommunication Consultants

V **Soft**
COMMUNICATIONS®
R.F. Communications Software
and Engineering Consulting

Area Translators



- Translators may not extend the protected contour area of a translator licensed to a commercial band primary station.
- NCE and non-co-owned commercial station translators may extend the translator's contour beyond the primary station's protected contour.
- Primary FM station's protected contours are the 54 dBu for class B, 57 dBu for class B1 and 60 dBu for all other classes.
- All Translators are secondary stations and may be booted off the air by full service stations

Sec. 74.1235 Power Limitations

(1) For FM translators located east of the Mississippi River or in Zone I-A as described in § 73.205(b)

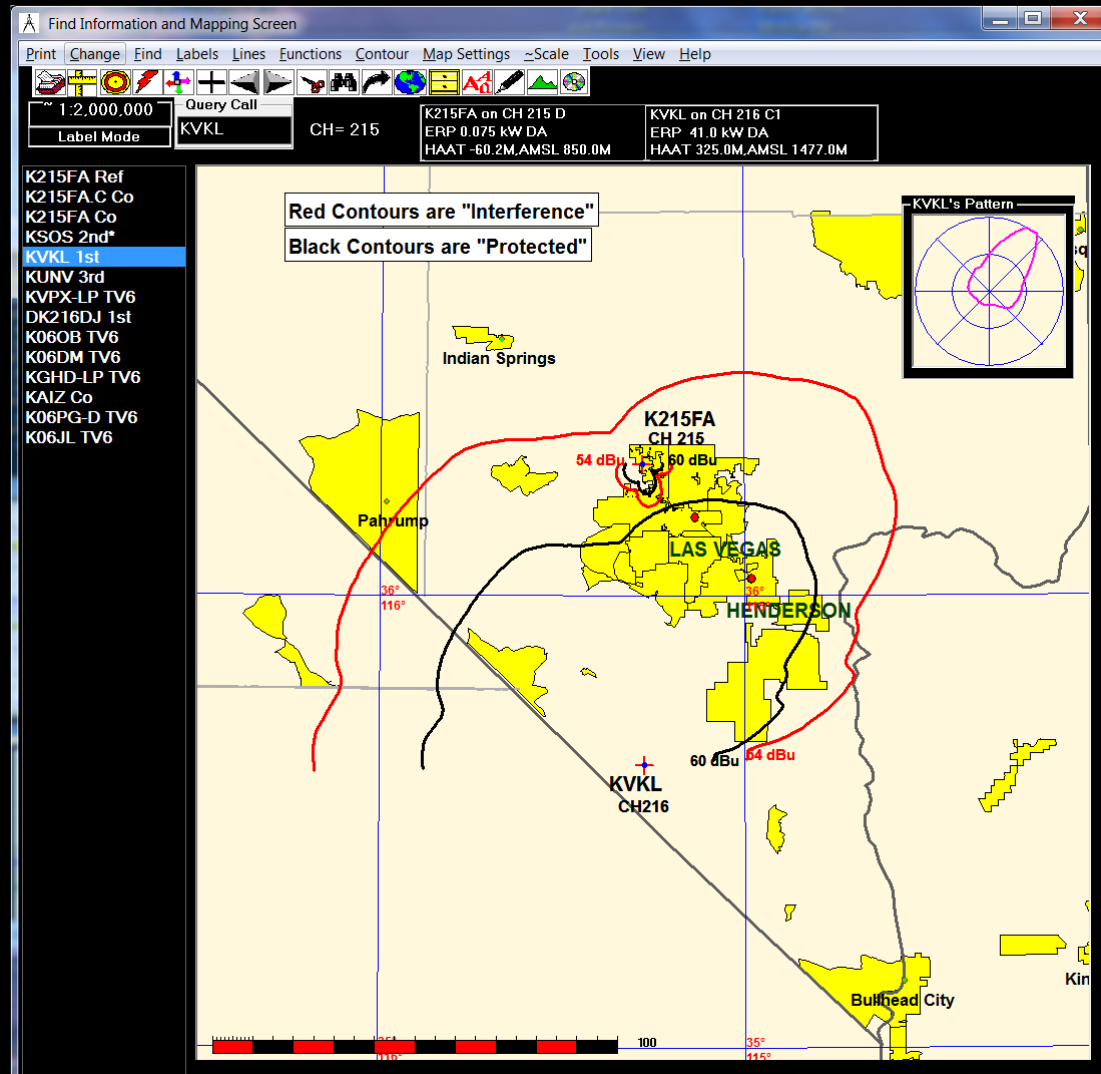
Radial HAAT (meters)	Maximum ERP (MERP in watts)
Less than or equal to 32	250
33 to 39	170
40 to 47	120
48 to 57	80
58 to 68	55
69 to 82	38
83 to 96	27
97 to 115	19
116 to 140	13
Greater than or equal to 141	10

Highest of 12 radials = HAAT

(2) For FM translators located in all other areas:

Radial HAAT (meters)	Maximum ERP (MERP in watts)
Less than or equal to 107	250
108 to 118	205
119 to 130	170
131 to 144	140
145 to 157	115
158 to 173	92
174 to 192	75
193 to 212	62
213 to 235	50
236 to 260	41
261 to 285	34
286 to 310	28
311 to 345	23
346 to 380	19
381 to 425	15.5
426 to 480	13
481 to 540	11
Greater than or equal to 541	10

Protected and Interference Contours



Fill-in Translators – Sec. 74.1201

- (h) Fill-in area. The area where the coverage contour of an FM translator or booster station is within the protected contour of the associated primary station
- AM Fill-in area. The area within the lesser of the 2 mV/m daytime contour of the AM radio broadcast station being rebroadcast and a 25-mile (40 km) radius centered at the AM transmitter site.

Interesting twists and facts

- Translators that are fill-in may transmit up to 250 watts without antenna height limitations as long as they do not extend the protected contour of the primary station.
- The 60 dBu of a 250 watt fill-in translator at 2000' HAAT has same coverage as a class B or C2 station.
- FM translators and fill-in translators may run a primary station's multicast programming, if desired.
- NCE band translators may be fed with alternate delivery but not commercial band translators unless they are fill in translators and then not with satellite.
- Translators may not cause "real" interference to a regularly listen to full-service station or translator.

Using HD2 to feed a translator

Translator is now a fill-in for VPR's WBTN-FM located on the same tower

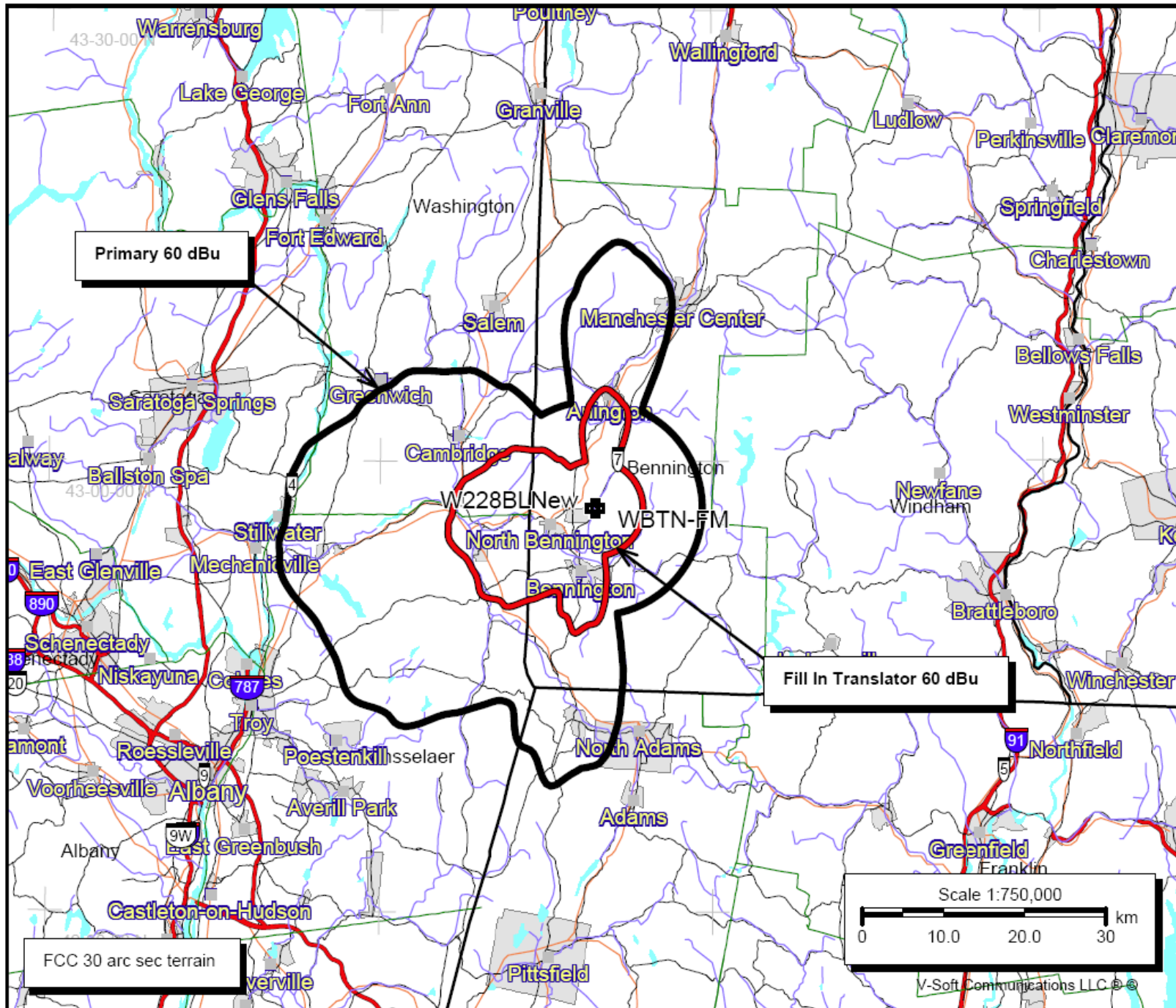
The screenshot shows the FM Commander software interface. The title bar reads "FM Commander Contour-to-Contour - HAAT Method= 0 ©V-Soft Communications®". The menu bar includes "File", "Print", "Settings", "Class", "Channel", "< Down", "> Up", "Find", "Views", "Help", and "About". The status bar shows "FCC NGDC 30 Sec" and "DATA: 03-17-11 East Zone". A summary box displays: "N. Lat. 42 56 53.0", "W. Lng. 73 10 34.0", "466 M COR", "0.12 kW", "Contours are detailed", "CH 228, 93.5", "D D", "South Bennington X", "1.7 M HAAT", "w228bl.vsf", and "Job: 03-20-11". Below this is a table of stations with columns: Call, Type, Ch, Location, Azi, Dist, In, and Out.

Call	Type	Ch	Location	Azi	Dist	In	Out	
W228BL	LIC	228D	South Benningto	VT	0.0	0.0	-59.0	-59.0
WEEY	LIC	228A	Swanzey	NH	92.7	68.9	-19.8*	19.1
AL4198	RSV-A	229A	Scotia	NY	267.4	70.5	-0.9	8.0
628196	APP	227D	Easton	NY	285.9	29.3	5.6	0.1
WYAI	LIC-N	229A	Scotia	NY	262.3	73.3	4.7	12.4
WZCR	LIC	228A	Hudson	NY	212.1	90.9	7.2	22.9
W227CA	LIC	227D	Rupert	VT	0.7	37.0	17.9	10.5

End of Screen List

Translator's power limit is set by application 628196. VPR also does this in Manchester, VT, with plans to do it in two other markets.

WBTV-FM Fill-In Translator New W228BL



Religious Translator Relays Top-40 HD2

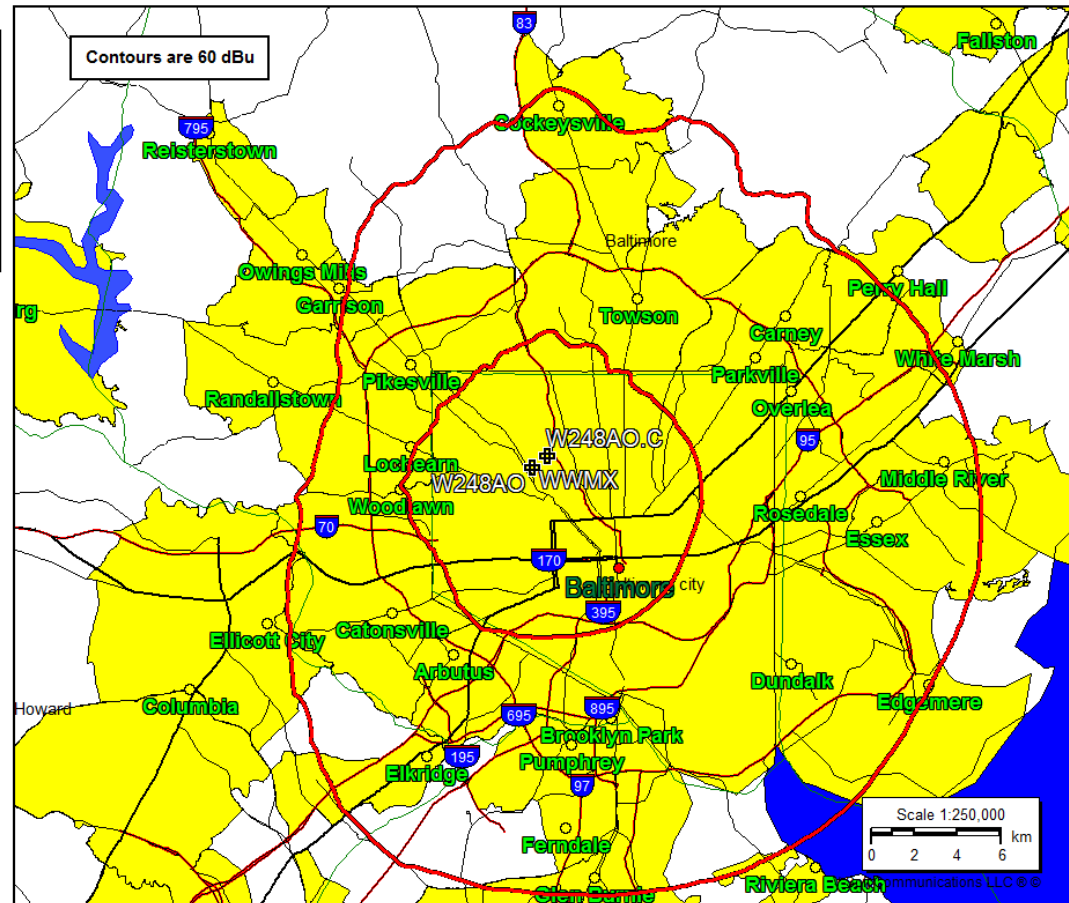
W248AO.C Becomes an HD2 Fill-in for WWMX

W248AO.C
BPF T20110328ACI
Latitude: 39-20-10 N
Longitude: 076-38-59 W
ERP: 0.25 kW
Channel: 248
Frequency: 97.5 MHz
AMSL Height: 265.0 m
Horiz. Pattern: Directional
Prop Model: FCC

W248AO
BLFT20090724AAA
Latitude: 39-19-53 N
Longitude: 076-39-28 W
ERP: 0.008 kW
Channel: 248
Frequency: 97.5 MHz
AMSL Height: 231.0 m
Horiz. Pattern: Omni

WWMX
BLH20030502AAI
Latitude: 39-20-10 N
Longitude: 076-38-59 W
ERP: 8.30 kW
Channel: 293
Frequency: 106.5 MHz
AMSL Height: 428.0 m
Horiz. Pattern: Omni

Doug Vernier
401 Main Street, Suite 213
Cedar Falls, Iowa 50613
Telecommunication Consultants
dvernier@earthlink.net (815)246-8442



W292DV – Fill-in- HD2 Clear Channel

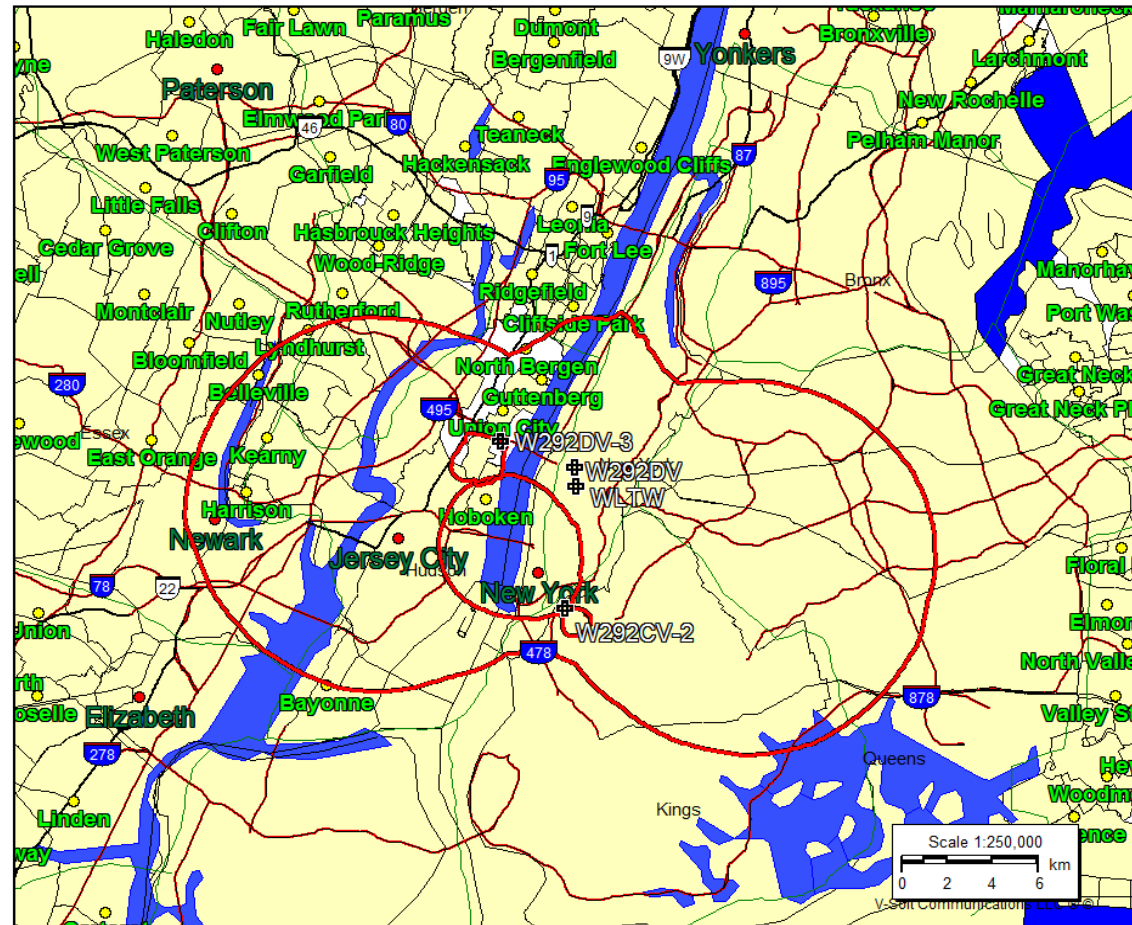
W292DV evolves into a Fill-in for WLTW

W292DV
BLFT20110503AEA
Latitude: 40-45-22 N
Longitude: 073-59-12 W
ERP: 0.099 kW
Channel: 292
Frequency: 106.3 MHz
AMSL Height: 286.0 m
Horiz. Pattern: Directional
Prop Model: FCC

WLTW
BLH19940203KA
Latitude: 40-44-54 N
Longitude: 073-59-10 W
ERP: 6.00 kW
Channel: 294
Frequency: 106.7 MHz
AMSL Height: 429.0 m
Horiz. Pattern: Omni

 **Doug Vernier**
401 Main Street, Suite 213
Cedar Falls, Iowa 50613
Telecommunication Consultants
©1999-2008

Contours are 60 dBu



Shows outgoing co-channel contour overlap

FM Commander Contour-to-Contour - HAAT Method= 0 ©V-Soft Communications®

File Print Settings Class Channel ≤ Down ≥ Up Find Views Help About

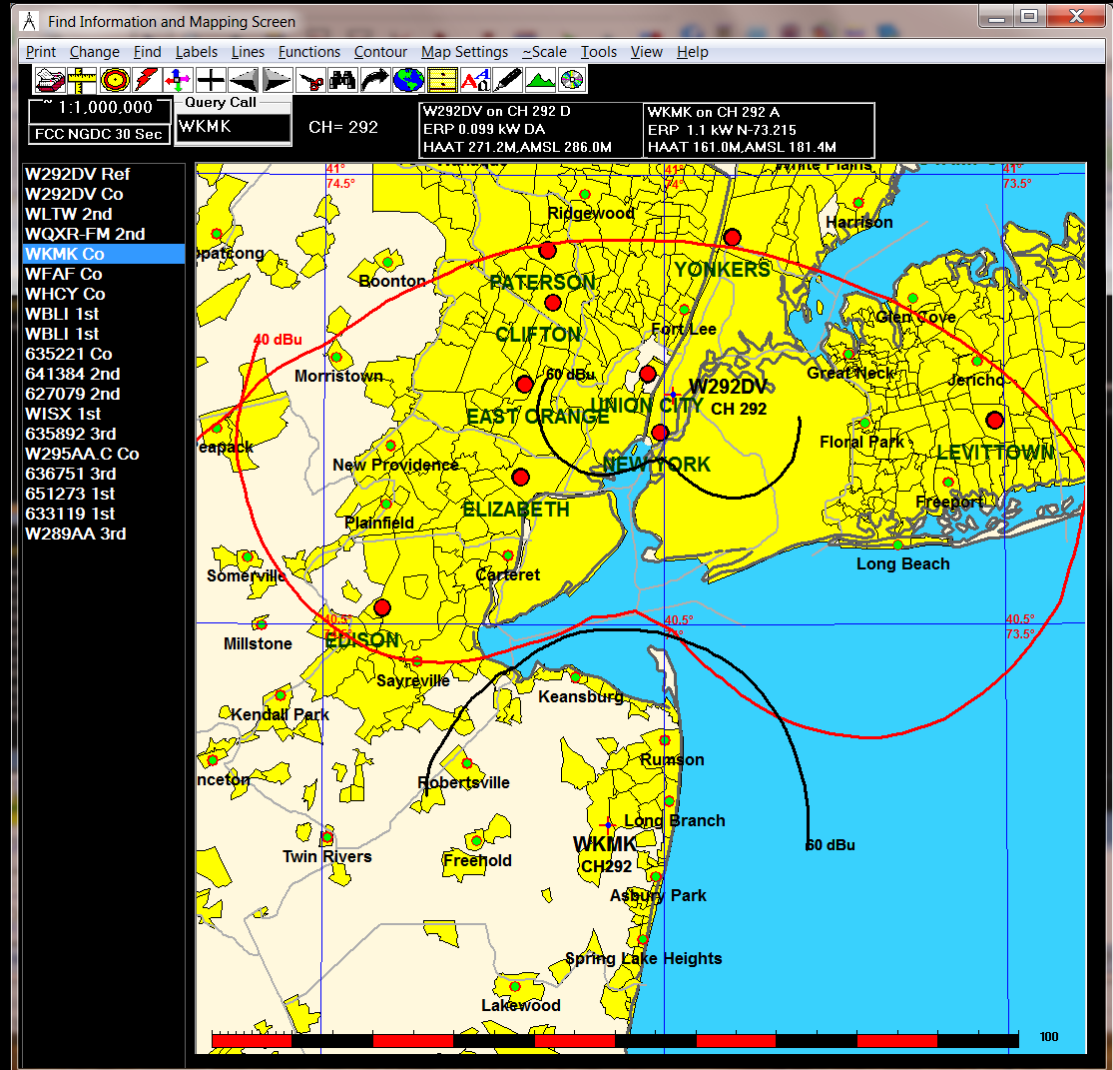
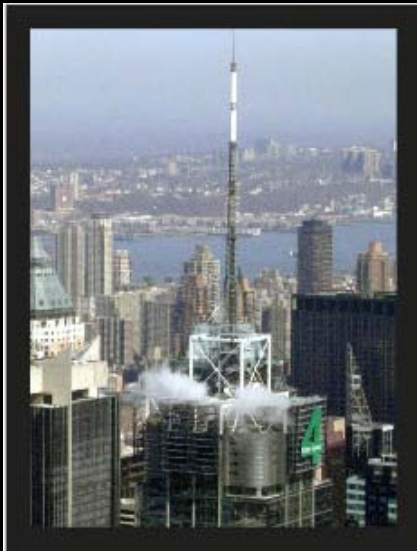
FCC NGDC 30 Sec DATA: 06-04-11 East Zone

N. Lat. 40 45 22.0 286 M COR Contours are detailed New York NY X w292dv.vsf
 W. Lng. 73 59 12.0 0.099 kW DA CH 292, 106.3 MHz, D D 271.2 M HAAT Job: 06-05-11

Call	Type	Ch	Location	Azi	Dist	In	Out	
W292DV	LIC-D	292D	New York	NY	0.0	0.0	-30.2	-30.2
WLTW	LIC	294B	New York	NY	176.9	0.9	-13.0*	-64.4*
WQXR-FM	LIC	290B1	Newark	NJ	176.9	0.9	-10.2*	-37.1*
WKMK	LIC-N	292A	Eatontown	NJ	188.5	53.7	-30.3*	-3.6
WFAF	LIC	292A	Mount Kisco	NY	28.4	54.3	-19.9*	10.1
WHCY	LIC	292A	Blairstown	NJ	291.7	89.0	-1.0	15.4
WBLI	LIC-D	291B	Patchogue	NY	82.8	80.2	11.8	1.0
WBLI	LIC-D	291B	Patchogue	NY	82.8	80.2	11.8	1.0
635221	APP	292D	Midland Park	NJ	333.7	29.3	2.4	2.9
641384	APP-D	290D	Edison	NJ	233.8	42.5	27.2	41.7
627079	APP-D	290D	Edison	NJ	233.8	42.5	27.3	41.8
WISX	LIC	291B	Philadelphia	PA	233.9	125.8	34.7	28.9
635892	APP	289D	Franklin Townsh	NJ	234.1	52.9	37.4	45.6
W295AA	CP	292D	Middletown	NY	335.2	85.6	45.7	56.0
636751	APP-D	289D	Bedford Hills	NY	26.5	55.0	48.4	53.0
651273	APP	291D	Monroe	NY	350.0	70.1	49.9	51.8
633119	APP-D	293D	Trenton	NJ	228.6	79.2	57.0	52.7

More...

W292DV and its Interference



Frequency Issues



- With commercial and public station move-ins and new allocations, translator may find the need to move the channel to avoid causing or receiving interference
- FCC rules say that a change of channel greater than the 3rd adjacent would be a major change. (I.F. changes, i.e. 53 or 54 channel jumps are allowed)
- FCC says it has become “kinder and gentler” on channel moves greater than 3 channels and they will consider waiver requests of the major change rule for translators that are “displaced” by powerful stations landing on the translators’ channels

Example K269EJ Displacement

FM Commander Contour-to-Contour - HAAT Method= 0 ©V-Soft Communications®

File Print Settings Class Channel < Down > Up Find Views Help About

FCC NGDC 30 Sec DATA: 03-17-11 West Zone

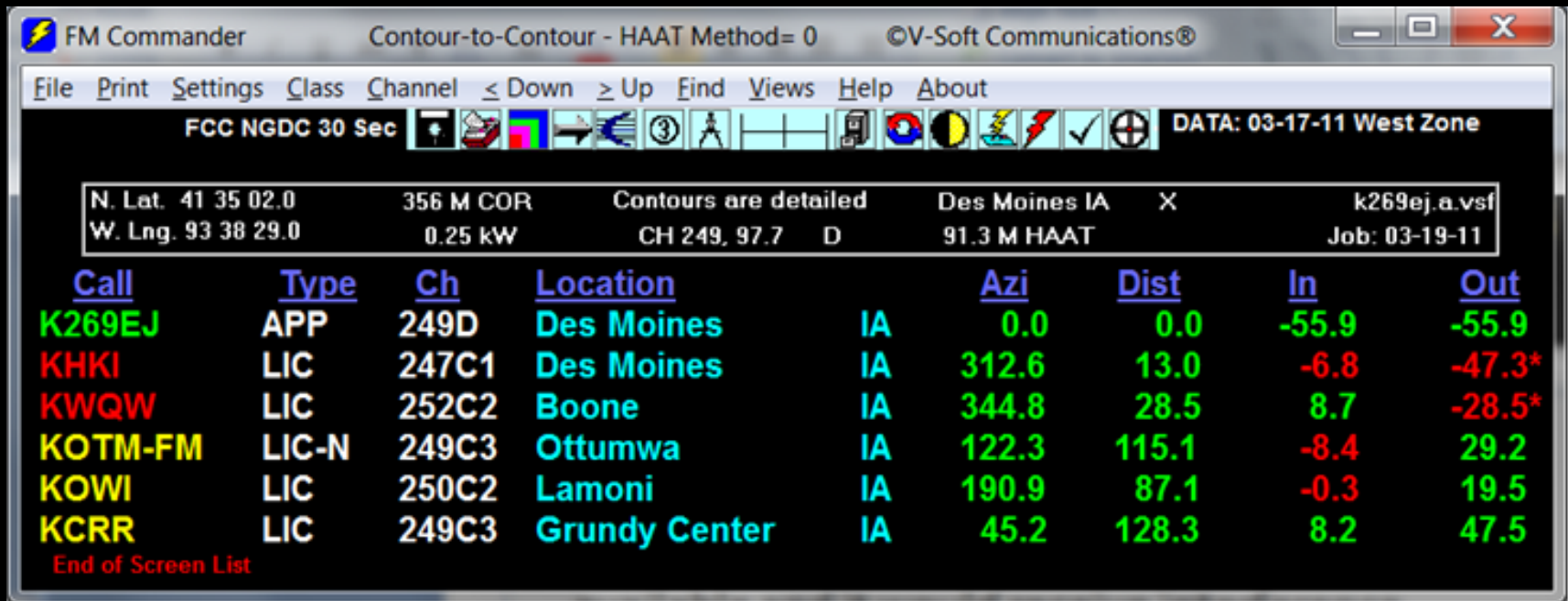
N. Lat. 41 35 02.0	356 M COR	Contours are detailed	Des Moines IA	X	k269ej.a.vsf
W. Lng. 93 38 29.0	0.25 kW	CH 269, 101.7 D	91.3 M HAAT		Job: 03-19-11

<u>Call</u>	<u>Type</u>	<u>Ch</u>	<u>Location</u>		<u>Azi</u>	<u>Dist</u>	<u>In</u>	<u>Out</u>
K269EJ	LIC	269D	Des Moines	IA	0.0	0.0	-55.9	-55.9
R13803	ADD	269A	Winterset	IA	228.4	30.6	-70.5*	-41.8
632743	APP	271D	Grimes	IA	327.9	9.4	-3.6*	5.1
641448	APP	271D	Des Moines	IA	313.2	13.1	1.8	-0.4
KKSI	LIC	268C2	Eddyville	IA	122.4	93.0	1.7	20.6
636855	APP	271D	West Des Moines	IA	256.6	17.1	4.0	4.7
KXIA	LIC	266C1	Marshalltown	IA	51.3	75.4	55.5	12.0

End of Screen List

How much received interference is too much?

- K269EJ, Des Moines has been displaced by a full service move-in on its channel
- A frequency study showed that only one channel was available and it would receive interference



The screenshot shows the FM Commander software interface. The title bar reads "FM Commander Contour-to-Contour - HAAT Method= 0 ©V-Soft Communications®". The menu bar includes "File", "Print", "Settings", "Class", "Channel", "< Down", "> Up", "Find", "Views", "Help", and "About". The status bar shows "FCC NGDC 30 Sec" and "DATA: 03-17-11 West Zone". The main display area contains a table with the following data:

Call	Type	Ch	Location		Azi	Dist	In	Out
K269EJ	APP	249D	Des Moines	IA	0.0	0.0	-55.9	-55.9
KHKI	LIC	247C1	Des Moines	IA	312.6	13.0	-6.8	-47.3*
KWQW	LIC	252C2	Boone	IA	344.8	28.5	8.7	-28.5*
KOTM-FM	LIC-N	249C3	Ottumwa	IA	122.3	115.1	-8.4	29.2
KOWI	LIC	250C2	Lamoni	IA	190.9	87.1	-0.3	19.5
KCRR	LIC	249C3	Grundy Center	IA	45.2	128.3	8.2	47.5

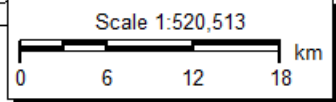
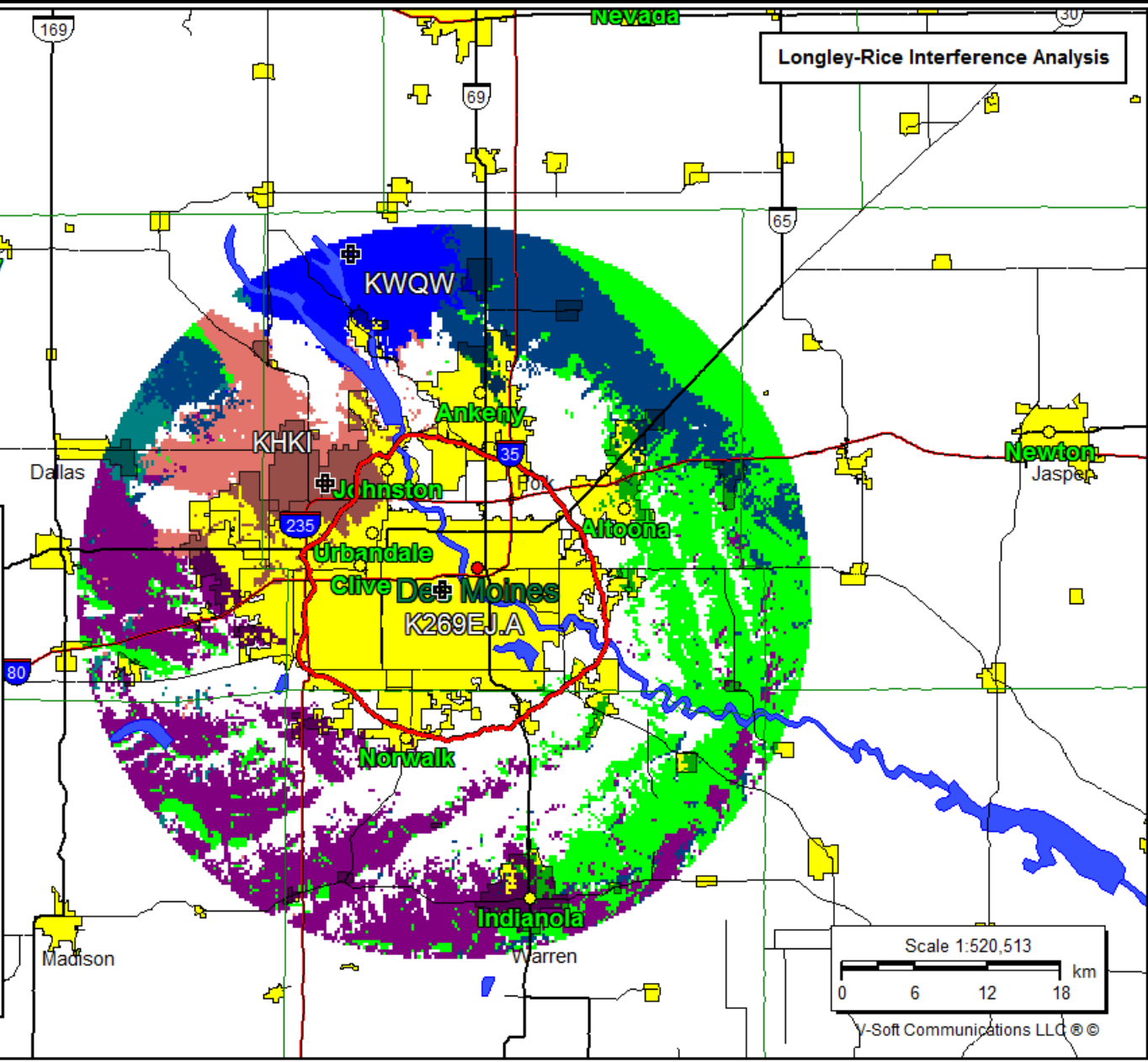
Additional information from the screenshot includes: N. Lat. 41 35 02.0, W. Lng. 93 38 29.0, 356 M COR, 0.25 kW, Contours are detailed, CH 249, 97.7 D, Des Moines IA, 91.3 M HAAT, and Job: 03-19-11. The text "End of Screen List" is visible at the bottom left.

Longley-Rice Interference Analysis

- K269EJ.A (249)
- NONE.C (246)
- KHKI (247)
- KBVU-FM (248)
- KOTM-FM (249)
- KHBT (249)
- KCRR (249)
- KOWI (250)
- KCMR (250)
- KHAK (251)
- KWQW (252)
- KVVL (246)

K269EJ.A

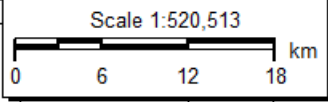
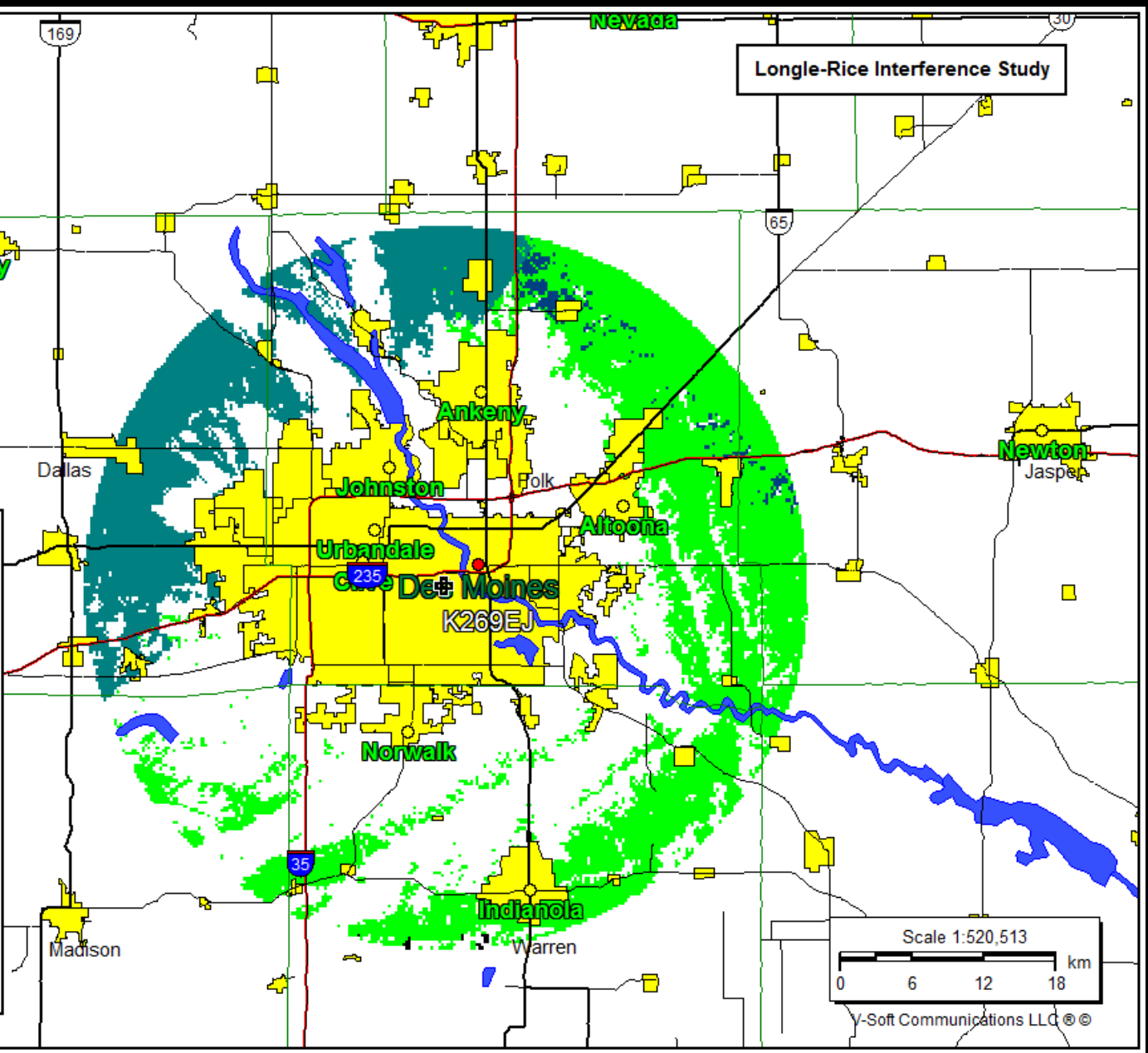
Latitude: 41-35-02 N
 Longitude: 093-38-29 W
 ERP: 0.25 kW
 Channel: 249
 Frequency: 97.7 MHz
 AMSL Height: 356.0 m
 Horiz. Pattern: Omni
 Prop Model: Longley/Rice
 Climate: Cont temperate
 Conductivity: 0.0200
 Dielec Const: 15.0
 Refractivity: 315.0
 Receiver Ht AG: 9.1 m
 Receiver Gain: 0 dB
 Time Variability: 50.0%
 Sit. Variability: 50.0%
 ITM Mode: Broadcast



Longle-Rice Interference Study

- K269EJ (269)
- KXIA (266)
- KSIB-FM (267)
- 1364396.A (268)
- KKSI (268)
- KAYL-FM (269)
- KNWS-FM (270)
- 1358865.A (271)
- KGOZ (269)

K269EJ
BLFT19980116TD
Latitude: 41-35-02 N
Longitude: 093-38-29 W
ERP: 0.25 kW
Channel: 269
Frequency: 101.7 MHz
AMSL Height: 356.0 m
Horiz. Pattern: Omni
Prop Model: Longley/Rice
Climate: Cont temperate
Conductivity: 0.0200
Dielec Const: 15.0
Refractivity: 315.0
Receiver Ht AG: 9.1 m
Receiver Gain: 0 dB
Time Variability: 50.0%
Sit. Variability: 50.0%
ITM Mode: Broadcast



Y-Soft Communications LLC ©

Example – This translator needs a 2nd adjacent waiver to protect WIYY & WASH

FM Commander Contour-to-Contour - HAAT Method= 0 ©V-Soft Communications®

File Print Settings Class Channel < Down > Up Find Views Help About

FCC NGDC 30 Sec DATA: 06-04-11 East Zone

N. Lat. 39 20 10.0 265 M COR Contours are detailed Baltimore MD X w248ao.c.vsf
 W. Lng. 76 38 59.0 0.25 kW DA CH 248, 97.5 MHz, D D 0.0 M HAAT * Job: 06-05-11

Call	Type	Ch	Location	Azi	Dist	In	Out	
W248AO	CP-D	248D	Baltimore	MD	0.0	0.0	-71.0	-71.0
W248AO	LIC	248D	Baltimore	MD	232.8	0.9	-34.3	-54.8
WIYY	LIC	250B	Baltimore	MD	211.7	0.2	-23.5*	-65.3*
WLTF	LIC	248B	Martinsburg	WV	276.9	122.2	-22.9*	3.0
WASH	LIC-N	246B	Washington	DC	221.0	56.7	34.0	-8.0*
WRYR-LP	LIC	248L1	Sherwood	MD	156.2	69.2	29.7	-0.1
WPEN-FM	LIC-Z	248B	Burlington	NJ	56.1	150.5	8.3	16.6
WRVV	LIC-N	247B	Harrisburg	PA	350.6	113.8	15.3	10.6
WLAN-FM	LIC	245B	Lancaster	PA	11.7	80.8	58.8	11.5
AL3047	RSV-A	248B	Burlington	NJ	57.6	189.3	34.6	53.5
WKTT	LIC	248A	Salisbury	MD	140.2	140.6	39.1	51.1
W249BE	LIC	249D	Alexandria	VA	215.2	72.6	49.3	42.9
636346	APP	247D	New London	PA	49.2	83.2	56.4	51.6
646554	APP	249D	Oxford	PA	49.2	83.2	56.5	51.6
WAFL	LIC	249A	Milford	DE	114.0	109.9	53.3	55.6
WMDM	LIC	249A	Lexington Park	MD	176.2	117.4	53.9	59.4
WENJ-FM	LIC	247B	Millville	NJ	90.0	161.5	64.6	56.2

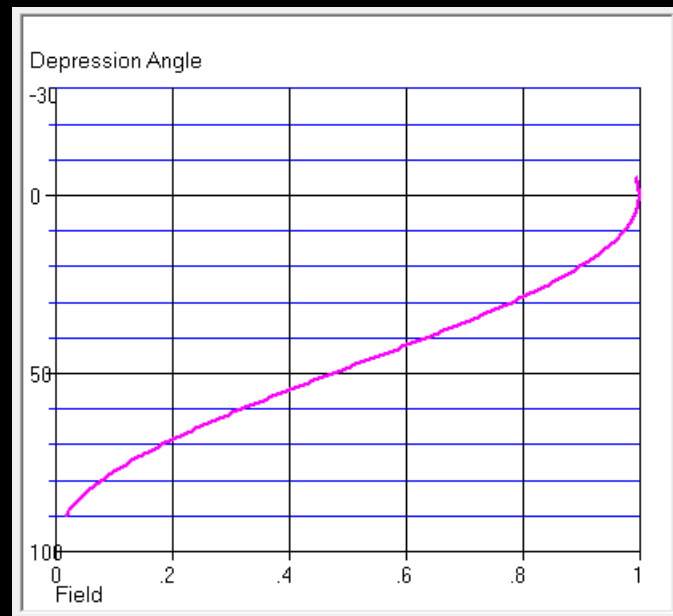
More...

2nd and 3rd Adjacent Waiver Twists

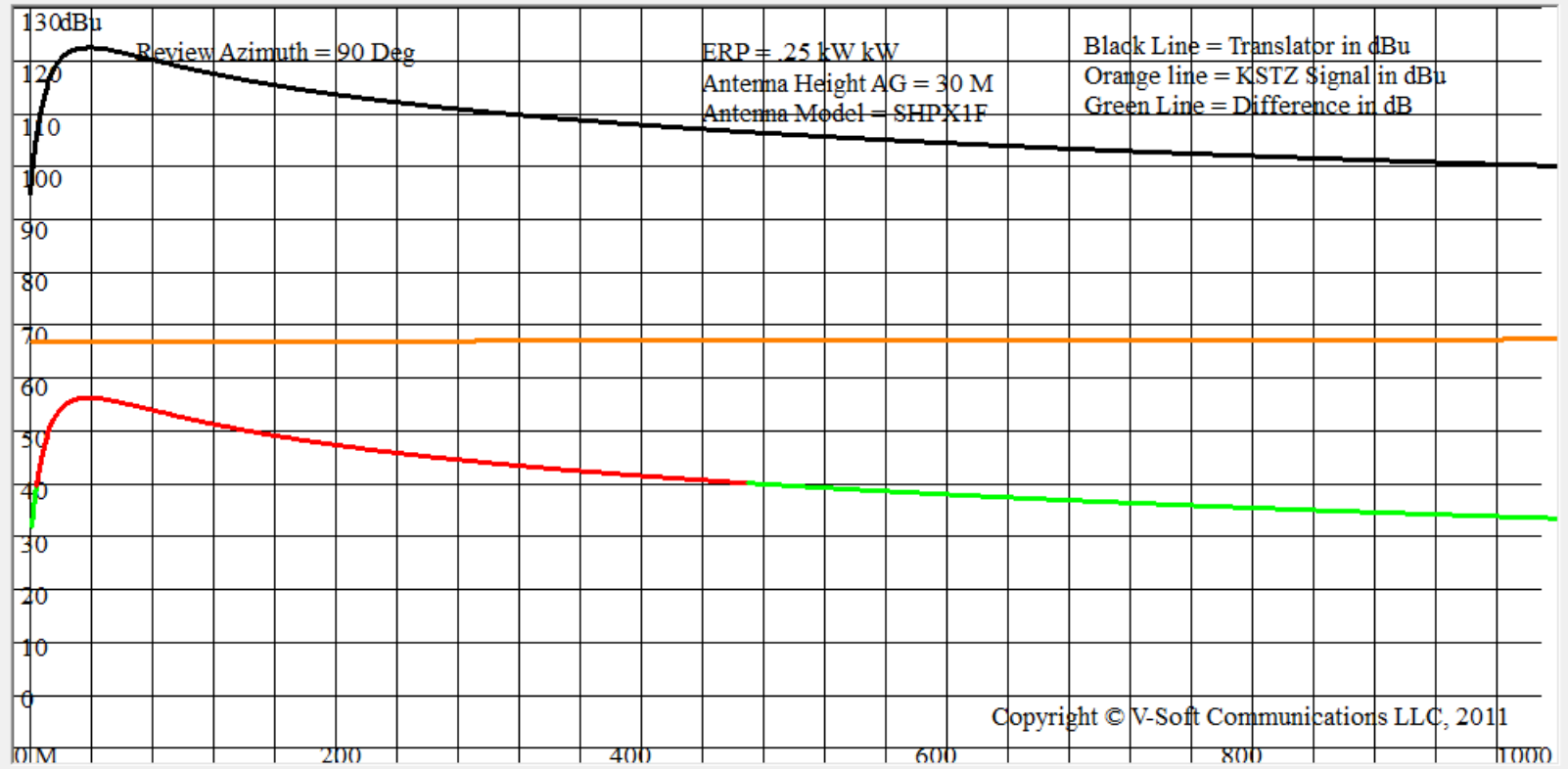
- Translators are routinely granted waivers to operate within the protected contour of a 2nd or 3rd adjacent full-service station
- Engineer must prove that the translator's interference signal is not more than 40 dB above the protected station signal at the same point... and that there are no people living or working there
- The secret is to employ an antenna with a vertical elevation field that produces a low signal level at the point of concern and keep the antenna high

Overcoming 2nd or 3rd adjacent interference

- When the proposed translator is within the normally protected contour of another station on a 2nd or 3rd adjacent channel
- Example, assume a translator's one-bay antenna's vertical field:



Graph of Field Values in dBu



Copyright © V-Soft Communications LLC, 2011

XScale 10,000 m 5,000 m 2,500 m 1,000 m 500 m 250 m

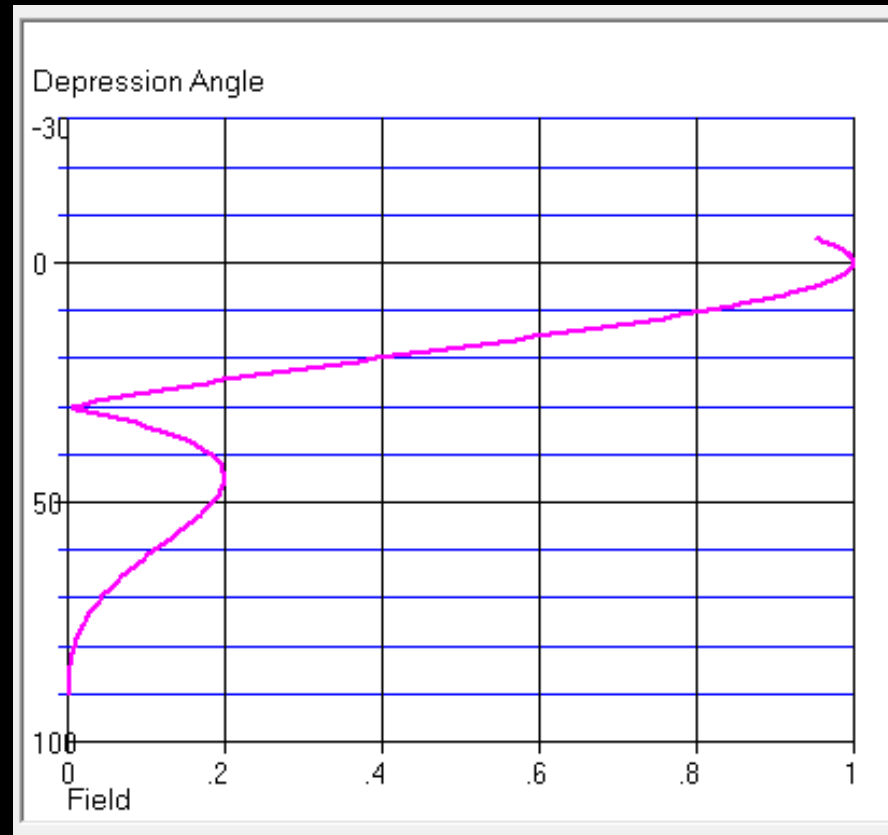
Show Mainform

Close

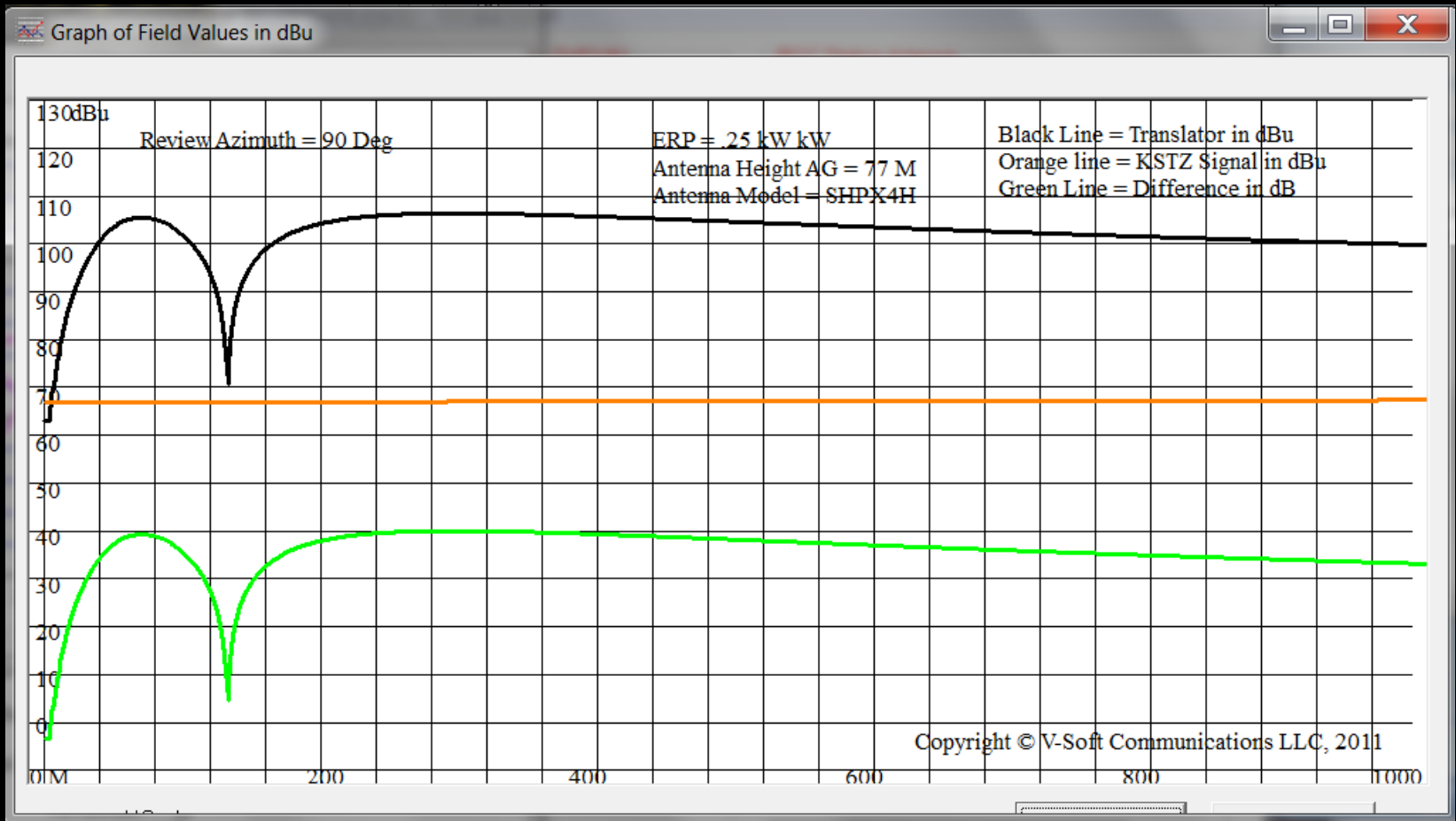
Use 4-bay half wave and raise antenna to 77 meters



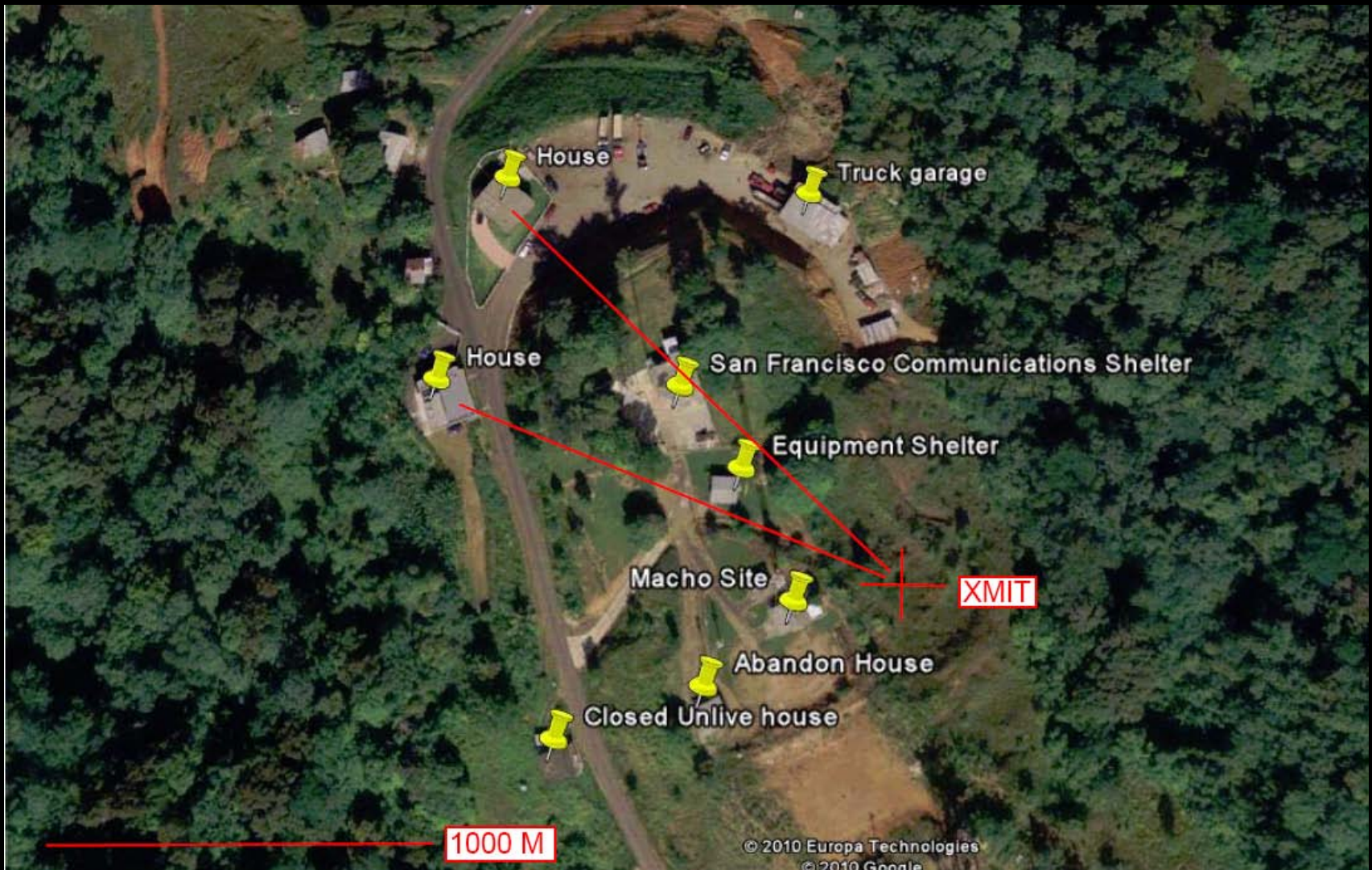
- Half wave 4-bay vertical field graph



Graph shows no interference from site using 4-bay half-wave antenna and antenna height of 77 meters above ground



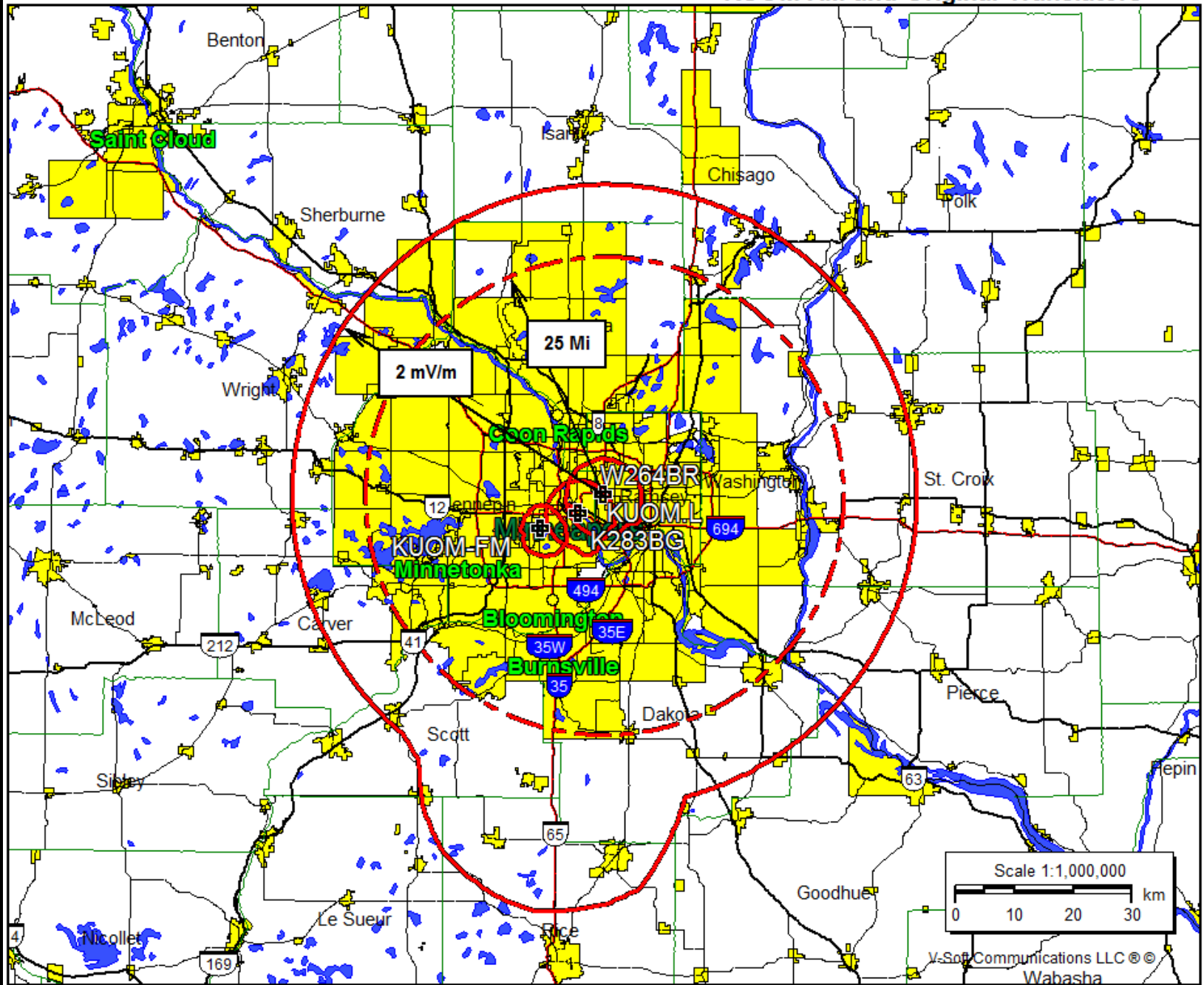
W283BI – Interference showing –Satellite Map



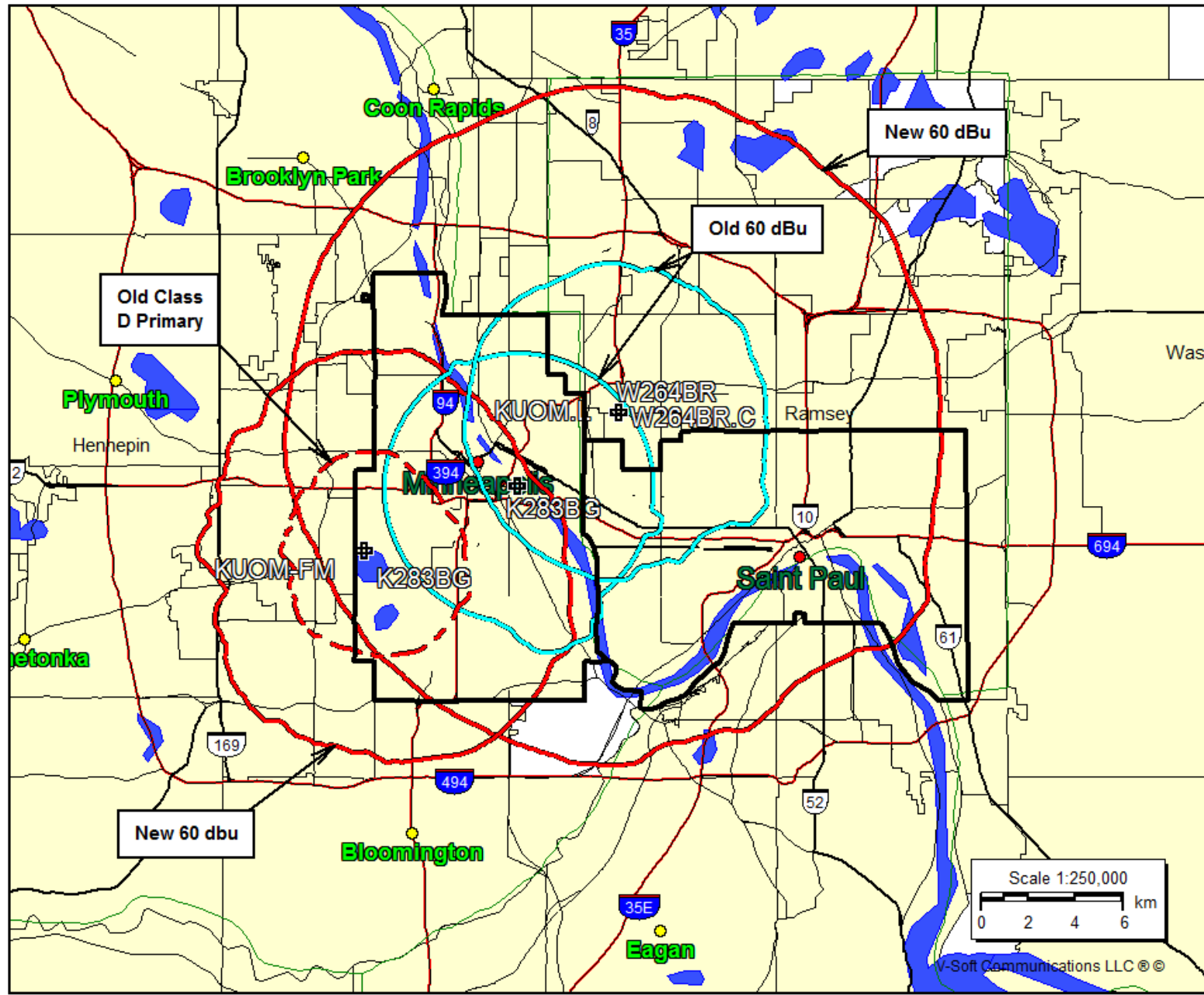
Translators for AM Stations

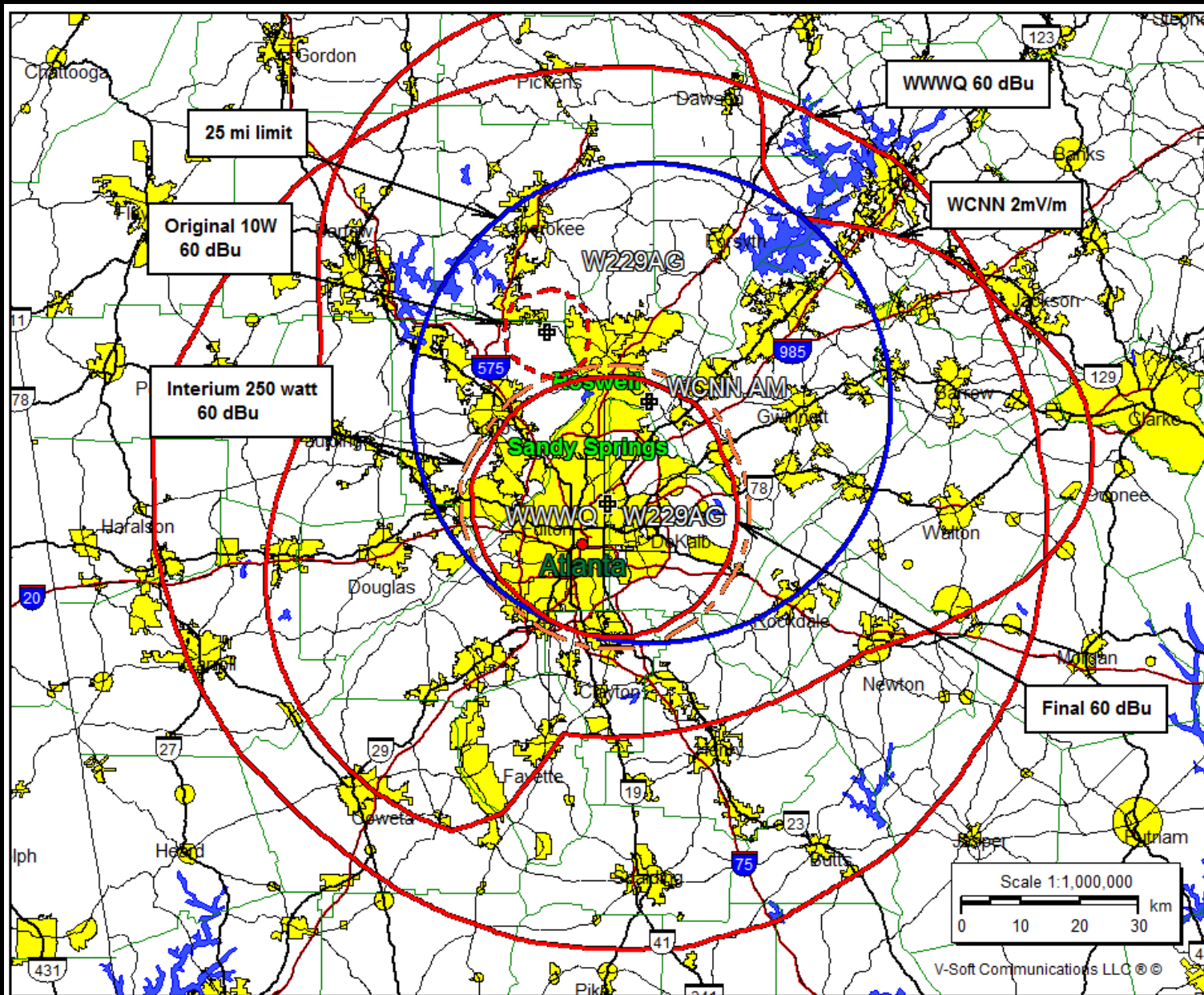
- To be used for AM, translators must be licensed before May 1st, 2009. This may change.
- Since 2009 ~500 FM translators are now used with AM stations.
- No portion of the FM translator's 60 dBu may exceed the 2 mV/m AM signal contour or 25 mile radius from the AM transmitter
- Translator must be co-owned by AM licensee or the translator licensee must have written consent
- AM day stations are allowed to "originate" programming on the FM translator at night
- No limit on the number of FM translators, unless they serve the same area.

KUOM AM and Original Translators



60 dBu when licensed as KUOM AM translators





Moving a translator to a new site

- Unlike NCE and commercial stations, translators have no requirement to serve a city of license with a certain value signal strength.
- A translator can be moved to a new site as long as some of the new 60 dBu contour overlaps with the old 60 dBu contour.
- FCC recently accepted a waiver of the overlapping rule to allow an FM translator to move well beyond the overlap to become an AM-Fill in translator.
- FCC has placed a freeze on translator move-ins from outside a spectrum limited market.
- Owners are hop-scotching translators to their final locations

FM Translator Band Hopping

- The FCC will no longer allow a commercial band FM translator to move into the non-commercial portion of the band unless the translator has been licensed on its current frequency for 2 years or more. This same restriction now applies to NCE band translators hopping into the commercial band.

Hop-scotching translators

- Moving a translator multiple times to get it to a new location is harder to do but still possible
- FCC slowdown 3 months is now 1 1/12 months
- Some applicants are using crank-up towers on trailers that can be moved from one location to another
- Recently, in Florida, the FCC cracked down on this because the sites were not “permanent”.

Who is buying Translators?



- **HORIZON CHRISTIAN FELLOWSHIP** is selling **73** FM translators to **RON UNKEFER's FIRST VENTURES CAPITAL PARTNERS** for **\$275,000**. The translators include K231AW/ABILENE, KS; K288FD/ARKADELPHIA, AR; K229AK/BAYWOOD-LOS OSOS, CA; W243BD/BEECHWOOD, MI; K288FF/BISMARCK, ND; W214BS/BLACK RIVER FALLS, WI; W270BH/BLOOMINGTON, IN; K273BQ/BLUE EARTH, MN; K205EZ/BOONE, IA; K217FB/BROWNFIELD, TX; K295AZ/BUTTONWILLOW, CA; K293BG/CAMBRIA, CA; K288FC/CAMDEN, AR; W277AQ/CANTON, IL; K264AY/CHAMBERLAIN, SD; K289BI/DAVENPORT, IA; K213EP/EAGLE GROVE, IA; K243AR/ELLSWORTH, KS; K204FM/FAIRMONT, MN; K210EA/FORDYCE, AR; K236BB/FORT DODGE, IA; K266BB/FORT MORGAN, CO; W227BL/GALENA, IL; W277BB/GRAND HAVEN, MI; W276BI/GRENADA, MS; W277AT/HAVANA, IL; K203EK/HOLYOKE, CO; K237EL/HURON, SD; W247BA/INDIANOLA, MS; K260BJ/KAHOKA, MO; K285FW/KING CITY, CA; K218DZ/LEVELLAND, TX; K288EZ/LITTLE ROCK, AR; K287AS/LOS BANOS, CA; W294AT/MACON, MS; W203BN/MACON, MS; K262BJ/MACON, MO; K252DO/MADERA, CA; K279AN/MARSHALLTOWN, IA; W290AZ/MARSHFIELD, WI; K296FG/MIDLAND, TX; K269EN/MONTICELLO, AR; K277AP/MORTON, TX; K274BT/MOUNT PLEASANT, IA; K254AS/NASHVILLE, AR; W220DR/NEILLSVILLE, WI; K238AZ/ODESSA, TX; K258BG/OSKALOOSA, IA; K299BA/OTTUMWA, IA; K219LA/PARSONS, KS; K237DH/PELLA, IA; K296FI/PIERRE, SD; K255AX/PINE BLUFF, AR; K277BB/PLAINVIEW, TX; K231BM/POPLAR BLUFF, MO; K205CQ/PRESCOTT, AR; K207EB/REDFIELD, SD; W282AS/SALTILLO, MS; K290BH/SAVANNA, IL; K242AZ/SEARCY, AR; K252DT/SENECA, KS; K266BH/SHERIDAN, AR; K248AY/SIOUX CITY, IA; K283AJ/SNYDER, TX; K248AR/STANTON, TX; K295AM/TRENTON, MO; K262BU/UNIONVILLE, MO; K254BN/WEST ODESSA, TX; W227AS/WHITEHALL, MI; W270AO/WINONA, MS; W278AT/WINONA, MS; K230AT/WINTERSET, IA; and K207EG/YUMA, CO.

Translator Receiving Issues

Azimuths and distances from the transmitter site of stations causing interference with the receipt of IBOC by the KFAI translator

<u>Call</u>	<u>Type</u>	<u>Ch</u>	<u>Location</u>		<u>Azi</u>	<u>Dist</u>
KFAI	LIC-D	212A	Minneapolis	MN	301.9	17.9
KMKL	LIC-D	212C3	North Branch	MN	6.5	72.9
KMOJ	LIC	210A	Minneapolis	MN	301.8	19.5
K214DF	LIC	214D	Golden Valley	MN	302.3	17.8
KGAC	LIC	213C1	St. Peter	MN	228.2	111.0
KSJR-FM	LIC	211C1	Collegeville	MN	301.1	132.9

End of Screen List

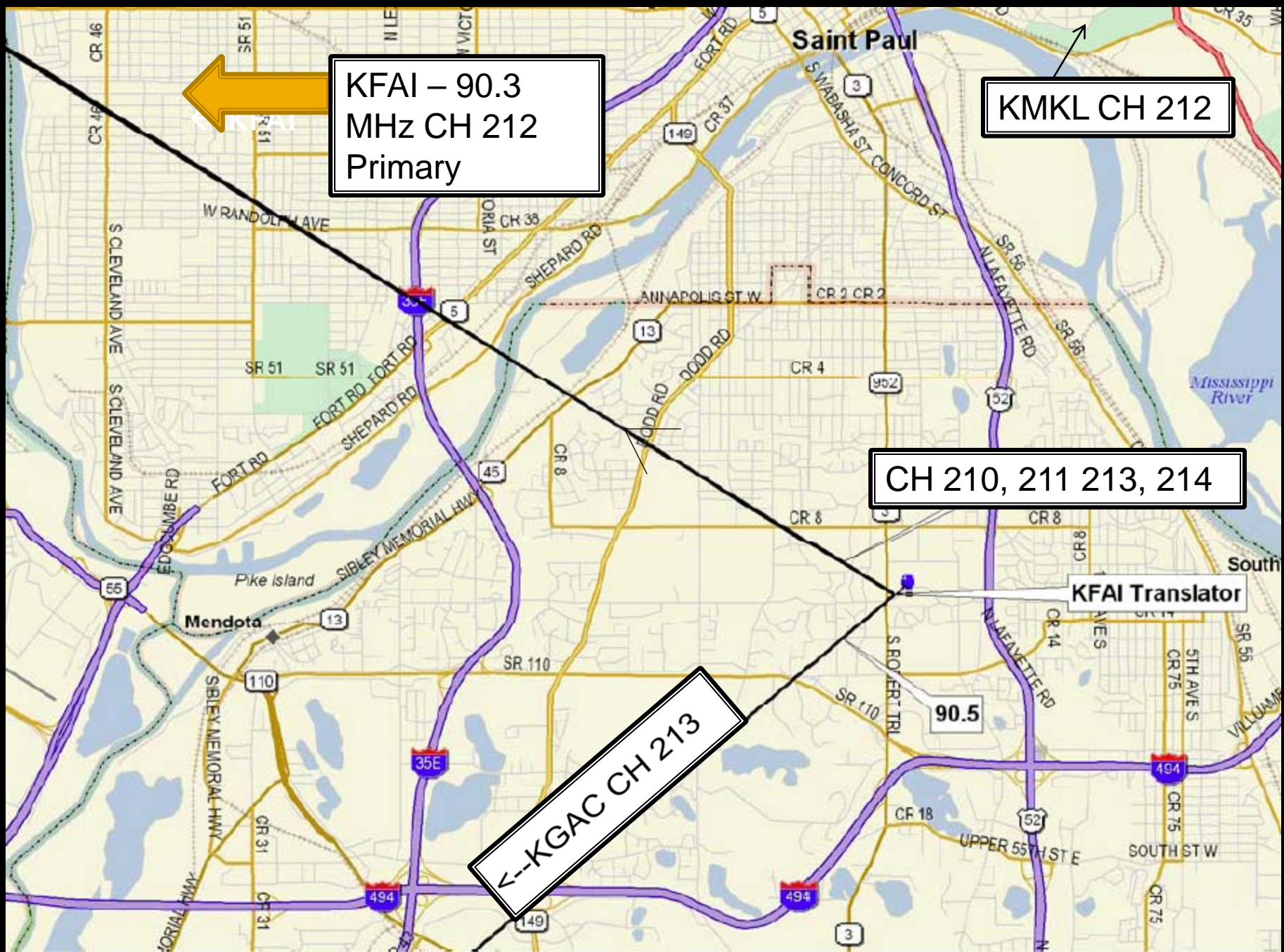
KFAI – 90.3
MHz CH 212
Primary

KMKL CH 212

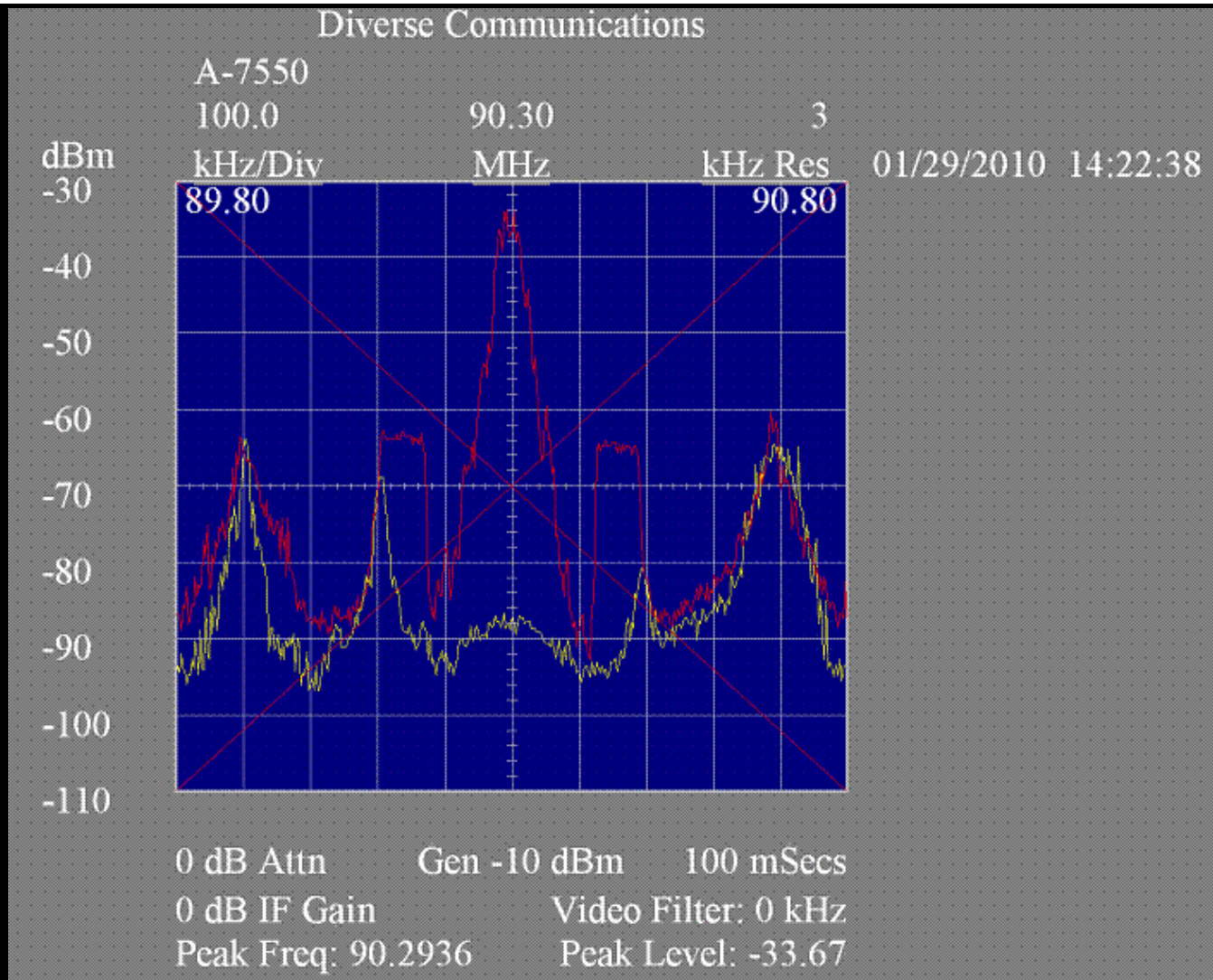
CH 210, 211 213, 214

KFAI Translator

KGAC CH 213



Spectrum Analyzer Capture



Local Community Radio Act

- LPFMs are secondary to full-service stations and equal to FM Translators and Boosters
- Forbids FCC from amending existing co, 1st and 2nd adjacent LPFM distance separations.
- Rules will be designed to protect the input frequencies of 3rd adjacent translators – (existing rules protect all adjacent channel FM translator inputs.)
- No protection to 3rd adjacent channels. Waivers can be granted for a 2nd adjacent with a showing of no interference.

FCC proposes New LPFM Rules

- LPFM stations will share a status equal to FM translators.
- 3274 translator applications remain in the top 150 markets, blocking LPFM.
- FCC wants to dismiss pending translator applications in the top 150 markets where it finds the market does not have enough LPFM frequencies.
- FCC must perform an economic study within one year to determine the impact of LPFM on full-service stations

Appendix A

Arb#	CF#	Fall 2010 Arbitron Rankings	Total Licensed Stations			LPFM Available in Grid			Pending	Result
Rank	Rank	Market	FM trans.	LPFM	NCE FM	Locations	Channels	Licensed	FX apps	
1	1	New York	4	0	16	0	0	0	183	Dismiss all FX
2	2	Los Angeles	16	4	13	0	0	0	115	Dismiss all FX
3	3	Chicago	17	6	44	0	0	0	50	Dismiss all FX
4	4	San Francisco	17	1	18	0	0	0	41	Dismiss all FX
5	5	Dallas-Ft. Worth	11	0	15	2	2	0	18	Dismiss all FX
6	6	Houston-Galveston	12	2	13	3	1	0	117	Dismiss all FX
7	7	Atlanta	19	4	12	4	4	0	31	Dismiss all FX
8	8	Philadelphia	15	0	21	0	0	0	170	Dismiss all FX
9	9	Washington, DC	8	1	5	0	0	0	9	Dismiss all FX
10	10	Boston	10	0	25	0	0	0	10	Dismiss all FX
11	11	Detroit	11	1	19	0	0	0	23	Dismiss all FX
12	12	Miami-Ft. Lauderdale-Hollywood	9	0	11	0	0	0	27	Dismiss all FX
13	13	Seattle-Tacoma	28	3	15	0	0	0	45	Dismiss all FX
14	14	Puerto Rico	9	0	11	0	0	0	8	Dismiss all FX
15	15	Phoenix	16	1	6	6	3	1	74	Dismiss all FX
16	16	Minneapolis-St. Paul	16	1	8	13	6	0	11	Dismiss all FX
17	17	San Diego	7	1	4	6	5	0	20	Dismiss all FX
18	18	Nassau-Suffolk (Long Island)	17	3	12	2	2	0	0	Dismiss all - see Mkt. #1
19	20	Denver-Boulder	12	2	8	3	3	0	40	Dismiss all FX
20	19	Tampa-St. Petersburg-Clearwater	10	2	6	8	5	0	39	Dismiss all FX
21	21	St. Louis	7	1	16	11	5	0	50	Dismiss all FX

In 2003 translator window 13,000 applications were filed. 4,219 filed by Radio Asst Ministries and Edgewater Broadcasting (RAM). Of those granted, 1,046 have been sold.

Existing LPFM Minimum Spacings Protecting FM Translators Sec 73.807

Distance to FM translator 60 dBu contour	Co-channel minimum separation (km)		First-adjacent channel minimum separation (km)		Second- and third-adjacent channel minimum separation (km) required	I.F. Channel minimum separation (km) 10.6 or 10.8 MHz
	Required	For no interference received	Required	For no interference received		
13.3 km or greater	39	67	28	35	21	5
Greater than 7.3 km, but less than 13.3 km	32	51	21	26	14	5
7.3 km or less	26	30	15	16	8	5

LPFM Separations to Full Service Stations

§ 73.807

47 CFR Ch. I (10-1-10 Edition)

Station class protected by LP100	Co-channel minimum separation (km)		First-adjacent channel minimum separation (km)		Second- and third-adjacent channel minimum separation (km)	I.F. channel minimum separations
	Required	For no interference received from max. class facility	Required	For no interference received from max. class facility		10.6 or 10.8 MHz
					Required	
LP100	24	24	14	14	None	None
D	24	24	13	13	6	3
A	67	92	56	56	29	6
B1	87	119	74	74	46	9
B	112	143	97	97	67	12
C3	78	119	67	67	40	9
C2	91	143	80	84	53	12
C1	111	178	100	111	73	20
C0	122	193	111	130	84	22
C	130	203	120	142	93	28

Booster Strategies

- Booster stations must operate on the primary station's co-channel
- Boosters can operate with ERP's up to 20% of the primary station's maximum class power
- Boosters may not extend the protected contour of a station (60 dBu for NCE stations)
- There is no freeze on Booster applications

Boosters must be carefully engineered

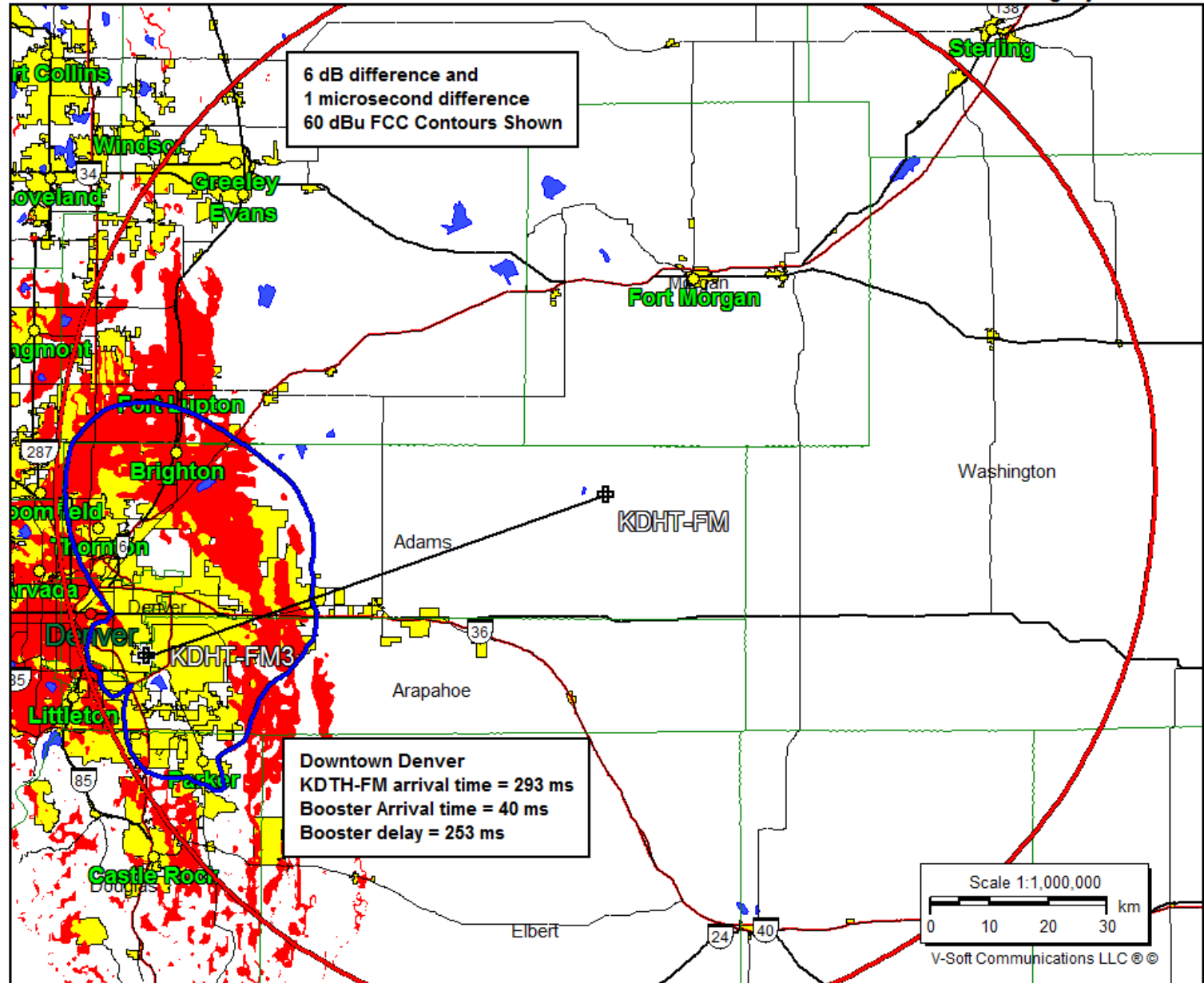
- Booster's can bite the hand that feeds them, i.e. interfere with the primary station
- Physical barriers such as mountains between the primary and the booster can help to insure success
- Boosters in flat areas are often unsuccessful
- Synchronized boosters can help, but cannot solve all cases of interference

KDHT-FM and its Booster - Longley-Rice

KDHT-FM
 BMLH20081028ABZ
 Latitude: 39-55-22 N
 Longitude: 103-58-18 W
 ERP: 97.00 kW
 Channel: 296
 Frequency: 107.1 MHz
 AMSL Height: 2109.0 m
 Horiz. Pattern: Omni
 Prop Model: Longley/Rice
 Climate: Cont temperate
 Conductivity: 0.0200
 Dielec Const: 15.0
 Refractivity: 315.0
 Receiver Ht AG: 9.1 m
 Receiver Gain: 0 dB
 Time Variability: 50.0%
 Sit. Variability: 50.0%
 ITM Mode: Broadcast

KDHT-FM3
 BLFTB20050729DSZ
 Latitude: 39-40-31 N
 Longitude: 104-52-22 W
 ERP: 20.00 kW
 Channel: 296
 Frequency: 107.1 MHz
 AMSL Height: 1766.0 m
 Horiz. Pattern: Directional


Doug Vernier
 401 Main Street, Suite 213
 Cedar Falls, Iowa 50613
Telecommunication Consultants
 dvernier@vcc.com (319)266-8482



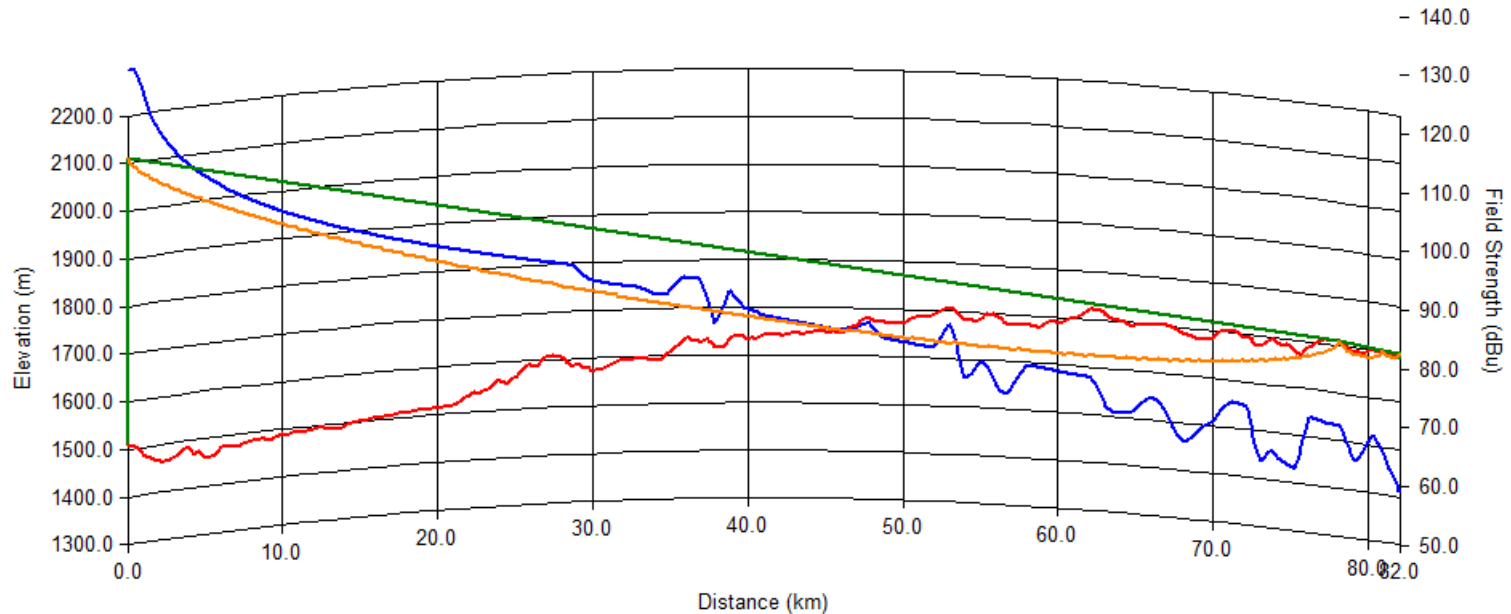
Profile Viewer

Edit Settings...

Hard Copy...

Save Graphic...

Copy...



Start Point

Latitude: 39-55-22 N

Longitude: 103-58-18 W

End Point

Latitude: 39-40-37.70 N

Longitude: 104-52-28.67 W

Options

Signal: KDHT-FM (296)

Antenna Properties...

Legend

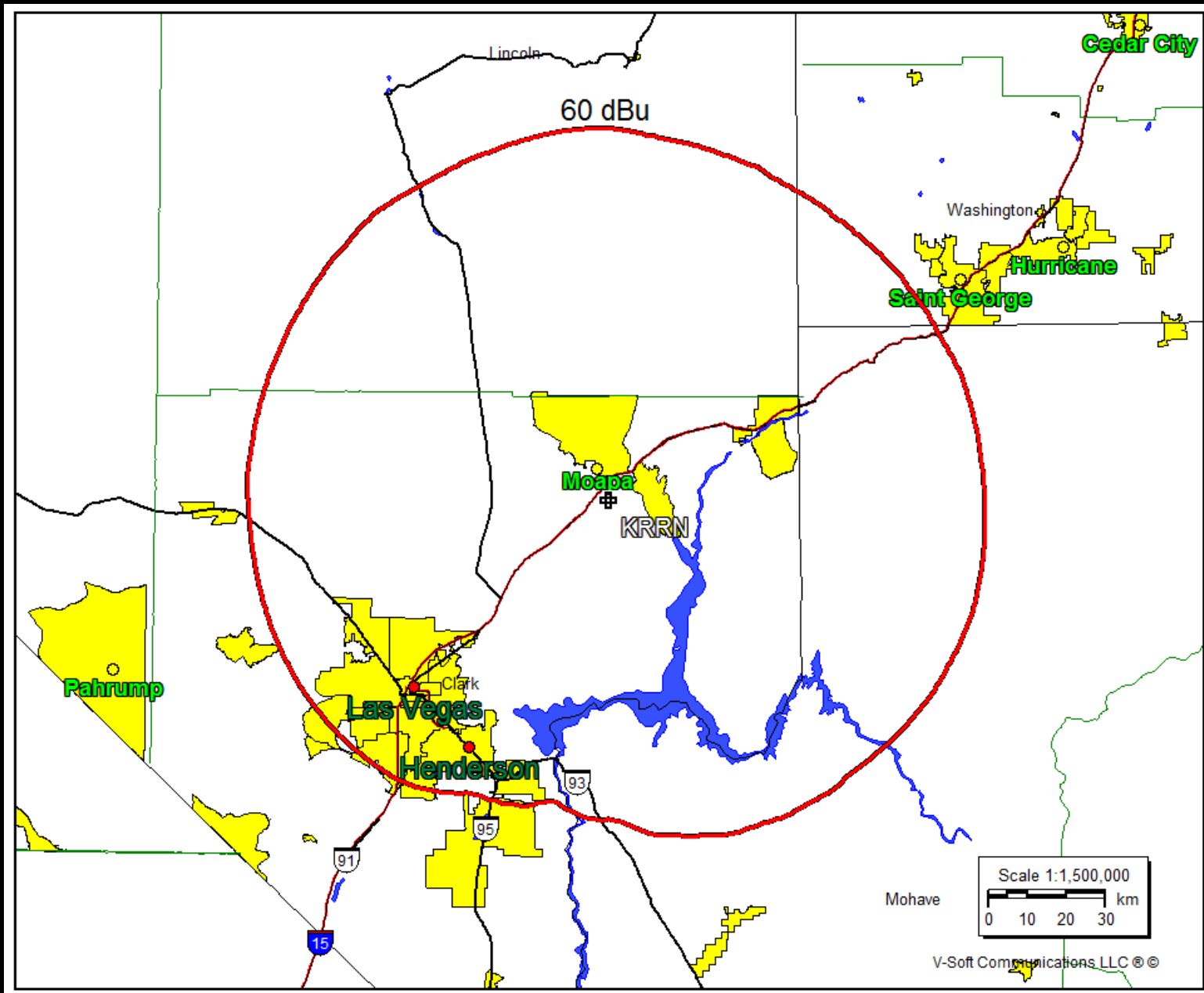
- Terrain
- Field Strength
- Line of Sight

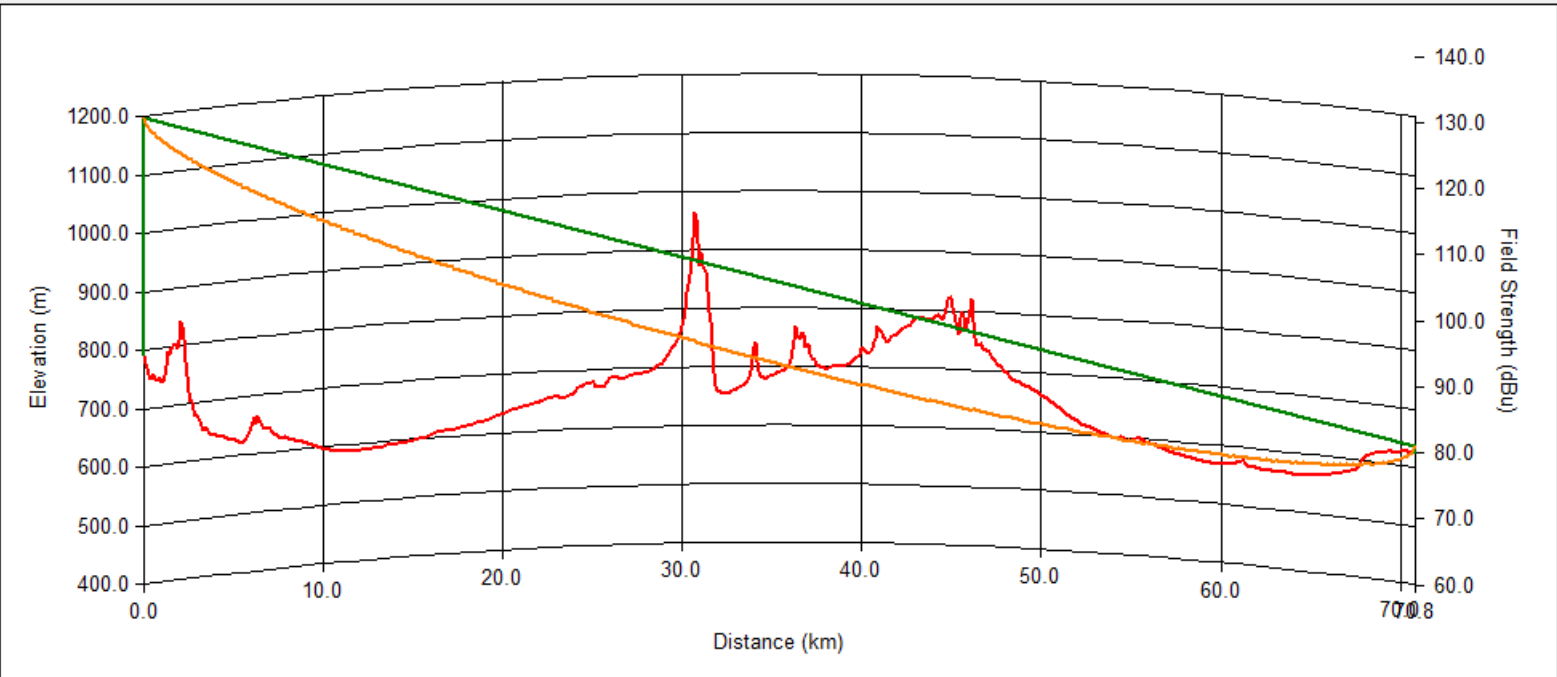
Distance & Bearing

Distance: 82.0 km

Bearing: 250.86 deg

Draw Profile





Start Point
Latitude: 36-36-04 N
Longitude: 114-35-06 W

End Point
Latitude: 36-10-03.52 N
Longitude: 115-09-49.39 W

Options
Signal: KRRN (224)

- Legend
- Terrain
 - Field Strength
 - Line of Sight

Distance & Bearing
Distance: 70.78 km
Bearing: 227.36 deg

Antenna Properties...
Draw Profile

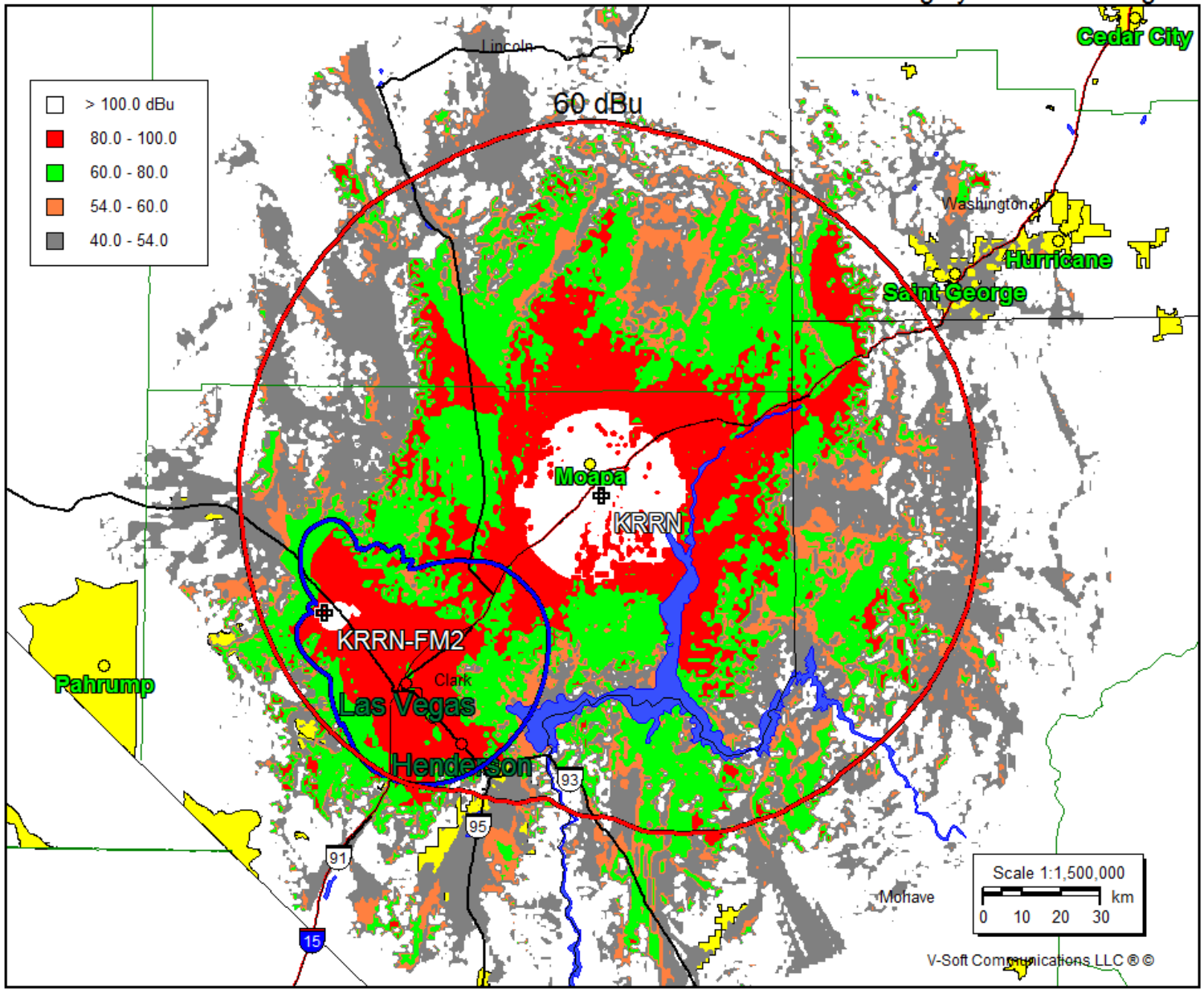
KRRN and KRRN-FM2 Longley-Rice Coverage

KRRN
 BLH20080327ADP
 Latitude: 36-36-04 N
 Longitude: 114-35-06 W
 ERP: 100.00 kW
 Channel: 224
 Frequency: 92.7 MHz
 AMSL Height: 1173.0 m
 Horiz. Pattern: Omni
 Prop Model: Longley/Rice
 Climate: Cont temperate
 Conductivity: 0.0200
 Dielec Const: 15.0
 Refractivity: 315.0
 Receiver Ht AG: 9.1 m
 Receiver Gain: 0 dB
 Time Variability: 50.0%
 Sit. Variability: 50.0%
 ITM Mode: Broadcast

KRRN-FM2
 BLFTB20080327ADQ
 Latitude: 36-20-00 N
 Longitude: 115-21-41 W
 ERP: 20.00 kW
 Channel: 224
 Frequency: 92.7 MHz
 AMSL Height: 1079.0 m
 Horiz. Pattern: Directional


Doug Vernier
 401 Main Street, Suite 213
 Cedar Falls, Iowa 50613

 Telecommunication Consultants
dvernier@vcc.com 319.266.4482

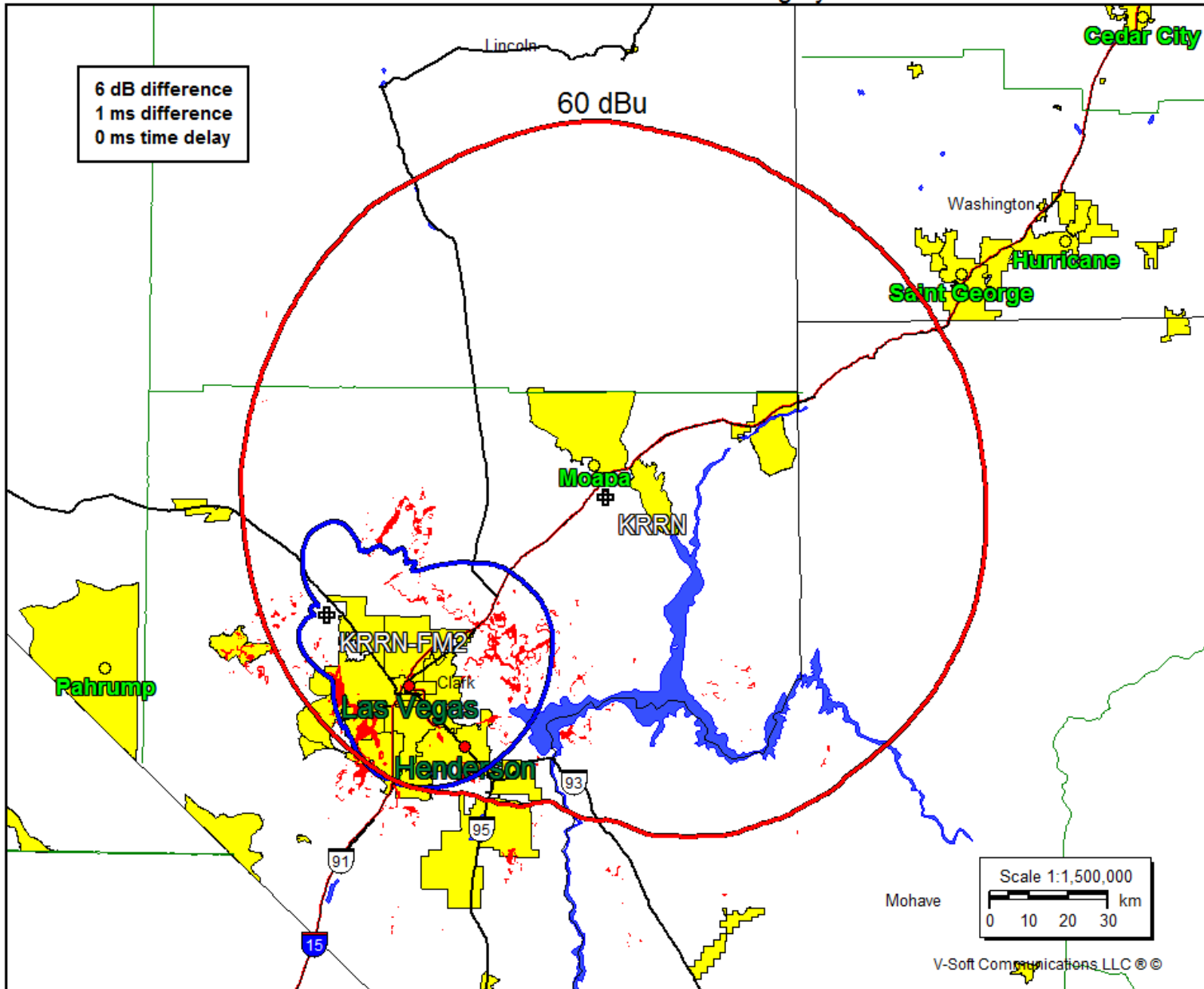


KRRN and KRRN-FM2 Longley-Rice Predicted Interference

KRRN
BLH20080327ADP
Latitude: 36-36-04 N
Longitude: 114-35-06 W
ERP: 100.00 kW
Channel: 224
Frequency: 92.7 MHz
AMSL Height: 1173.0 m
Horiz. Pattern: Omni
Prop Model: Longley/Rice
Climate: Cont temperate
Conductivity: 0.0200
Dielec Const: 15.0
Refractivity: 315.0
Receiver Ht AG: 9.1 m
Receiver Gain: 0 dB
Time Variability: 50.0%
Sit. Variability: 50.0%
ITM Mode: Broadcast

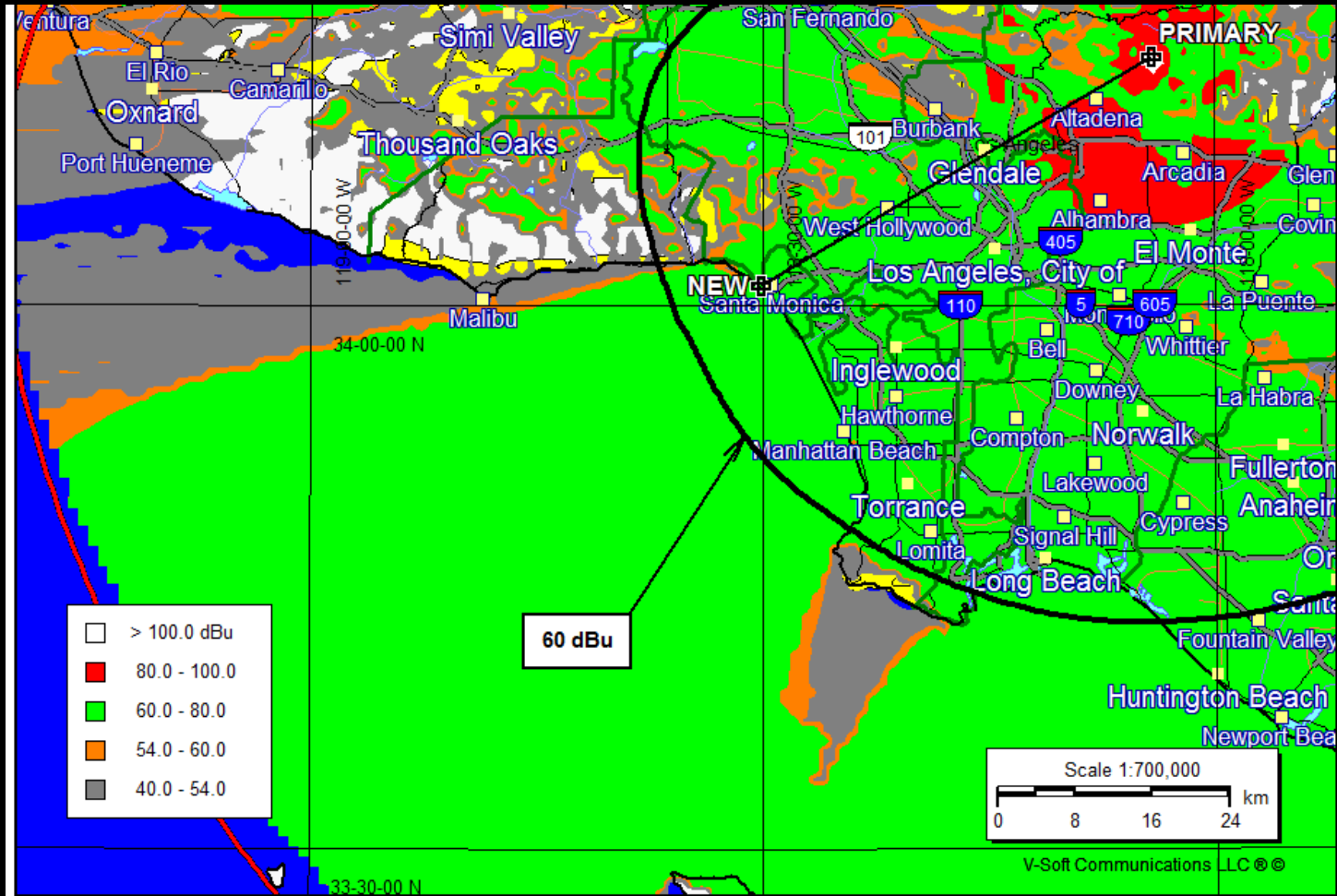
KRRN-FM2
BLFTB20080327ADQ
Latitude: 36-20-00 N
Longitude: 115-21-41 W
ERP: 20.00 kW
Channel: 224
Frequency: 92.7 MHz
AMSL Height: 1079.0 m
Horiz. Pattern: Directional

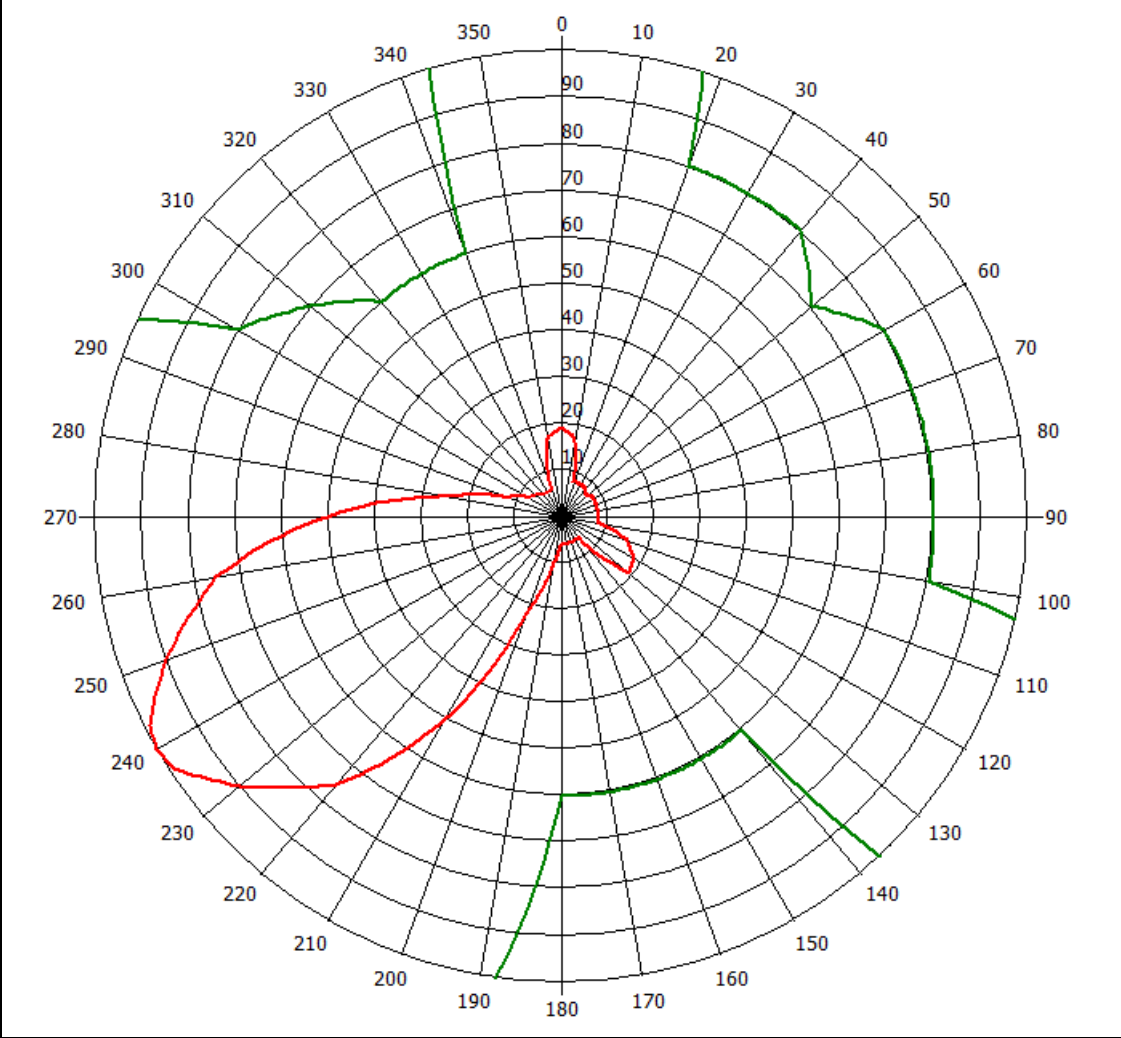
6 dB difference
1 ms difference
0 ms time delay



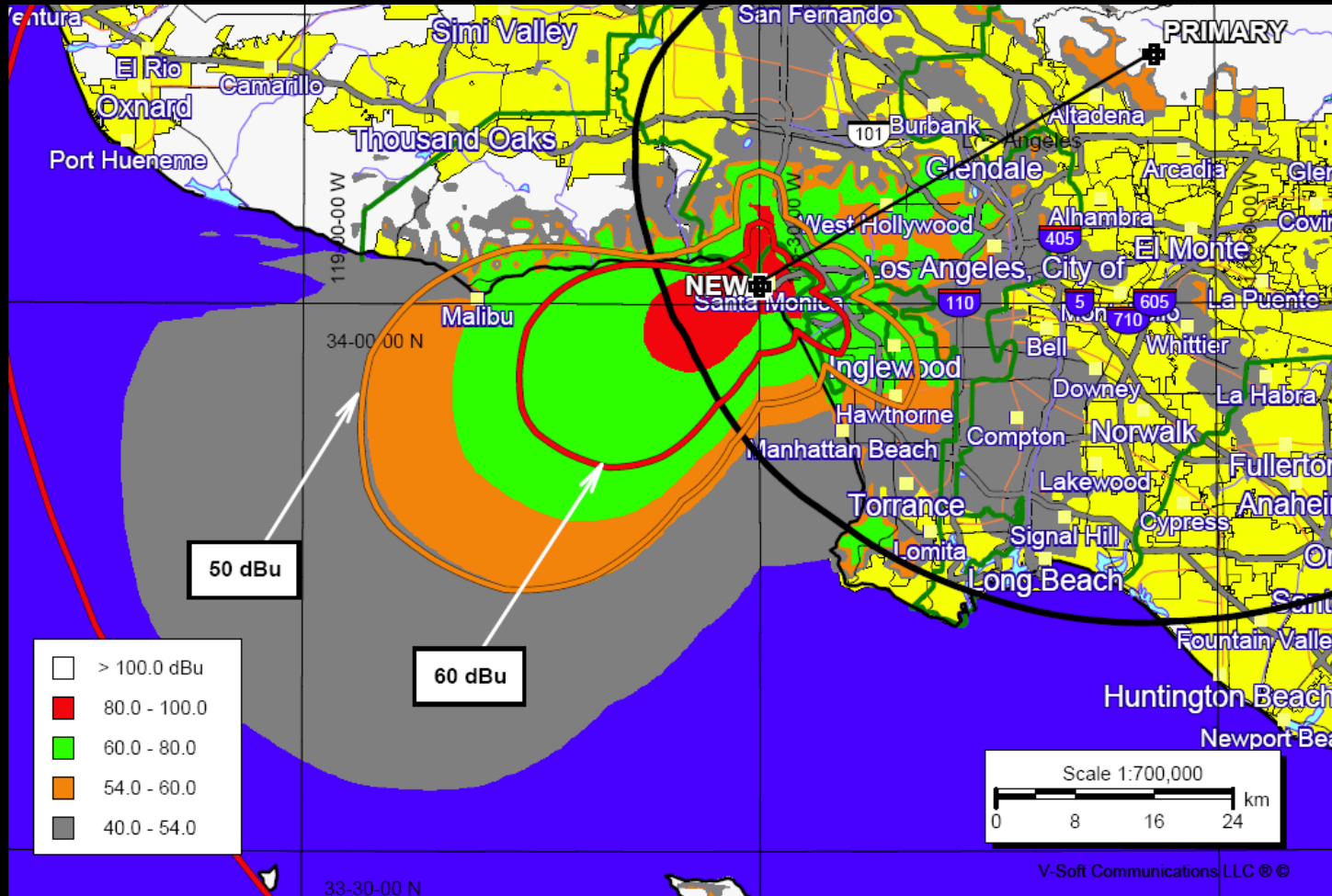
V Doug Vernier
401 Main Street, Suite 213
Cedar Falls, Iowa 50613
Telecommunication Consultants
dvernier@vcc.com (319)266-8482

Primary Station's Longley-Rice





Booster Station's Longley-Rice



In Summary

- Fill-in FM translators offer significant opportunities, for both FM and AM stations
- Translator upgrade, site moves, are popular
- Translators can be displaced – waivers are granted more freely.
- Outgoing and incoming interference is an important issue.
- A translator can run another station's HD2 or HD3 as input and if located inside its protected contour it can become a fill-in
- New Rules for LPFM may bump many MX translator applications currently on file

In Summary

- HD translators have been unsuccessful due to interference at the input
- New co-channel boosters applications are not frozen
- Boosters work best when there is terrain blockage
- Boosters can be synchronized but only at specific points
- The best boosters overcome a distant input signal with a powerful signal over a populated area



IBOC FM Translator



Strategies for

FM Translators & Boosters Comments and Questions?

V **Doug Vernier**
401 Main Street, Suite 213
Cedar Falls, Iowa 50613

Telecommunication Consultants

V **Soft**
COMMUNICATIONS®
R.F. Communications Software
and Engineering Consulting