

STEPHEN S. LOCKWOOD, PE, PMP

THOMAS M. ECKELS, PE
THOMAS S. GORTON, PE

JAMES B. HATFIELD, PE
BENJAMIN F. DAWSON III, PE
ERIK C. SWANSON, PE, PMP
DAVID J. PINION, PE
STEPHEN PUMPLE, M.Eng, MBA, PMP
CONSULTANTS

HATFIELD & DAWSON
CONSULTING ELECTRICAL ENGINEERS
9500 GREENWOOD AVE. N.
SEATTLE, WASHINGTON 98103

TELEPHONE (206) 783-9151
FACSIMILE (206) 789-9834
E-MAIL hatdaw@hatdaw.com

MAURY L. HATFIELD, PE
(1942-2009)
PAUL W. LEONARD, PE
(1925-2011)

ENGINEERING REPORT

APPLICATION for CONSTRUCTION PERMIT to MODIFY ANTENNA SYSTEM

WRDB(AM)

1400 kHz

Reedsburg, Wisconsin

Facility ID 59233

1 kW Day, 0.64 kW Night ND-U

Magnum Communications, Inc.

November 2022

Purpose of Application

This Engineering Report has been prepared in support of an application by Magnum Communications Inc. ("Magnum") to modify the antenna system of WRDB(AM), 1400 kHz, Reedsburg, Wisconsin. Magnum proposes replacement of the existing WRDB tower with a 75 foot Valcom antenna at the same location using the existing ground system.

Allocation Considerations

Daytime

The proposed 1kW non-directional operation of WRDB will not result in prohibited contour overlap with any licensed or proposed facility, with the exception of WIZM La Crosse, WI and KADR, Elkader, IA. Existing overlap with both of these stations is reduced by this proposal, as demonstrated by the daytime allocation study map exhibits included in this application. All allocation studies are based on data from the November 2, 2022 edition of the CDBS and M3 ground conductivity data.

Nighttime

The proposed 640 Watt nighttime operation of WRDB will not enter the 25% RSS of any first-adjacent channel facility, as demonstrated by the Site to Site RSS calculations included in this report. This exhibit considers all facilities listed in the CDBS for which WRDB will exceed the 10% RSS threshold.

Per DA 08-448, and discussions with Commission staff regarding the use of a ground system other than the specified 120 feet radius, all maps and allocation studies in this report are based on an antenna efficiency of 283.6 mV/m/kW at 1 km. The site to site RSS calculations are based on f-theta using a radiator height equal to the physical height of the Valcom antenna, 75 feet (38.4 degrees at 1400 kHz).

Facilities Proposed

Magnum proposes continued operation of WRDB on 1400 kHz with a power of 1kW daytime and 640 Watts nighttime time, using an omni-directional antenna (ND-U). The proposed daytime 5 mV/m contour will cover 100% of Reedsburg, as demonstrated in the map exhibit titled *Coverage of Community of License*. The proposed antenna is a 75 foot Valcom V33085AM-CL2-FT fiberglass mast, to be located at the same location as the existing WRDB tower.

The coordinates contained in this application correct those on the current station license by 1 second of latitude and one second of longitude.

The area within the 1V/m blanketing contour of the proposed 1kW daytime operation of WRDB is unpopulated¹, thus satisfying the requirements of §73.24(g).

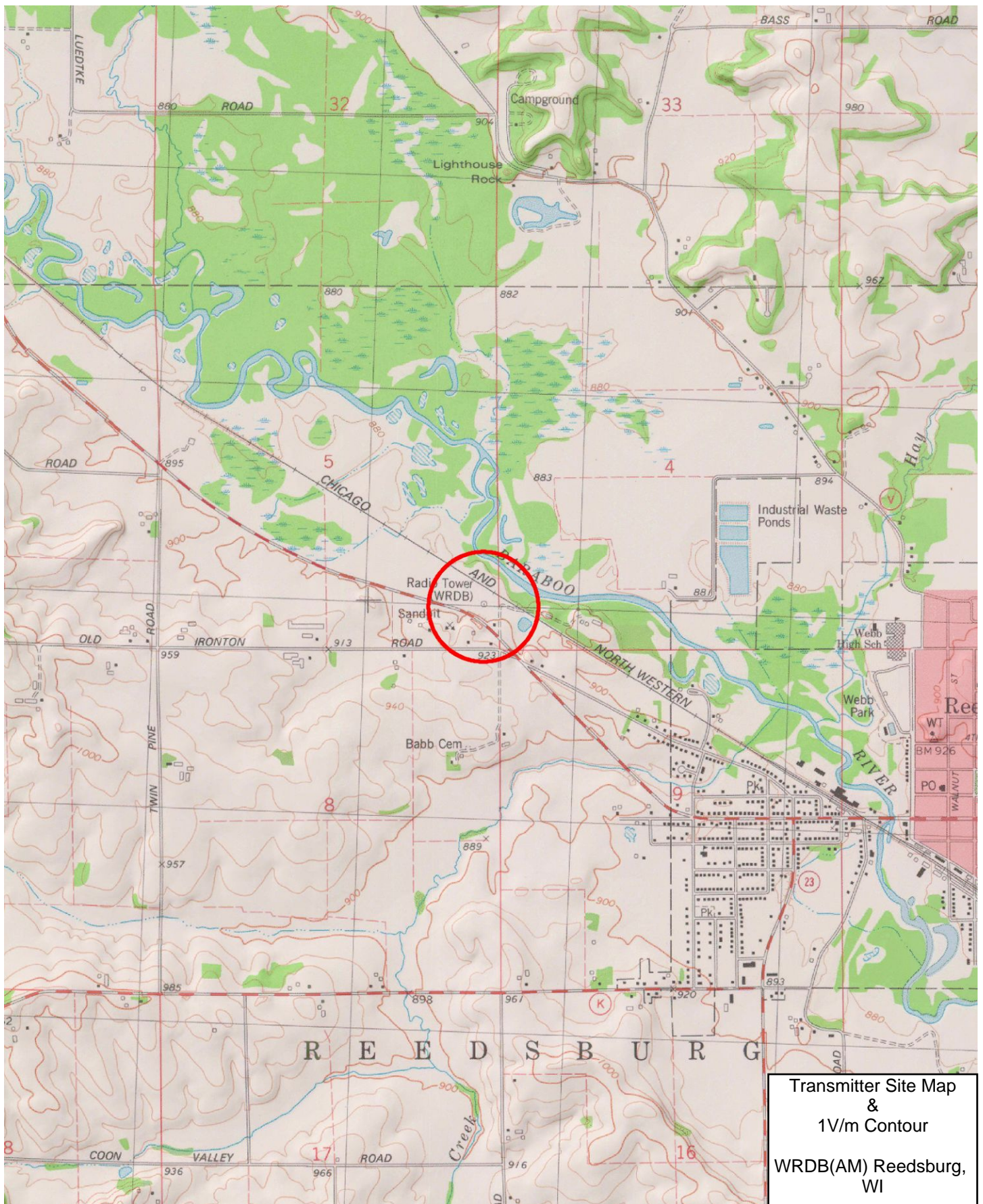
The ground system consists of 120 buried copper radials, 175 feet (90 degrees) in length around the base of the tower.

Antenna tower access is restricted by a fence with a locked gate that is at least 3 meters from the tower base, as required by OET-65. The antenna tower is posted with warning signs, and all station personnel and contractors will be required to follow appropriate safety procedures before any work is commenced on the antenna tower, including reduction in power or discontinuance of operation before any maintenance work is undertaken.

¹Based on 2020 US Census data, block centroid method.



WRDB Transmitter Site Photograph



Transmitter Site Map
&
1V/m Contour
WRDB(AM) Reedsburg,
WI

Mercator Projection

WGS84

UTM Zone 15T

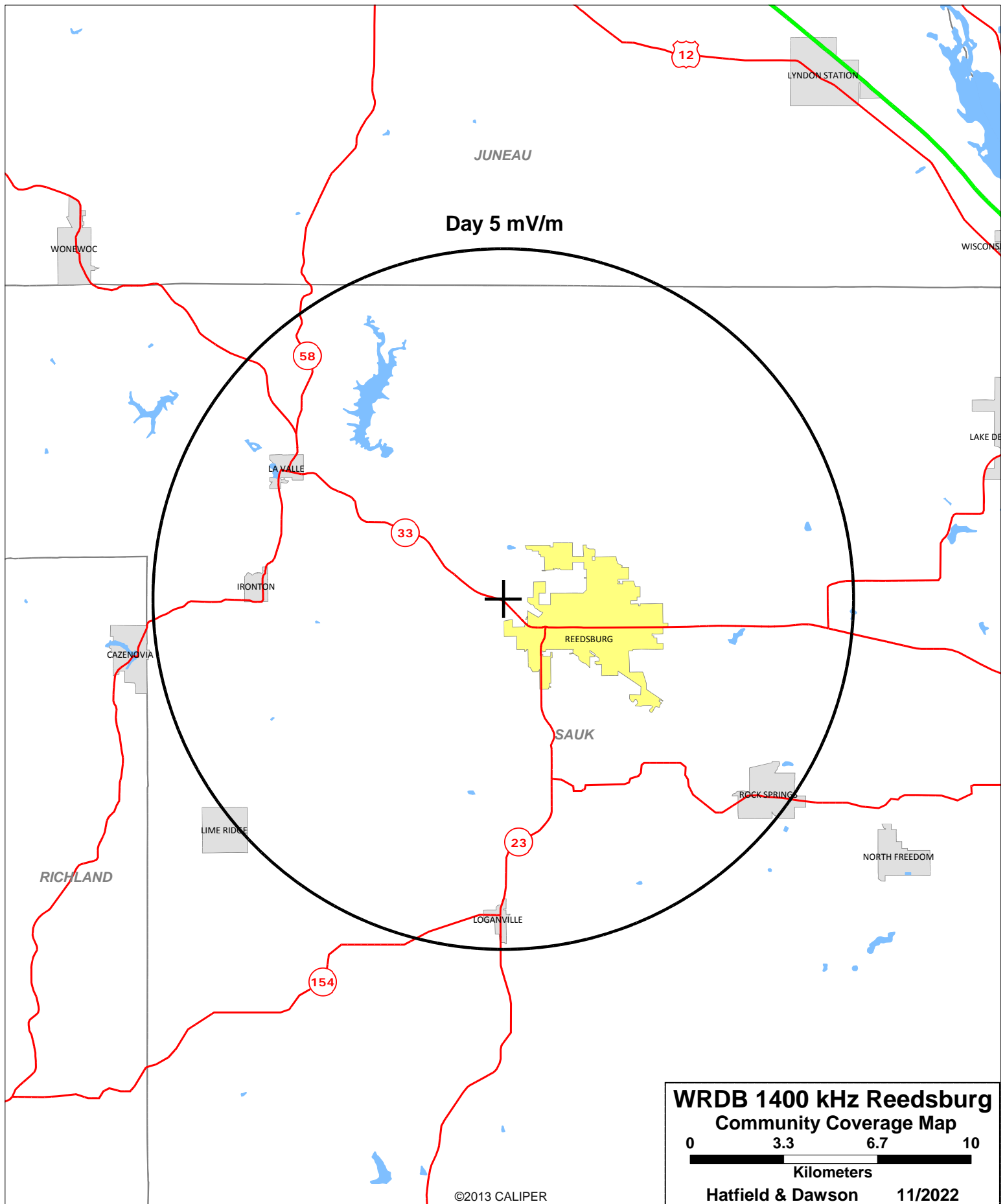


0.5 1.0 1.5 2.0 2.5 km



0.5 1.0 1.5 mi
Scale **1:24000** 1 inch = 2000 feet





WRDB

Freq: 1400 kHz

Class: C

Latitude: 43-32-29 N

Longitude: 090-02-06 W

Power: 1 kW

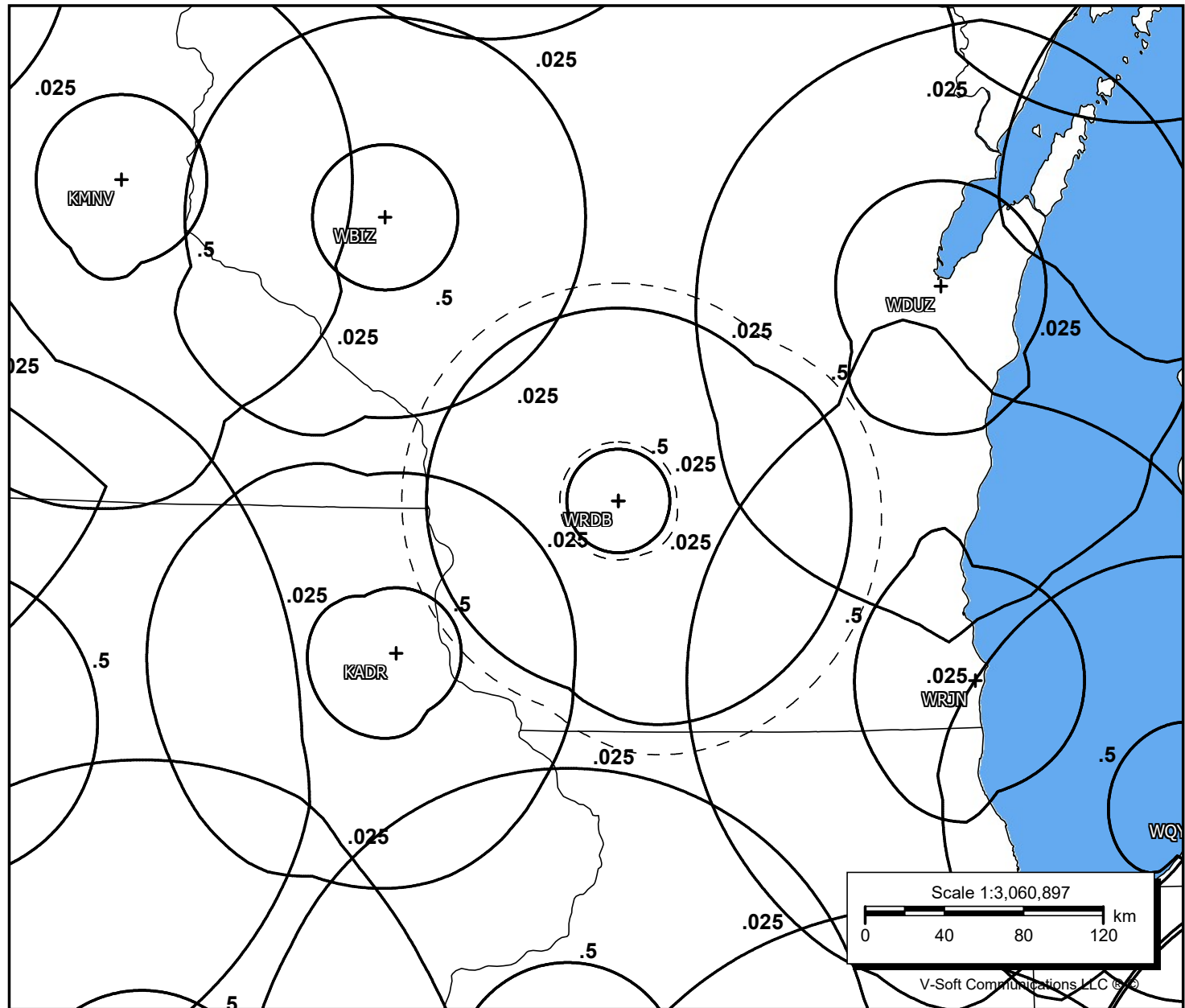
RMS: 283.6 mV/m @1km

Towers: 1

Aucs: 0

Daytime Allocation Study
Co-Channel

Dashed Lines are
Licensed Contours



WRDB

Freq: 1400 kHz

Class: C

Latitude: 43-32-29 N

Longitude: 090-02-06 W

Power: 1 kW

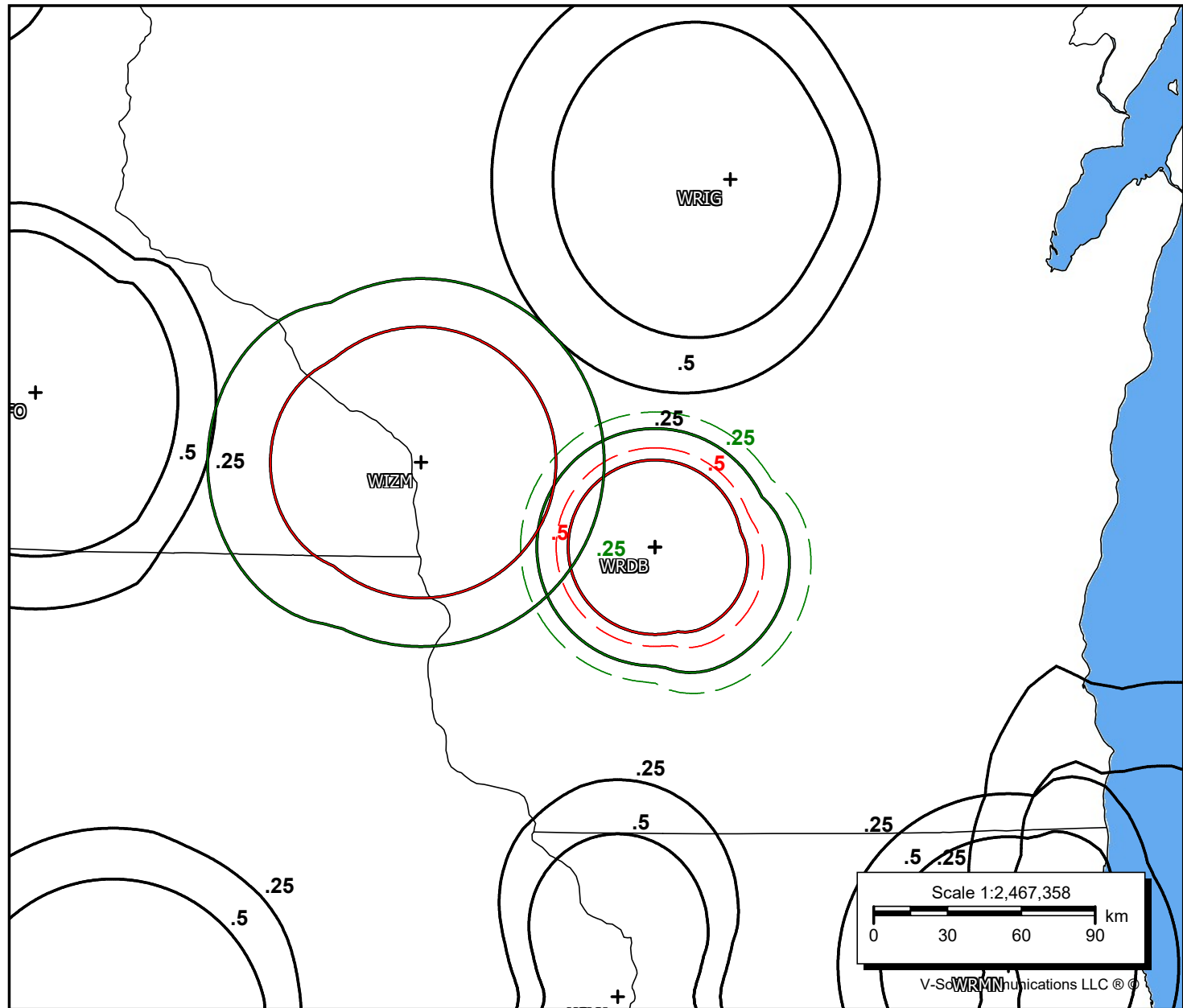
RMS: 283.6 mV/m @1km

Towers: 1

Aucs: 0

Daytime Allocation Study
1st-adjacent Channel

Dashed Lines are
Licensed Contours



WRDB

Freq: 1400 kHz

Class: C

Latitude: 43-32-29 N

Longitude: 090-02-06 W

Power: 1 kW

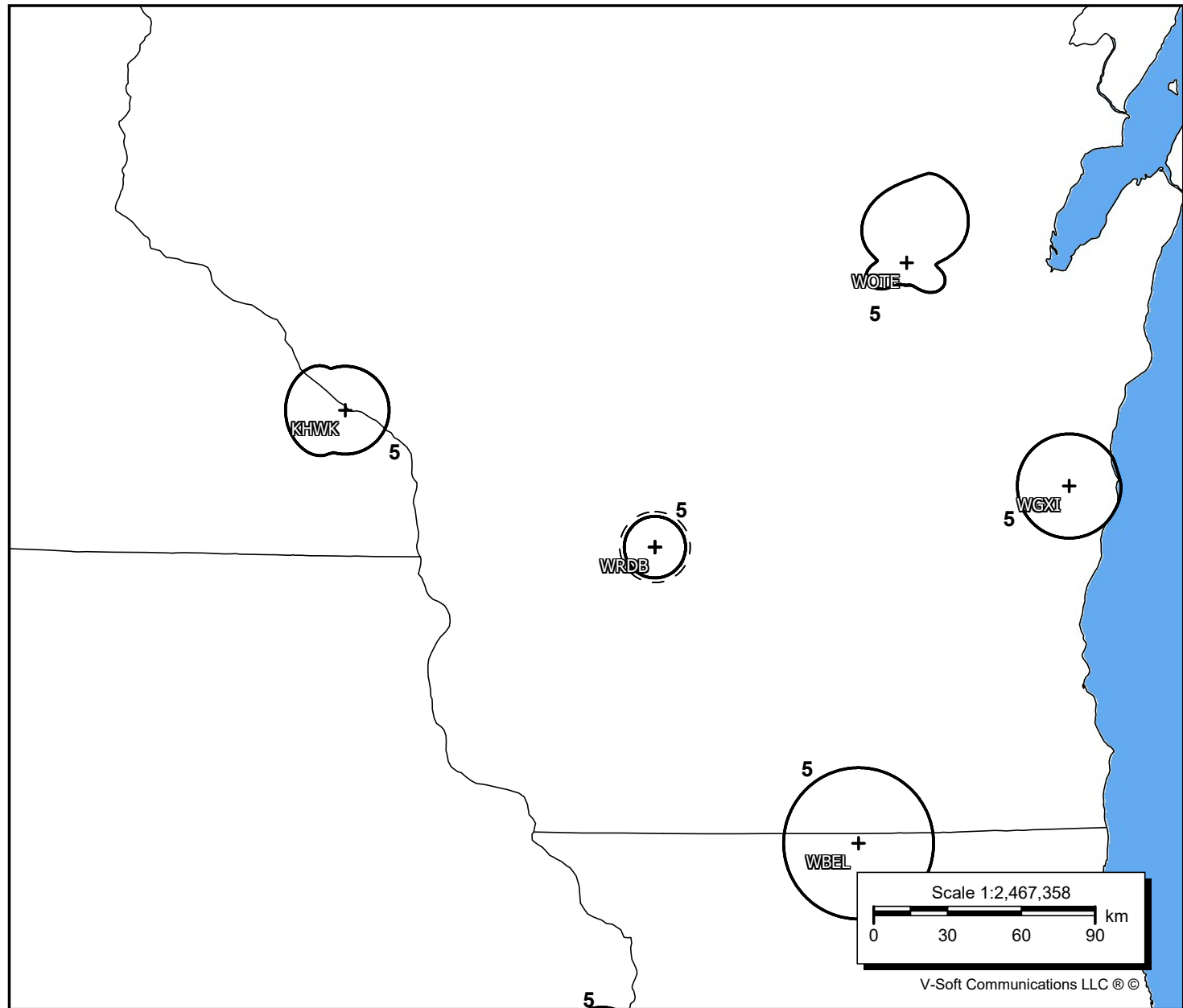
RMS: 283.6 mV/m @1km

Towers: 1

Aucs: 0

Daytime Allocation Study
2nd-adjacent Channel

Dashed Lines are
Licensed Contours



WRDB

Freq: 1400 kHz

Class: C

Latitude: 43-32-29 N

Longitude: 090-02-06 W

Power: 1 kW

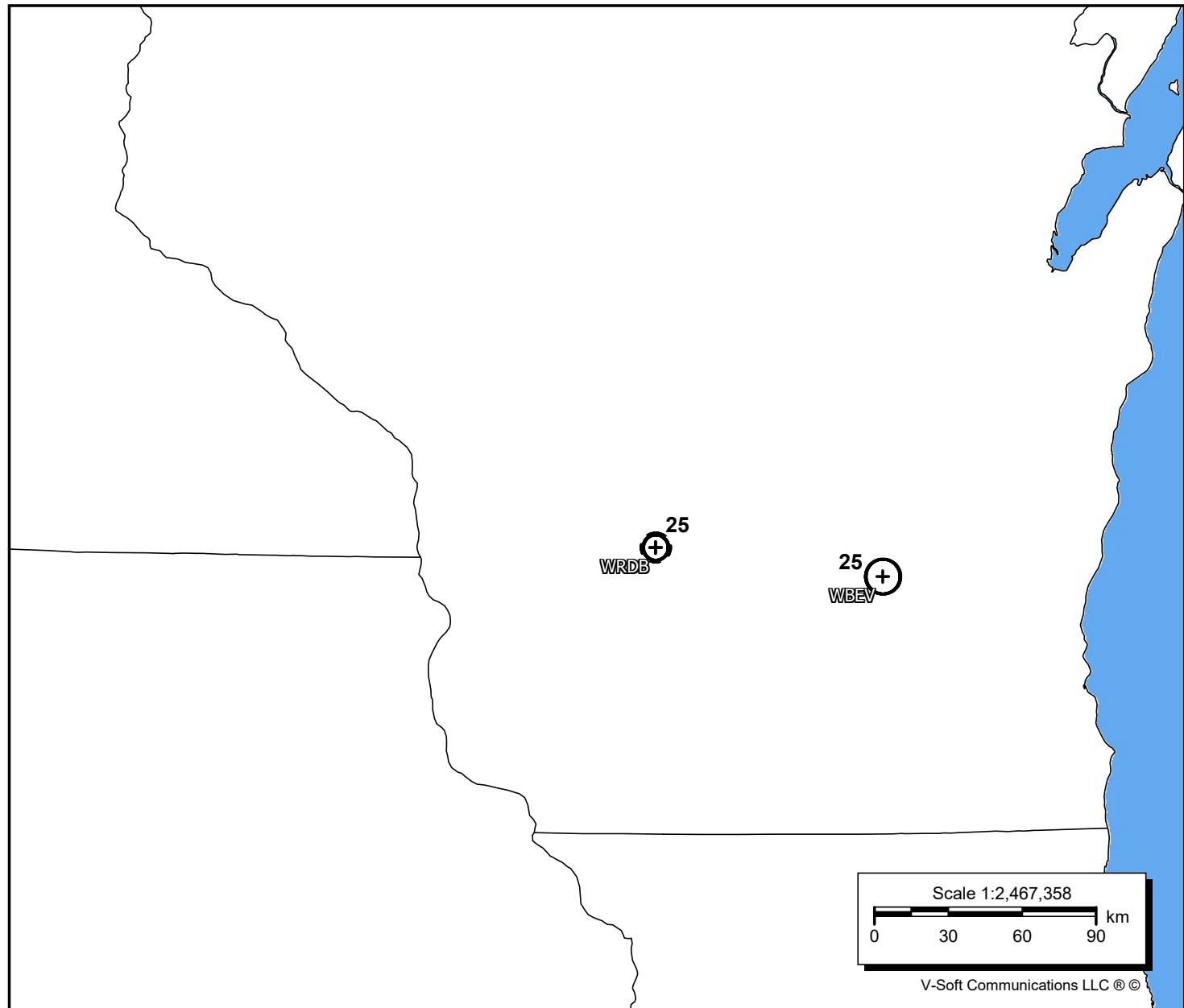
RMS: 283.6 mV/m @1km

Towers: 1

Augs: 0

Daytime Allocation Study
3rd-adjacent Channel

Dashed Lines are
Licensed Contours



Site to Site RSS Calculations

Protected Station: WIZM, 1410 kHz - LA CROSSE, WI, US

Coordinates: 43-50-49 N, 091-13-07 W

Standard: FCC Rules (1992 Skywave Propagation Model) [10%]

Current:

Call	Freq (kHz)	Limit (mV/m)	(%)
WOC	1420	2.017	100.0
WING	1410	1.734	85.9
WPOP	1410	1.680	63.1
KTOE	1420	1.633	51.9
----- 50% -----			
WBIZ	1400	1.172	33.0
KDKT	1410	1.062	28.4
KGSO	1410	1.018	26.2
----- 25% -----			
KVFD	1400	0.989	24.6
KADR	1400	0.982	23.7
1410CKSL/	1410	0.941	22.1
WRMN	1410	0.930	21.3
WRJN	1400	0.924	20.7
KITE	1410	0.902	19.8
WATW	1400	0.878	18.9
KWYO	1410	0.815	17.2
KEYL	1400	0.801	16.7
KOOQ	1410	0.801	16.5
KCOG	1400	0.787	16.0
KKLO	1410	0.762	15.3
KRWB	1410	0.757	15.0
WCCY	1400	0.754	14.8
WDWS	1400	0.752	14.6
WLAQ	1410	0.737	14.1
KIIX	1410	0.735	13.9
KMNV	1400	0.728	13.7
KMHL	1400	0.713	13.3
XEBS/A	1410	0.706	13.0
WQYQ	1400	0.675	12.3
WGIL	1400	0.652	11.8
WNGL	1410	0.642	11.6
WDUZ	1400	0.615	11.0
WQXO	1400	0.609	10.8
CJWI (1) /	1410	0.590	10.4
WLJN	1400	0.588	10.3

Proposed:

Call	Freq (kHz)	Limit (mV/m)	(%)
WOC	1420	2.017	100.0
WING	1410	1.734	85.9
WPOP	1410	1.680	63.1
KTOE	1420	1.633	51.9
----- 50% -----			
WBIZ	1400	1.172	33.0
KDKT	1410	1.062	28.4
KGSO	1410	1.018	26.2
----- 25% -----			
*WRDB-PRO	1400	1.001	24.9
KVFD	1400	0.989	23.9
KADR	1400	0.982	23.0
1410CKSL/	1410	0.941	21.5
WRMN	1410	0.930	20.8
WRJN	1400	0.924	20.2
KITE	1410	0.902	19.3
WATW	1400	0.878	18.5
KWYO	1410	0.815	16.9
KEYL	1400	0.801	16.3
KOOQ	1410	0.801	16.1
KCOG	1400	0.787	15.6
KKLO	1410	0.762	15.0
KRWB	1410	0.757	14.7
WCCY	1400	0.754	14.5
WDWS	1400	0.752	14.3
WLAQ	1410	0.737	13.9
KIIX	1410	0.735	13.7
KMNV	1400	0.728	13.4
KMHL	1400	0.713	13.0
XEBS/A	1410	0.706	12.8
WQYQ	1400	0.675	12.1
WGIL	1400	0.652	11.6
WNGL	1410	0.642	11.4
WDUZ	1400	0.615	10.8
WQXO	1400	0.609	10.6
CJWI (1) /	1410	0.590	10.3
WLJN	1400	0.588	10.2

Protected Station: WGRB, 1390 kHz - CHICAGO, IL, US
 Coordinates: 41-44-13 N, 087-42-00 W
 Standard: FCC Rules (1992 Skywave Propagation Model) [10%]

Current:

Call	Freq (kHz)	Limit (mV/m)	(%)
WFBL	1390	2.197	100.0
WNIO	1390	2.001	91.1
WTJF	1390	1.715	57.7
----- 50% -----			
WSPO	1390	1.594	46.4
KENN	1390	1.563	41.3
WKJG	1380	1.520	37.1
WHMA	1390	1.399	32.0
KXFN	1380	1.293	28.1
WRSC	1390	1.225	25.7
----- 25% -----			
KCRC	1390	1.220	24.7
WLCM	1390	1.206	23.8
WRIG	1390	1.203	23.0
WQYQ	1400	1.174	21.9
KRRZ	1390	1.160	21.1
*WRDB	1400	1.055	18.8
WBAT	1400	1.049	18.4
WDTK	1400	1.036	17.8
WBFN	1400	0.982	16.6
YVZC-A	1390	0.968	16.2
WSAM	1400	0.931	15.4
WZHF	1390	0.879	14.3
XEOR/A	1390	0.828	13.4
KLTX	1390	0.819	13.1
WEOA	1400	0.779	12.3
KADR	1400	0.771	12.1
KFRA	1390	0.770	12.0
XEJTC69/A	1390	0.767	11.9
1390CHOO/	1390	0.727	11.2
KJFF	1400	0.721	11.0
WMAN	1400	0.718	10.9
WBEL	1380	0.704	10.6
WCYN	1400	0.698	10.5
WLJN	1400	0.678	10.1

Proposed:

Call	Freq (kHz)	Limit (mV/m)	(%)
WFBL	1390	2.197	100.0
WNIO	1390	2.001	91.1
WTJF	1390	1.715	57.7
----- 50% -----			
WSPO	1390	1.594	46.4
KENN	1390	1.563	41.3
WKJG	1380	1.520	37.1
WHMA	1390	1.399	32.0
KXFN	1380	1.293	28.1
WRSC	1390	1.225	25.7
----- 25% -----			
KCRC	1390	1.220	24.7
WLCM	1390	1.206	23.8
WRIG	1390	1.203	23.0
WQYQ	1400	1.174	21.9
KRRZ	1390	1.160	21.1
WBAT	1400	1.049	18.7
WDTK	1400	1.036	18.2
WBFN	1400	0.982	16.9
YVZC-A	1390	0.968	16.5
WSAM	1400	0.931	15.6
WZHF	1390	0.879	14.5
*WRDB-PRO	1400	0.860	14.1
XEOR/A	1390	0.828	13.4
KLTX	1390	0.819	13.2
WEOA	1400	0.779	12.4
KADR	1400	0.771	12.2
KFRA	1390	0.770	12.1
XEJTC69/A	1390	0.767	11.9
1390CHOO/	1390	0.727	11.2
KJFF	1400	0.721	11.1
WMAN	1400	0.718	11.0
WBEL	1380	0.704	10.7
WCYN	1400	0.698	10.5
WLJN	1400	0.678	10.2
XERUY1/A	1390	0.669	10.0

Protected Station: 1400CKDR-2/ , 1400 kHz - Sioux Lookout, ON, CA
 Coordinates: 50-05-44 N, 091-54-31 W
 Standard: Canadian (Figure 4) [10%]

Current:

Call	Freq (kHz)	Limit (mV/m)	(%)
WATW	1400	6.907	100.0
WCCY	1400	6.834	98.9
KEYL	1400	6.796	69.9
KMNV	1400	6.703	56.5
----- 50% -----			
WBIZ	1400	6.485	47.6
WQXO	1400	6.471	42.8
*WRDB	1400	6.440	39.2
1400MBBR/	1400	6.431	36.4
KQDJ	1400	6.208	33.0
WKNW	1400	5.760	29.1
KMHL	1400	5.522	26.8
WLJN	1400	5.419	25.4
----- 25% -----			
WDUZ	1400	5.166	23.4
KVFD	1400	5.044	22.3
WSAM	1400	4.965	21.4
WRJN	1400	4.867	20.5
WDTK	1400	4.743	19.6
1400ESPANO/	1400	4.552	18.4
KBJM	1400	4.529	18.0
1400COCHRA/	1400	4.501	17.6
WGIL	1400	4.293	16.6
KBRB	1400	4.253	16.2
WDWS	1400	4.143	15.6
1400CKRN/	1400	4.024	14.9
KADR	1400	4.017	14.7
KXGN	1400	3.856	14.0
WQYQ	1400	3.724	13.4
KLIN	1400	3.496	12.4
1400CKCB/	1400	3.258	11.5
KCOG	1400	3.223	11.3
WBFN	1400	3.003	10.5

Proposed:

Call	Freq (kHz)	Limit (mV/m)	(%)
WATW	1400	6.907	100.0
WCCY	1400	6.834	98.9
KEYL	1400	6.796	69.9
KMNV	1400	6.703	56.5
----- 50% -----			
WBIZ	1400	6.485	47.6
WQXO	1400	6.471	42.8
1400MBBR/	1400	6.431	39.1
KQDJ	1400	6.208	35.2
WKNW	1400	5.760	30.8
KMHL	1400	5.522	28.2
WLJN	1400	5.419	26.6
----- 25% -----			
WDUZ	1400	5.166	24.5
KVFD	1400	5.044	23.2
WSAM	1400	4.965	22.3
WRJN	1400	4.867	21.3
WDTK	1400	4.743	20.3
1400ESPANO/	1400	4.552	19.1
KBJM	1400	4.529	18.7
1400COCHRA/	1400	4.501	18.2
WGIL	1400	4.293	17.1
KBRB	1400	4.253	16.7
WDWS	1400	4.143	16.0
*WRDB-PRO	1400	4.128	15.8
1400CKRN/	1400	4.024	15.2
KADR	1400	4.017	15.0
KXGN	1400	3.856	14.2
WQYQ	1400	3.724	13.6
KLIN	1400	3.496	12.6
1400CKCB/	1400	3.258	11.7
KCOG	1400	3.223	11.5
WBFN	1400	3.003	10.6

Protected Station: WRMN, 1410 kHz - ELGIN, IL, US
 Coordinates: 42-00-21 N, 088-17-55 W
 Standard: FCC Rules (1992 Skywave Propagation Model) [10%]

Current:

Call	Freq (kHz)	Limit (mV/m)	(%)
WIZM	1410	5.977	100.0
WING	1410	4.003	66.9
-----	50%	-----	
1410CKSL/	1410	2.322	32.2
WOC	1420	2.235	29.5
-----	25%	-----	
WPOP	1410	1.936	24.5
KKLO	1410	1.579	19.4
WQYQ	1400	1.271	15.3
KGSO	1410	1.162	13.8
*WRDB	1400	1.045	12.3
WDTK	1400	0.943	11.0
WBAT	1400	0.932	10.8
WBFN	1400	0.904	10.4
WNGL	1410	0.896	10.3
KADR	1400	0.894	10.2
WSAM	1400	0.877	10.0

Proposed:

Call	Freq (kHz)	Limit (mV/m)	(%)
WIZM	1410	5.977	100.0
WING	1410	4.003	66.9
-----	50%	-----	
1410CKSL/	1410	2.322	32.2
WOC	1420	2.235	29.5
-----	25%	-----	
WPOP	1410	1.936	24.5
KKLO	1410	1.579	19.4
WQYQ	1400	1.271	15.3
KGSO	1410	1.162	13.8
*WRDB-PRO	1400	0.988	11.6
WDTK	1400	0.943	11.0
WBAT	1400	0.932	10.8
WBFN	1400	0.904	10.5
WNGL	1410	0.896	10.3
KADR	1400	0.894	10.2
WSAM	1400	0.877	10.0

Protected Station: 1400ESPANO/ , 1400 kHz - Espanola, ON, CA
 Coordinates: 46-14-33 N, 081-46-23 W
 Standard: Canadian (Figure 4) [10%]

Current:

Call	Freq (kHz)	Limit (mV/m)	(%)
1400CKCB/	1400	8.992	100.0
WKNW	1400	8.978	99.8
WDTK	1400	8.703	68.4
1400CKRN/	1400	8.346	54.1
-----	50%	-----	
WQXO	1400	7.739	44.1
1400CHVR1/	1400	7.573	39.5
WSAM	1400	7.426	36.0
WCCY	1400	7.339	33.5
WSLB	1400	7.318	31.6
1400COCHRA/	1400	7.268	30.0
WJET	1400	7.155	28.2
WKBI	1400	7.049	26.8
-----	25%	-----	
1400CKSJ/	1400	6.719	24.6
*WRDB	1400	6.624	23.6
WDNY	1400	6.562	22.7
WRJN	1400	6.325	21.4
WMAN	1400	6.286	20.8
WWWS	1400	6.236	20.2
WDWS	1400	6.151	19.5
WQYQ	1400	6.082	18.9
WBBB	1400	6.068	18.5
WYUP	1400	5.935	17.8
WRAK	1400	5.854	17.3
KMNV	1400	5.800	16.9
WATW	1400	5.658	16.2
WICK	1400	5.656	16.0
WBTH	1400	5.489	15.4
WBAT	1400	5.455	15.1
WBFN	1400	5.383	14.7
WDUZ	1400	5.343	14.4
WBIZ	1400	5.304	14.2
WSTC	1400	5.256	13.9
WAMC	1400	5.249	13.8
WOND	1400	5.179	13.5
WTSL	1400	5.023	12.9
WGIL	1400	4.988	12.7
WLTN	1400	4.963	12.6
WEST	1400	4.935	12.4
WKAV	1400	4.929	12.3
WHGB	1400	4.898	12.1
1400CKFL/	1400	4.860	11.9
WHMP	1400	4.860	11.8
WVRC	1400	4.846	11.7
WZFC	1400	4.810	11.6
WCYN	1400	4.520	10.8
WLJN	1400	4.467	10.6
WRON	1400	4.268	10.1

Proposed:

Call	Freq (kHz)	Limit (mV/m)	(%)
1400CKCB/	1400	8.992	100.0
WKNW	1400	8.978	99.8
WDTK	1400	8.703	68.4
1400CKRN/	1400	8.346	54.1
-----	50%	-----	
WQXO	1400	7.739	44.1
1400CHVR1/	1400	7.573	39.5
WSAM	1400	7.426	36.0
WCCY	1400	7.339	33.5
WSLB	1400	7.318	31.6
1400COCHRA/	1400	7.268	30.0
WJET	1400	7.155	28.2
WKBI	1400	7.049	26.8
-----	25%	-----	
1400CKSJ/	1400	6.719	24.6
WDNY	1400	6.562	23.4
WRJN	1400	6.325	21.9
WMAN	1400	6.286	21.3
WWWS	1400	6.236	20.6
WDWS	1400	6.151	19.9
WQYQ	1400	6.082	19.3
WBBB	1400	6.068	18.9
WYUP	1400	5.935	18.2
WRAK	1400	5.854	17.7
KMNV	1400	5.800	17.2
WATW	1400	5.658	16.5
WICK	1400	5.656	16.3
WBTH	1400	5.489	15.6
WBAT	1400	5.455	15.3
WBFN	1400	5.383	15.0
WDUZ	1400	5.343	14.7
WBIZ	1400	5.304	14.4
WSTC	1400	5.256	14.1
WAMC	1400	5.249	14.0
WOND	1400	5.179	13.7
WTSL	1400	5.023	13.1
WGIL	1400	4.988	12.9
WLTN	1400	4.963	12.7
WEST	1400	4.935	12.6
WKAV	1400	4.929	12.5
WHGB	1400	4.898	12.3
1400CKFL/	1400	4.860	12.1
WHMP	1400	4.860	12.0
WVRC	1400	4.846	11.9
WZFC	1400	4.810	11.7
WCYN	1400	4.520	10.9
WLJN	1400	4.467	10.7
*WRDB-PRO	1400	4.275	10.2
WRON	1400	4.268	10.1
WVAE	1400	4.220	10.0

Protected Station: 1400MBBR/ , 1400 kHz - Brandon, MB, CA
 Coordinates: 49-43-18 N, 099-58-53 W
 Standard: Canadian (Figure 4) [10%]

Current:

Call	Freq (kHz)	Limit (mV/m)	(%)
KQDJ	1400	8.112	100.0
KBJM	1400	7.264	89.5
KXGN	1400	7.231	66.4
KMNV	1400	6.656	50.9
----- 50% -----			
KEYL	1400	6.471	44.1
KBRB	1400	5.881	36.6
WCCY	1400	5.865	34.3
KMHL	1400	5.617	31.1
WATW	1400	5.253	27.7
WBIZ	1400	4.912	25.0
----- 25% -----			
KCOW	1400	4.684	23.1
KVFD	1400	4.669	22.4
KODI	1400	4.532	21.2
*WRDB	1400	4.511	20.7
KKTL	1400	4.444	19.9
KXGF	1400	4.313	19.0
1400CKSQ/	1400	4.299	18.6
KLIN	1400	3.904	16.6
WQXO	1400	3.449	14.4
KFTM	1400	3.422	14.2
WDUZ	1400	3.315	13.6
1400CJEK/	1400	3.294	13.4
WGIL	1400	3.158	12.7
KSPT	1400	3.018	12.1
KADR	1400	3.012	11.9
WLJN	1400	2.994	11.8
KART	1400	2.920	11.4
WRJN	1400	2.912	11.3
KAYS	1400	2.776	10.7
KCOG	1400	2.749	10.5
WKNW	1400	2.663	10.2
1400CKGR/	1400	2.662	10.1
WDWS	1400	2.658	10.0

Proposed:

Call	Freq (kHz)	Limit (mV/m)	(%)
KQDJ	1400	8.112	100.0
KBJM	1400	7.264	89.5
KXGN	1400	7.231	66.4
KMNV	1400	6.656	50.9
----- 50% -----			
KEYL	1400	6.471	44.1
KBRB	1400	5.881	36.6
WCCY	1400	5.865	34.3
KMHL	1400	5.617	31.1
WATW	1400	5.253	27.7
WBIZ	1400	4.912	25.0
----- 25% -----			
KCOW	1400	4.684	23.1
KVFD	1400	4.669	22.4
KODI	1400	4.532	21.2
KKTL	1400	4.444	20.4
KXGF	1400	4.313	19.4
1400CKSQ/	1400	4.299	19.0
KLIN	1400	3.904	16.9
WQXO	1400	3.449	14.7
KFTM	1400	3.422	14.4
WDUZ	1400	3.315	13.8
1400CJEK/	1400	3.294	13.6
WGIL	1400	3.158	12.9
KSPT	1400	3.018	12.3
KADR	1400	3.012	12.1
WLJN	1400	2.994	12.0
KART	1400	2.920	11.6
WRJN	1400	2.912	11.5
KAYS	1400	2.776	10.9
*WRDB-PRO	1400	2.775	10.8
KCOG	1400	2.749	10.6
WKNW	1400	2.663	10.3
1400CKGR/	1400	2.662	10.2
WDWS	1400	2.658	10.1

Statement of Engineer

This Engineering Report, relative to a change in facilities for WRDB(AM) has been prepared by the undersigned. All representations contained herein are true to the best of my knowledge. I am an experienced radio engineer whose qualifications are a matter of record with the Federal Communications Commission. I am an engineer in the firm of Hatfield and Dawson Consulting Engineers and am Registered as a Professional Engineer in the States of Washington and Oregon.

Signed this 4th day of November, 2022



Thomas S. Gorton, P.E.