

ENGINEERING EXHIBIT

Digital Television Station Application for Minor Modification of Licensed Facility prepared for

CBS Broadcasting Inc.
WCCO-TV Minneapolis, MN
Facility ID 9629
Ch. 32 1000 kW 456 m

CBS Broadcasting Inc. ("CBS") is the licensee of digital television station WCCO-TV, Channel 32, Facility ID 9629, Minneapolis MN. WCCO-TV is licensed (BMLCDT-20120907ABQ) to operate with 1000 kW effective radiated power ("ERP") using a nondirectional antenna at 432 meters height above average terrain ("HAAT"). *CBS* proposes herein to relocate WCCO-TV to an adjacent tower structure and increase antenna HAAT to 456 meters.

The licensed WCCO-TV facility is located at one of two adjacent guyed tower structures which are of similar overall height and separated 100 feet horizontally. The towers, owned by Telefarm, Inc., are located at 960 County Road F, Shoreview, MN and are associated with FCC Antenna Structure Registration ("ASR") numbers 1023882 and 1023883. WCCO-TV's licensed main antenna is on the Telefarm South tower, ASR# 1023882. As proposed herein, WCCO-TV will be relocated to a new antenna to be installed atop the Telefarm North tower, ASR# 1023883. The new WCCO-TV antenna is part of a reconfiguration project that will replace the existing top-mounted antennas on the North tower. No change to the overall structure height will result.

CBS proposes to operate WCCO-TV with an ERP of 1000 kW nondirectional at 456 meters antenna HAAT. The proposed antenna is an elliptically polarized Dielectric model TFU-33ETT/VP-R O6 (25 percent vertical polarization). The horizontally polarized ERP is 1000 kW and the vertically polarized ERP is 250 kW. The antenna will be shared with KARE (Ch. 31, Facility ID 23079, Minneapolis MN).

Figure 1 supplies a map that demonstrates compliance with §73.625(a)(1) regarding coverage of the entire principal community. The proposed facility's predicted population exceeds 95 percent of the baseline facility's population as described in the *Incentive Auction Closing and Channel Reassignment Public Notice* ("CCRPN", DA 17-317, released April 13, 2017).

The proposed facility expands the WCCO-TV service contour beyond that established by the CCRPN. Interference study per FCC OET Bulletin 69¹ shows that the proposal complies with the 0.5 percent limit of new interference caused to pertinent nearby full service and Class A television stations as required by §73.616. The interference study output report is provided as Table 1.

Since the antenna HAAT is increased and the ERP will remain at 1000 kW nondirectional, the noise limited service contour ("NLSC") is expanded slightly in all directions and no NLSC loss area will be created.

The proposed 1000 kW ERP exceeds the maximum permitted by §73.622(f)(8)(i) for the proposed antenna HAAT of 456 meters. Section 73.622(f)(5) permits the maximum ERP to be exceeded in order to provide the same geographic coverage area as the largest station within the same market. As demonstrated in Figure 2, the total area within the proposed WCCO-TV NLSC is 38,819 square kilometers, which does not exceed the NLSC area of KARE (43,463 sq. km, Ch. 11, Minneapolis MN, file# 0000001486) or KMSP-TV (39,120 sq. km, CP, Ch. 9, Minneapolis MN, file# 0000035734). Thus, the 1000 kW ERP specified herein is in compliance with §73.622(f)(5) of the FCC's Rules.

Human Exposure to Radiofrequency Electromagnetic Field (Environmental)

The proposed operation was evaluated for human exposure to RF energy using the procedures outlined in the FCC's OET Bulletin Number 65. Based on OET-65 equation (10), and

¹FCC Office of Engineering and Technology Bulletin number 69, *Longley-Rice Methodology for Evaluating TV Coverage and Interference*, February 6, 2004 ("OET-69"). This analysis employed the FCC's current "TVStudy" software with the default application processing template settings, 2 km cell size, and 1 km terrain increment. Comparisons of various results of this computer program (run on a Mac processor) to the FCC's implementation of TVStudy show excellent correlation.

considering 5 percent antenna relative field in downward elevations (pattern data shows less than 5 percent relative field at angles 20 to 90 degrees below the antenna), the calculated signal density near the tower at two meters above ground level attributable to the proposed facility is $0.6 \mu\text{W}/\text{cm}^2$, which is 0.2 percent of the general population/uncontrolled maximum permitted exposure limit. This is well below the five percent threshold limit described in §1.1307(b) regarding sites with multiple emitters, categorically excluding the applicant from responsibility for taking any corrective action in the areas where the proposal's contribution is less than five percent.

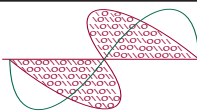
The general public will not be exposed to RF levels attributable to the proposal in excess of the FCC's guidelines. RF exposure warning signs will continue to be posted. With respect to worker safety, the applicant will coordinate exposure procedures with all pertinent stations and will reduce power or cease operation as necessary to protect persons having access to the site, tower, or antenna from RF electromagnetic field exposure in excess of FCC guidelines. This exhibit is limited to the evaluation of exposure to RF electromagnetic field. No increase in structure height is proposed.

List of Attachments

Figure 1	Proposed Coverage Contours
Figure 2	Maximum ERP per §73.622(f)
Table 1	TVStudy Analysis of Proposal
Form 2100	Saved Version of Engineering Sections from FCC Form at Time of Upload

Chesapeake RF Consultants, LLC

Joseph M. Davis, P.E.	July 29, 2021	
207 Old Dominion Road	Yorktown, VA 23692	703-650-9600

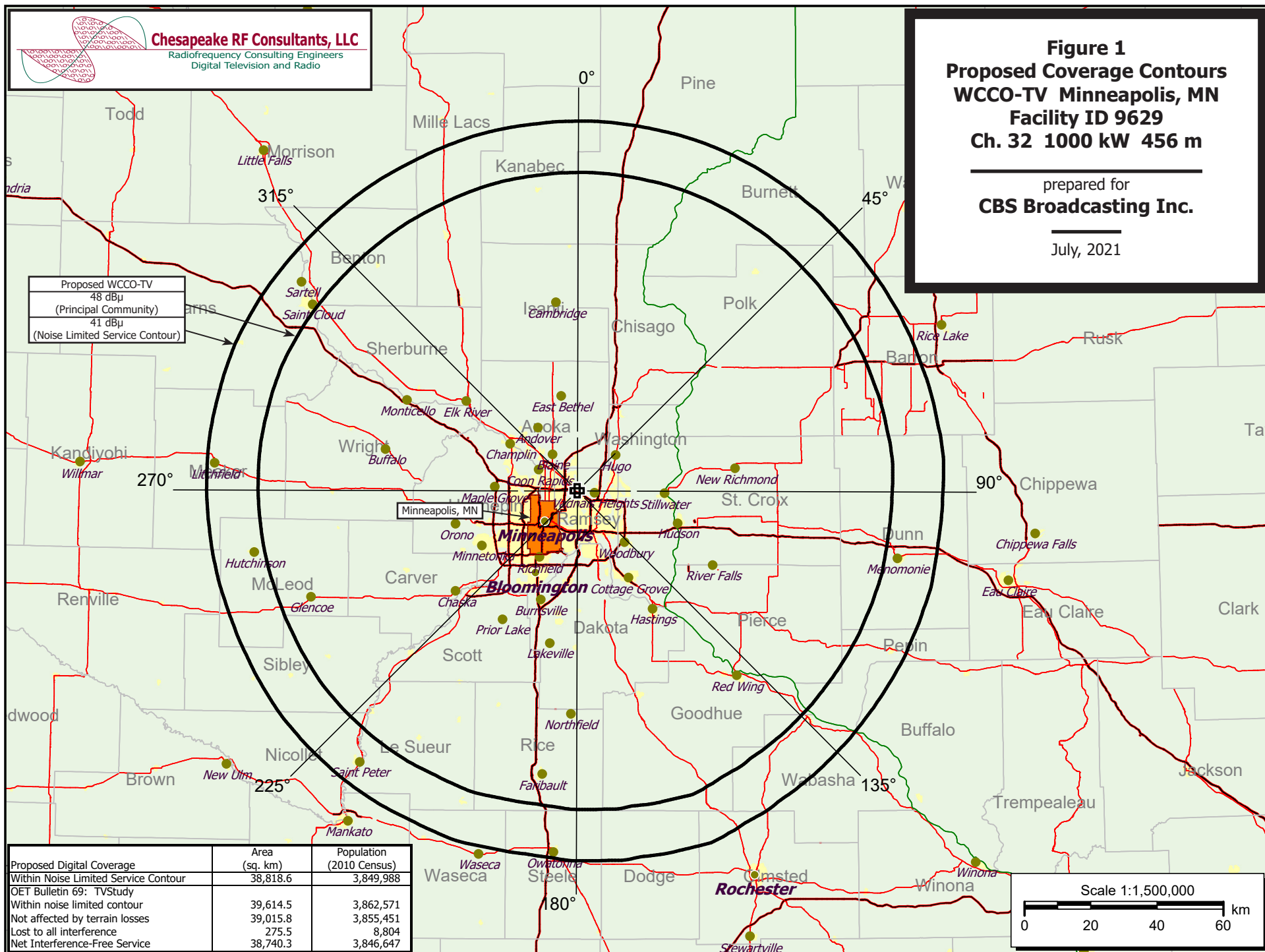


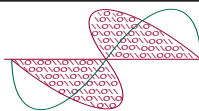
Chesapeake RF Consultants, LLC
Radiofrequency Consulting Engineers
Digital Television and Radio

Figure 1
Proposed Coverage Contours
WCCO-TV Minneapolis, MN
Facility ID 9629
Ch. 32 1000 kW 456 m

prepared for
CBS Broadcasting Inc.

July, 2021





Chesapeake RF Consultants, LLC
Radiofrequency Consulting Engineers
Digital Television and Radio

Figure 2
Coverage Contour Comparison
WCCO-TV Minneapolis, MN
Facility ID 9629
Ch. 32 1000 kW 456 m

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Proposed WCCO-TV
41 dBu Contour (NLSC)
Area: 38,819 sq. km

KARE Ch. 11 Minneapolis, MN
Lic File# 000001486
36 dBu Contour (NLSC)
Area: 43,463 sq. km

KMSP-TV Ch. 9 Minneapolis, MN
CP File# 0000035734
36 dBu Contour (NLSC)
Area: 39,120 sq. km

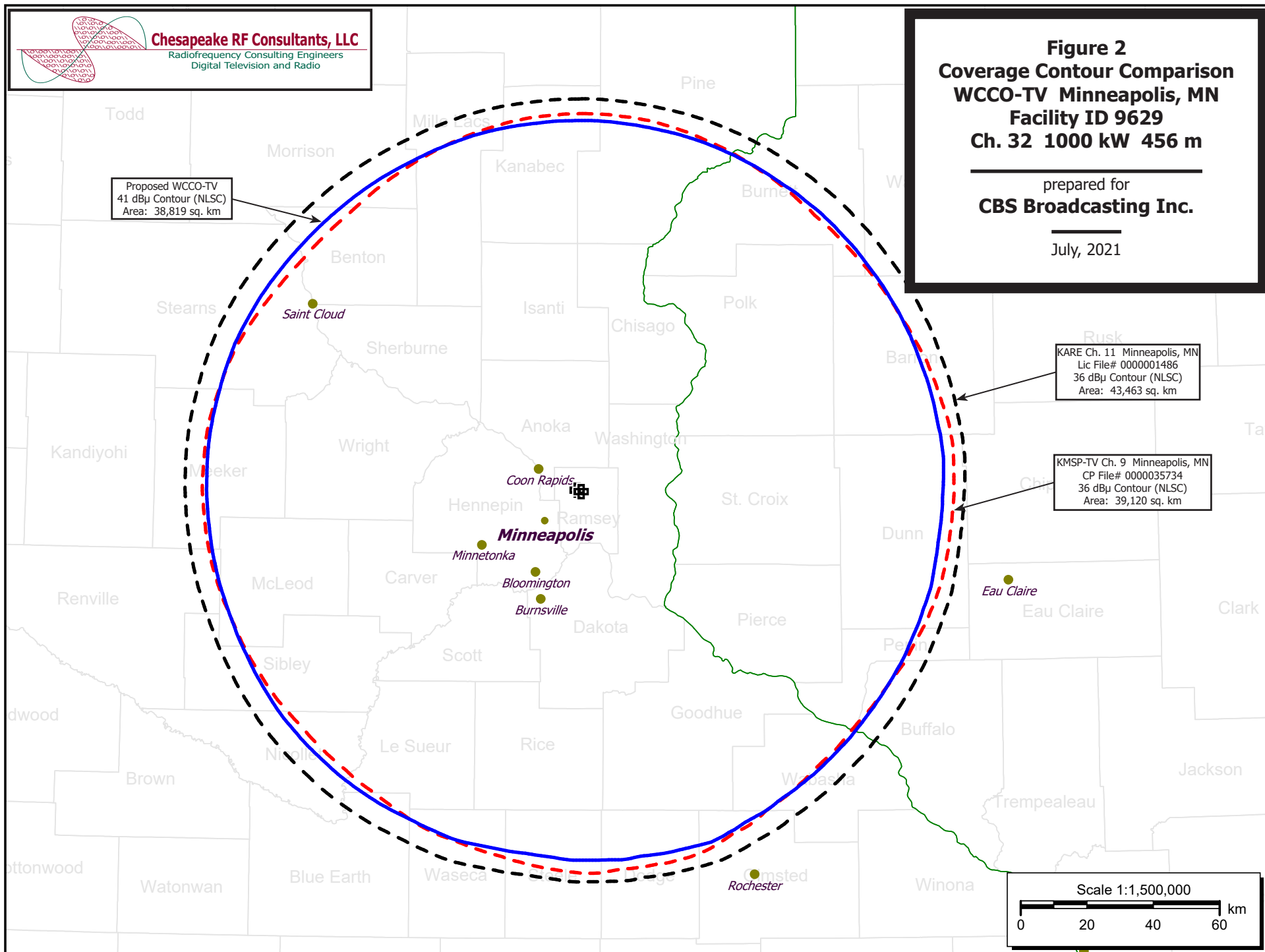
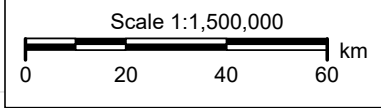


Table 1 WCCO-TV TVStudy Analysis of Proposal
(page 1 of 3)



tvstudy v2.2.5 (4uoc83)
Database: localhost, Study: WCCO-TV_prop, Model: Longley-Rice
Start: 2021.07.28 14:29:40

Study created: 2021.07.28 14:29:40

Study build station data: LMS TV 2021-07-27

Proposal: WCCO-TV D32 DT APP MINNEAPOLIS, MN
File number: WCCO-TV prop
Facility ID: 9629
Station data: User record
Record ID: 3779
Country: U.S.
Zone: II

Search options:
Baseline record excluded if station has CP

Stations potentially affected by proposal:

IX	Call	Chan	Svc	Status	City, State	File Number	Distance
No	WRPT	D31	DT	LIC	HIBBING, MN	BLEDT20090603AAY	258.1 km
Yes	KARE	D31	DT	CP	MINNEAPOLIS, MN	BLANK0000135138	0.0
Yes	KCRG-TV	D32	DT	CP	CEDAR RAPIDS, IA	BLANK0000150618	322.1
Yes	KMEG	D32	DT	LIC	SIOUX CITY, IA	BLANK0000064025	369.8
No	WTMJ-TV	D32	DT	LIC	MILWAUKEE, WI	BLANK0000086939	472.0
No	KDLH	D33	DT	LIC	DULUTH, MN	BLANK0000007407	207.6
Yes	K33LN-D	D33	DC	LIC	MINNEAPOLIS, MN	BLDTA20111219AEB	14.2
No	WLAX	D33	DT	LIC	LA CROSSE, WI	BLANK0000121622	198.1

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D32
Latitude: 45 3 45.00 N (NAD83)
Longitude: 93 8 22.00 W
Height AMSL: 732.4 m
HAAT: 455.9 m
Peak ERP: 1000 kW
Antenna: Omnidirectional
Elev Pattn: Generic
Elec Tilt: 0.70

40.5 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	1000 kW	458.8 m	112.5 km
45.0	1000	452.9	112.0
90.0	1000	443.5	111.3
135.0	1000	452.3	112.0
180.0	1000	458.4	112.5
225.0	1000	463.8	112.9
270.0	1000	462.3	112.8
315.0	1000	455.5	112.3

ERP exceeds maximum
ERP: 1000 kW ERP maximum: 644 kW

Proposal 25.51 dBu contour does not cross Canadian border
Distance to Canadian border: 352.5 km

Distance to Mexican border: 1847.0 km

Conditions at FCC monitoring station: Grand Island NE
Bearing: 224.9 degrees Distance: 629.5 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 245.3 degrees Distance: 1127.6 km

Table 1 WCCO-TV TVStudy Analysis of Proposal
(page 2 of 3)



Study cell size: 2.00 km
Profile point spacing: 1.00 km

Maximum new IX to full-service and Class A: 0.50%
Maximum new IX to LPTV: 2.00%

Interference to BLANK0000135138 CP scenario 1

Desired:	Call KARE	Chan D31	Svc DT	Status CP	City, State MINNEAPOLIS, MN	File Number BLANK0000135138	Distance			
Undesireds:	WCCO-TV	D32	DT	BL	MINNEAPOLIS, MN	DTVBL9629	0.0 km			
	WCCO-TV	D32	DT	APP	MINNEAPOLIS, MN	WCCO-TV prop	0.0			
	KSTC-TV	D30	DT	LIC	MINNEAPOLIS, MN	BLANK0000080959	0.0			
	WRPT	D31	DT	LIC	HIBBING, MN	BLEDT20090603AAY	258.2			
Service area		Terrain-limited			IX-free, before	IX-free, after	Percent New IX			
39726.6	3,868,644	39143.9	3,861,457		39131.9	3,860,492	39116.0	3,860,413	0.04	0.00
Undesired				Total IX		Unique IX, before		Unique IX, after		
WCCO-TV	D32	DT	BL	0.0		0		0		
WCCO-TV	D32	DT	APP	19.9		93		15.9		79
KSTC-TV	D30	DT	LIC	4.0		14		0.0		0
WRPT	D31	DT	LIC	8.0		951		8.0		951

Interference to BLANK0000150618 CP scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance		
Desired:	KCRG-TV	D32	DT	CP	CEDAR RAPIDS, IA	BLANK0000150618			
Undesireds:	WCCO-TV	D32	DT	BL	MINNEAPOLIS, MN	DTVBL9629	322.1 km		
	WCCO-TV	D32	DT	APP	MINNEAPOLIS, MN	WCCO-TV prop	322.1		
	WQAD-TV	D31	DT	LIC	MOLINE, IL	BLANK0000120809	165.7		
	KMEG	D32	DT	LIC	SIOUX CITY, IA	BLANK0000064025	359.1		
	WICD	D32	DT	LIC	CHAMPAIGN, IL	BLANK0000059351	413.8		
	WLPD-CD	D32	DC	CP	PLANO, IL	BLANK0000153593	352.3		
	WTJR	D32	DT	LIC	QUINCY, IL	BLCDT20091110ADL	264.3		
	KSMO-TV	D32	DT	LIC	KANSAS CITY, MO	BLANK0000072612	420.7		
	WTMJ-TV	D32	DT	LIC	MILWAUKEE, WI	BLANK0000086939	334.4		
	KTVO	D33	DT	CP	KIRKSVILLE, MO	BLANK0000111691	204.4		
	WLAX	D33	DT	LIC	LA CROSSE, WI	BLANK0000121622	170.0		
Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
46885.6	1,120,894	46286.5	1,099,424	45507.3	1,083,416	45507.3	1,083,415	-0.00	0.00
Undesired				Total IX		Unique IX, before		Unique IX, after	
WCCO-TV	D32	DT	BL	107.2	750	67.5	628		
WCCO-TV	D32	DT	APP	111.2	751		629	67.5	
WQAD-TV	D31	DT	LIC	173.2	5,404	104.7	2,182	104.7	2,182
KMEG	D32	DT	LIC	52.1	190	40.1	129	40.1	129
WICD	D32	DT	LIC	4.0	24	0.0	0	0.0	0
WTJR	D32	DT	LIC	375.4	11,065	282.9	7,753	282.9	7,753
WTMJ-TV	D32	DT	LIC	183.9	2,028	128.0	1,758	128.0	1,758
WLAX	D33	DT	LIC	35.7	146	23.8	124	19.8	124

Interference to BLANK0000064025 LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	KMEG	D32	DT	LIC	SIOUX CITY, IA	BLANK0000064025	
Undesireds:	WCCO-TV	D32	DT	BL	MINNEAPOLIS, MN	DTVBL9629	369.8 km
	WCCO-TV	D32	DT	APP	MINNEAPOLIS, MN	WCCO-TV prop	369.8
	KMTV-TV	D31	DT	LIC	OMAHA, NE	BLANK0000074904	143.2
	KCRG-TV	D32	DT	CP	CEDAR RAPIDS, IA	BLANK0000150618	359.1
	KSMO-TV	D32	DT	LIC	KANSAS CITY, MO	BLANK0000072612	415.5

Table 1 WCCO-TV TVStudy Analysis of Proposal
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Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX
47088.1 708,748	46810.8 704,130	45745.2 697,301	45729.3 697,146	0.03 0.02
Undesired	Total IX	Unique IX, before	Unique IX, after	
WCCO-TV D32 DT BL	23.9 130	23.9 130		
WCCO-TV D32 DT APP	39.7 285		39.7 285	
KMTV-TV D31 DT LIC	753.9 4,198	749.9 4,146	749.9 4,146	
KCRG-TV D32 DT CP	287.9 2,501	287.9 2,501	287.9 2,501	
KSMO-TV D32 DT LIC	4.0 52	0.0 0	0.0 0	

Interference to BLANK0000064025 LIC scenario 2

Call	Chan	Svc	Status	City, State	File Number	Distance
Desired: KMEG	D32	DT	LIC	SIOUX CITY, IA	BLANK0000064025	
Undesireds: WCCO-TV	D32	DT	BL	MINNEAPOLIS, MN	DTVBL9629	369.8 km
WCCO-TV	D32	DT	APP	MINNEAPOLIS, MN	WCCO-TV prop	369.8
KMTV-TV	D31	DT	LIC	OMAHA, NE	BLANK0000074904	143.2
KCRG-TV	D32	DT	CP	CEDAR RAPIDS, IA	BLANK0000150618	359.1
KSMO-TV	D32	DT	LIC	KANSAS CITY, MO	BLANK0000153303	415.5

Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX
47088.1 708,748	46810.8 704,130	45745.2 697,301	45729.3 697,146	0.03 0.02
Undesired	Total IX	Unique IX, before	Unique IX, after	
WCCO-TV D32 DT BL	23.9 130	23.9 130		
WCCO-TV D32 DT APP	39.7 285		39.7 285	
KMTV-TV D31 DT LIC	753.9 4,198	749.9 4,146	749.9 4,146	
KCRG-TV D32 DT CP	287.9 2,501	287.9 2,501	287.9 2,501	
KSMO-TV D32 DT LIC	4.0 52	0.0 0	0.0 0	

Interference to BLDTA20111219AEB LIC scenario 1

Call	Chan	Svc	Status	City, State	File Number	Distance
Desired: K33LN-D	D33	DC	LIC	MINNEAPOLIS, MN	BLDTA20111219AEB	
Undesireds: WCCO-TV	D32	DT	BL	MINNEAPOLIS, MN	DTVBL9629	14.2 km
WCCO-TV	D32	DT	APP	MINNEAPOLIS, MN	WCCO-TV prop	14.2
KDLH	D33	DT	LIC	DULUTH, MN	BLANK0000007407	220.5
WLAX	D33	DT	LIC	LA CROSSE, WI	BLANK0000121622	199.3
KTCA-TV	D34	DT	LIC	ST. PAUL, MN	BLEDT20060802AAO	14.8

Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX
8444.0 2,981,651	8407.8 2,974,958	6234.7 2,763,006	6067.0 2,753,902	2.69 0.33
Undesired	Total IX	Unique IX, before	Unique IX, after	
WCCO-TV D32 DT BL	2024.9 194,956	699.4 54,091		
WCCO-TV D32 DT APP	2204.5 204,989		867.1 63,195	
KDLH D33 DT LIC	8.0 157	0.0 0	0.0 0	
WLAX D33 DT LIC	39.9 966	12.0 88	12.0 88	
KTCA-TV D34 DT LIC	1457.7 157,720	120.2 16,628	108.2 15,699	

Interference to proposal scenario 1

Call	Chan	Svc	Status	City, State	File Number	Distance
Desired: WCCO-TV	D32	DT	APP	MINNEAPOLIS, MN	WCCO-TV prop	
Undesireds: KCRG-TV	D32	DT	CP	CEDAR RAPIDS, IA	BLANK0000150618	322.1 km
KMEG	D32	DT	LIC	SIOUX CITY, IA	BLANK0000064025	369.8
WLAX	D33	DT	LIC	LA CROSSE, WI	BLANK0000121622	198.1

Service area	Terrain-limited	IX-free	Percent IX
39614.5 3,862,571	39015.8 3,855,451	38740.3 3,846,647	0.71 0.23
Undesired	Total IX	Unique IX	Prct Unique IX
KCRG-TV D32 DT CP	259.5 8,305	235.6 7,821	0.60 0.20
KMEG D32 DT LIC	36.0 950	12.0 466	0.03 0.01
WLAX D33 DT LIC	4.0 33	4.0 33	0.01 0.00

**Channel and
Facility
Information**

Section	Question	Response
Proposed Community of License	Facility ID	9629
	State	Minnesota
	City	MINNEAPOLIS
	DTV Channel	32
	Designated Market Area	Minneapolis-St. Paul
Facility Type	Facility Type	Commercial
	Station Type	Main
Zone	Zone	2

**Antenna Location
Data**

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1023883
Coordinates (NAD83)	Latitude	45° 03' 45.0" N+
	Longitude	093° 08' 22.0" W-
	Structure Type	TOWER-A free standing or guyed struct
	Overall Structure Height	438.3 meters
	Support Structure Height	392.6 meters
	Ground Elevation (AMSL)	304.9 meters
Antenna Data	Height of Radiation Center Above Ground Level	427.5 meters
	Height of Radiation Center Above Average Terrain	455.9 meters
	Height of Radiation Center Above Mean Sea Level	732.4 meters
	Effective Radiated Power	1000 kW

**Antenna
Technical Data**

Section	Question	Response
Antenna Type	Antenna Type	Non-Directional
	Do you have an Antenna ID?	
	Antenna ID	
Antenna Manufacturer and Model	Manufacturer:	Dielectric
	Model	TFU-33ETT/VP-R O6
	Rotation	
	Electrical Beam Tilt	0.7
	Mechanical Beam Tilt	Not Applicable
	toward azimuth	
	Polarization	Elliptical
DTV and DTS: Elevation Pattern	Does the proposed antenna propose elevation radiation patterns that vary with azimuth for reasons other than the use of mechanical beam tilt?	No
	Uploaded file for elevation antenna (or radiation) pattern data	

**Construction
Permit
Certifications**

Section	Question	Response
Post-Incentive Auction Expedited Processing	It will operate on the DTV channel for this station as established in the post-incentive auction channel reassignment public notice.	Yes
	It will operate post-incentive auction facilities that do not expand the noise-limited service contour in any direction beyond that established by the post-incentive auction channel reassignment public notice.	No
	It will operate post-incentive auction facilities that match or reduce by no more than five percent with respect to predicted population from those defined in the post-incentive auction channel reassignment public notice.	Yes
	The antenna structure to be used by this facility has been registered by the Commission and will not require re-registration to support the proposed antenna, OR the FAA has previously determined that the proposed structure will not adversely affect safety in air navigation and this structure qualifies for later registration under the Commission's phased registration plan, OR the proposed installation on this structure does not require notification to the FAA pursuant to 47 C.F.R. Section 17.7.	Yes
Environmental Effect	Would a Commission grant of Authorization for this location be an action which may have a significant environmental effect? (See 47 C.F.R. Section 1.1306)	No
Broadcast Facility	The proposed facility complies with the applicable engineering standards and assignment requirements of 47 C. F.R. Sections 73.616, 73.622(i), 73.623(e), 73.625, 73.1030, and 73.1125.	Yes