

ENGINEERING EXHIBIT

Application for Minor Modification of Digital Low Power Television Station Construction Permit

prepared for

Gray Television Licensee, LLC

K20PB-D Williston, ND

Facility ID 187437

Ch. 20 0.36 kW Directional

Gray Television Licensee, LLC (“Gray”) is the permittee of unbuilt digital Low Power Television station K20PB-D, Channel 20, Williston ND, Facility ID 187437. K20PB-D is authorized to operate pursuant to a Construction Permit (“CP”, file# 0000157654) with 0.2 kW effective radiated power (“ERP”), nondirectional. The current CP was obtained as a displacement of the previously authorized operation on Channel 46 (callsign K46ME-D). *Gray* herein seeks a modification of the current CP to specify increased ERP, reduced antenna height, and use of a directional antenna.

No change in site location is proposed from that which is currently authorized. The proposed facility will employ a new antenna to be side-mounted on the existing tower structure associated with FCC Antenna Structure Registration number 1050840. No change to the overall structure height is proposed.

The proposed antenna is a Kathrein model 75010325 (single panel) having elliptical polarization. The proposed ERP is 0.36 kW horizontally polarized and 0.15 kW vertically polarized using a “simple” out of channel emission mask. A plot of the directional antenna’s azimuthal pattern is supplied in Figure 1. Figure 2 depicts the 51 dB μ coverage contour of the proposed facility as well as those of the current and original CP facilities, demonstrating compliance with §73.3572 for a minor change.

Interference study per OET Bulletin 69¹ shows that the proposal complies with the FCC's interference protection requirements toward all digital television, television translator, LPTV, and Class A stations. The results, summarized in Table 1, show that any new interference does not exceed the FCC's interference limits (0.5 percent to full power and Class A stations, and 2.0 percent to secondary stations) to any facility.

The site is located 96 km from the U.S. – Canada border. For Canada referral purposes, the 24.36 dBμ F(50,10) contour is relevant for digital Low Power Television operations on Channel 20. The 24.36 dBμ F(50,10) contour is depicted in Figure 3 and does not reach Canada. Thus, international coordination is not required.

Human Exposure to Radiofrequency Electromagnetic Field (Environmental)

The proposed facility was evaluated for human exposure to Radiofrequency ("RF") energy using the procedures outlined in the FCC's OET Bulletin Number 65. Based on OET-65 equation (10), and considering the antenna relative field in downward elevations, the graph in Figure 4 depicts calculated power density levels attributable to the proposed facility at locations near the site at a height of two meters above ground level. The maximum calculated RF electromagnetic field attributable to the proposed facility is 4.3 percent of the general population / uncontrolled maximum permissible exposure limit at any location two meters above ground level. This is 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,

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, 1 km cell size, and 1.0 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.

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 change in structure height is proposed.

List of Attachments

Figure 1	Antenna Azimuthal Pattern
Figure 2	Coverage Contour Comparison
Figure 3	Interfering Contour Towards Canada
Figure 4	Calculated RF Electromagnetic Field
Table 1	TVStudy Analysis of Proposal
Form 2100	Saved Version of Engineering Sections of FCC Form at Time of Upload

Chesapeake RF Consultants, LLC

Joseph M. Davis, P.E.	December 22, 2021	
207 Old Dominion Road	Yorktown, VA 23692	703-650-9600

**Azimuth Pattern - Relative Field
(True North)**

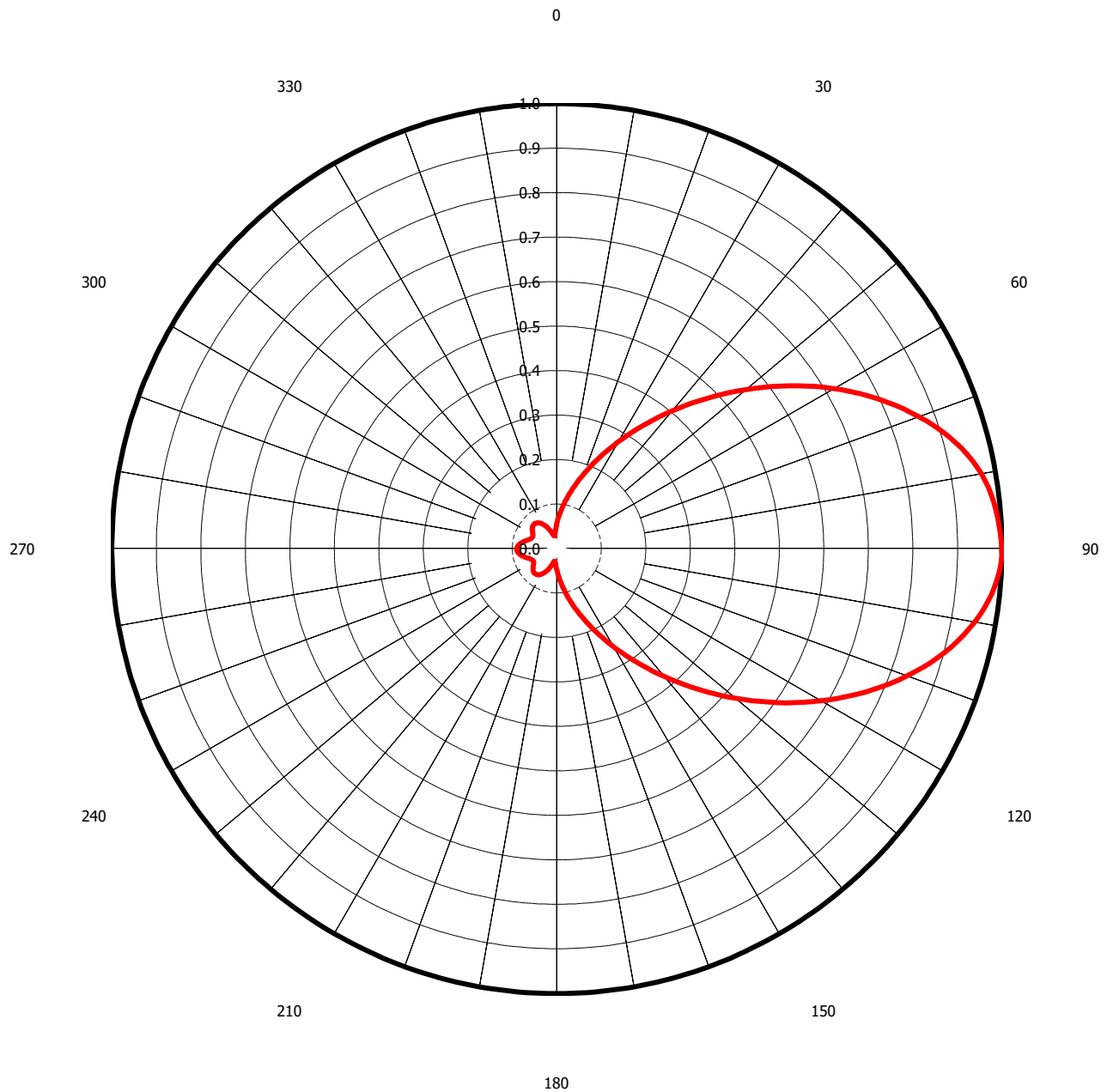
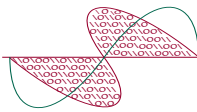


Figure 1
Antenna Azimuthal Pattern
K20PB-D Williston, ND
Facility ID 187437
Ch. 20 0.36 kW Directional

prepared for
Gray Television Licensee, LLC

December, 2021

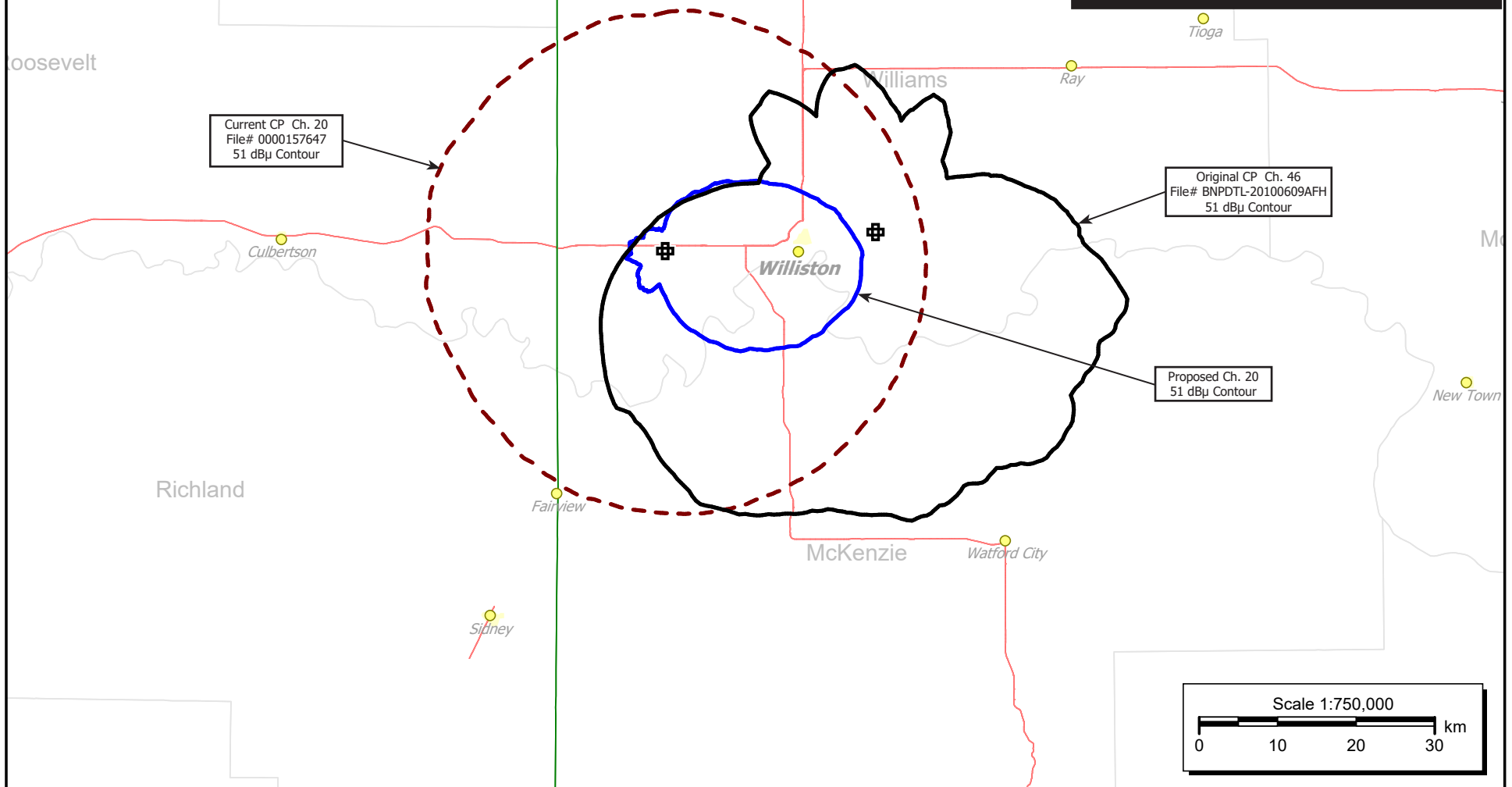


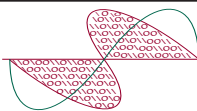
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Digital Television and Radio

Figure 2
Coverage Contour Comparison
K20PB-D Williston, ND
Facility ID 187437
Ch. 20 0.36 kW Directional

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Radiofrequency Consulting Engineers
Digital Television and Radio

Figure 3
Interfering Contour Towards Canada
K20PB-D Williston, ND
Facility ID 187437
Ch. 20 0.36 kW Directional

prepared for
Gray Television Licensee, LLC

December, 2021

Canada

United States

Proposed K20PB-D
24.36 dBu F(50,10)

Minot

Williston

Dickinson

Scale 1:2,000,000

0 20 40 60 km

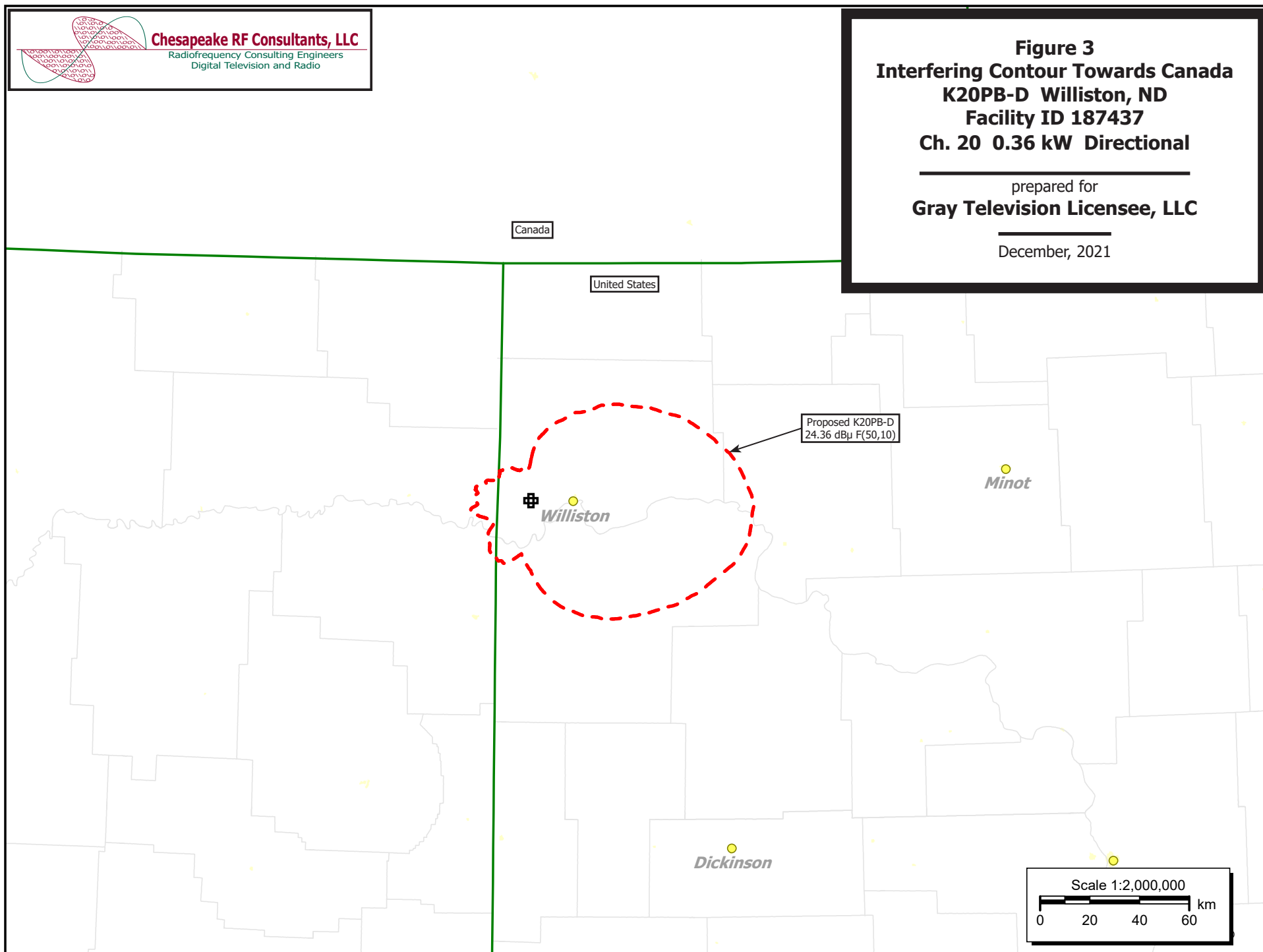


Figure 4
Calculated RF Electromagnetic Field
K20PB-D Williston, ND
Facility ID 187437
Ch. 20 0.36 kW Directional

prepared for
Gray Television Licensee, LLC

December, 2021

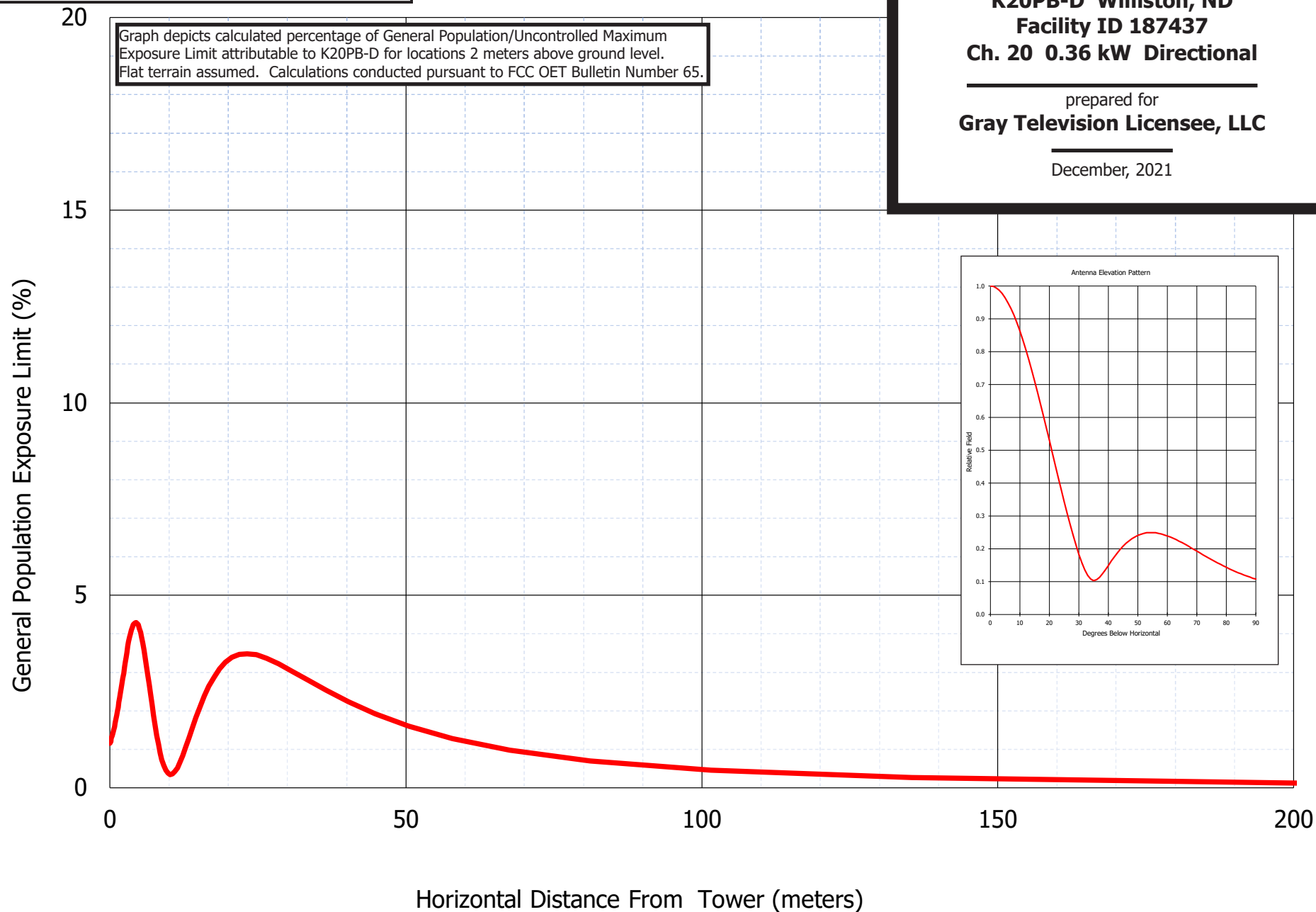


Table 1 K20PB-D TV Study Analysis of Proposal
(page 1 of 2)



tvstudy v2.2.5 (4uoc83)
Database: localhost, Study: K20PB-D prop mod, Model: Longley-Rice
Start: 2021.12.21 16:43:45

Study created: 2021.12.21 16:43:45

Study build station data: LMS TV 2021-12-21

Proposal: K20PB-D D20 LD APP WILLISTON, ND
File number: K20PB-D prop mod
Facility ID: 187437
Station data: User record
Record ID: 4089
Country: U.S.

Build options:
Protect pre-transition records not on baseline channel

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	K19JR-D	D19	LD	CP	WOLF POINT, MT	BLANK0000013205	123.7 km
No	K19JR-D	D19	LD	LIC	WOLF POINT, MT	BLDTT20120614ACJ	136.2
No	KXMA-TV	D19	DT	LIC	DICKINSON, ND	BLCDT20090715AHZ	171.8
No	K20LK-D	D20	LD	LIC	COLSTRIP, ETC., MT	BLDTT20120608AAV	344.0
No	K20JS-D	D20	LD	LIC	GLASGOW, MT	BLDTT20110705ABR	205.5
No	K20BP-D	D20	LD	LIC	PHILLIPS COUNTY, MT	BLDTT20111116AUB	351.0
No	KJRE	D20	DT	LIC	ELLENDAL, ND	BLDTT20041109AAB	428.6

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D20
Mask: Simple
Latitude: 48 8 2.00 N (NAD83)
Longitude: 103 51 38.00 W
Height AMSL: 724.7 m (Adjusted based on actual ground elevation calculation)
HAAT: 0.0 m
Peak ERP: 0.360 kW
Antenna: KAT 750 10325 1x 90.0 deg
Elev Pattern: Generic

49.4 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	0.001 kW	43.6 m	4.1 km
45.0	0.083	58.8	13.8
90.0	0.360	117.0	27.3
135.0	0.073	130.2	19.9
180.0	0.000	121.6	6.4
225.0	0.002	55.4	5.3
270.0	0.003	42.1	5.1
315.0	0.002	32.7	4.1

Database HAAT does not agree with computed HAAT
Database HAAT: 0 m Computed HAAT: 75 m

Proposal 24.36 dBu contour does not cross Canadian border
Distance to Canadian border: 96.2 km

Distance to Mexican border: 1831.2 km

Conditions at FCC monitoring station: Grand Island NE
Bearing: 149.8 degrees Distance: 909.2 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:

Table 1 K20PB-D TVStudy Analysis of Proposal
(page 2 of 2)



Bearing: 187.5 degrees Distance: 893.7 km

No land mobile station failures found

Study cell size: 1.00 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 proposal scenario 1

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	K20PB-D	D20	LD	APP	WILLISTON, ND	K20PB-D prop mod	
	Service area			Terrain-limited		IX-free	Percent IX
565.6	17,429	534.1		17,384	534.1	17,384	0.00 0.00

**Channel and
Facility
Information**

Section	Question	Response
Facility ID	187437	
State	North Dakota	
City	WILLISTON	
LPD Channel	20	

Primary station proposed to be rebroadcast:

Facility Id	Call Sign	City	State
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Antenna Location Data

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1050840
Coordinates (NAD83)	Latitude	48° 08' 02.0" N+
	Longitude	103° 51' 38.0" W-
	Structure Type	GTOWER-Guyed Structure Used for Communication Purposes
	Overall Structure Height	266.4 meters
	Support Structure Height	243.8 meters
	Ground Elevation (AMSL)	714.1 meters
Antenna Data	Height of Radiation Center Above Ground Level	9.1 meters
	Height of Radiation Center Above Mean Sea Level	723.2 meters
	Effective Radiated Power	0.36 kW

**Antenna
Technical Data**

Section	Question	Response
Antenna Type	Antenna Type	Directional Custom
	Do you have an Antenna ID?	No
	Antenna ID	
Antenna Manufacturer and Model	Manufacturer:	Kathrein
	Model	750 10325 1x
	Rotation	90 degrees
	Electrical Beam Tilt	Not Applicable
	Mechanical Beam Tilt	Not Applicable
	toward azimuth	
	Polarization	Elliptical
Elevation Radiation 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	
	Out-of-Channel Emission Mask:	Simple

Directional Antenna Relative Field Values (Pre-rotated Pattern)

Degree	Value	Degree	Value	Degree	Value	Degree	Value
0	1.000	90	0.048	180	0.090	270	0.056
10	0.953	100	0.029	190	0.079	280	0.107
20	0.838	110	0.046	200	0.063	290	0.179
30	0.685	120	0.066	210	0.062	300	0.277
40	0.524	130	0.075	220	0.072	310	0.404
50	0.376	140	0.070	230	0.074	320	0.556
60	0.255	150	0.060	240	0.063	330	0.719
70	0.163	160	0.066	250	0.042	340	0.866
80	0.095	170	0.083	260	0.029	350	0.968

Additional Azimuths

Degree	V _A
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