

ENGINEERING EXHIBIT

Digital Television Station Application for Minor Modification of Licensed Facility

prepared for

Gray Television Licensee, LLC

WECT(DT) Wilmington NC

Facility ID 48666

Ch. 23 550 kW 592 m

Gray Television Licensee, LLC (“Gray”) is the licensee of digital television station WECT(DT), Channel 23, Facility ID 48666, Wilmington NC. WECT is licensed (file# 0000111584) to operate at 510 kW effective radiated power (“ERP”) with a directional antenna at 590 meters height above average terrain (“HAAT”). *Gray* proposes herein to utilize a replacement antenna and operate WECT at increased ERP of 550 kW at 592 meters HAAT.

The existing WECT broadband panel directional antenna has become deficient and will be replaced with a new antenna of the same style. WECT shares the antenna with stations WSFX-TV Channel 29 and WWAY Channel 24, both Wilmington NC. The replacement antenna, supplied by an alternate manufacturer, has a similar but not exact directional azimuthal pattern as compared to the licensed facility. Manufacturing differences also place the resulting proposed antenna radiation center height above ground level at 588.2 meters, an increase of 1.2 meters above the licensed value. The proposed replacement antenna will be top-mounted in lieu of the existing antenna on the WECT tower structure corresponding to FCC Antenna Structure Registration number 1008242.

The proposed antenna is a horizontally polarized ERI model ETU14U4-HTP4Ox-24/23/29. *Gray* proposes to operate WECT with an ERP of 550 kW at 592 meters antenna HAAT. The directional antenna’s azimuthal pattern is depicted in Figure 1 and the elevation pattern is supplied in Figure 2.

Figure 3 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 WECT noise limited service contour ("NLSC") 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.

The proposed WECT NLSC encompasses and expands beyond nearly all of the licensed facility's NLSC. Minor NLSC loss areas are created due to the directional pattern variations of the replacement antenna. The NLSC of nearby licensed television stations which overlap the loss areas are provided on Figure 4 to demonstrate the availability of other services. All of the NLSC loss areas are considered "well served" since at least five other licensed television facilities provide NLSC overlap. There are at least eight other NLSC services available throughout all of the loss areas.

The proposed 550 kW ERP exceeds the maximum permitted by §73.622(f)(8) for the proposed antenna HAAT of 592 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 5, the total area within the proposed WECT NLSC is 35,949 square kilometers, which does not exceed the NLSC area of WWAY (37,628 sq. km). Thus, the 550 kW ERP specified herein complies with §73.622(f)(5).

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 1.0 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.

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 considering 15 percent antenna relative field in downward elevations (pattern data shows less than 15 percent relative field at angles 10 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 $1.2 \mu\text{W}/\text{cm}^2$, which is 0.3 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.

List of Attachments

Figure 1	Antenna Azimuthal Pattern
Figure 2	Antenna Elevation Pattern
Figure 3	Proposed Coverage Contours
Figure 4	Coverage Contour Comparison – Alternate DTV Services
Figure 5	Coverage Contour Comparison - 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.	January 13, 2023	
207 Old Dominion Road	Yorktown, VA 23692	703-650-9600

Azimuth Pattern

Type:	ETUP4Ox-H	Polarization:	Horizontal
Directivity:	1.91 numeric (2.86 dB)	Frequency:	23 (ATSC)
Peak(s) at:		Location:	Wilmington, NC
		NOTE: Pattern shape and directivity may vary with channel and mounting configuration.	

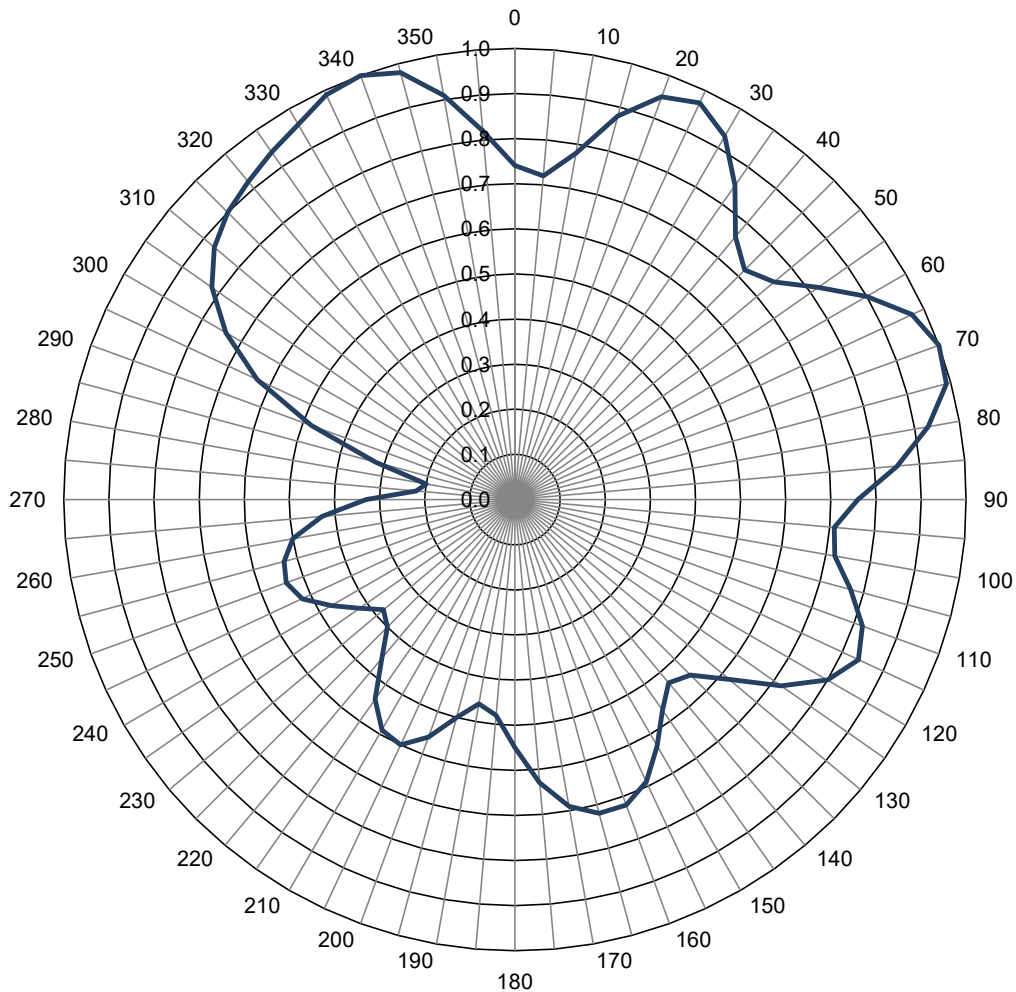
Relative Field

Figure 1
Antenna Azimuthal Pattern
WECT(DT) Wilmington NC
Facility ID 48666
Ch. 23 550 kW 592 m

prepared for
Gray Television Licensee, LLC

January, 2023

Elevation Pattern

Type:	ETU-14U4-H	Polarization:	Horizontal
Directivity:		Frequency:	23 (ATSC)
Main Lobe:	30.44 numeric (14.83 dB)	Location:	Wilmington, NC
Horizontal:	14.92 numeric (11.74 dB)	Beam Tilt:	1.00 degrees

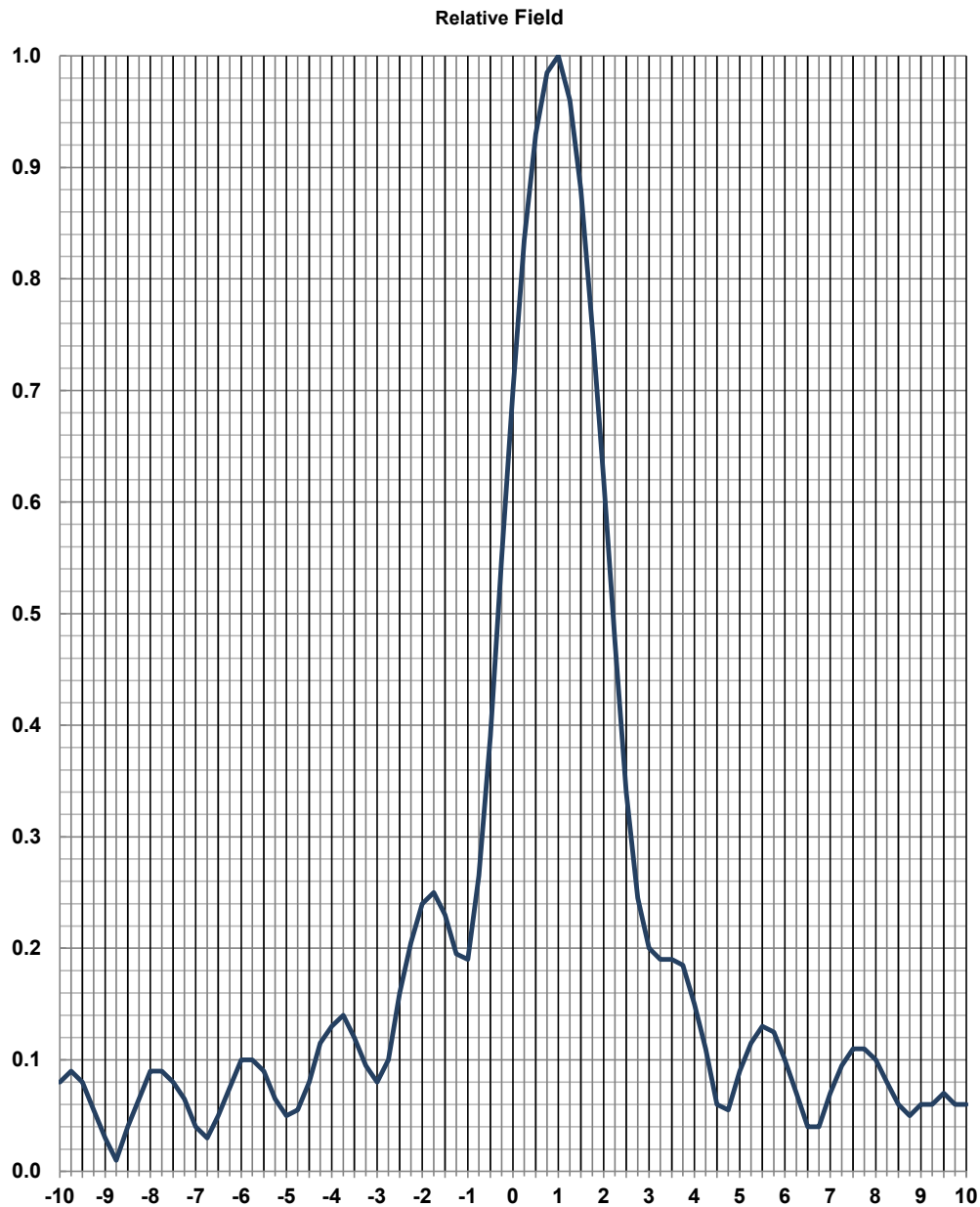
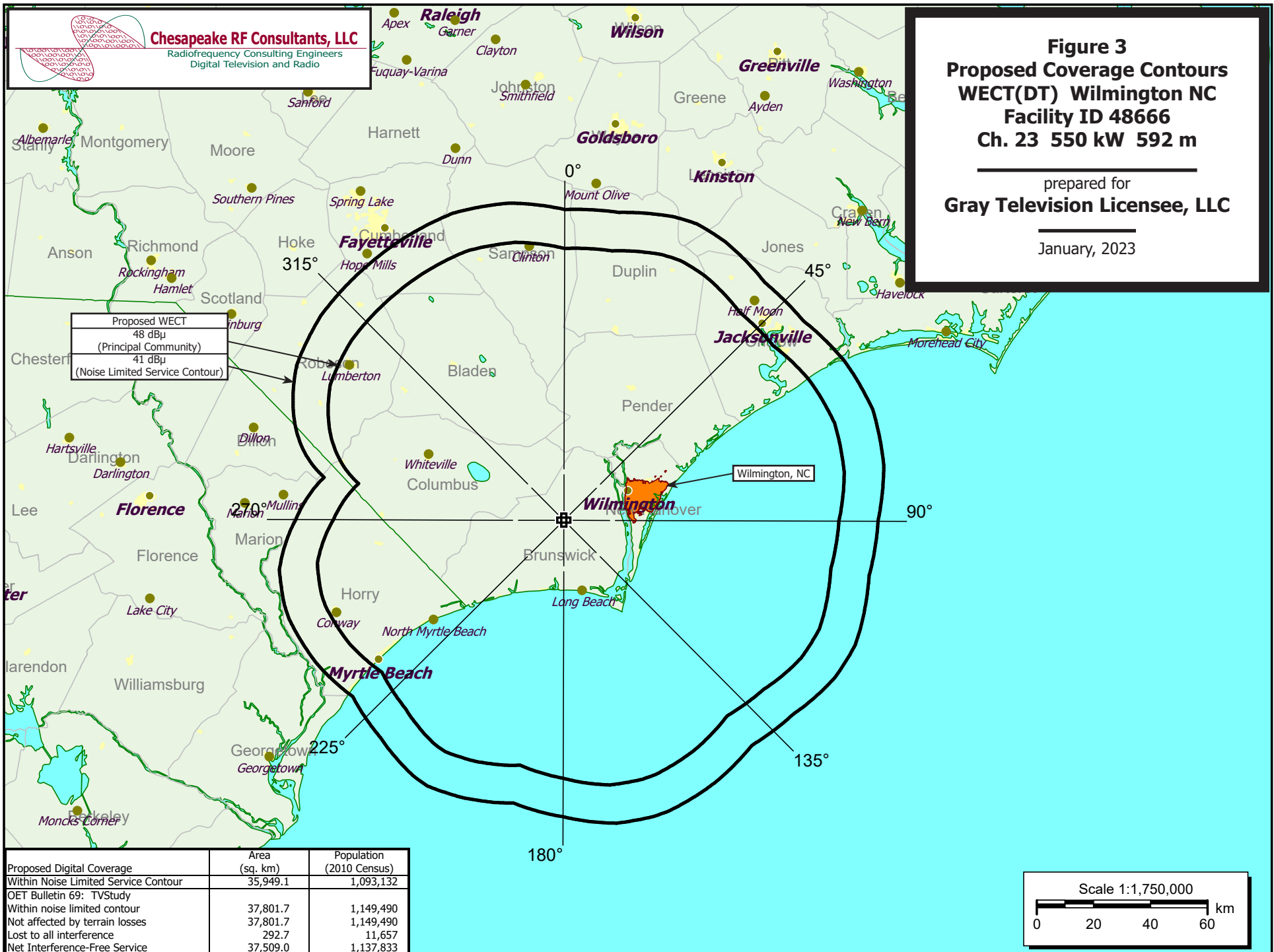


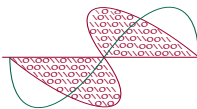
Figure 2
Antenna Elevation Pattern
WECT(DT) Wilmington NC
Facility ID 48666
Ch. 23 550 kW 592 m

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Proposed Digital Coverage	Area (sq. km)	Population (2010 Census)
Within Noise Limited Service Contour	35,949.1	1,093,132
OET Bulletin 69: TVStudy		
Within noise limited contour	37,801.7	1,149,490
Not affected by terrain losses	37,801.7	1,149,490
Lost to all interference	292.7	11,657
Net Interference-Free Service	37,509.0	1,137,833

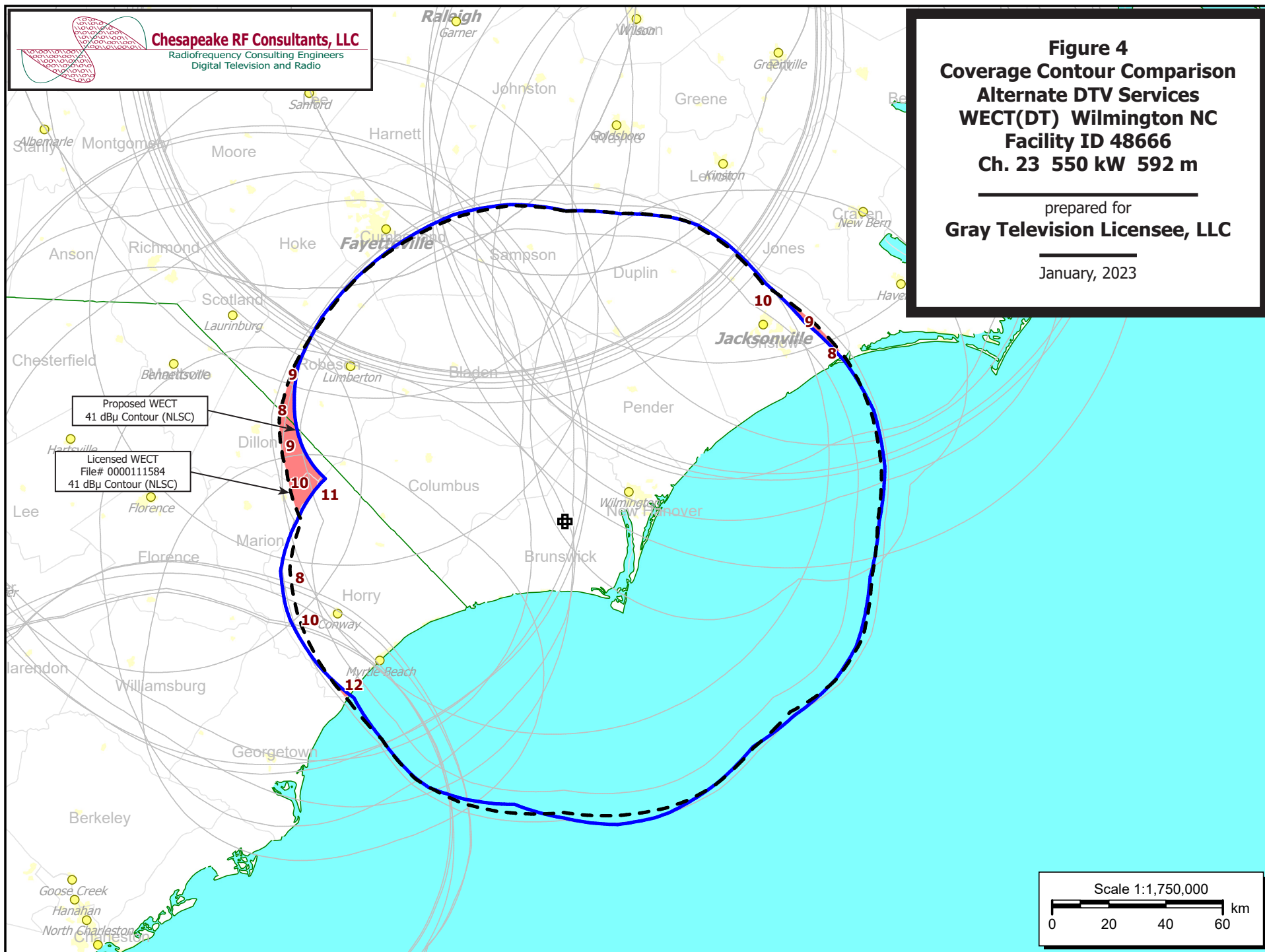


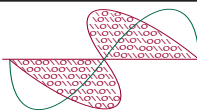
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Radiofrequency Consulting Engineers
Digital Television and Radio

Figure 4
Coverage Contour Comparison
Alternate DTV Services
WECT(DT) Wilmington NC
Facility ID 48666
Ch. 23 550 kW 592 m

prepared for
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Radiofrequency Consulting Engineers
Digital Television and Radio

Figure 5
Coverage Contour Comparison
Maximum ERP per §73.622(f)
WECT(DT) Wilmington NC
Facility ID 48666
Ch. 23 550 kW 592 m

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Gray Television Licensee, LLC

January, 2023

WWAY Ch. 24 Wilmington, NC
File# 0000100423
41 dBμ Contour (NLSC)
Area: 37,628.2 sq. km

Proposed WECT
41 dBμ Contour (NLSC)
Area: 35,949.1 sq. km

Scale 1:1,750,000
0 20 40 60 km

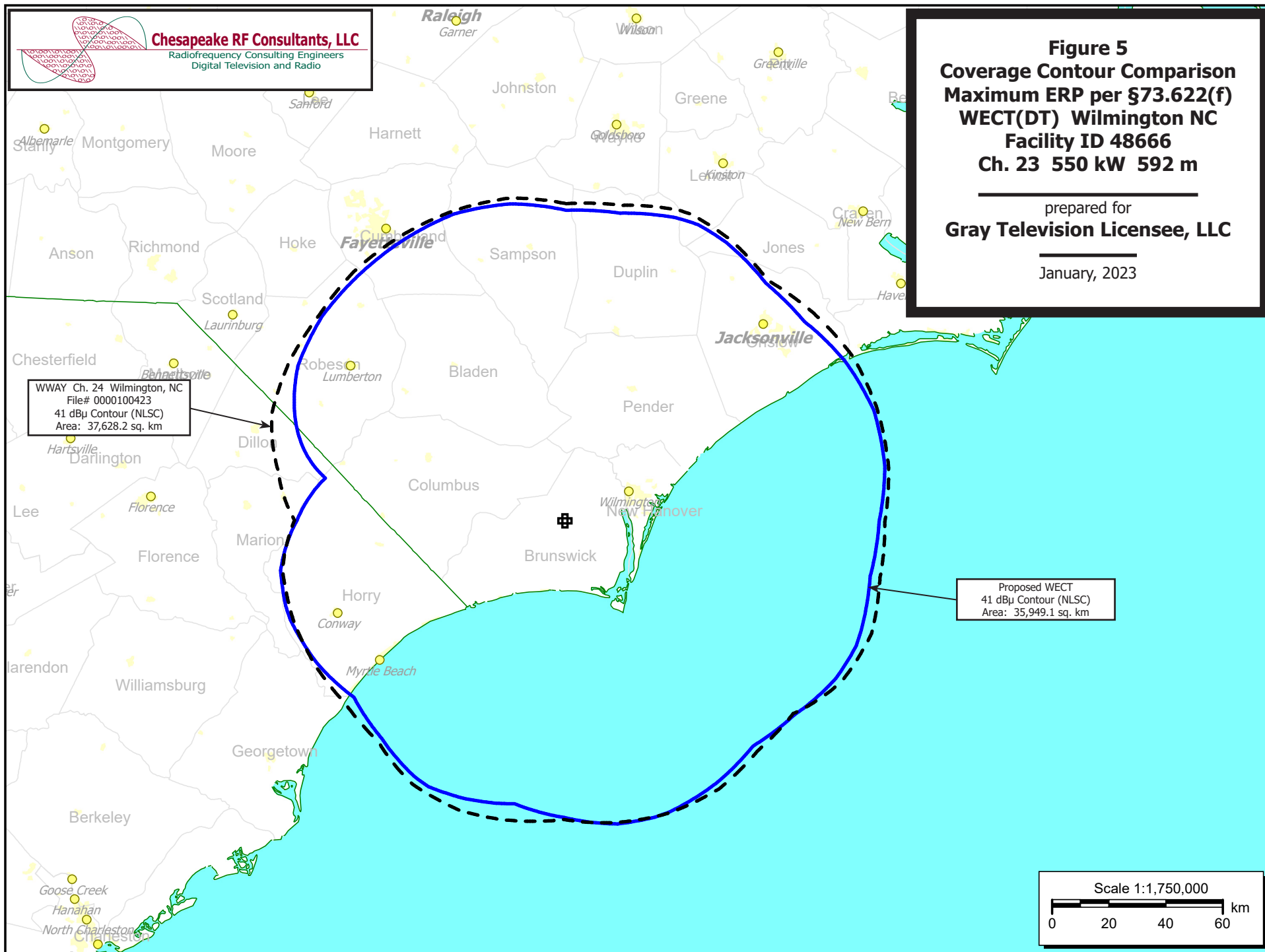


Table 1 WECT TVStudy Analysis of Proposal
(page 1 of 3)



tvstudy v2.2.5 (4uoc83)
Database: localhost, Study: WECT ETU 550kW, Model: Longley-Rice
Start: 2023.01.11 11:08:04

Study created: 2023.01.11 11:08:04

Study build station data: LMS TV 2023-01-07

Proposal: WECT D23 DT APP WILMINGTON, NC
File number: WECT ETU 550kW
Facility ID: 48666
Station data: User record
Record ID: 4810
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
Yes	WUVC-DT	D22	DT	LIC	FAYETTEVILLE, NC	BLANK0000125505	169.5 km
No	WACH	D22	DT	LIC	COLUMBIA, SC	BLANK0000093772	237.0
No	WTOC-TV	D23	DT	CP	SAVANNAH, GA	BLANK0000203704	374.2
Yes	WBTW	D23	DT	LIC	CHARLOTTE, NC	BLANK0000147971	306.2
Yes	WNGT-CD	D23	DC	LIC	RALEIGH, NC	BLANK0000143970	174.6
No	WITD-CD	D23	DC	LIC	CHESAPEAKE, VA	BLANK0000001500	335.2
No	WTVR-TV	D23	DT	LIC	RICHMOND, VA	BLANK0000185678	379.5
No	WUBX-CD	D24	DC	LIC	DURHAM, ETC., NC	BLANK0000108883	213.0
No	WWAY	D24	DT	LIC	WILMINGTON, NC	BLANK0000100423	0.0
No	WITV	D24	DT	LIC	CHARLESTON, SC	BLANK0000118279	193.9

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D23
Latitude: 34 7 54.00 N (NAD83)
Longitude: 78 11 16.00 W
Height AMSL: 607.4 m
HAAT: 592.2 m
Peak ERP: 550 kW
Antenna: Ch23 ETU14U4 AZpat 20210304-390-1r1 0.0 deg
Elev Pattn: Generic
Elec Tilt: 1.00

39.7 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	300 kW	590.9 m	111.8 km
45.0	306	591.3	112.0
90.0	324	599.7	112.9
135.0	168	592.6	106.8
180.0	162	596.6	106.7
225.0	83.9	590.2	100.7
270.0	51.8	588.5	96.6
315.0	426	588.0	114.8

ERP exceeds maximum

ERP: 550 kW ERP maximum: 336 kW

Distance to Canadian border: 916.0 km

Distance to Mexican border: 2013.2 km

Conditions at FCC monitoring station: Laurel MD
Bearing: 11.9 degrees Distance: 572.6 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:

Table 1 WECT TVStudy Analysis of Proposal
(page 2 of 3)



Bearing: 293.5 degrees Distance: 2476.0 km

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 BLANK0000125505 LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	WUVC-DT	D22	DT	LIC	FAYETTEVILLE, NC	BLANK0000125505	
Undesireds:	WECT	D23	DT	BL	WILMINGTON, NC	DTVBL48666	169.5 km
	WECT	D23	DT	APP	WILMINGTON, NC	WECT ETU 550kW	169.5
	WUNG-TV	D21	DT	LIC	CONCORD, NC	BLANK0000113063	148.8
	WUNJ-TV	D21	DT	LIC	WILMINGTON, NC	BLANK0000126699	148.9
	WACH	D22	DT	LIC	COLUMBIA, SC	BLANK0000093772	225.0
	WCVE-TV	D22	DT	LIC	RICHMOND, VA	BLANK0000112529	254.1
	WBTV	D23	DT	LIC	CHARLOTTE, NC	BLANK0000147971	200.7
	WNGT-CD	D23	DC	LIC	RALEIGH, NC	BLANK0000143970	44.0

	Service area	Terrain-limited		IX-free, before		IX-free, after	Percent New IX
	37861.3	3,768,817	37432.3	3,748,841	35925.7	3,697,159	0.00 0.00

Undesired			Total IX	Unique IX, before		Unique IX, after	
WECT D23 DT BL			79.6	611		0.0 0	
WECT D23 DT APP			119.3	811		0.0 0	
WUNG-TV D21 DT LIC			497.9	27,247		401.5 22,573	
WUNJ-TV D21 DT LIC			246.6	1,911		127.3 1,100	
WACH D22 DT LIC			203.1	7,427		143.0 4,055	
WCVE-TV D22 DT LIC			518.6	14,582		510.6 14,464	
WBTV D23 DT LIC			44.4	1,414		4.0 54	
WNGT-CD D23 DC LIC			104.5	3,951		96.5 3,833	

Interference to BLANK0000147971 LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	WBTV	D23	DT	LIC	CHARLOTTE, NC	BLANK0000147971	
Undesireds:	WECT	D23	DT	BL	WILMINGTON, NC	DTVBL48666	306.2 km
	WECT	D23	DT	APP	WILMINGTON, NC	WECT ETU 550kW	306.2
	WUVC-DT	D22	DT	LIC	FAYETTEVILLE, NC	BLANK0000125505	200.7
	WACH	D22	DT	LIC	COLUMBIA, SC	BLANK0000093772	144.0
	WKPT-CD	D22	DC	LIC	KINGSPORT, TN	BLDTA20120420ACJ	180.5
	WTOC-TV	D23	DT	CP	SAVANNAH, GA	BLANK0000203704	368.2
	WKPI-TV	D23	DT	LIC	PIKEVILLE, KY	BLANK0000087418	244.8
	WNGT-CD	D23	DC	LIC	RALEIGH, NC	BLANK0000143970	242.3
	WAPW-CD	D23	DC	LIC	ABINGDON, ETC., VA	BLANK0000116775	173.8
	WTVR-TV	D23	DT	LIC	RICHMOND, VA	BLANK0000185678	399.7
	WCNC-TV	D24	DT	LIC	CHARLOTTE, NC	BLANK0000147158	2.4

	Service area	Terrain-limited		IX-free, before		IX-free, after	Percent New IX
	46335.0	4,433,795	44133.5	4,296,893	43046.9	4,262,608	-0.12 -0.01

Undesired			Total IX	Unique IX, before		Unique IX, after	
WECT D23 DT BL			340.1	9,342		283.7 7,995	
WECT D23 DT APP			288.8	9,136		232.3 7,669	
WUVC-DT D22 DT LIC			40.4	1,274		8.1 255	
WACH D22 DT LIC			359.0	4,511		287.2 3,039	
WKPT-CD D22 DC LIC			4.0	183		0.0 0	
WTOC-TV D23 DT CP			99.7	2,183		23.9 711	
WKPI-TV D23 DT LIC			24.0	557		12.0 170	
WNGT-CD D23 DC LIC			68.5	9,401		12.0 6,373	
WAPW-CD D23 DC LIC			28.0	351		20.0 147	
WTVR-TV D23 DT LIC			4.0	1,644		0.0 0	
WCNC-TV D24 DT LIC			295.4	10,625		291.4 10,625	

Table 1 WECT TVStudy Analysis of Proposal
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Interference to BLANK0000143970 LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance		
Desired:	WNGT-CD	D23	DC	LIC	RALEIGH, NC	BLANK0000143970			
Undesireds:	WECT	D23	DT	BL	WILMINGTON, NC	DTVBL48666	174.6 km		
	WECT	D23	DT	APP	WILMINGTON, NC	WECT ETU 550kW	174.6		
	WUVC-DT	D22	DT	LIC	FAYETTEVILLE, NC	BLANK0000125505	44.0		
	WBTW	D23	DT	LIC	CHARLOTTE, NC	BLANK0000147971	242.3		
	WUBX-CD	D24	DC	LIC	DURHAM, ETC., NC	BLANK0000108883	42.0		
Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
9489.3	1,689,045	9481.3	1,688,769	9215.7	1,664,720	9195.6	1,663,577	0.22	0.07
Undesired				Total IX	Unique IX, before		Unique IX, after		
WECT	D23	DT	BL	76.3	3,878	60.1	3,349		
WECT	D23	DT	APP	100.4	5,094		80.2	4,492	
WUVC-DT	D22	DT	LIC	161.3	8,338	133.1	5,574	129.0	5,501
WBTW	D23	DT	LIC	16.2	700	0.0	0	0.0	0
WUBX-CD	D24	DC	LIC	52.1	14,248	44.1	12,362	44.1	12,362

Interference to proposal scenario 1
1.01% interference received

Desired:	Call WECT	Chan D23	Svc DT	Status APP	City, State WILMINGTON, NC	File Number WECT ETU 550kW	Distance
Undesireds:	WUVC-DT	D22	DT	LIC	FAYETTEVILLE, NC	BLANK0000125505	169.5 km
	WBTW	D23	DT	LIC	CHARLOTTE, NC	BLANK0000147971	306.2
	WNGT-CD	D23	DC	LIC	RALEIGH, NC	BLANK0000143970	174.6
Service area		Terrain-limited			IX-free	Percent IX	
37801.7	1,149,490	37801.7	1,149,490	37509.0	1,137,833	0.77	1.01
Undesired				Total IX	Unique IX	Prcnt Unique IX	
WUVC-DT	D22	DT	LIC	27.7	829	0.0	0.00
WBTW	D23	DT	LIC	7.9	1,514	4.0	0.01
WNGT-CD	D23	DC	LIC	288.7	10,216	261.0	0.69

**Channel and
Facility
Information**

Section	Question	Response
Proposed Community of License	Facility ID	48666
	State	North Carolina
	City	WILMINGTON
	DTV Channel	23
	Designated Market Area	Wilmington
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	1008242
Coordinates (NAD83)	Latitude	34° 07' 54.0" N+
	Longitude	078° 11' 16.0" W-
	Structure Type	GTOWER-Guyed Structure Used for Communication Purposes
	Overall Structure Height	595.6 meters
	Support Structure Height	548.0 meters
	Ground Elevation (AMSL)	19.2 meters
Antenna Data	Height of Radiation Center Above Ground Level	588.2 meters
	Height of Radiation Center Above Average Terrain	592.2 meters
	Height of Radiation Center Above Mean Sea Level	607.4 meters
	Effective Radiated Power	550 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:	ERI
	Model	ETU14U4-HTP4Ox-24/23/29
	Rotation	0 degrees
	Electrical Beam Tilt	1
	Mechanical Beam Tilt	Not Applicable
	toward azimuth	
	Polarization	Horizontal
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	

Directional Antenna Relative Field Values (Pre-rotated Pattern)

Degree	Value	Degree	Value	Degree	Value	Degree	Value
0	0.739	90	0.768	180	0.543	270	0.307
10	0.768	100	0.714	190	0.446	280	0.183
20	0.927	110	0.800	200	0.531	290	0.456
30	0.905	120	0.767	210	0.552	300	0.717
40	0.746	130	0.593	220	0.428	310	0.852
50	0.747	140	0.513	230	0.353	320	0.908
60	0.907	150	0.623	240	0.444	330	0.961
70	0.999	160	0.706	250	0.504	340	1.000
80	0.937	170	0.678	260	0.472	350	0.918

Additional Azimuths

Degree	V _A
253	0.505
24	0.956
207	0.571
163	0.708
113	0.818