

ENGINEERING EXHIBIT

Application for Digital Television Station Modification of Auxiliary Antenna Construction Permit

prepared for

WSFX License Subsidiary, LLC

WSFX-TV Wilmington NC

Facility ID 72871

Ch. 29 17 kW 212 m

WSFX License Subsidiary, LLC ("WLS") is the licensee of digital television station WSFX-TV, Facility ID 72871, Channel 29, Wilmington NC. WSFX-TV is licensed (file# 0000111706) to operate with a top-mounted directional antenna at 200 kW effective radiated power ("ERP") and 590 meters height above average terrain ("HAAT"). A Construction Permit ("CP" file# 0000207372) authorizes WSFX-TV to implement a replacement top-mounted directional antenna at 240 kW ERP and 592 meters HAAT. A separate CP (file# 0000207374) authorizes an auxiliary antenna for WSFX-TV. *WLS* herein seeks to modify the WSFX-TV auxiliary antenna CP to specify reduced power and height.

The auxiliary antenna CP authorizes a side-mounted antenna on the same tower structure as the licensed main antenna, to operate at 31.9 kW ERP (directional) and an antenna HAAT of 452 meters. Due to manufacturer and supplier shortages of flexible coaxial transmission line, the auxiliary antenna has been installed at a lower elevation on the tower and will operate at a lower ERP. As proposed herein, the WSFX-TV auxiliary antenna will operate with 17 kW ERP at 212 meters HAAT. As with the main antenna, the proposed auxiliary antenna will be shared with stations WECT Channel 23 and WWAY Channel 24, both Wilmington NC.

The WSFX-TV tower structure is associated with FCC Antenna Structure Registration number 1008242. No change to the overall structure height will result from this proposal.

The auxiliary antenna is an elliptically horizontally polarized directional Dielectric model TFU-16WB/VP-R C160 (33.5 percent vertical polarization). The maximum horizontally polarized ERP is 17 kW and the maximum vertically polarized ERP is 5.7 kW. The vertically

polarized component will not exceed the horizontally polarized component at any azimuth. The directional antenna's azimuthal patterns are supplied in Figures 1 and 1A for horizontal and vertical polarization, respectively. The antenna's elevation pattern is depicted in Figure 2.

Figure 3 shows that the 41 dBμ noise limited service contour ("NLSC") of the proposed auxiliary facility does not extend beyond those of the licensed main and authorized replacement main antenna facilities. Thus, the proposal complies with §73.1675(a).

Human Exposure to Radiofrequency Electromagnetic Field (Environmental)

The proposed facility 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 15 percent antenna relative field in downward elevations (pattern data shows 15 percent or less relative field at angles 25 to 90 degrees below the antenna), the calculated power density attributable to the proposed facility at locations near the transmitter site at a height of two meters above ground level is $0.4 \mu\text{W}/\text{cm}^2$, which is 0.1 percent of the general population / uncontrolled maximum permissible 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.

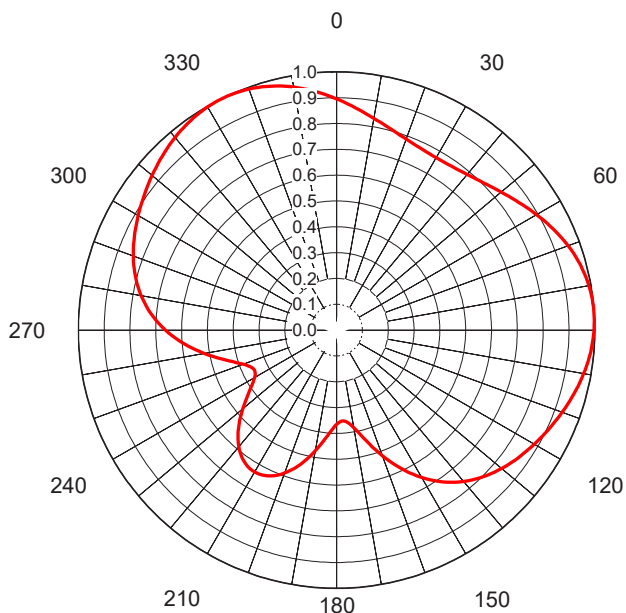
The general public will not be exposed to RF levels attributable to the proposal in excess of the FCC's guidelines. RF exposure warning signs will continue to be posted. With respect to worker safety, the applicant will coordinate exposure procedures with all pertinent stations and will reduce power 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, 1A Antenna Azimuthal Pattern
Figure 2 Antenna Elevation Pattern
Figure 3 Proposed Auxiliary Contours
Form 2100 Saved Version of Engineering Sections of FCC Form at Time of Upload

Chesapeake RF Consultants, LLC

Joseph M. Davis, P.E. July 11, 2023
207 Old Dominion Road Yorktown, VA 23692 703-650-9600



AZIMUTH PATTERN Horizontal Polarization

Proposal No. **20230111jmd**
 Date **11-Jan-23**
 Call Letters **WSFX-TV**
 Channel **29**
 Frequency **563 MHz**
 Antenna Type **TFU-16WB/VP-R C160**
 Gain **1.64 (2.16dB)**
 Calculated

Pattern Number **WB-C160-29 Hpol**

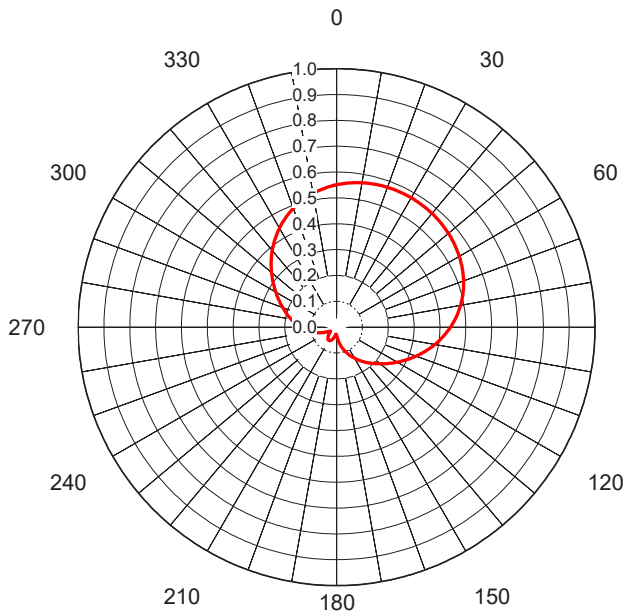
Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	0.895	36	0.777	72	0.964	108	0.939	144	0.728	180	0.365	216	0.618	252	0.408	288	0.826	324	0.986
1	0.889	37	0.779	73	0.969	109	0.934	145	0.717	181	0.372	217	0.612	253	0.420	289	0.832	325	0.988
2	0.882	38	0.781	74	0.973	110	0.930	146	0.707	182	0.381	218	0.605	254	0.433	290	0.837	326	0.991
3	0.876	39	0.784	75	0.977	111	0.925	147	0.695	183	0.390	219	0.597	255	0.446	291	0.843	327	0.993
4	0.869	40	0.787	76	0.981	112	0.921	148	0.684	184	0.400	220	0.589	256	0.461	292	0.848	328	0.995
5	0.863	41	0.790	77	0.984	113	0.916	149	0.672	185	0.412	221	0.580	257	0.475	293	0.853	329	0.997
6	0.857	42	0.794	78	0.987	114	0.912	150	0.659	186	0.423	222	0.570	258	0.490	294	0.859	330	0.998
7	0.850	43	0.798	79	0.990	115	0.907	151	0.646	187	0.436	223	0.560	259	0.505	295	0.863	331	0.999
8	0.844	44	0.802	80	0.992	116	0.903	152	0.633	188	0.448	224	0.549	260	0.520	296	0.868	332	1.000
9	0.838	45	0.806	81	0.994	117	0.898	153	0.619	189	0.461	225	0.537	261	0.535	297	0.873	333	1.000
10	0.833	46	0.811	82	0.996	118	0.893	154	0.605	190	0.474	226	0.525	262	0.550	298	0.878	334	1.000
11	0.827	47	0.816	83	0.997	119	0.889	155	0.591	191	0.487	227	0.513	263	0.565	299	0.882	335	1.000
12	0.822	48	0.821	84	0.998	120	0.884	156	0.577	192	0.500	228	0.500	264	0.580	300	0.887	336	0.999
13	0.816	49	0.826	85	0.999	121	0.879	157	0.562	193	0.513	229	0.487	265	0.594	301	0.892	337	0.998
14	0.811	50	0.832	86	0.999	122	0.875	158	0.547	194	0.525	230	0.474	266	0.609	302	0.896	338	0.997
15	0.807	51	0.838	87	0.999	123	0.870	159	0.532	195	0.537	231	0.461	267	0.623	303	0.901	339	0.995
16	0.802	52	0.843	88	0.999	124	0.865	160	0.517	196	0.549	232	0.448	268	0.636	304	0.905	340	0.993
17	0.798	53	0.849	89	0.998	125	0.860	161	0.502	197	0.560	233	0.436	269	0.650	305	0.910	341	0.991
18	0.794	54	0.856	90	0.997	126	0.855	162	0.487	198	0.570	234	0.423	270	0.662	306	0.914	342	0.988
19	0.791	55	0.862	91	0.996	127	0.850	163	0.472	199	0.580	235	0.412	271	0.675	307	0.919	343	0.985
20	0.787	56	0.868	92	0.994	128	0.845	164	0.458	200	0.589	236	0.400	272	0.687	308	0.923	344	0.982
21	0.784	57	0.875	93	0.992	129	0.840	165	0.444	201	0.598	237	0.390	273	0.699	309	0.928	345	0.978
22	0.781	58	0.881	94	0.990	130	0.834	166	0.430	202	0.605	238	0.381	274	0.710	310	0.932	346	0.974
23	0.779	59	0.888	95	0.987	131	0.829	167	0.417	203	0.612	239	0.373	275	0.721	311	0.936	347	0.970
24	0.777	60	0.894	96	0.985	132	0.823	168	0.405	204	0.618	240	0.366	276	0.731	312	0.941	348	0.965
25	0.775	61	0.901	97	0.982	133	0.816	169	0.394	205	0.623	241	0.361	277	0.741	313	0.945	349	0.961
26	0.774	62	0.907	98	0.979	134	0.810	170	0.384	206	0.627	242	0.357	278	0.751	314	0.949	350	0.955
27	0.772	63	0.914	99	0.975	135	0.803	171	0.375	207	0.630	243	0.355	279	0.760	315	0.954	351	0.950
28	0.772	64	0.920	100	0.972	136	0.796	172	0.367	208	0.633	244	0.354	280	0.768	316	0.958	352	0.945
29	0.771	65	0.926	101	0.968	137	0.789	173	0.361	209	0.634	245	0.355	281	0.777	317	0.962	353	0.939
30	0.771	66	0.932	102	0.964	138	0.781	174	0.357	210	0.635	246	0.358	282	0.785	318	0.966	354	0.933
31	0.771	67	0.938	103	0.960	139	0.773	175	0.354	211	0.634	247	0.363	283	0.792	319	0.970	355	0.927
32	0.772	68	0.944	104	0.956	140	0.765	176	0.353	212	0.633	248	0.369	284	0.800	320	0.973	356	0.921
33	0.772	69	0.949	105	0.952	141	0.756	177	0.353	213	0.630	249	0.377	285	0.807	321	0.977	357	0.915
34	0.773	70	0.955	106	0.948	142	0.747	178	0.356	214	0.627	250	0.386	286	0.813	322	0.980	358	0.908
35	0.775	71	0.960	107	0.943	143	0.738	179	0.360	215	0.623	251	0.396	287	0.820	323	0.983	359	0.902



Figure 1
Auxiliary Antenna Azimuthal Pattern
Horizontal Polarization
WSFX-TV Wilmington NC
Facility ID 72871
Ch. 29 17 kW 212 m

prepared for
WSFX License Subsidiary, LLC

July, 2023



AZIMUTH PATTERN Vertical Polarization

Proposal No. **20230111jmd**
Date **11-Jan-23**
Call Letters **WSFX-TV**
Channel **29**
Frequency **563 MHz**
Antenna Type **TFU-16WB/VP-R C160**
Gain **2.64 (4.21dB)**
Calculated

Pattern Number **WB-C160-29 Vpol**

Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	0.551	36	0.577	72	0.517	108	0.340	144	0.162	180	0.031	216	0.057	252	0.071	288	0.213	324	0.410
1	0.553	37	0.576	73	0.513	109	0.334	145	0.158	181	0.029	217	0.056	253	0.075	289	0.217	325	0.415
2	0.555	38	0.576	74	0.510	110	0.328	146	0.154	182	0.028	218	0.055	254	0.079	290	0.222	326	0.421
3	0.556	39	0.575	75	0.507	111	0.322	147	0.150	183	0.027	219	0.053	255	0.083	291	0.226	327	0.426
4	0.558	40	0.574	76	0.503	112	0.316	148	0.147	184	0.027	220	0.052	256	0.087	292	0.231	328	0.432
5	0.560	41	0.574	77	0.499	113	0.310	149	0.143	185	0.027	221	0.051	257	0.090	293	0.236	329	0.437
6	0.561	42	0.573	78	0.495	114	0.305	150	0.139	186	0.028	222	0.049	258	0.094	294	0.241	330	0.442
7	0.563	43	0.572	79	0.491	115	0.299	151	0.135	187	0.029	223	0.047	259	0.098	295	0.246	331	0.447
8	0.564	44	0.571	80	0.487	116	0.293	152	0.132	188	0.030	224	0.045	260	0.102	296	0.251	332	0.452
9	0.566	45	0.570	81	0.483	117	0.288	153	0.128	189	0.031	225	0.044	261	0.106	297	0.256	333	0.457
10	0.567	46	0.569	82	0.479	118	0.282	154	0.124	190	0.033	226	0.042	262	0.110	298	0.261	334	0.462
11	0.568	47	0.568	83	0.475	119	0.277	155	0.120	191	0.035	227	0.040	263	0.114	299	0.266	335	0.467
12	0.569	48	0.567	84	0.470	120	0.271	156	0.116	192	0.037	228	0.038	264	0.118	300	0.272	336	0.471
13	0.570	49	0.566	85	0.465	121	0.266	157	0.113	193	0.039	229	0.036	265	0.122	301	0.277	337	0.476
14	0.571	50	0.565	86	0.461	122	0.261	158	0.109	194	0.041	230	0.034	266	0.125	302	0.282	338	0.480
15	0.572	51	0.564	87	0.456	123	0.255	159	0.105	195	0.043	231	0.032	267	0.129	303	0.288	339	0.485
16	0.573	52	0.562	88	0.451	124	0.250	160	0.101	196	0.045	232	0.031	268	0.133	304	0.294	340	0.489
17	0.574	53	0.561	89	0.446	125	0.245	161	0.097	197	0.047	233	0.030	269	0.137	305	0.299	341	0.493
18	0.575	54	0.559	90	0.441	126	0.240	162	0.094	198	0.048	234	0.029	270	0.141	306	0.305	342	0.497
19	0.575	55	0.558	91	0.436	127	0.235	163	0.090	199	0.050	235	0.028	271	0.144	307	0.311	343	0.501
20	0.576	56	0.556	92	0.431	128	0.230	164	0.086	200	0.052	236	0.028	272	0.148	308	0.316	344	0.505
21	0.576	57	0.554	93	0.425	129	0.225	165	0.082	201	0.053	237	0.028	273	0.152	309	0.322	345	0.508
22	0.577	58	0.552	94	0.420	130	0.221	166	0.078	202	0.054	238	0.029	274	0.156	310	0.328	346	0.512
23	0.577	59	0.550	95	0.415	131	0.216	167	0.074	203	0.056	239	0.030	275	0.160	311	0.334	347	0.515
24	0.577	60	0.548	96	0.409	132	0.212	168	0.070	204	0.057	240	0.032	276	0.164	312	0.340	348	0.519
25	0.578	61	0.546	97	0.403	133	0.207	169	0.067	205	0.057	241	0.034	277	0.167	313	0.346	349	0.522
26	0.578	62	0.544	98	0.398	134	0.203	170	0.063	206	0.058	242	0.037	278	0.171	314	0.352	350	0.525
27	0.578	63	0.542	99	0.392	135	0.198	171	0.059	207	0.059	243	0.039	279	0.175	315	0.358	351	0.528
28	0.578	64	0.539	100	0.386	136	0.194	172	0.055	208	0.059	244	0.042	280	0.179	316	0.364	352	0.531
29	0.578	65	0.537	101	0.381	137	0.190	173	0.052	209	0.059	245	0.046	281	0.183	317	0.369	353	0.534
30	0.578	66	0.534	102	0.375	138	0.186	174	0.048	210	0.059	246	0.049	282	0.187	318	0.375	354	0.537
31	0.578	67	0.532	103	0.369	139	0.182	175	0.045	211	0.059	247	0.052	283	0.191	319	0.381	355	0.539
32	0.578	68	0.529	104	0.363	140	0.178	176	0.042	212	0.059	248	0.056	284	0.195	320	0.387	356	0.542
33	0.578	69	0.526	105	0.357	141	0.174	177	0.039	213	0.059	249	0.060	285	0.200	321	0.393	357	0.544
34	0.577	70	0.523	106	0.351	142	0.170	178	0.036	214	0.058	250	0.063	286	0.204	322	0.398	358	0.546
35	0.577	71	0.520	107	0.345	143	0.166	179	0.033	215	0.058	251	0.067	287	0.208	323	0.404	359	0.549



Figure 1A
Auxiliary Antenna Azimuthal Pattern
Vertical Polarization
WSFX-TV Wilmington NC
Facility ID 72871
Ch. 29 17 kW 212 m

prepared for
WSFX License Subsidiary, LLC

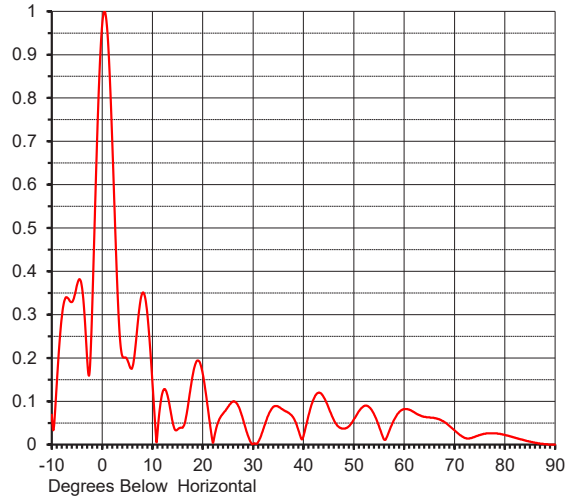
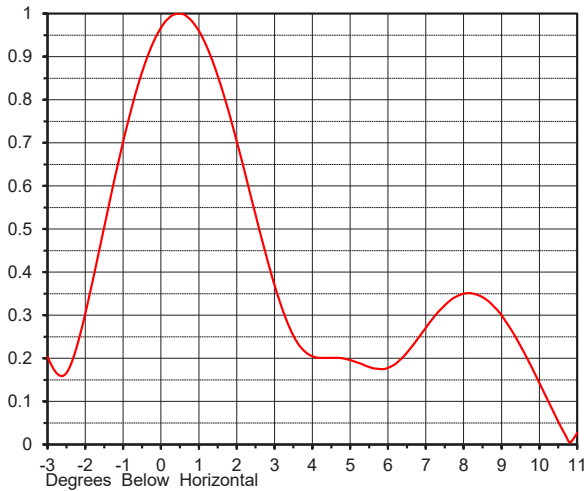
July, 2023

ELEVATION PATTERN

Proposal No. 20230111jmd
Date 11-Jan-23
Call Letters WSFX-TV
Channel 29
Frequency 563 MHz
Antenna Type TFU-16WB/VP-R C160

RMS Directivity at Main Lobe 14.5 (11.61 dB)
RMS Directivity at Horizontal 13.5 (11.30 dB)
Calculated

Beam Tilt 0.55 deg
Pattern Number 16W145055-29



Angle	Field
-10.0	0.069
-9.0	0.142
-8.0	0.295
-7.0	0.340
-6.0	0.329
-5.0	0.368
-4.0	0.363
-3.0	0.203
-2.0	0.304
-1.0	0.703
0.0	0.967
1.0	0.960
2.0	0.704
3.0	0.370
4.0	0.205
5.0	0.196
6.0	0.178
7.0	0.271
8.0	0.350
9.0	0.300

Angle	Field
10.0	0.143
11.0	0.027
12.0	0.120
13.0	0.113
14.0	0.053
15.0	0.035
16.0	0.039
17.0	0.085
18.0	0.160
19.0	0.194
20.0	0.163
21.0	0.085
22.0	0.004
23.0	0.050
24.0	0.071
25.0	0.087
26.0	0.099
27.0	0.090
28.0	0.058
29.0	0.020

Angle	Field
30.0	0.002
31.0	0.006
32.0	0.035
33.0	0.067
34.0	0.087
35.0	0.088
36.0	0.080
37.0	0.074
38.0	0.062
39.0	0.033
40.0	0.019
41.0	0.067
42.0	0.104
43.0	0.120
44.0	0.110
45.0	0.085
46.0	0.058
47.0	0.041
48.0	0.037
49.0	0.042

Angle	Field
50.0	0.058
51.0	0.077
52.0	0.089
53.0	0.087
54.0	0.071
55.0	0.043
56.0	0.012
57.0	0.030
58.0	0.057
59.0	0.075
60.0	0.082
61.0	0.081
62.0	0.075
63.0	0.068
64.0	0.064
65.0	0.063
66.0	0.061
67.0	0.058
68.0	0.052
69.0	0.043

Angle	Field
70.0	0.033
71.0	0.023
72.0	0.016
73.0	0.014
74.0	0.018
75.0	0.022
76.0	0.025
77.0	0.026
78.0	0.026
79.0	0.025
80.0	0.022
81.0	0.019
82.0	0.016
83.0	0.013
84.0	0.010
85.0	0.007
86.0	0.004
87.0	0.002
88.0	0.001
89.0	0.000
90.0	0.000



Figure 2
Auxiliary Antenna Elevation Pattern
WSFX-TV Wilmington NC
Facility ID 72871
Ch. 29 17 kW 212 m

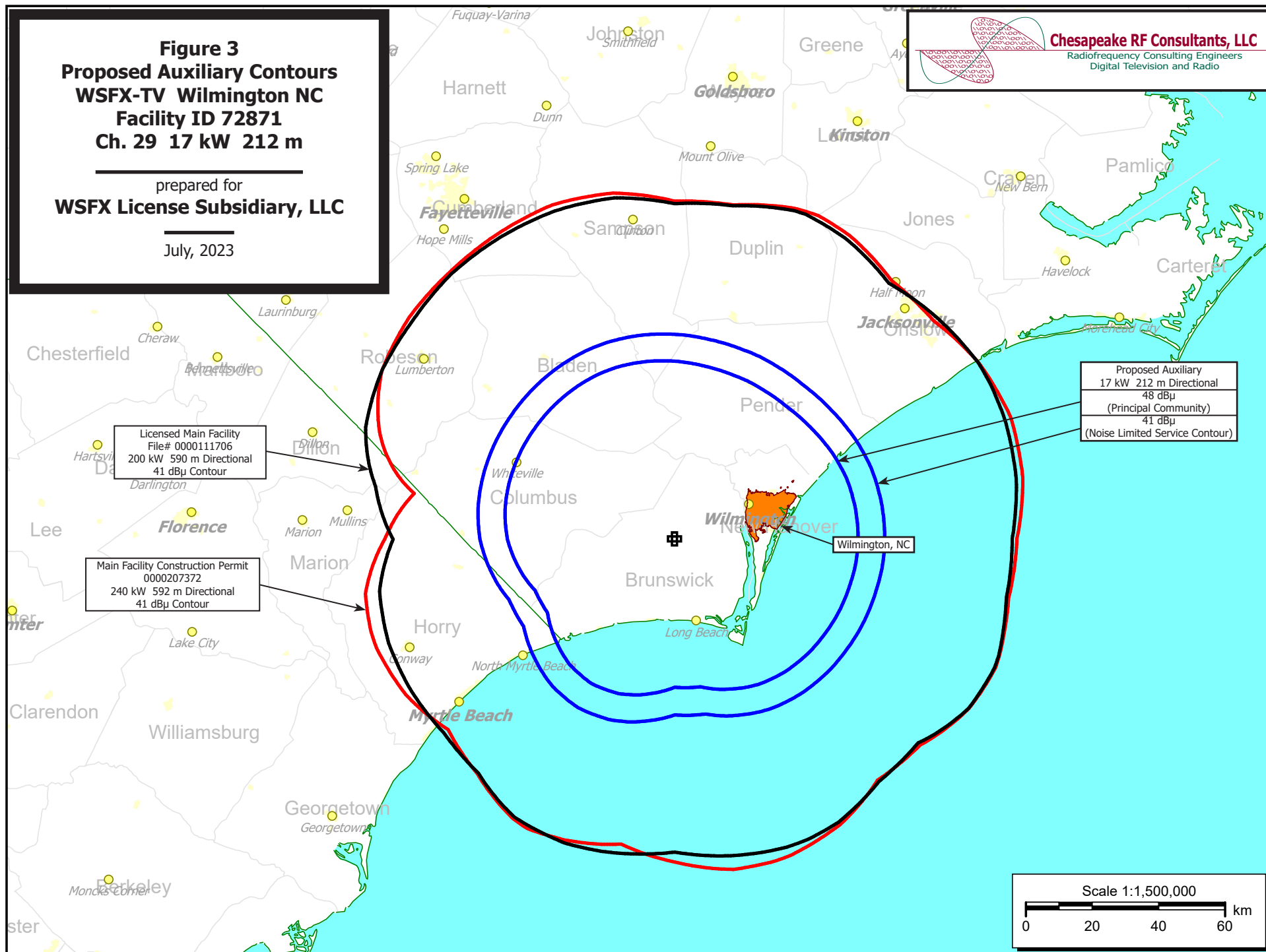
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Figure 3
Proposed Auxiliary Contours
WSFX-TV Wilmington NC
Facility ID 72871
Ch. 29 17 kW 212 m

prepared for
WSFX License Subsidiary, LLC

July, 2023



**Channel and
Facility
Information**

Section	Question	Response
Proposed Community of License	Facility ID	72871
	State	North Carolina
	City	WILMINGTON
	DTX Channel	29
	Designated Market Area	Wilmington
Facility Type	Facility Type	Commercial
	Station Type	Auxiliary
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	207.9 meters
	Height of Radiation Center Above Average Terrain	211.9 meters
	Height of Radiation Center Above Mean Sea Level	227.1 meters
	Effective Radiated Power	17 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:	Dielectric
	Model	TFU-16WB/VP-R C160
	Rotation	30 degrees
	Electrical Beam Tilt	0.55
	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	

Directional Antenna Relative Field Values (Pre-rotated Pattern)

Degree	Value	Degree	Value	Degree	Value	Degree	Value
0	0.771	90	0.884	180	0.635	270	0.887
10	0.787	100	0.834	190	0.589	280	0.932
20	0.832	110	0.765	200	0.474	290	0.973
30	0.894	120	0.659	210	0.366	300	0.998
40	0.955	130	0.517	220	0.386	310	0.993
50	0.992	140	0.384	230	0.520	320	0.956
60	0.997	150	0.365	240	0.663	330	0.895
70	0.972	160	0.474	250	0.768	340	0.833
80	0.930	170	0.589	260	0.837	350	0.787

Additional Azimuths

Degree	V _A
56	0.999
304	1.000