

ENGINEERING EXHIBIT

Incentive Auction Channel Reassignment

Application for Minor Modification of Digital Television Station Construction Permit

prepared for

Gray Television Licensee, LLC

KVLY-TV Fargo, ND

Facility ID 61961

Ch. 36 330 kW 594 m

Gray Television Licensee, LLC (“Gray”) is the licensee of digital television station KVLY-TV, Channel 44, Facility ID 61961, Fargo, ND. Reassignment of KVLY-TV from Channel 44 to Channel 18 was specified in the *Incentive Auction Closing and Channel Reassignment Public Notice* (“CCRPN”, DA 17-317, released April 13, 2017). At the second filing window,¹ Gray proposed modification of the KVLY-TV Channel 18 Construction Permit (“CP”, file# 0000025091) to change KVLY-TV to Channel 36 and expand the service area. The modified CP (file# 0000034096) was granted on January 23, 2018.

The modified CP authorizes operation at 770 kW effective radiated power (“ERP”) with a directional antenna at 595 meters height above average terrain (“HAAT”). Gray proposes herein to utilize a different directional antenna and to reduce the ERP and HAAT to 330 kW at 594 meters.

As with the current CP authorization, the proposed antenna will be installed at the top-mount position, in place of KVLY-TV’s former analog Channel 11 antenna. The tower structure corresponds to FCC Antenna Structure Registration (“ASR”) number 1046244, having an overall structure height above ground of 628.8 meters. The antenna replacement will result in a reduction of the structure’s overall height to 605.3 meters. Following construction, the FAA will be notified of the reduction in height and the FCC ASR will be modified accordingly.

¹Public Notice “*Incentive Auction Task Force and Media Bureau Announce the Opening of the Second Filing Window for Eligible Full Power and Class A Television Station—October 3 Through November 2, 2017*” DA 17-911, released September 20, 2017.

The proposed antenna is an elliptically polarized Dielectric model TUM-4P190-10/30H-1-R (30 percent vertical polarization). The maximum horizontally polarized ERP is 330 kW and the maximum vertically polarized ERP is 99 kW. The vertically polarized component will not exceed the horizontally polarized component at any azimuth.

The directional pattern has a “peanut” shape. The proposed antenna system has panel radiators oriented in four different azimuths. In order to achieve the desired directional pattern, the number of stacked panel layers at each azimuth is varied. The pattern’s peanut shape is developed by stacks of ten panels each at 0°T and 160°T. At 80°T, where the pattern is centered, a stack of seven panels is used. To the west at 260°T, a stack of three panels is specified. Electrical beamtilt of 1.0 degree is employed for the dominant stacks at 0°T and 160°T. The electrical beamtilt for the reduced count of panel stacks at 80°T and 260°T is 1.1 degree. The amount of beamtilt specified in the accompanying FCC Form 2100 Antenna Technical Data section is given as 1.0 degree as that represents the beamtilt along the azimuths of maximum radiation. Elevation pattern plots and data are provided in Figure 2 for the 0°T and 160°T faces, Figure 2A for the 80°T face, and Figure 2B for the 260°T face.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 *CCRPN* baseline facility’s population.

Interference study per FCC OET Bulletin 69³ shows that the proposal complies with the 0.5 percent limit of new interference caused to pertinent nearby post-auction full service and

²As discussed informally with FCC Staff, a response of “No” is provided in the accompanying Form 2100 Antenna Technical Data section question regarding whether the elevation pattern varies for reasons other than the use of mechanical beamtilt. A “yes” response would prompt the upload of pattern data in XML format, a feature which is primarily intended to be associated with DTS facilities. This application does not rely on specific elevation pattern data to comply with coverage or interference requirements; therefore use of the default elevation pattern can be utilized.

³FCC 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.

Class A television stations and reassignments as required by §73.616. The interference study output report is provided as Table 1.

The site location is within the Canadian coordination zone (184 km to the Canada border). There are no Canada television stations or allotments located within the pertinent culling distances for interference analysis consideration, based on current FCC LMS data.

A comparison map of the KVLV-TV Channel 36 authorized and proposed noise-limited service contours (“NLSC”, 41 dBμ) is provided as Figure 4. The NLSC of the proposed modification will not extend beyond that of the existing CP. Therefore, no further coordination with Canada should be necessary. Further, the proposal complies with the FCC’s NLSC expansion “freeze” Public Notice⁴ of April 5, 2013 (DA 13-618) to the extent it may be applicable to reassigned stations such as KVLV-TV.

The nearest FCC monitoring station is 719 km distant at Grand Island, NE. This exceeds by a large margin the threshold minimum distance specified in §73.1030(c)(3) that would suggest consideration of the monitoring station. The site is not located within the areas requiring coordination with “quiet” zones specified in §73.1030(a) and (b). There are no authorized AM stations within 3 kilometers of the site.

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 20 percent antenna relative field in downward elevations (pattern data shows less than 20 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 $1.6 \mu\text{W}/\text{cm}^2$, which is 0.4 percent of the general population/uncontrolled maximum permitted exposure limit. This is well below the five percent threshold limit described in

⁴“Media Bureau Announces Limitations on the Filing and Processing of Full Power and Class A Television Station Modification Applications, Effective Immediately, and Reminds Stations of Spectrum Act Preservation Mandate,” DA 13-618, Public Notice, released April 5, 2013.

§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.

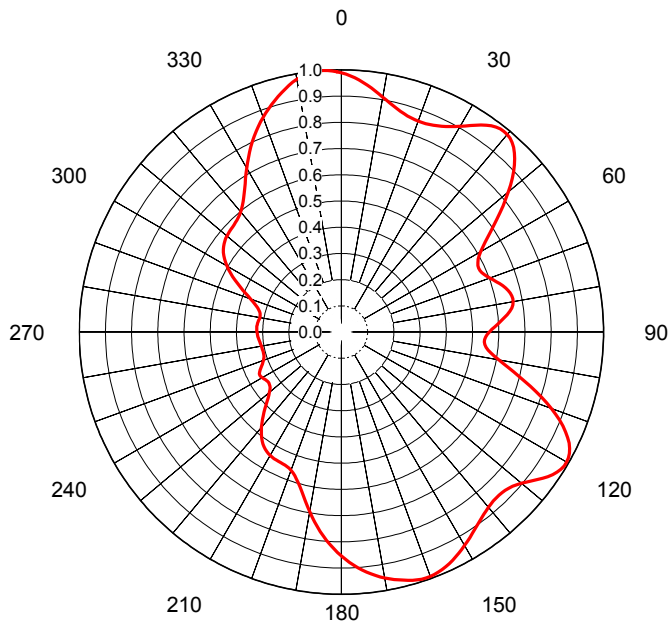
The general public will not be exposed to RF levels attributable to the proposal in excess of the FCC's guidelines. RF exposure warning signs will continue to be posted. With respect to worker safety, the applicant will coordinate exposure procedures with all pertinent stations and will reduce power 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, 2A, 2B	Antenna Elevation Pattern
Figure 3	Proposed Coverage Contours
Figure 4	Coverage Contour Comparison
Table 1	OET Bulletin 69 Interference Study
Form 2100	Saved Version of Engineering Sections from FCC Form at Time of Upload

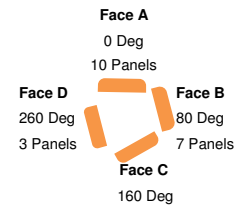
Chesapeake RF Consultants, LLC

Joseph M. Davis, P.E.	February 28, 2018	
207 Old Dominion Road	Yorktown, VA 23692	703-650-9600



AZIMUTH PATTERN Horizontal Polarization

Proposal No. **C-70416-5**
 Date **1-Feb-18**
 Call Letters **KVLY**
 Channel **36**
 Frequency **605 MHz**
 Antenna Type **TUM-4P190-10/30H-1-R**
 Gain **1.9 (2.79dB)**
 Calculated



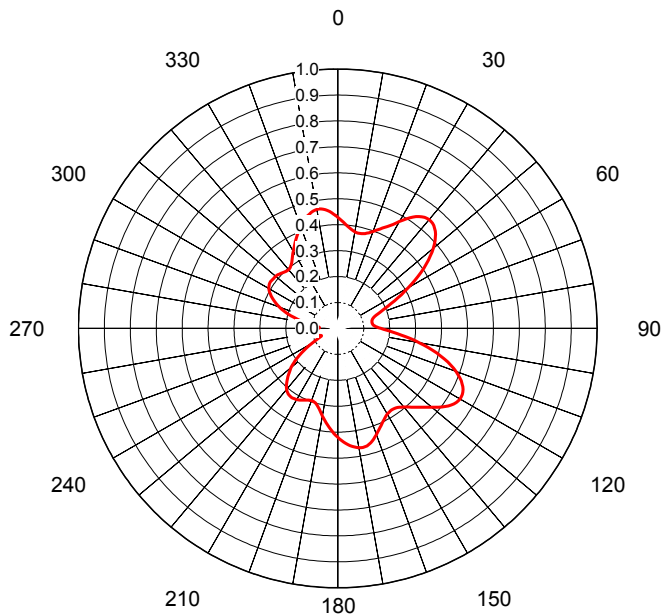
Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	0.989	36	0.972	72	0.622	108	0.802	144	0.895	180	0.854	216	0.514	252	0.311	288	0.347	324	0.634
1	0.984	37	0.979	73	0.631	109	0.828	145	0.902	181	0.841	217	0.505	253	0.309	289	0.357	325	0.646
2	0.978	38	0.984	74	0.640	110	0.852	146	0.909	182	0.827	218	0.496	254	0.308	290	0.368	326	0.660
3	0.971	39	0.985	75	0.649	111	0.876	147	0.917	183	0.813	219	0.485	255	0.307	291	0.380	327	0.674
4	0.964	40	0.984	76	0.656	112	0.898	148	0.924	184	0.798	220	0.474	256	0.308	292	0.394	328	0.690
5	0.955	41	0.980	77	0.661	113	0.918	149	0.932	185	0.782	221	0.462	257	0.308	293	0.408	329	0.706
6	0.947	42	0.973	78	0.665	114	0.937	150	0.940	186	0.766	222	0.450	258	0.308	294	0.422	330	0.722
7	0.938	43	0.963	79	0.666	115	0.953	151	0.948	187	0.749	223	0.437	259	0.309	295	0.437	331	0.738
8	0.928	44	0.950	80	0.665	116	0.966	152	0.955	188	0.731	224	0.425	260	0.310	296	0.451	332	0.755
9	0.919	45	0.935	81	0.662	117	0.977	153	0.962	189	0.713	225	0.412	261	0.311	297	0.465	333	0.771
10	0.910	46	0.917	82	0.656	118	0.985	154	0.968	190	0.695	226	0.400	262	0.312	298	0.479	334	0.787
11	0.901	47	0.898	83	0.648	119	0.990	155	0.974	191	0.677	227	0.388	263	0.313	299	0.492	335	0.803
12	0.893	48	0.877	84	0.636	120	0.992	156	0.979	192	0.660	228	0.377	264	0.315	300	0.504	336	0.818
13	0.885	49	0.854	85	0.623	121	0.991	157	0.984	193	0.642	229	0.367	265	0.316	301	0.515	337	0.832
14	0.878	50	0.831	86	0.610	122	0.988	158	0.987	194	0.626	230	0.358	266	0.318	302	0.526	338	0.846
15	0.872	51	0.807	87	0.598	123	0.981	159	0.990	195	0.611	231	0.351	267	0.319	303	0.535	339	0.859
16	0.866	52	0.782	88	0.585	124	0.972	160	0.992	196	0.598	232	0.345	268	0.320	304	0.543	340	0.872
17	0.862	53	0.758	89	0.574	125	0.961	161	0.992	197	0.586	233	0.341	269	0.321	305	0.550	341	0.885
18	0.859	54	0.733	90	0.564	126	0.949	162	0.991	198	0.576	234	0.339	270	0.322	306	0.556	342	0.896
19	0.857	55	0.710	91	0.556	127	0.935	163	0.988	199	0.568	235	0.338	271	0.323	307	0.560	343	0.908
20	0.856	56	0.687	92	0.551	128	0.922	164	0.985	200	0.561	236	0.338	272	0.323	308	0.564	344	0.919
21	0.857	57	0.666	93	0.547	129	0.909	165	0.980	201	0.557	237	0.340	273	0.324	309	0.567	345	0.931
22	0.858	58	0.647	94	0.547	130	0.897	166	0.975	202	0.553	238	0.342	274	0.323	310	0.570	346	0.942
23	0.860	59	0.629	95	0.549	131	0.887	167	0.970	203	0.551	239	0.345	275	0.322	311	0.572	347	0.952
24	0.863	60	0.614	96	0.555	132	0.879	168	0.965	204	0.550	240	0.348	276	0.321	312	0.574	348	0.962
25	0.868	61	0.601	97	0.564	133	0.873	169	0.959	205	0.549	241	0.351	277	0.320	313	0.575	349	0.971
26	0.873	62	0.591	98	0.577	134	0.869	170	0.952	206	0.548	242	0.352	278	0.319	314	0.577	350	0.979
27	0.880	63	0.584	99	0.592	135	0.866	171	0.945	207	0.548	243	0.351	279	0.317	315	0.579	351	0.986
28	0.888	64	0.579	100	0.609	136	0.865	172	0.938	208	0.547	244	0.347	280	0.316	316	0.581	352	0.991
29	0.896	65	0.577	101	0.629	137	0.865	173	0.930	209	0.545	245	0.342	281	0.316	317	0.584	353	0.996
30	0.907	66	0.578	102	0.651	138	0.867	174	0.921	210	0.543	246	0.336	282	0.317	318	0.588	354	0.998
31	0.918	67	0.581	103	0.674	139	0.869	175	0.911	211	0.541	247	0.330	283	0.318	319	0.592	355	1.000
32	0.929	68	0.587	104	0.699	140	0.873	176	0.901	212	0.537	248	0.325	284	0.321	320	0.598	356	1.000
33	0.941	69	0.594	105	0.724	141	0.877	177	0.890	213	0.533	249	0.320	285	0.326	321	0.605	357	0.999
34	0.953	70	0.602	106	0.750	142	0.882	178	0.879	214	0.528	250	0.316	286	0.331	322	0.613	358	0.997
35	0.964	71	0.612	107	0.776	143	0.888	179	0.866	215	0.521	251	0.313	287	0.339	323	0.623	359	0.994



Figure 1
Antenna Azimuthal Pattern
Horizontal Polarization
KVLY-TV Fargo, ND
Facility ID 61961
Ch. 36 330 kW 594 m

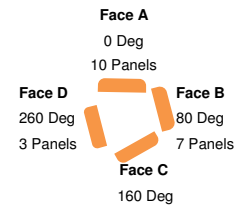
prepared for
Gray Television Licensee, LLC

February, 2018



AZIMUTH PATTERN Vertical Polarization

Proposal No. **C-70416-5**
 Date **1-Feb-18**
 Call Letters **KVLY**
 Channel **36**
 Frequency **605 MHz**
 Antenna Type **TUM-4P190-10/30H-1-R**
 Gain **2.39 (3.79dB)**
 Calculated



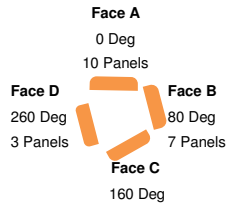
Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	0.429	36	0.534	72	0.150	108	0.458	144	0.379	180	0.420	216	0.319	252	0.089	288	0.220
1	0.422	37	0.539	73	0.145	109	0.472	145	0.378	181	0.413	217	0.317	253	0.094	289	0.230
2	0.416	38	0.544	74	0.141	110	0.485	146	0.377	182	0.406	218	0.314	254	0.098	290	0.239
3	0.410	39	0.546	75	0.138	111	0.497	147	0.377	183	0.398	219	0.311	255	0.102	291	0.247
4	0.404	40	0.548	76	0.136	112	0.507	148	0.377	184	0.391	220	0.307	256	0.105	292	0.256
5	0.398	41	0.547	77	0.135	113	0.517	149	0.379	185	0.383	221	0.302	257	0.108	293	0.264
6	0.393	42	0.546	78	0.134	114	0.525	150	0.382	186	0.375	222	0.296	258	0.109	294	0.271
7	0.389	43	0.542	79	0.134	115	0.532	151	0.385	187	0.367	223	0.290	259	0.110	295	0.279
8	0.385	44	0.537	80	0.134	116	0.537	152	0.389	188	0.358	224	0.283	260	0.110	296	0.286
9	0.381	45	0.531	81	0.134	117	0.541	153	0.393	189	0.350	225	0.275	261	0.109	297	0.292
10	0.379	46	0.524	82	0.134	118	0.544	154	0.398	190	0.342	226	0.267	262	0.108	298	0.297
11	0.377	47	0.515	83	0.135	119	0.545	155	0.404	191	0.334	227	0.259	263	0.105	299	0.302
12	0.376	48	0.505	84	0.136	120	0.544	156	0.410	192	0.326	228	0.251	264	0.102	300	0.306
13	0.376	49	0.493	85	0.138	121	0.542	157	0.416	193	0.319	229	0.243	265	0.099	301	0.310
14	0.377	50	0.481	86	0.141	122	0.539	158	0.422	194	0.313	230	0.235	266	0.095	302	0.313
15	0.378	51	0.467	87	0.146	123	0.534	159	0.429	195	0.308	231	0.226	267	0.090	303	0.314
16	0.381	52	0.453	88	0.151	124	0.528	160	0.436	196	0.303	232	0.216	268	0.085	304	0.315
17	0.384	53	0.438	89	0.158	125	0.521	161	0.442	197	0.300	233	0.205	269	0.081	305	0.316
18	0.388	54	0.421	90	0.166	126	0.512	162	0.448	198	0.297	234	0.193	270	0.076	306	0.315
19	0.393	55	0.405	91	0.177	127	0.503	163	0.454	199	0.296	235	0.181	271	0.073	307	0.315
20	0.398	56	0.387	92	0.188	128	0.493	164	0.459	200	0.296	236	0.168	272	0.071	308	0.314
21	0.404	57	0.369	93	0.201	129	0.483	165	0.463	201	0.297	237	0.155	273	0.071	309	0.313
22	0.410	58	0.351	94	0.215	130	0.473	166	0.466	202	0.298	238	0.142	274	0.072	310	0.313
23	0.416	59	0.333	95	0.231	131	0.463	167	0.468	203	0.300	239	0.129	275	0.077	311	0.311
24	0.423	60	0.314	96	0.247	132	0.454	168	0.469	204	0.303	240	0.116	276	0.083	312	0.310
25	0.430	61	0.296	97	0.265	133	0.445	169	0.468	205	0.305	241	0.104	277	0.092	313	0.308
26	0.437	62	0.278	98	0.283	134	0.437	170	0.467	206	0.308	242	0.093	278	0.102	314	0.305
27	0.445	63	0.260	99	0.301	135	0.430	171	0.465	207	0.310	243	0.083	279	0.112	315	0.303
28	0.454	64	0.244	100	0.320	136	0.422	172	0.462	208	0.313	244	0.075	280	0.124	316	0.301
29	0.465	65	0.228	101	0.338	137	0.415	173	0.458	209	0.315	245	0.070	281	0.137	317	0.299
30	0.476	66	0.213	102	0.357	138	0.408	174	0.454	210	0.316	246	0.068	282	0.149	318	0.297
31	0.488	67	0.199	103	0.375	139	0.402	175	0.450	211	0.318	247	0.069	283	0.162	319	0.296
32	0.498	68	0.186	104	0.393	140	0.396	176	0.445	212	0.319	248	0.071	284	0.174	320	0.296
33	0.509	69	0.175	105	0.411	141	0.390	177	0.439	213	0.320	249	0.075	285	0.186	321	0.296
34	0.518	70	0.165	106	0.427	142	0.386	178	0.433	214	0.320	250	0.080	286	0.198	322	0.298
35	0.526	71	0.157	107	0.443	143	0.382	179	0.427	215	0.320	251	0.085	287	0.209	323	0.301



Figure 1A
Antenna Azimuthal Pattern
Vertical Polarization
KVLY-TV Fargo, ND
Facility ID 61961
Ch. 36 330 kW 594 m

prepared for
Gray Television Licensee, LLC

February, 2018



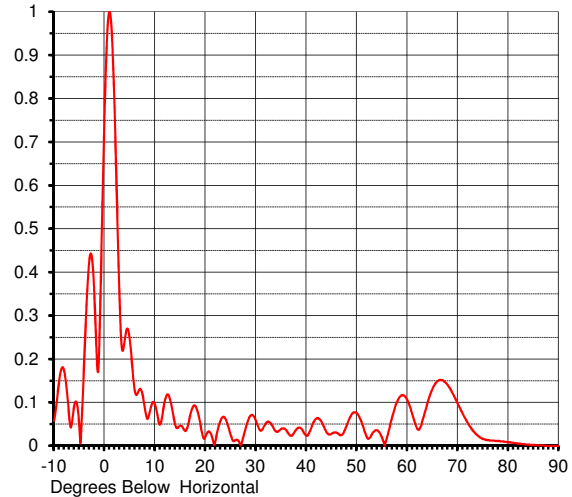
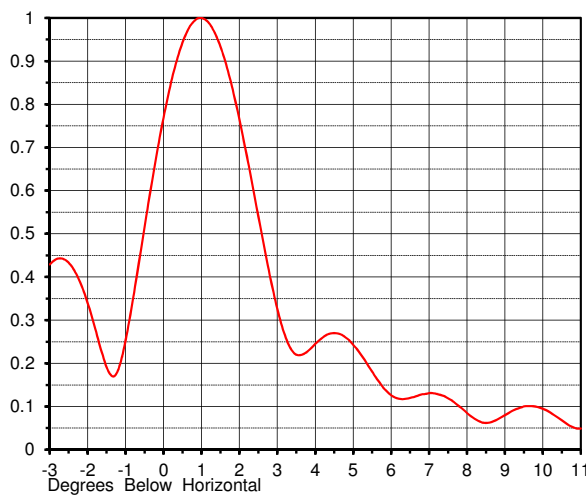
Face A and C

ELEVATION PATTERN

Proposal No. **C-70416-5**
 Date **1-Feb-18**
 Call Letters **KVLY**
 Channel **36**
 Frequency **605 MHz**
 Antenna Type **TUM-4P190-10/30H-1-R**

RMS Directivity at Main Lobe **19.8 (12.97 dB)**
 RMS Directivity at Horizontal **11.7 (10.68 dB)**
Calculated

Beam Tilt **1.00 deg**
 Pattern Number **10U198100**



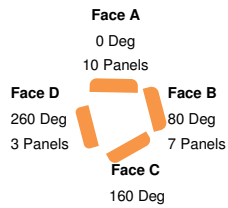
Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
-10.0	0.058	10.0	0.095	30.0	0.057	50.0	0.075	70.0	0.097
-9.0	0.149	11.0	0.049	31.0	0.035	51.0	0.051	71.0	0.073
-8.0	0.172	12.0	0.106	32.0	0.052	52.0	0.019	72.0	0.052
-7.0	0.065	13.0	0.106	33.0	0.050	53.0	0.027	73.0	0.035
-6.0	0.093	14.0	0.049	34.0	0.033	54.0	0.036	74.0	0.023
-5.0	0.044	15.0	0.046	35.0	0.039	55.0	0.018	75.0	0.016
-4.0	0.207	16.0	0.034	36.0	0.036	56.0	0.021	76.0	0.013
-3.0	0.429	17.0	0.072	37.0	0.023	57.0	0.067	77.0	0.012
-2.0	0.340	18.0	0.091	38.0	0.038	58.0	0.102	78.0	0.011
-1.0	0.253	19.0	0.049	39.0	0.039	59.0	0.117	79.0	0.010
0.0	0.769	20.0	0.021	40.0	0.023	60.0	0.105	80.0	0.008
1.0	1.000	21.0	0.029	41.0	0.043	61.0	0.072	81.0	0.007
2.0	0.765	22.0	0.014	42.0	0.063	62.0	0.038	82.0	0.005
3.0	0.326	23.0	0.059	43.0	0.055	63.0	0.058	83.0	0.004
4.0	0.245	24.0	0.061	44.0	0.031	64.0	0.099	84.0	0.003
5.0	0.243	25.0	0.024	45.0	0.028	65.0	0.132	85.0	0.002
6.0	0.126	26.0	0.013	46.0	0.030	66.0	0.149	86.0	0.001
7.0	0.131	27.0	0.001	47.0	0.025	67.0	0.151	87.0	0.001
8.0	0.085	28.0	0.043	48.0	0.048	68.0	0.140	88.0	0.000
9.0	0.080	29.0	0.070	49.0	0.073	69.0	0.120	89.0	0.000
						90.0	0.000	90.0	0.000

Figure 2

Antenna Elevation Pattern - 0°T and 160°T Faces
KVLY-TV Fargo, ND
Facility ID 61961
Ch. 36 330 kW 594 m

prepared for
Gray Television Licensee, LLC

February, 2018



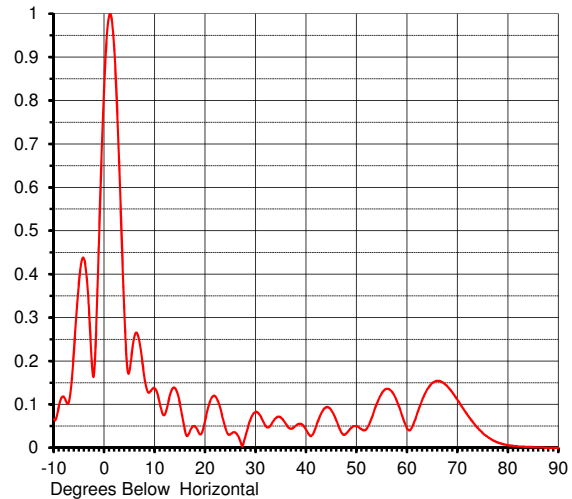
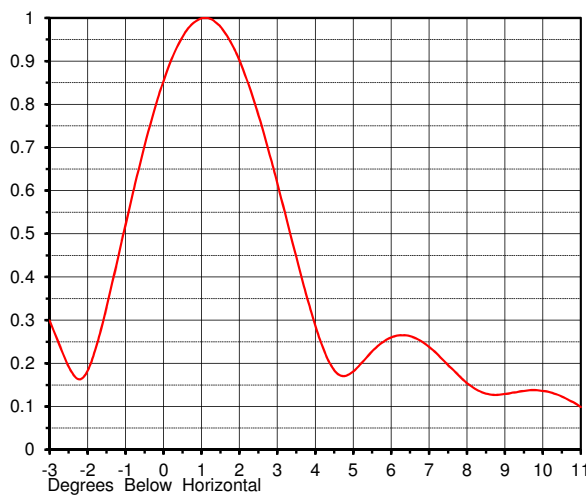
Face B

ELEVATION PATTERN

Proposal No. **C-70416-5**
 Date **1-Feb-18**
 Call Letters **KVLY**
 Channel **36**
 Frequency **605 MHz**
 Antenna Type **TUM-4P190-10/30H-1-R**

RMS Directivity at Main Lobe **13.9 (11.44 dB)**
 RMS Directivity at Horizontal **10.2 (10.09 dB)**
Calculated

Beam Tilt **1.10 deg**
 Pattern Number **07U139110**



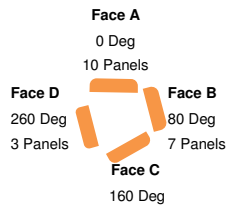
Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
-10.0	0.066	10.0	0.136	30.0	0.083	50.0	0.050	70.0	0.109
-9.0	0.098	11.0	0.099	31.0	0.071	51.0	0.042	71.0	0.091
-8.0	0.116	12.0	0.078	32.0	0.049	52.0	0.045	72.0	0.074
-7.0	0.108	13.0	0.123	33.0	0.053	53.0	0.071	73.0	0.059
-6.0	0.235	14.0	0.137	34.0	0.069	54.0	0.103	74.0	0.045
-5.0	0.391	15.0	0.097	35.0	0.069	55.0	0.127	75.0	0.033
-4.0	0.433	16.0	0.036	36.0	0.054	56.0	0.136	76.0	0.024
-3.0	0.299	17.0	0.041	37.0	0.044	57.0	0.128	77.0	0.017
-2.0	0.183	18.0	0.048	38.0	0.052	58.0	0.105	78.0	0.012
-1.0	0.521	19.0	0.031	39.0	0.055	59.0	0.073	79.0	0.008
0.0	0.854	20.0	0.067	40.0	0.040	60.0	0.043	80.0	0.006
1.0	0.999	21.0	0.110	41.0	0.028	61.0	0.049	81.0	0.004
2.0	0.902	22.0	0.118	42.0	0.052	62.0	0.081	82.0	0.003
3.0	0.617	23.0	0.088	43.0	0.081	63.0	0.112	83.0	0.003
4.0	0.288	24.0	0.043	44.0	0.094	64.0	0.136	84.0	0.002
5.0	0.181	25.0	0.032	45.0	0.085	65.0	0.150	85.0	0.001
6.0	0.260	26.0	0.034	46.0	0.061	66.0	0.154	86.0	0.001
7.0	0.238	27.0	0.011	47.0	0.034	67.0	0.150	87.0	0.001
8.0	0.154	28.0	0.031	48.0	0.034	68.0	0.140	88.0	0.000
9.0	0.129	29.0	0.068	49.0	0.047	69.0	0.126	89.0	0.000
								90.0	0.000



Figure 2A
Antenna Elevation Pattern - 80°T Face
KVLY-TV Fargo, ND
Facility ID 61961
Ch. 36 330 kW 594 m

prepared for
Gray Television Licensee, LLC

February, 2018



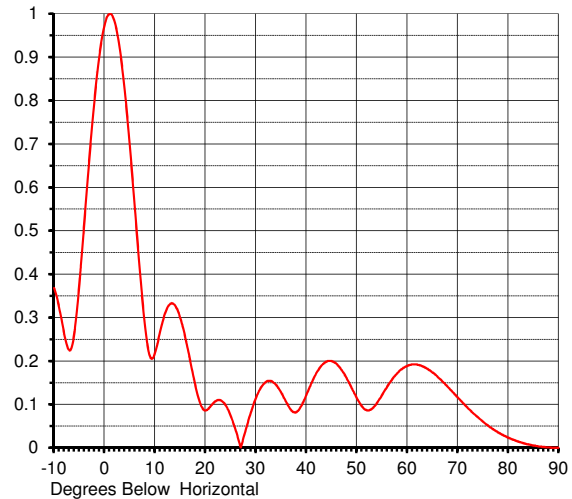
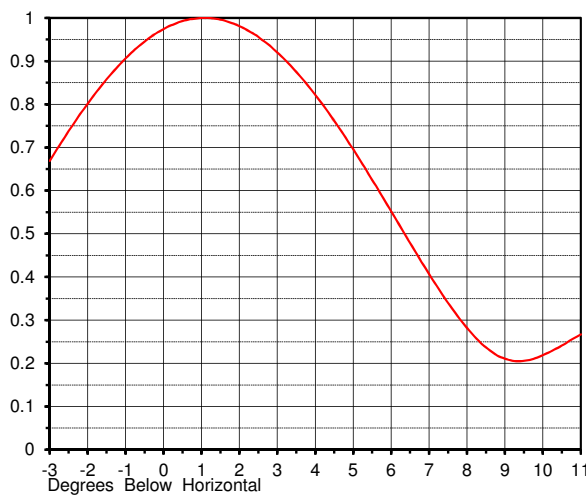
Face D

ELEVATION PATTERN

Proposal No. **C-70416-5**
 Date **1-Feb-18**
 Call Letters **KVLY**
 Channel **36**
 Frequency **605 MHz**
 Antenna Type **TUM-4P190-10/30H-1-R**

RMS Directivity at Main Lobe **6.0 (7.78 dB)**
 RMS Directivity at Horizontal **5.7 (7.56 dB)**
Calculated

Beam Tilt **1.10 deg**
 Pattern Number **03U060110**



Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
-10.0	0.368	10.0	0.219	30.0	0.115	50.0	0.114	70.0	0.116
-9.0	0.323	11.0	0.267	31.0	0.139	51.0	0.095	71.0	0.103
-8.0	0.263	12.0	0.310	32.0	0.152	52.0	0.086	72.0	0.091
-7.0	0.225	13.0	0.331	33.0	0.154	53.0	0.090	73.0	0.080
-6.0	0.264	14.0	0.327	34.0	0.145	54.0	0.104	74.0	0.070
-5.0	0.377	15.0	0.299	35.0	0.127	55.0	0.122	75.0	0.060
-4.0	0.521	16.0	0.254	36.0	0.105	56.0	0.141	76.0	0.051
-3.0	0.669	17.0	0.199	37.0	0.086	57.0	0.158	77.0	0.043
-2.0	0.801	18.0	0.143	38.0	0.082	58.0	0.172	78.0	0.035
-1.0	0.906	19.0	0.100	39.0	0.097	59.0	0.182	79.0	0.029
0.0	0.974	20.0	0.086	40.0	0.122	60.0	0.189	80.0	0.023
1.0	1.000	21.0	0.096	41.0	0.149	61.0	0.192	81.0	0.018
2.0	0.981	22.0	0.107	42.0	0.173	62.0	0.191	82.0	0.014
3.0	0.920	23.0	0.109	43.0	0.190	63.0	0.188	83.0	0.011
4.0	0.822	24.0	0.098	44.0	0.199	64.0	0.182	84.0	0.008
5.0	0.696	25.0	0.073	45.0	0.200	65.0	0.173	85.0	0.005
6.0	0.552	26.0	0.039	46.0	0.193	66.0	0.163	86.0	0.003
7.0	0.407	27.0	0.001	47.0	0.179	67.0	0.152	87.0	0.002
8.0	0.282	28.0	0.043	48.0	0.159	68.0	0.140	88.0	0.001
9.0	0.211	29.0	0.082	49.0	0.137	69.0	0.128	89.0	0.000
								90.0	0.000



Figure 2B
Antenna Elevation Pattern - 260°T Face
KVLY-TV Fargo, ND
Facility ID 61961
Ch. 36 330 kW 594 m

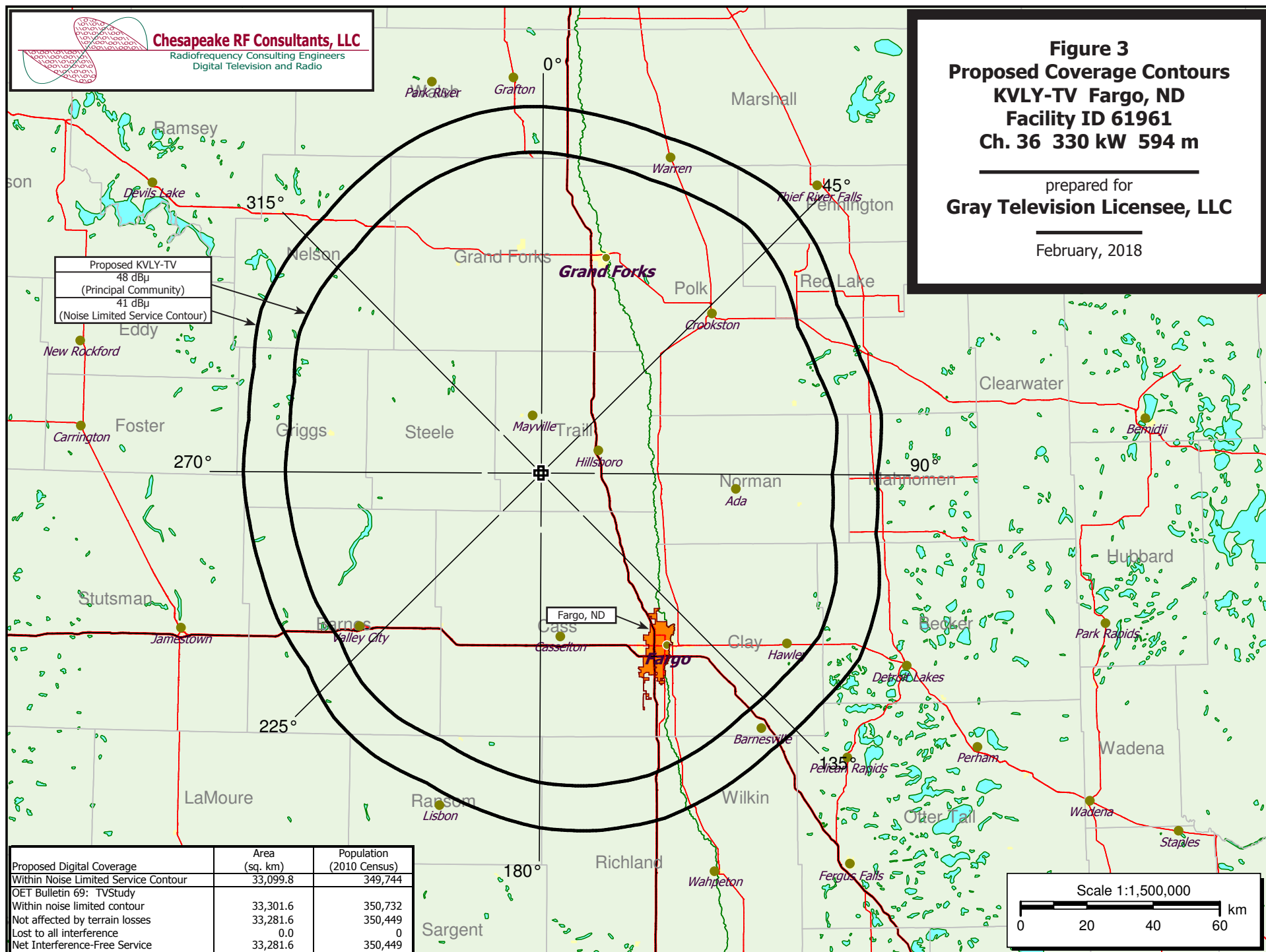
prepared for
Gray Television Licensee, LLC

February, 2018

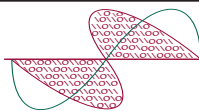


prepared for
Gray Television Licensee, LLC

February, 2018



Proposed Digital Coverage	Area (sq. km)	Population (2010 Census)
Within Noise Limited Service Contour	33,099.8	349,744
OET Bulletin 69: TVStudy		
Within noise limited contour	33,301.6	350,732
Not affected by terrain losses	33,281.6	350,449
Lost to all interference	0.0	0
Net Interference-Free Service	33,281.6	350,449



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

Figure 4
Coverage Contour Comparison
KVLY-TV Fargo, ND
Facility ID 61961
Ch. 36 330 kW 594 m

prepared for
Gray Television Licensee, LLC

February, 2018

Proposed KVLY-TV Ch. 36
330 kW 594 m
41 dBμ Contour (NLSC)

Authorized KVLY-TV Ch. 36
File # 0000034096
770 kW 595 m
41 dBμ Contour (NLSC)

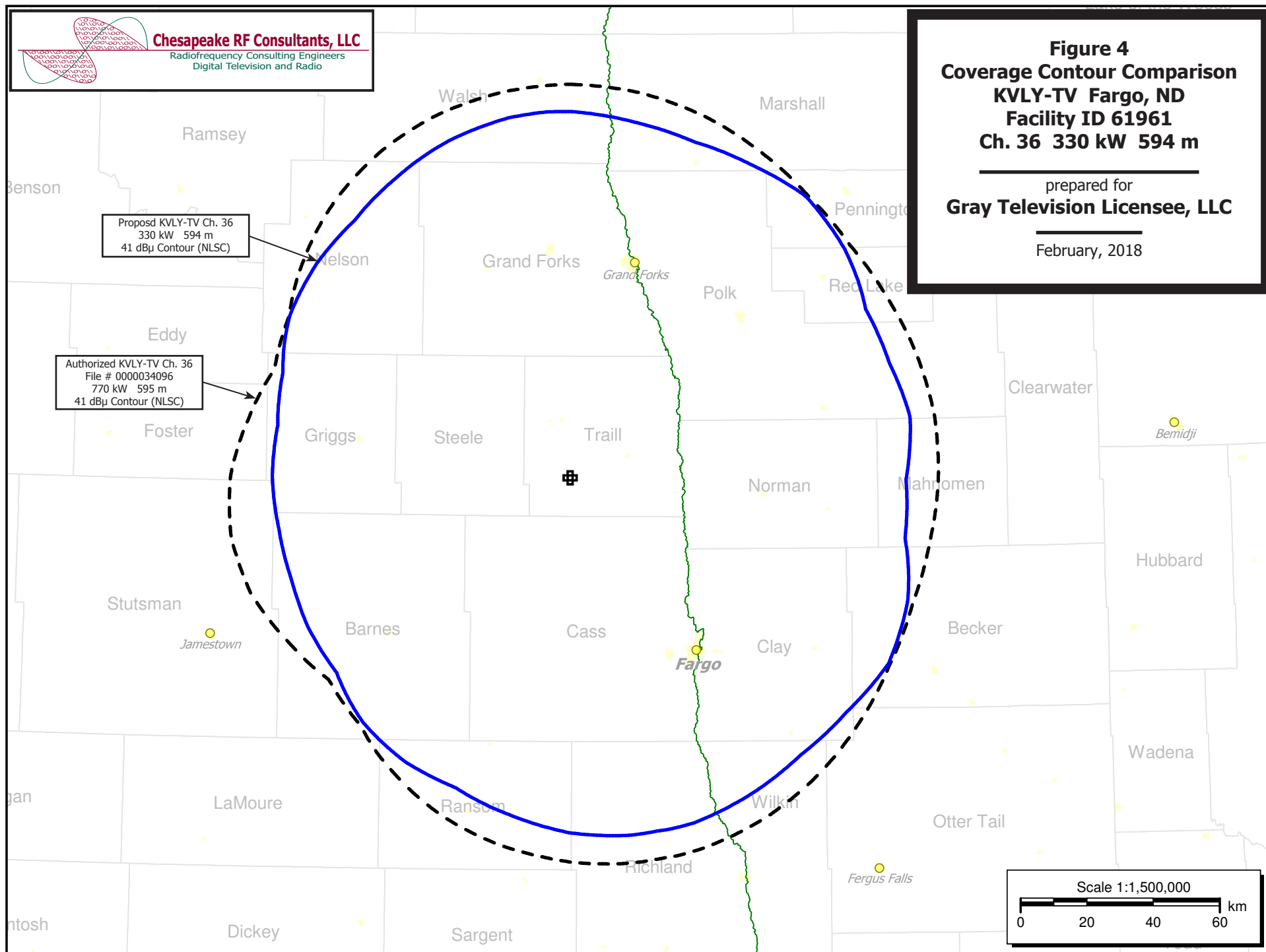
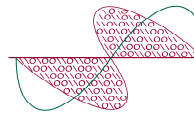


Table 1 KVLV-TV OET Bulletin 69 Interference Study
(page 1 of 2)



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

tvstudy v2.2.4 (Z2Qqz3)
Database: localhost, Study: KVLV-TV 330kW TUM, Model: Longley-Rice
Start: 2018.02.28 09:37:22

Study created: 2018.02.28 09:37:22

Study build station data: LMS TV 2018-02-28 LMSTV

Proposal: KVLV-TV D36 DT APP FARGO, ND
File number: KVLV-TV 330kW TUM
Facility ID: 61961
Station data: User record
Record ID: 1798
Country: U.S.
Zone: II

Stations potentially affected by proposal:

IX	Call	Chan	Svc	Status	City, State	File Number	Distance
No	KWSD	D36	DT	LIC	SIOUX FALLS, SD	BLCDT20100201AFD	430.1 km
No	KWSD	D36	DT	APP	SIOUX FALLS, SD	BLANK0000035767	430.1

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D36
Latitude: 47 20 32.00 N (NAD83)
Longitude: 97 17 21.00 W
Height AMSL: 896.7 m
HAAT: 593.9 m
Peak ERP: 330 kW
Antenna: TUM-4P190 20180201 0.0 deg
Elev Pattern: Generic
Elec Tilt: 1.00

40.9 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	323 kW	603.7 m	110.6 km
45.0	272	609.4	109.4
90.0	105	612.6	101.3
135.0	258	611.2	109.0
180.0	241	582.0	107.0
225.0	57.1	573.4	94.2
270.0	34.2	570.6	89.8
315.0	113	588.0	100.8

**Proposal is within coordination distance of Canadian border
Distance to Canadian border: 184.3 km

Distance to Mexican border: 1898.0 km

Conditions at FCC monitoring station: Grand Island NE
Bearing: 187.7 degrees Distance: 719.3 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 221.4 degrees Distance: 1020.9 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%

Table 1 KVLV-TV OET Bulletin 69 Interference Study
 (page 2 of 2)



 Interference to proposal scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	KVLV-TV	D36	DT	APP	FARGO, ND	KVLV-TV 330kW TUM	
	Service area	Terrain-limited				IX-free	Percent IX
33301.6	350,732	33281.6		350,449	33281.6	350,449	0.00 0.00

**Channel and
Facility
Information**

Pre-filled and fixed to reassignment Ch-18 on electronic form. FCC Staff to change to authorized Ch-36 after form is submitted.

Section	Question	Response
Proposed Community of License	Facility ID	61961
	State	North Dakota
	City	FARGO
	DTV Channel	18
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	1046244
Coordinates (NAD83)	Latitude	47° 20' 32.0" N+
	Longitude	097° 17' 21.0" W-
	Structure Type	TOWER-A free standing or guyed struct
	Overall Structure Height	628.8 meters
	Support Structure Height	594.7 meters
	Ground Elevation (AMSL)	297.2 meters
Antenna Data	Height of Radiation Center Above Ground Level	599.5 meters
	Height of Radiation Center Above Average Terrain	593.9 meters
	Height of Radiation Center Above Mean Sea Level	896.7 meters
	Effective Radiated Power	330 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:	DIE
	Model	TUM-4P190-10/30H-1-R
	Rotation	0 degrees
	Electrical Beam Tilt	1.0
	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	V _A (Authorized Value)	Degree	V _A (Authorized Value)	Degree	V _A (Authorized Value)	Degree	V _A (Authorized Value)
0	0.989	90	0.564	180	0.854	270	0.322
10	0.910	100	0.609	190	0.695	280	0.316
20	0.856	110	0.852	200	0.561	290	0.368
30	0.907	120	0.992	210	0.543	300	0.504
40	0.984	130	0.897	220	0.474	310	0.57
50	0.831	140	0.873	230	0.358	320	0.598
60	0.614	150	0.940	240	0.348	330	0.722
70	0.602	160	0.992	250	0.316	340	0.872
80	0.665	170	0.952	260	0.31	350	0.979

Additional Azimuths

Degree	V _A
79	0.666
39	0.985
356	1.000

**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.	No
	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 Section 1.1306 of 47 C.F.R.)	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