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**Engineering Statement  
Minor Modification of K22NJ-D  
Channel 22 at Worland, WY  
December 2021**

**I. Background**

This Engineering Statement has been prepared on behalf of Central Wyoming College ("CWC"), licensee of digital TV translator station K22NJ-D. This material has been prepared in connection with an application for minor modification.

This proposal moves the K22NJ-D transmitter site by a distance of 24.5 miles. This is within the 30 miles which is permitted. There is also overlap of the licensed and proposed 51 dBu contours, as depicted on the attached map exhibit.

**II. Interference Study**

Study has been made of all cochannel and adjacent-channel facilities in the vicinity of the proposed operation, including a detailed Longley-Rice interference study to demonstrate that the proposed operation will not cause interference to any authorized or pending proposed facilities. This study was performed using the Commission's TVStudy software.

The results of this study indicate that the proposed facility is predicted to cause zero additional interference to any of the listed stations, beyond the allowed values of 0.5% to full-power and Class A stations, and 2.0% to low-power stations. Based on the foregoing interference study, it is believed that the proposed facility can operate without risk of interference to other stations.

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Study created: 2021.12.22 14:43:20

Study build station data: LMS TV 2021-12-19

Proposal: K22NJ-D D22 LD APP WORLAND, WY  
File number: WORLAND22  
Facility ID: 167591  
Station data: User record  
Record ID: 1333  
Country: U.S.

Build options:

Protect pre-transition records not on baseline channel

Stations potentially affected by proposal:

IX	Call	Chan	Svc	Status	City, State	File Number	Distance
Yes	K21JU-D	D21	LD	LIC	MEETEETSE, WY	BLDTT20120321AAN	80.8 km
No	K22IK-D	D22	LD	LIC	REXBURG, ETC., ID	BLDTL20090710AEE	328.8
No	K22KN-D	D22	LD	CP	BOZEMAN, MT	BNPDTL20100505AJD	291.7
No	K22NN-D	D22	LD	LIC	FORSYTH, MT	BLANK0000124961	261.1
Yes	KHMT	D22	DT	LIC	HARDIN, MT	BLCDT20090226AAD	187.2
No	K22OV-D	D22	LD	CP	CAPUTA, SD	BLANK0000157645	368.5
No	K22IY-D	D22	LD	LIC	BIG PINEY, WY	BLANK0000156765	215.2
No	K22IY-D	N22	TX	LIC	BIG PINEY, WY	BLTT20100119AAE	215.2
No	K49LJ-D	D22	LD	CP	CASPER, WY	BLANK0000035784	193.5
No	K22AD	D22	LD	CP	GILLETTE, WY	BLANK0000115871	190.1
No	K22AD	N22	TX	LIC	GILLETTE, WY	BLTTL19940224JS	190.1
No	K22CI-D	D22	LD	LIC	LANDER, WY	BLDTT20101203ABR	147.6
No	K23IX-D	D23	LD	LIC	CLARK, ETC., WY	BLDTT20100107AEA	138.7
No	DDKSWY-LP	N29	TX	APP	SHERIDAN, WY	BLTTL20100422ADU	95.3

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D22  
Mask: Simple  
Latitude: 44 4 1.30 N (NAD83)  
Longitude: 107 51 55.90 W  
Height AMSL: 1445.2 m  
HAAT: 0.0 m  
Peak ERP: 0.870 kW  
Antenna: 270.0 deg  
Elev Pattn: Generic  
Elec Tilt: 1.75

49.6 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	0.316 kW	134.0 m	27.6 km
45.0	0.030	97.2	13.6
90.0	0.023	70.0	10.8
135.0	0.026	67.4	10.9
180.0	0.270	121.5	25.9
225.0	0.758	196.8	35.8
270.0	0.858	159.7	34.3
315.0	0.779	187.7	35.5

Database HAAT does not agree with computed HAAT  
Database HAAT: 0 m Computed HAAT: 129 m

Distance to Canadian border: 548.3 km

Distance to Mexican border: 1365.3 km

Conditions at FCC monitoring station: Grand Island NE  
Bearing: 111.1 degrees Distance: 848.0 km

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Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:  
Bearing: 152.8 degrees    Distance: 485.4 km

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%

No IX check failures found.

### III. RF Exposure Study

The power density calculations shown below were made using the techniques outlined in OET Bulletin No. 65. "Ground level" calculations in this report have been made at a reference height of 2 meters above ground to provide a worst-case estimate of exposure for persons standing on the ground in the vicinity of the tower. The equation shown below was used to calculate the ground level power density figures from each antenna.

$$S(\mu W / cm^2) = \frac{33.40981 \times AdjERP(Watts)}{D^2}$$

Where: *AdjERP(Watts)* is the maximum lobe effective radiated power times the element pattern factor times the array pattern factor.

*D* is the distance in meters from the center of radiation to the calculation point.

Power density levels produced by the proposed K22NJ-D facility were calculated for an elevation of 2 meters above ground using the manufacturer's vertical plane pattern for the horizontally-polarized Kathrein 75010402 antenna proposed in this application. The highest calculated power density from the proposed antenna alone occurs at a point 2 meters from the base of the antenna support structure. At this point the power density from the proposed facility is calculated to be 5.9  $\mu W/cm^2$ , which is 1.7% of 345.3  $\mu W/cm^2$  (the FCC maximum for uncontrolled environments at the Channel 22 frequency).

These calculations show that the maximum calculated power density produced at two meters above ground level by the proposed operation of K22NJ-D alone is less than 5% of the applicable FCC exposure limit at all locations between 1 and 500 meters from the base of the antenna support structure. Section 1.1307 of the Commission's Rules exempts applications for new facilities or

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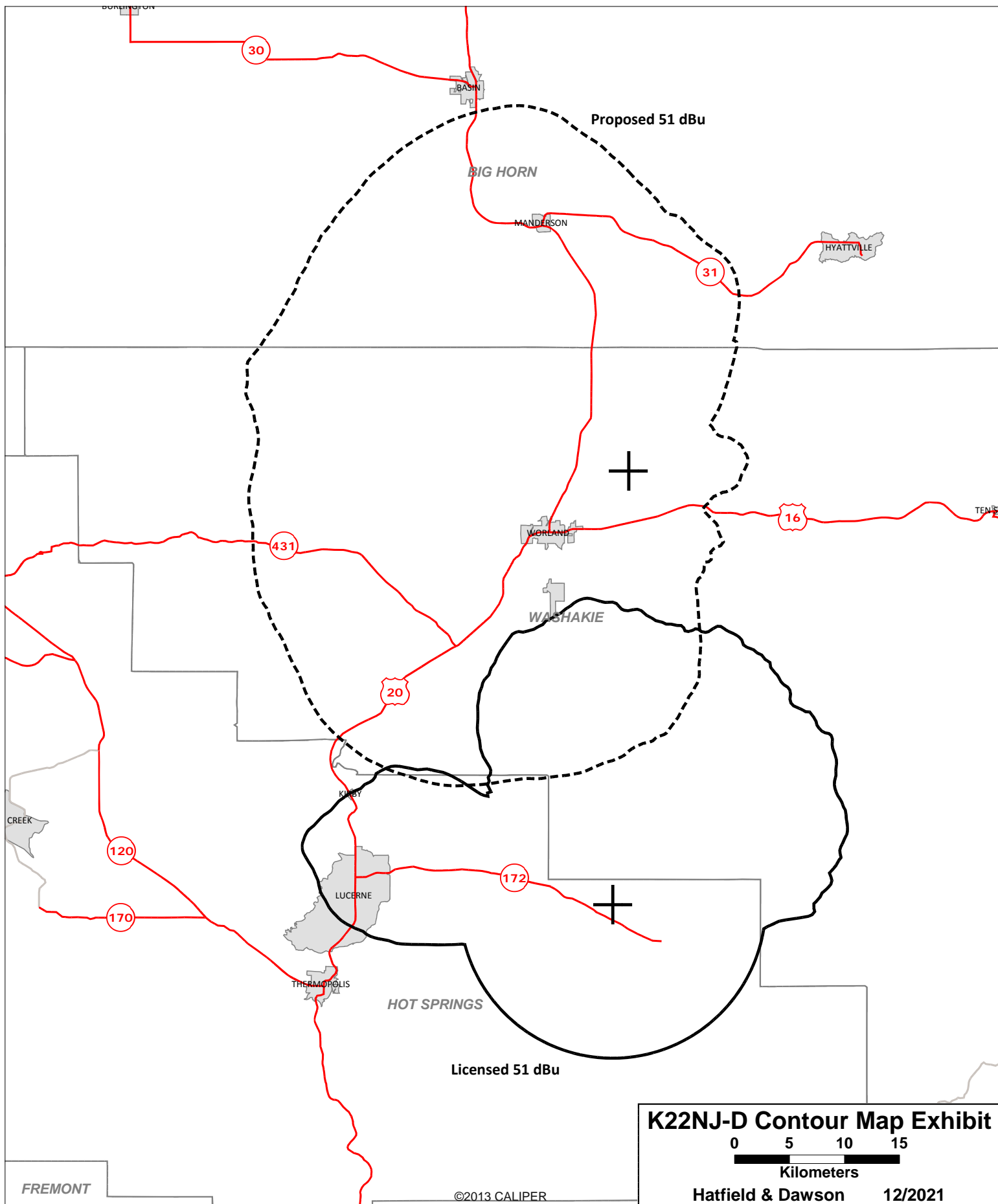
modifications to existing facilities from the requirement of preparing an environmental assessment when the calculated emissions from the applicant's proposed facility are predicted to be less than 5% of the applicable FCC exposure limit. Therefore, the proposed facility is in compliance with Section 1.1301 *et seq* and no further analysis of RF exposure at this site is required in this application.

Pursuant to OET Bulletin No. 65, all station personnel and contractors are required to follow appropriate safety procedures before any work is commenced on the antenna tower, including reduction in power or discontinuance of operation before any maintenance work is undertaken. The permittee/licensee in coordination with other users of the site must reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from radiofrequency exposure in excess of FCC guidelines.

December 22, 2021

Erik C. Swanson, P.E.

Hatfield & Dawson Consulting Engineers



# K22NJ-D Worland

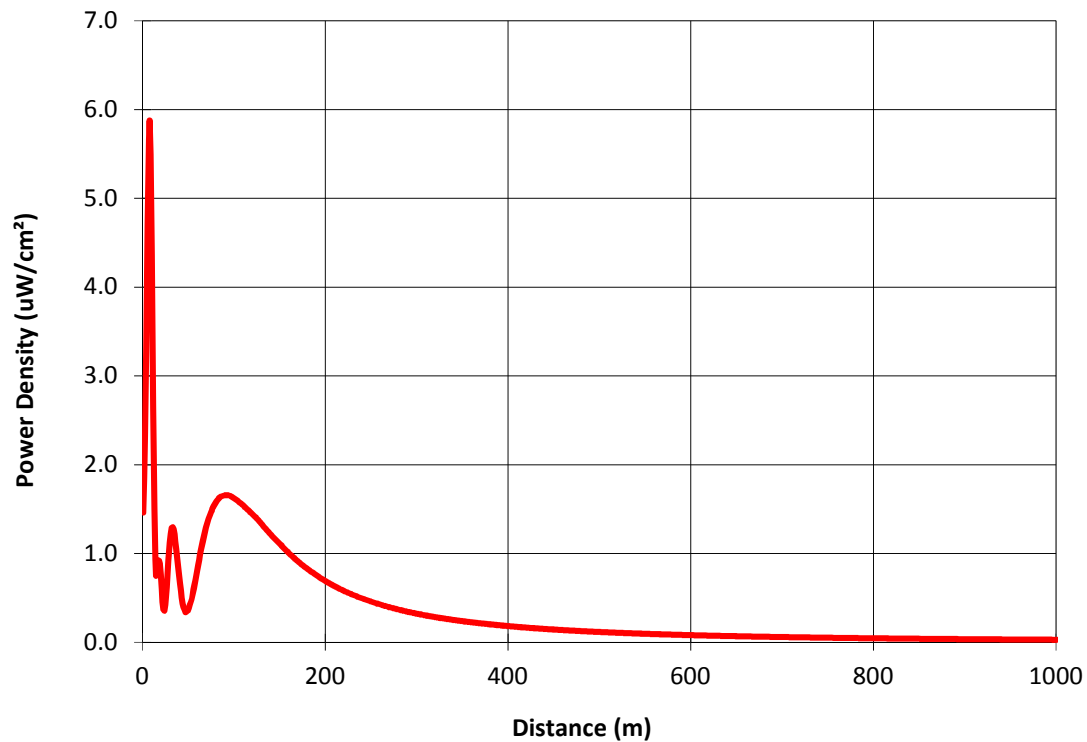
## Ground-Level Power Density Calculations

### Using Manufacturer's Vertical Plane Pattern

Antenna	75010402		
ERP	870	Watts H (avg)	
	-	Watts V (avg)	
Antenna AGL	15.2	meters less 2m is	13.2 meters above the reference plane
MBT	0	degrees	

Calculated  
Maximum is 5.9  $\mu\text{W}/\text{cm}^2$  at 7 meters from the tower

### Power Density vs Distance



**K22NJ-D Worland**  
**Ground-Level Power Density Calculations**  
**Using Manufacturer's Vertical Plane Pattern**

Distance From Tower (meters)	Hypotenuse (meters)	Depression Angle (with MBT adjust) (degrees)	Interpolated Rel Field	Adjusted ERP (watts)	Power Density uW/cm <sup>2</sup>
0	13.20	90.00	0.094	7.6	1.46
1	13.24	85.67	0.106	9.7	1.85
2	13.35	81.38	0.123	13.1	2.45
3	13.54	77.20	0.142	17.6	3.22
4	13.79	73.14	0.165	23.6	4.14
5	14.12	69.25	0.186	30.0	5.03
6	14.50	65.56	0.202	35.6	5.66
7	14.94	62.06	0.212	39.3	5.88
8	15.44	58.78	0.212	39.2	5.50
9	15.98	55.71	0.200	34.8	4.56
10	16.56	52.85	0.181	28.5	3.47
11	17.18	50.19	0.156	21.1	2.39
12	17.84	47.73	0.127	13.9	1.46
13	18.53	45.44	0.105	9.6	0.93
14	19.24	43.32	0.098	8.3	0.75
15	19.98	41.35	0.103	9.3	0.78
16	20.74	39.52	0.113	11.2	0.87
17	21.52	37.83	0.121	12.8	0.92
18	22.32	36.25	0.123	13.2	0.88
19	23.14	34.79	0.118	12.2	0.76
20	23.96	33.42	0.109	10.3	0.60
21	24.80	32.15	0.098	8.3	0.45
22	25.66	30.96	0.091	7.3	0.37
23	26.52	29.85	0.093	7.5	0.36
24	27.39	28.81	0.104	9.5	0.42
25	28.27	27.83	0.124	13.3	0.56
26	29.16	26.92	0.145	18.2	0.72
27	30.05	26.05	0.164	23.5	0.87
28	30.96	25.24	0.183	29.0	1.01
29	31.86	24.47	0.198	34.3	1.13
30	32.78	23.75	0.212	39.2	1.22
31	33.69	23.06	0.224	43.8	1.29
32	34.62	22.42	0.231	46.4	1.29
33	35.54	21.80	0.235	48.1	1.27
34	36.47	21.22	0.236	48.5	1.22
35	37.41	20.66	0.234	47.7	1.14
36	38.34	20.14	0.231	46.2	1.05
37	39.28	19.63	0.225	43.9	0.95
38	40.23	19.16	0.218	41.3	0.85
39	41.17	18.70	0.210	38.2	0.75
40	42.12	18.26	0.201	35.1	0.66
41	43.07	17.85	0.192	32.0	0.58
42	44.03	17.45	0.183	29.1	0.50
43	44.98	17.07	0.174	26.4	0.44
44	45.94	16.70	0.170	25.0	0.40

45	46.90	16.35	0.166	24.0	0.36
46	47.86	16.01	0.162	23.0	0.34
47	48.82	15.69	0.168	24.5	0.34
48	49.78	15.38	0.173	26.0	0.35
49	50.75	15.08	0.178	27.6	0.36
50	51.71	14.79	0.189	31.0	0.39
51	52.68	14.51	0.201	35.1	0.42
52	53.65	14.24	0.212	39.3	0.46
53	54.62	13.99	0.224	43.7	0.49
54	55.59	13.74	0.240	50.2	0.54
55	56.56	13.50	0.256	57.0	0.59
56	57.53	13.26	0.271	63.9	0.64
57	58.51	13.04	0.286	70.9	0.69
58	59.48	12.82	0.303	79.7	0.75
59	60.46	12.61	0.320	89.0	0.81
60	61.43	12.41	0.337	98.5	0.87
61	62.41	12.21	0.353	108.2	0.93
62	63.39	12.02	0.368	118.0	0.98
63	64.37	11.83	0.384	128.5	1.04
64	65.35	11.65	0.400	139.1	1.09
65	66.33	11.48	0.415	149.8	1.14
66	67.31	11.31	0.430	160.6	1.18
67	68.29	11.15	0.444	171.5	1.23
68	69.27	10.99	0.458	182.4	1.27
69	70.25	10.83	0.471	193.2	1.31
70	71.23	10.68	0.484	204.1	1.34
71	72.22	10.53	0.497	215.0	1.38
72	73.20	10.39	0.510	225.9	1.41
73	74.18	10.25	0.522	236.7	1.44
74	75.17	10.11	0.533	247.5	1.46
75	76.15	9.98	0.545	258.3	1.49
76	77.14	9.85	0.556	269.2	1.51
77	78.12	9.73	0.567	280.0	1.53
78	79.11	9.61	0.578	290.8	1.55
79	80.10	9.49	0.589	301.5	1.57
80	81.08	9.37	0.599	312.2	1.59
81	82.07	9.26	0.609	322.7	1.60
82	83.06	9.14	0.619	333.2	1.61
83	84.04	9.04	0.628	343.6	1.63
84	85.03	8.93	0.637	353.6	1.63
85	86.02	8.83	0.646	363.2	1.64
86	87.01	8.73	0.655	372.8	1.65
87	88.00	8.63	0.663	382.3	1.65
88	88.98	8.53	0.671	391.6	1.65
89	89.97	8.44	0.679	400.9	1.65
90	90.96	8.34	0.687	410.1	1.66
91	91.95	8.25	0.694	419.2	1.66
92	92.94	8.16	0.702	428.2	1.66
93	93.93	8.08	0.709	437.0	1.65
94	94.92	7.99	0.716	445.8	1.65
95	95.91	7.91	0.722	453.8	1.65
96	96.90	7.83	0.729	461.7	1.64