

**Comprehensive Technical Exhibit**  
*Amendment Application for Construction Permit*  
**BPFT-20110928AAZ**  
K292FZ - Mount Vernon, Iowa  
KZIA, Inc.  
November, 2011

**Amendment to Application for Construction Permit**

The following engineering statement and attached exhibits have been prepared for **KZIA, Inc.** ("KZIA"), licensee of FM translator station K292FZ at Mount Vernon, Iowa, and are in support of their amendment to application for construction permit to modify that facility.<sup>1</sup> Under this amendment, KZIA seeks to change the antenna type from that requested in the original application. All other parameters associated with the facility would remain unchanged.

The change in the antenna type would not affect the coverage of the facility. In addition, it does not change the interference and allocation situations of the facility. Contour protection would still be adequately maintained to all facilities with the exception of K295AC at Iowa City. Although contour protection would not be met to that facility, interference is not predicted to occur to any resident population. Any interference that could occur would affect one solitary residence, and then, only in a highly transient fashion.

The original application proposed the use of a Shively 6812-3 antenna. KZIA proposes the use of an ERI 100A-2F antenna instead. This would change from a three-bay antenna to a two-bay antenna. The exhibits that address the alternate interference study, Exhibits E-5 through E-8 in the original application, have been appropriately modified for the use of the different proposed antenna. These exhibits will maintain the same number as in the original application, but instead will be designated "A-#" where "#" corresponds to the exhibit number. As with the original application, these exhibits will be discussed. An additional exhibit, exhibit A-5A will be included to illustrate the areas where Longley-Rice interference may occur.

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<sup>1</sup> The Facility ID for K292FZ at Mount Vernon, Iowa is 153604.

Exhibit A-5 illustrates the extremely small areas where interference to K295AC may be predicted to occur. This small area is then transferred to a satellite image of the vicinity and indicated in Exhibit A-5A. These areas do not affect any regularly inhabited structures, and only affect a shed and a portion of a barn on a single farm. The farmhouse lies outside of the interference area. Exhibit A-6 is a summary of the affected area, and indicates that zero resident population is affected by the potential interference.

A second methodology for studying the interference can be employed. This methodology specifically utilizes the vertical radiation pattern and the Commission's contour methodology. The map in Exhibit A-7 illustrates the transmitter site for K295AC as well as the proposed transmitter site for K292FZ and a family of contours for K295AC. As this family of contours illustrates, the 67-70 dBu F(50,50) service contours for K295AC lie in the vicinity of the proposed K292FZ transmitter site.

In order to consider a worst-case scenario for the potential interference under this methodology, it will be assumed that a field strength of 67 dBu exists in relevant areas. Under the Commission's definition of interference, areas where the field strength from the proposed translator would be in excess of 40 dB above the field strength from K295AC would potentially receive interference. This is due to the channel separation between the two facilities, and results in the condition where interference could potentially occur when the K292FZ field strength is in excess of 107 dBu.

The power density for the proposed facility at a field strength of 107 dBu is given by the following equation:

$$S = \frac{E^2}{Z_0} = \frac{(0.2239)^2}{377} = \mathbf{0.0001329} \quad \text{Eq. 1}$$

In this equation, S represents the calculated power density in Watts per square meter, E is the electric field intensity, which for 107 dBu is 0.2239 Volts per meter, and  $Z_0$  is the characteristic impedance of free space of 377 Ohms.

The power density is also given by:

$$S = \frac{P}{4\pi R^2} \quad \text{Eq. 2}$$

Where S is in the same units, P is the power in Watts (175 in this case), and R is the distance. Rearranging the terms in the equation, it can be solved for the distance to the desired power density as follows:

$$R^2 = \frac{P}{4\pi S} \quad \text{Eq. 3}$$

The results of these calculations for depression angles of 0 degrees to 90 degrees are tabulated in Exhibit A-8. It was assumed for these calculations that an ERI 100A-2F antenna would be utilized. This antenna is assumed to be omni-directional in the horizontal plane. The relative field values at the listed depression angles are based on the published data for the antenna.

The resulting "R" or radius value from Eq. 3 corresponds to the "Field Strength Radius" column in Exhibit A-8. Since each radius is assigned to a specific depression angle, the radius has both a horizontal and vertical component to it. The specific horizontal and vertical distances from the center of radiation were derived using basic trigonometry. Depression angles where the vertical radius is less than approximate 3 meters AGL, including negative values, result in areas where interference is assumed to potentially be experienced by resident population in the area. As indicated in the tabulation, there are a number of areas where the interference zone is within 3 meters of ground level. These areas exist within a radius of 105.5 meters from the tower site.

The resulting radius is depicted in Exhibit A-9. The affected areas by this methodology are essentially identical to those illustrated in the preceding exhibit. As with the preceding exhibit, the potential interference area is limited to a small area of a single farm with no inhabited buildings.

The proposed translator continues to be exempt from environmental processing. The supporting structure to be utilized by KZIA for this translator is a structure that is registered with the Commission. RF exposure hazards to the general public will not exist due to the low effective radiated power. A worst-case analysis predicts the power density to be  $1.51 \mu\text{W}/\text{cm}^2$  at 2 meters above ground level. This is considerably less than the upper limit permissible under the uncontrolled environment condition of the applicable safety standard. The addition of K292FZ to this structure will also not result in a condition where the aggregate power density at ground level would exceed the uncontrolled environment condition. KZIA will coordinate with other users to reduce power or cease operation as necessary to prevent workers from being exposed to levels of radiofrequency radiation in excess of applicable standards.

The preceding statement and attached exhibits have been prepared by me, or under my direction, and are true and accurate to the best of my belief and knowledge.



Above signature is digitized copy of actual signature  
License Expires November 30, 2013

**Jeremy D. Ruck, PE**  
**November 7, 2011**

**K295AC**

BLFT20110307AAS  
Latitude: 41-38-45 N  
Longitude: 091-30-32 W  
ERP: 0.25 kW  
Channel: 295  
Frequency: 106.9 MHz  
AMSL Height: 238.0 m  
Elevation: 225.0 m  
Horiz. Pattern: Omni  
Vert. Pattern: Yes  
Elec Tilt: 0.0  
Prop Model: Longley/Rice  
Climate: Cont temperate  
Conductivity: 0.0050  
Dielec Const: 15.0  
Refractivity: 311.0  
Receiver Ht AG: 9.1 m  
Receiver Gain: 0 dB  
Time Variability: 50.0%  
Sit. Variability: 50.0%  
ITM Mode: Broadcast

**D.L. Markley & Associates, Inc.**

- K295AC (295)
- K292FZ.X (292)

Proposed K292FZ  
Transmitter Site

K295AC Site

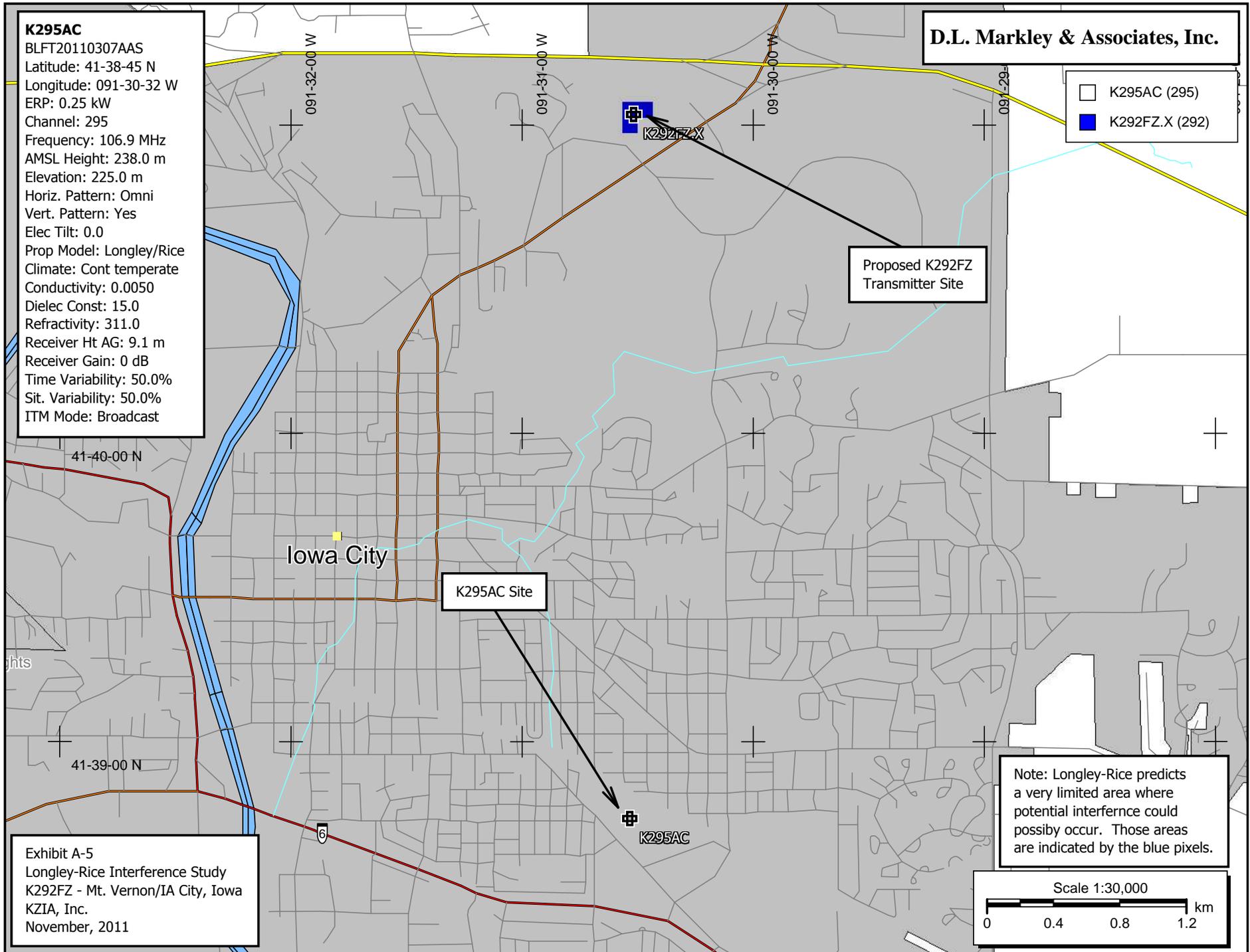
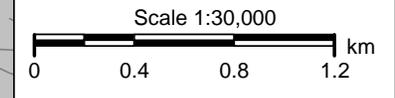
K295AC

K292FZ.X

Iowa City

Note: Longley-Rice predicts a very limited area where potential interference could possibly occur. Those areas are indicated by the blue pixels.

Exhibit A-5  
Longley-Rice Interference Study  
K292FZ - Mt. Vernon/IA City, Iowa  
KZIA, Inc.  
November, 2011



**Exhibit A-5A**  
*Areas of Predicted Longley-Rice Interference*



Exhibit A-6 - Summary of Longley-Rice Interference Study

Population Database: 2010 US Census (PL)

K295AC (295) Iowa City, IA - BLFT20110307AAS  
Lat: 41-38-45 N Lng: 091-30-32 W ERP: 0.25 kW AMSL: 238.0 m  
FM Interference Study  
Protected: Circle: R = 25 km  
Interference considered within 120 km.  
Signal Resolution: 0.1 km

Study Date: 11/07/2011  
FM Database Date: 11/07/2011

D/U Ratios Used:  
Co: 20.0 dB  
First Adj: 6.0 dB  
Second Adj: -40.0 dB  
Third Adj: -40.0 dB

Threshold for reception: 48.0 dBu.

Primary Terrain: V-Soft 3 Second US Terrain  
Secondary Terrain: V-Soft 30 Second US Database

Population Database: 2010 US Census (PL)

Percentages calculated using a baseline population of 128,025.

Stations which cause interference:

Call Letters	H Units	Population	%	Area (sq. km)
K292FZ.X (292)	0	0	0.000	0.03

Masking Summary:

Call Letters	Total Interference		Unique Interference	
	Population	%	Population	%
K292FZ.X (292)	0	0.000	0	0.000

Call Letters	City	State	Dist	Azi
K292FZ.X (292)	Mount Vernon	IA	4.2	0.3

Totals for K295AC (295)

Calculation Area Population:	142,104	[ 1961.1 sq. km ]
Not Affected by Terrain Loss:	128,025	[ 1384.8 sq. km ]
Interfered Population:	0	[ 0.0 sq. km ]
Interference Free:	128,025	[ 1384.7 sq. km ]
Percent Interference:	0.00 %	
Terrain Blocked Population:	14,079	[ 576.3 sq. km ]

Contour Area Population:

141,910

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Interference Free Breakdown:

White:	105,588	[	82.5%	]
Black:	6,138	[	4.8%	]
Hispanic:	6,617	[	5.2%	]
Native American:	228	[	0.2%	]
Asian:	6,745	[	5.3%	]
Pacific Islander:	46	[	0.0%	]
Mixed Race:	2,435	[	1.9%	]
Other:	228	[	0.2%	]
Total:	128,025			

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	Housing Units	Population	%
Iowa			
Cedar County			
Total	8,064	18,499	
K295AC (295)	1,083	2,628	
IxFree	1,083	2,628	100.00
Johnson County			
Total	55,967	130,882	
K295AC (295)	52,353	121,866	
IxFree	52,353	121,866	100.00
Linn County			
Total	92,251	211,226	
K295AC (295)	16	38	
IxFree	16	38	100.00
Muscatine County			
Total	17,910	42,745	
K295AC (295)	514	1,425	
IxFree	514	1,425	100.00
Washington County			
Total	9,516	21,704	
K295AC (295)	846	2,068	
IxFree	846	2,068	100.00

**K292FZ.X**  
BLFT20090306AAB  
Latitude: 41-41-02 N  
Longitude: 091-30-31 W  
ERP: 0.175 kW  
Channel: 292  
Frequency: 106.3 MHz  
AMSL Height: 324.6 m  
Elevation: 235.747 m  
Horiz. Pattern: Omni  
Vert. Pattern: No  
Prop Model: None

**K295AC**  
BLFT20110307AAS  
Latitude: 41-38-45 N  
Longitude: 091-30-32 W  
ERP: 0.25 kW  
Channel: 295  
Frequency: 106.9 MHz  
AMSL Height: 238.0 m  
Elevation: 210.0 m  
Horiz. Pattern: Omni  
Vert. Pattern: No  
Prop Model: None

Proposed 107 dBu  
F(50,10) Contour

D.L. Markley & Associates, Inc.

- 70 dBu F(50,50) Contour
- 69 dBu F(50,50) Contour
- 68 dBu F(50,50) Contour
- 67 dBu F(50,50) Contour

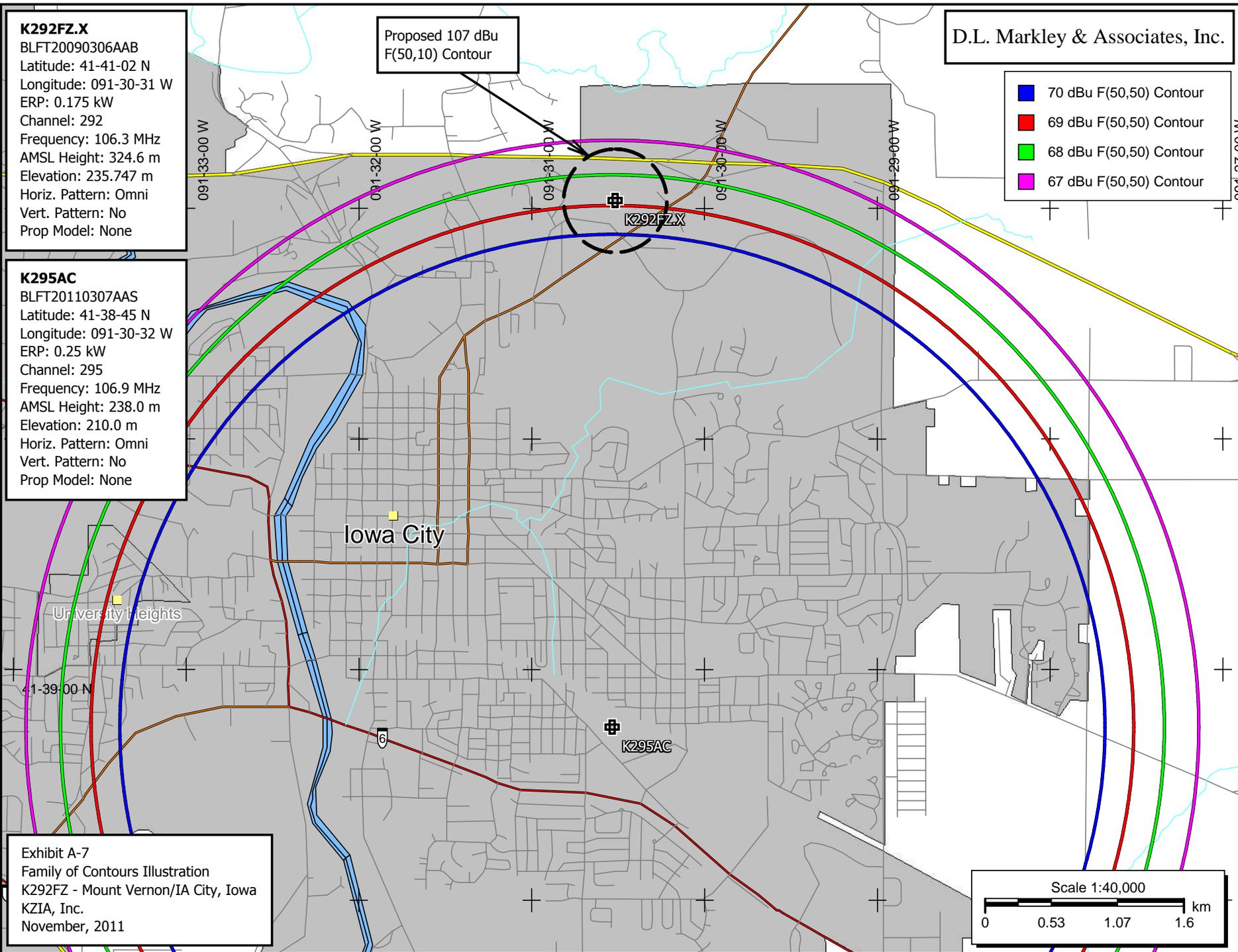


Exhibit A-7  
Family of Contours Illustration  
K292FZ - Mount Vernon/IA City, Iowa  
KZIA, Inc.  
November, 2011

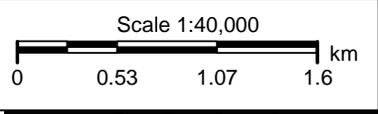


Exhibit A-8 - Summary of Power Density Calculations								
Facility:	K292FZ							
COR:		89.9	m AGL				Z0 (Ohms)	377
ERP:		175	Watts				<b>ALL distances meters</b>	
Antenna:	ERI 100A-2F							
FS Contour:		107	dBu					
E Field Strength:		0.2239	V/m					
Power Density:		0.0001329409	W/m^2					
Dep.			ERP in	Radius	Field Strength	Radius	Radius	Radius
θ	Erel	Prel	Watts	Squared	Radius	Vert. Dist.	AGL	Horiz. Dist.
0	1.000	1.000	175.00	104753.739	323.66	0.00	89.90	323.66
1	0.998	0.996	174.30	104335.143	323.01	5.64	84.26	322.96
2	0.994	0.988	172.91	103500.466	321.71	11.23	78.67	321.52
3	0.985	0.970	169.79	101634.697	318.80	16.68	73.22	318.37
4	0.974	0.949	166.02	99377.358	315.24	21.99	67.91	314.47
5	0.960	0.922	161.28	96541.046	310.71	27.08	62.82	309.53
6	0.942	0.887	155.29	92954.697	304.88	31.87	58.03	303.21
7	0.922	0.850	148.76	89049.478	298.41	36.37	53.53	296.19
8	0.899	0.808	141.44	84662.077	290.97	40.49	49.41	288.14
9	0.873	0.762	133.37	79835.863	282.55	44.20	45.70	279.07
10	0.845	0.714	124.95	74796.789	273.49	47.49	42.41	269.34
11	0.814	0.663	115.95	69409.409	263.46	50.27	39.63	258.62
12	0.781	0.610	106.74	63895.696	252.78	52.56	37.34	247.25
13	0.745	0.555	97.13	58140.944	241.12	54.24	35.66	234.94
14	0.708	0.501	87.72	52509.278	229.15	55.44	34.46	222.34
15	0.669	0.448	78.32	46883.688	216.53	56.04	33.86	209.15
16	0.629	0.396	69.24	41444.874	203.58	56.11	33.79	195.69
17	0.587	0.345	60.30	36094.891	189.99	55.55	34.35	181.69
18	0.544	0.296	51.79	31000.403	176.07	54.41	35.49	167.45
19	0.499	0.249	43.58	26083.786	161.50	52.58	37.32	152.71
20	0.455	0.207	36.23	21686.643	147.26	50.37	39.53	138.38
21	0.409	0.167	29.27	17523.310	132.38	47.44	42.46	123.58
22	0.363	0.132	23.06	13803.295	117.49	44.01	45.89	108.93
23	0.317	0.100	17.59	10526.599	102.60	40.09	49.81	94.44
24	0.272	0.074	12.95	7750.101	88.03	35.81	54.09	80.42
25	0.226	0.051	8.94	5350.402	73.15	30.91	58.99	66.29
26	0.180	0.032	5.67	3394.021	58.26	25.54	64.36	52.36
27	0.135	0.018	3.19	1909.137	43.69	19.84	70.06	38.93
28	0.091	0.008	1.45	867.466	29.45	13.83	76.07	26.01
29	0.048	0.002	0.40	241.353	15.54	7.53	82.37	13.59
30	0.006	0.000	0.01	3.771	1.94	0.97	88.93	1.68
31	0.036	0.001	0.23	135.761	11.65	6.00	83.90	9.99
32	0.076	0.006	1.01	605.058	24.60	13.03	76.87	20.86
33	0.114	0.013	2.27	1361.380	36.90	20.10	69.80	30.94
34	0.151	0.023	3.99	2388.490	48.87	27.33	62.57	40.52
35	0.187	0.035	6.12	3663.134	60.52	34.72	55.18	49.58
36	0.221	0.049	8.55	5116.277	71.53	42.04	47.86	57.87
37	0.253	0.064	11.20	6705.182	81.89	49.28	40.62	65.40
38	0.284	0.081	14.11	8449.018	91.92	56.59	33.31	72.43

Exhibit A-8 - Summary of Power Density Calculations									
Facility:	K292FZ								
COR:	89.9 m AGL						Z0 (Ohms)	377	
ERP:	175 Watts						ALL distances meters		
Antenna:	ERI 100A-2F								
FS Contour:	107 dBu								
E Field Strength:	0.2239 V/m								
Power Density:	0.0001329409 W/m^2								
Dep.			ERP in	Radius	Field Strength	Radius	Radius	Radius	
θ	Erel	Prel	Watts	Squared	Radius	Vert. Dist.	AGL	Horiz. Dist.	
39	0.312	0.097	17.04	10197.148	100.98	63.55	26.35	78.48	
40	0.339	0.115	20.11	12038.404	109.72	70.53	19.37	84.05	
41	0.364	0.132	23.19	13879.451	117.81	77.29	12.61	88.91	
42	0.387	0.150	26.21	15688.863	125.26	83.81	6.09	93.08	
43	0.409	0.167	29.27	17523.310	132.38	90.28	-0.38	96.81	
44	0.428	0.183	32.06	19189.209	138.53	96.23	-6.33	99.65	
45	0.445	0.198	34.65	20743.859	144.03	101.84	-11.94	101.84	
46	0.461	0.213	37.19	22262.369	149.21	107.33	-17.43	103.65	
47	0.475	0.226	39.48	23635.062	153.74	112.44	-22.54	104.85	
48	0.487	0.237	41.50	24844.340	157.62	117.14	-27.24	105.47	
49	0.497	0.247	43.23	25875.116	160.86	121.40	-31.50	105.53	
50	0.506	0.256	44.81	26820.728	163.77	125.46	-35.56	105.27	
51	0.513	0.263	46.05	27567.937	166.04	129.03	-39.13	104.49	
52	0.518	0.268	46.96	28107.942	167.65	132.11	-42.21	103.22	
53	0.522	0.272	47.68	28543.718	168.95	134.93	-45.03	101.68	
54	0.524	0.275	48.05	28762.863	169.60	137.21	-47.31	99.69	
55	0.525	0.276	48.23	28872.749	169.92	139.19	-49.29	97.46	
56	0.525	0.276	48.23	28872.749	169.92	140.87	-50.97	95.02	
57	0.523	0.274	47.87	28653.186	169.27	141.96	-52.06	92.19	
58	0.520	0.270	47.32	28325.411	168.30	142.73	-52.83	89.19	
59	0.516	0.266	46.59	27891.312	167.01	143.15	-53.25	86.01	
60	0.511	0.261	45.70	27353.401	165.39	143.23	-53.33	82.69	
61	0.505	0.255	44.63	26714.822	163.45	142.95	-53.05	79.24	
62	0.498	0.248	43.40	25979.346	161.18	142.31	-52.41	75.67	
63	0.490	0.240	42.02	25151.373	158.59	141.31	-51.41	72.00	
64	0.482	0.232	40.66	24336.808	156.00	140.21	-50.31	68.39	
65	0.472	0.223	38.99	23337.457	152.77	138.45	-48.55	64.56	
66	0.462	0.213	37.35	22359.057	149.53	136.60	-46.70	60.82	
67	0.452	0.204	35.75	21401.608	146.29	134.66	-44.76	57.16	
68	0.440	0.194	33.88	20280.324	142.41	132.04	-42.14	53.35	
69	0.429	0.184	32.21	19278.983	138.85	129.63	-39.73	49.76	
70	0.416	0.173	30.28	18128.263	134.64	126.52	-36.62	46.05	
71	0.404	0.163	28.56	17097.486	130.76	123.63	-33.73	42.57	
72	0.391	0.153	26.75	16014.856	126.55	120.36	-30.46	39.11	
73	0.377	0.142	24.87	14888.544	122.02	116.69	-26.79	35.67	
74	0.357	0.127	22.30	13350.759	115.55	111.07	-21.17	31.85	
75	0.343	0.118	20.59	12324.173	111.01	107.23	-17.33	28.73	
76	0.336	0.113	19.76	11826.278	108.75	105.52	-15.62	26.31	
77	0.321	0.103	18.03	10793.930	103.89	101.23	-11.33	23.37	

Exhibit A-8 - Summary of Power Density Calculations								
Facility:		K292FZ						
COR:		89.9 m AGL				Z0 (Ohms)	377	
ERP:		175 Watts				<b>ALL distances meters</b>		
Antenna:		ERI 100A-2F						
FS Contour:		107 dBu						
E Field Strength:		0.2239 V/m						
Power Density:		0.0001329409 W/m <sup>2</sup>						
Dep.			ERP in	Radius	Field Strength	Radius	Radius	Radius
θ	Erel	Prel	Watts	Squared	Radius	Vert. Dist.	AGL	Horiz. Dist.
78	0.307	0.094	16.49	9872.935	99.36	97.19	-7.29	20.66
79	0.292	0.085	14.92	8931.723	94.51	92.77	-2.87	18.03
80	0.277	0.077	13.43	8037.650	89.65	88.29	1.61	15.57
81	0.262	0.069	12.01	7190.716	84.80	83.75	6.15	13.27
82	0.247	0.061	10.68	6390.921	79.94	79.17	10.73	11.13
83	0.232	0.054	9.42	5638.265	75.09	74.53	15.37	9.15
84	0.217	0.047	8.24	4932.749	70.23	69.85	20.05	7.34
85	0.202	0.041	7.14	4274.372	65.38	65.13	24.77	5.70
86	0.187	0.035	6.12	3663.134	60.52	60.38	29.52	4.22
87	0.172	0.030	5.18	3099.035	55.67	55.59	34.31	2.91
88	0.156	0.024	4.26	2549.287	50.49	50.46	39.44	1.76
89	0.141	0.020	3.48	2082.609	45.64	45.63	44.27	0.80
90	0.126	0.016	2.78	1663.070	40.78	40.78	49.12	0.00

**Exhibit A-9**  
*Area of Predicted Contour Based Interference*

