

ENGINEERING REPORT RE
APPLICATION IN SUPPORT OF CONSTRUCTION PERMIT
FOR REPACKED FACILITIES PURSUANT TO DA 17-314
WMEA-DT, BIDDEFORD, MAINE
CHANNEL 36 42.1 KW 231 METERS

JULY 2017

COHEN, DIPPELL AND EVERIST, P.C.
CONSULTING ENGINEERS
RADIO AND TELEVISION
WASHINGTON, D.C.

COHEN, DIPPELL AND EVERIST, P. C.

City of Washington)
) ss
District of Columbia)

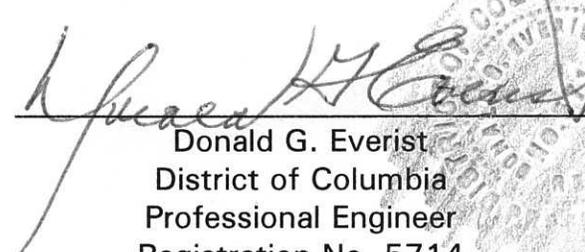
Donald G. Everist, being duly sworn upon his oath, deposes and states that:

He is a graduate electrical engineer, a Registered Professional Engineer in the District of Columbia, and is President, Secretary and Treasurer of Cohen, Dippell and Everist, P.C., Consulting Engineers, Radio - Television, with offices at 1420 N Street, N.W., Suite One, Washington, D.C. 20005;

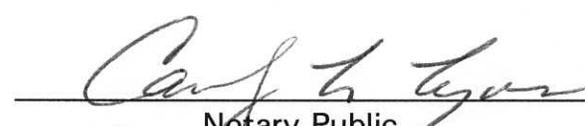
That his qualifications are a matter of record in the Federal Communications Commission;

That the attached engineering report was prepared by him or under his supervision and direction and

That the facts stated herein are true of his own knowledge, except such facts as are stated to be on information and belief, and as to such facts he believes them to be true.


Donald G. Everist
District of Columbia
Professional Engineer
Registration No. 5714

Subscribed and sworn to before me this 10th day of July, 2017.


Notary Public

My Commission Expires: 2/28/2018



Introduction

This engineering report has been prepared on behalf of Maine Public Broadcasting Corporation, licensee of TV station WMEA-TV, Biddeford, Maine, in support of its application for construction permit for repacked facilities pursuant to DA 17-314. At present, WMEA-TV operates on digital Channel 45 with 50 kW effective radiated power ("ERP") and 231 meters antenna height above average terrain ("HAAT").

WMEA-TV has been allotted Channel 36 in the incentive auction repack with 42.1 kW maximum ERP and 231 meters HAAT from its digital Channel 45 antenna site. It is proposed to operate WMEA-TV on Channel 36 with a directional ERP of 42.1 kW at 231 meters HAAT.

Antenna Site

It is proposed to install the Channel 36 DTV antenna at the same location as the existing Channel 45 antenna on the existing tower. The geographic coordinates (NAD-27) of the existing tower are as follows.

North Latitude: 43° 25' 00"

West Longitude: 70° 48' 17"

NAD-27

North Latitude: 43° 25' 00.3"

West Longitude: 70° 48' 15.2"

NAD-83

The following data shows the pertinent information concerning the proposed DTV operation.

Antenna and Elevation Data

Antenna:	Dielectric	Model TFU-18ETT-R S240
	Beam Tilt	0.75 degrees electrical

Elevation of the site above mean sea level:	192.2 meters (629.9 feet)
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Elevation of the top of supporting structure: above ground	163.3 meters (535.8 feet)
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Elevation of the top of existing structure: above mean sea level	355.3 meters (1165.7 feet)
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Height of DTV antenna radiation center: meters above ground	157.4 meters (516.4 feet)
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Height of DTV antenna radiation center: above mean sea level	349.4 meters (1146.3 feet)
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Height of DTV antenna radiation center: above average terrain	231 meters
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The attached Exhibit E-1 shows a vertical sketch of the proposed WMEA-TV antenna supporting structure. The FCC tower registration number is 1037792.

Topographic Data

The average elevation data of the eight cardinal and other radials, from 3.2 to 16.1 kilometers has been previously established.

Contour Data

Utilizing the formula in Section 73.625(b)(2) for the effective heights shown on the attached tabulation, the depression angle A_h , for each azimuth has been calculated. The maximum radiation values has been used to calculate ERP where the vertical radiation pattern at these angles is greater than 90% of the maximum.

The distances along each radial to the limits of F(50,90) 48 and 40.848 dBu contours were determined as specified in Section 73.625(b) by reference to the propagation data for Channels 14-69, as published by the Commission in Figures 10b and 10c, Section 73.699 of its rules.

The distances along the radials spaced every ten degrees to the 48 and 40.858 dBu contours, the average elevations, and the effective antenna heights are included on the attached tabulation (Table I). The 48 and 40.858 dBu contours determined from these distances are shown on the attached map (Exhibit E-3).

Exhibit E-4 provides a comparison of the current noise limited contour in relation to that proposed.

Environmental Statement

An evaluation has been made to determine compliance with the Commission's specified standards for human exposure to RF fields as set forth in the OET Bulletin No. 65 dated August 1997.

The RFF contribution of each station will be calculated using the following formula:

$$S = \frac{33.4(F^2) \text{ Total ERP}}{R^2}$$

where:

S = power density in $\mu\text{W}/\text{cm}^2$

F = relative field factor

Total ERP = ERP Horizontal Polarization + ERP Vertical Polarization

R = RCAGL - 2 meters

ERP = RMS ERP in watts for DTV Stations

WMEA-TV proposes to operate with a maximum effective radiated power of 42.1 kW and a radiation center of 157.4 meters above ground level. The TV antenna relative field factor is 0.125 in the downward direction (10° to 90°). It is calculated that proposed operation would have less than one microwatts per square centimeter ($\mu\text{W}/\text{cm}^2$) RF field at 2 meters above the base of tower. The Commission's MPE guidelines for Channel 36 (602-608 MHz) TV operation are [2,017] $\mu\text{W}/\text{cm}^2$ for the occupational/controlled and 403 $\mu\text{W}/\text{cm}^2$ for the general population/uncontrolled environment. The computed RF field due to the proposed operation would be less than one percent of the MPE for the general population/uncontrolled environment.

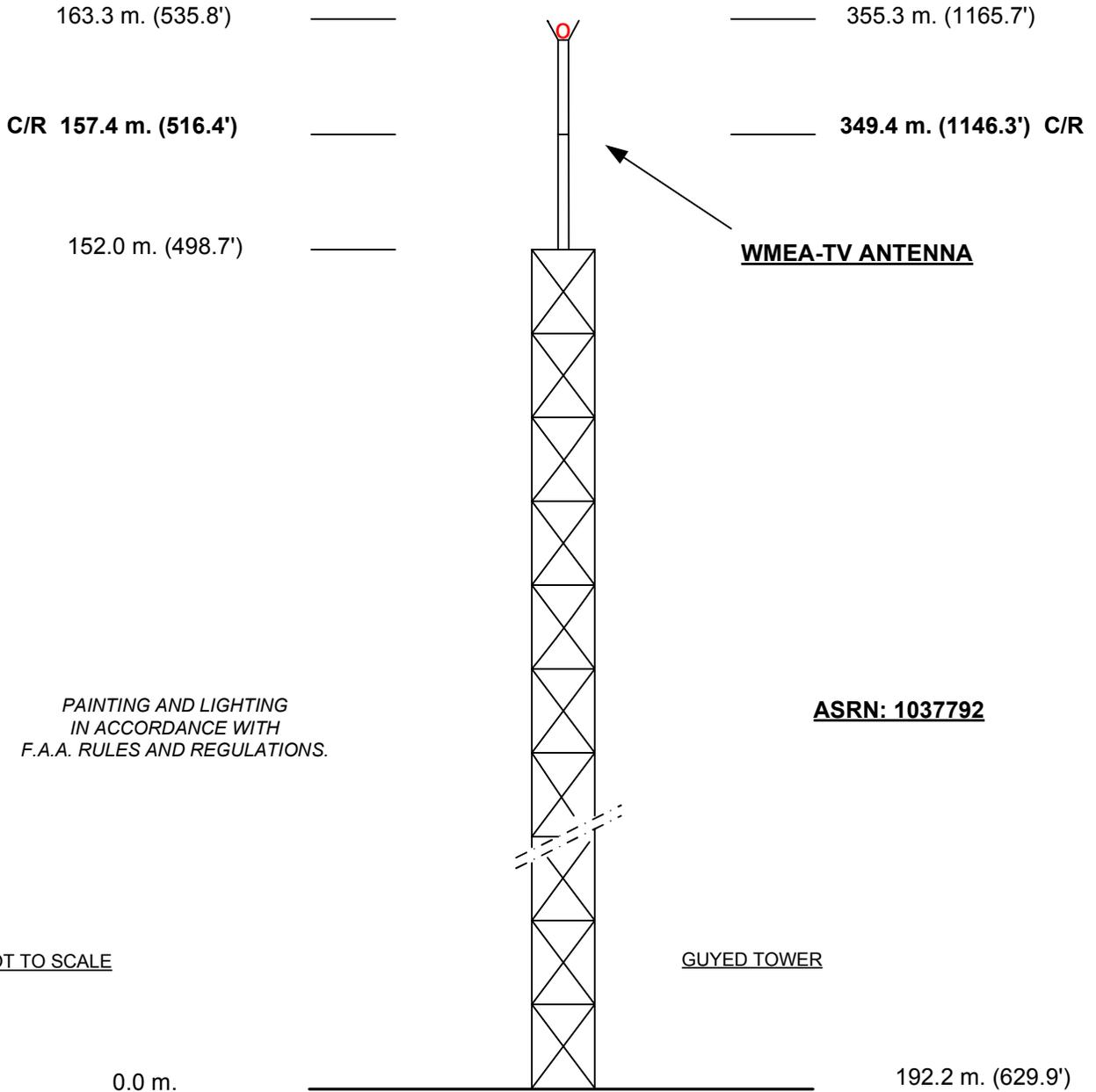
Therefore, members of the public and personnel working around the proposed TV facility would not be exposed to RF fields exceeding the Commission's guidelines. With respect to work performed on the tower, station WMEA-TV in coordination with other communication operations that may be on the tower will establish procedures to ensure that workers are not exposed to RF fields above the Commission's guidelines, by reducing or turning off the power, as appropriate.

For the reasons stated above, it is believed this proposal complies with Section 1.1307(a) and (b) of the Commission's Rules; therefore, under Section 1.1306, it is categorically excluded from the environmental processing.

- (a)(8) The existing tower lighting will remain unchanged.
- (b) Workers and the general public will not be subjected to RFF levels in excess of the current FCC guidelines contained in OET Bulletin 65 (Edition 97-01) and Supplement A. Authorized personnel will be alerted to areas of the antennas where potential radiation levels are in excess of the FCC guidelines. A security fence with a locked gate precludes access to the tower site.

ABOVE GROUND

ABOVE MEAN SEA LEVEL



PAINTING AND LIGHTING
IN ACCORDANCE WITH
F.A.A. RULES AND REGULATIONS.

ASRN: 1037792

NOT TO SCALE

GUYED TOWER

EXHIBIT E - 1
VERTICAL SKETCH
FOR THE REPACKING OPERATION OF
WMEA-TV, BIDDEFORD, MAINE
CHANNEL 36 42.1 kW ERP 231 METERS HAAT
JUNE 2017

EXHIBIT E-2

ANTENNA MANUFACTURER DATA



Antenna Model:

TFU-18ETT-R S240

Proposal Number: **C-70886**
Date: **15-Jun-17**
Customer: **Maine PBS**
Location: **Biddeford, ME**

Electrical Specifications

Polarization: **Horizontal**
Azimuth Pattern: **Directional**
Antenna Input: **3-1/8" 50 Ohm EIA/DCA**
VSWR: **Channel 1.08 : 1**
Bandwidth: **6 MHz**
Rated Input Power: **5 kW (6.99 dBk) Maximum Average Power**

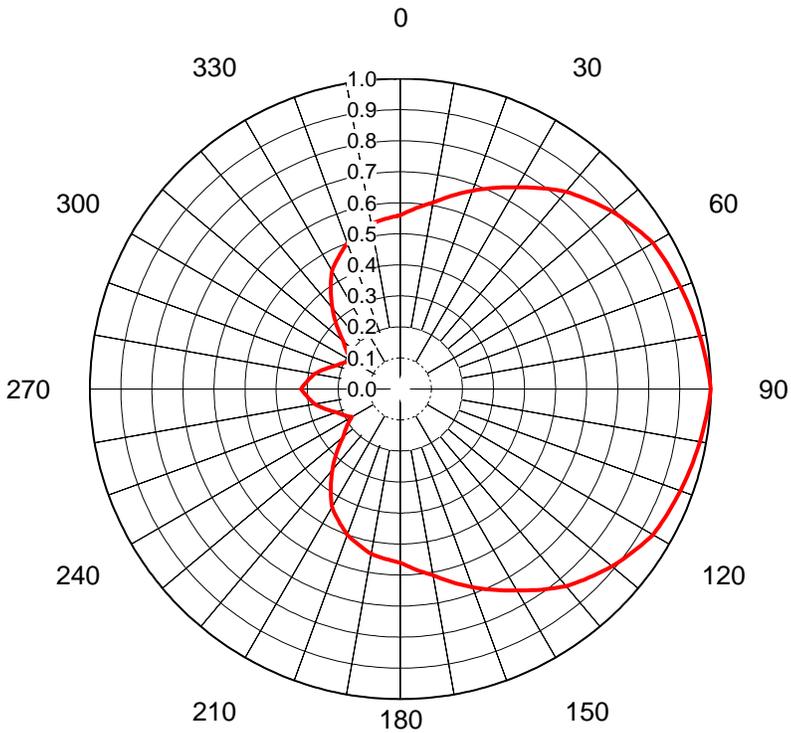
Mechanical Specifications

Mounting: **Top Mounted**
Environmental Protection: **Full Radome**
Height: **33.7 ft (10.3m)** less Lightning Protector **37.7 ft (11.5m)** with Lightning Protector
Weight: **5050 lb (2.3t)** Excludes Mounts
Effective Projected Area: **35.3 ft² (3.3m²) TIA-222-G** Basic Wind Speed: **100 m/h (160.9 km/h)**

Channel Specifications

Call	CH	Freq	Hpol ERP	TPO	Peak Main Lobe Hpol Gain	Peak at Horizontal Hpol Gain
WMEA	36	605 MHz	42.1 kW (16.24 dBk)	1.9 kW (2.73 dBk)	39.49 (15.97dB)	33.28 (15.22dB)

AZIMUTH PATTERN Horizontal Polarization



Proposal No. **C-70886**
 Date **15-Jun-17**
 Call Letters **WMEA**
 Channel **36**
 Frequency **605 MHz**
 Antenna Type **TFU-18ETT-R S240**
 Gain **2.38 (3.76dB)**
 Calculated

Deg	Value																		
0	0.560	36	0.798	72	0.964	108	0.964	144	0.798	180	0.560	216	0.380	252	0.232	288	0.232	324	0.380
1	0.565	37	0.806	73	0.966	109	0.962	145	0.790	181	0.558	217	0.370	253	0.238	289	0.226	325	0.390
2	0.570	38	0.814	74	0.968	110	0.960	146	0.782	182	0.556	218	0.360	254	0.244	290	0.220	326	0.400
3	0.575	39	0.822	75	0.970	111	0.958	147	0.774	183	0.554	219	0.350	255	0.250	291	0.216	327	0.410
4	0.580	40	0.830	76	0.972	112	0.956	148	0.766	184	0.552	220	0.340	256	0.256	292	0.212	328	0.420
5	0.585	41	0.836	77	0.974	113	0.954	149	0.758	185	0.550	221	0.330	257	0.262	293	0.208	329	0.430
6	0.590	42	0.842	78	0.976	114	0.952	150	0.750	186	0.548	222	0.320	258	0.268	294	0.204	330	0.440
7	0.595	43	0.848	79	0.978	115	0.950	151	0.743	187	0.546	223	0.310	259	0.274	295	0.200	331	0.446
8	0.600	44	0.854	80	0.980	116	0.948	152	0.736	188	0.544	224	0.300	260	0.280	296	0.196	332	0.452
9	0.605	45	0.860	81	0.982	117	0.946	153	0.729	189	0.542	225	0.290	261	0.284	297	0.192	333	0.458
10	0.610	46	0.866	82	0.984	118	0.944	154	0.722	190	0.540	226	0.280	262	0.288	298	0.188	334	0.464
11	0.617	47	0.872	83	0.986	119	0.942	155	0.715	191	0.536	227	0.270	263	0.292	299	0.184	335	0.470
12	0.624	48	0.878	84	0.988	120	0.940	156	0.708	192	0.532	228	0.260	264	0.296	300	0.180	336	0.476
13	0.631	49	0.884	85	0.990	121	0.935	157	0.701	193	0.528	229	0.250	265	0.300	301	0.186	337	0.482
14	0.638	50	0.890	86	0.992	122	0.930	158	0.694	194	0.524	230	0.240	266	0.304	302	0.192	338	0.488
15	0.645	51	0.895	87	0.994	123	0.925	159	0.687	195	0.520	231	0.234	267	0.308	303	0.198	339	0.494
16	0.652	52	0.900	88	0.996	124	0.920	160	0.680	196	0.516	232	0.228	268	0.312	304	0.204	340	0.500
17	0.659	53	0.905	89	0.998	125	0.915	161	0.673	197	0.512	233	0.222	269	0.316	305	0.210	341	0.504
18	0.666	54	0.910	90	1.000	126	0.910	162	0.666	198	0.508	234	0.216	270	0.320	306	0.216	342	0.508
19	0.673	55	0.915	91	0.998	127	0.905	163	0.659	199	0.504	235	0.210	271	0.316	307	0.222	343	0.512
20	0.680	56	0.920	92	0.996	128	0.900	164	0.652	200	0.500	236	0.204	272	0.312	308	0.228	344	0.516
21	0.687	57	0.925	93	0.994	129	0.895	165	0.645	201	0.494	237	0.198	273	0.308	309	0.234	345	0.520
22	0.694	58	0.930	94	0.992	130	0.890	166	0.638	202	0.488	238	0.192	274	0.304	310	0.240	346	0.524
23	0.701	59	0.935	95	0.990	131	0.884	167	0.631	203	0.482	239	0.186	275	0.300	311	0.250	347	0.528
24	0.708	60	0.940	96	0.988	132	0.878	168	0.624	204	0.476	240	0.180	276	0.296	312	0.260	348	0.532
25	0.715	61	0.942	97	0.986	133	0.872	169	0.617	205	0.470	241	0.184	277	0.292	313	0.270	349	0.536
26	0.722	62	0.944	98	0.984	134	0.866	170	0.610	206	0.464	242	0.188	278	0.288	314	0.280	350	0.540
27	0.729	63	0.946	99	0.982	135	0.860	171	0.605	207	0.458	243	0.192	279	0.284	315	0.290	351	0.542
28	0.736	64	0.948	100	0.980	136	0.854	172	0.600	208	0.452	244	0.196	280	0.280	316	0.300	352	0.544
29	0.743	65	0.950	101	0.978	137	0.848	173	0.595	209	0.446	245	0.200	281	0.274	317	0.310	353	0.546
30	0.750	66	0.952	102	0.976	138	0.842	174	0.590	210	0.440	246	0.204	282	0.268	318	0.320	354	0.548
31	0.758	67	0.954	103	0.974	139	0.836	175	0.585	211	0.434	247	0.208	283	0.262	319	0.330	355	0.550
32	0.766	68	0.956	104	0.972	140	0.830	176	0.580	212	0.428	248	0.212	284	0.256	320	0.340	356	0.552
33	0.774	69	0.958	105	0.970	141	0.822	177	0.575	213	0.410	249	0.216	285	0.250	321	0.350	357	0.554
34	0.782	70	0.960	106	0.968	142	0.814	178	0.570	214	0.400	250	0.220	286	0.244	322	0.360	358	0.556
35	0.790	71	0.962	107	0.966	143	0.806	179	0.565	215	0.390	251	0.226	287	0.238	323	0.370	359	0.558

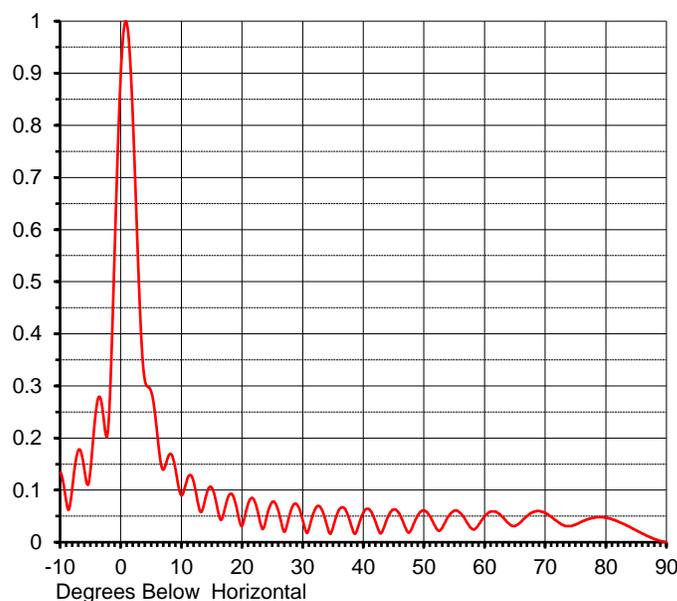
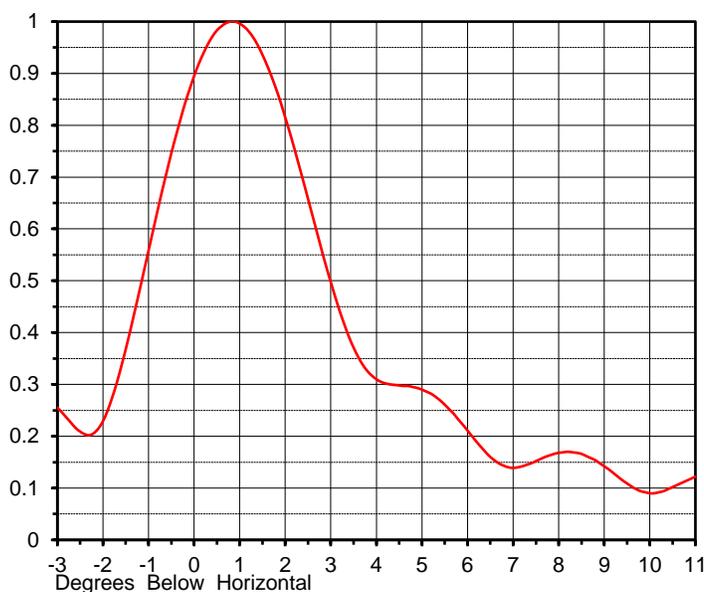
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ELEVATION PATTERN

Proposal No. **C-70886**
 Date **15-Jun-17**
 Call Letters **WMEA**
 Channel **36**
 Frequency **605 MHz**
 Antenna Type **TFU-18ETT-R S240**

RMS Directivity at Main Lobe **16.6 (12.20 dB)**
 RMS Directivity at Horizontal **14.0 (11.46 dB)**
Calculated

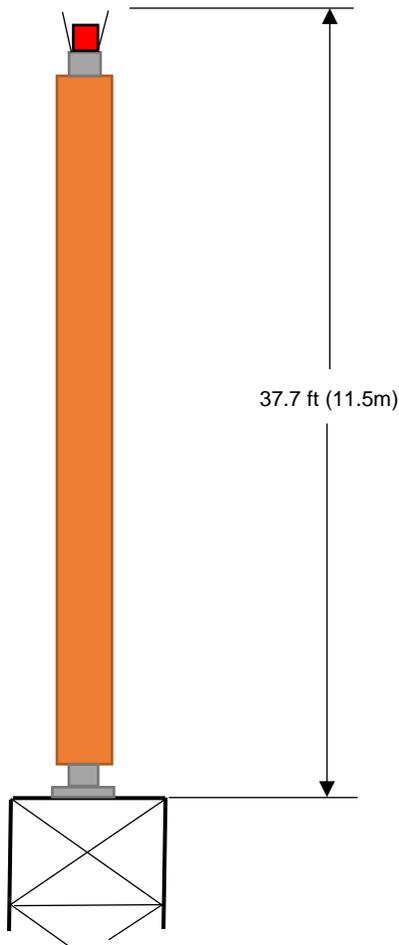
Beam Tilt **0.75 deg**
 Pattern Number **18E166075**



Angle	Field								
-10.0	0.134	10.0	0.090	30.0	0.039	50.0	0.061	70.0	0.056
-9.0	0.073	11.0	0.125	31.0	0.028	51.0	0.048	71.0	0.048
-8.0	0.113	12.0	0.113	32.0	0.064	52.0	0.026	72.0	0.039
-7.0	0.178	13.0	0.059	33.0	0.064	53.0	0.029	73.0	0.032
-6.0	0.132	14.0	0.090	34.0	0.029	54.0	0.050	74.0	0.031
-5.0	0.149	15.0	0.103	35.0	0.032	55.0	0.061	75.0	0.034
-4.0	0.267	16.0	0.057	36.0	0.064	56.0	0.055	76.0	0.040
-3.0	0.246	17.0	0.061	37.0	0.062	57.0	0.038	77.0	0.044
-2.0	0.249	18.0	0.093	38.0	0.029	58.0	0.025	78.0	0.047
-1.0	0.597	19.0	0.067	39.0	0.028	59.0	0.035	79.0	0.048
0.0	0.918	20.0	0.033	40.0	0.058	60.0	0.051	80.0	0.047
1.0	0.990	21.0	0.077	41.0	0.062	61.0	0.059	81.0	0.044
2.0	0.786	22.0	0.078	42.0	0.037	62.0	0.057	82.0	0.039
3.0	0.468	23.0	0.034	43.0	0.020	63.0	0.047	83.0	0.034
4.0	0.305	24.0	0.050	44.0	0.049	64.0	0.035	84.0	0.028
5.0	0.286	25.0	0.078	45.0	0.063	65.0	0.032	85.0	0.022
6.0	0.200	26.0	0.056	46.0	0.051	66.0	0.040	86.0	0.016
7.0	0.140	27.0	0.021	47.0	0.024	67.0	0.051	87.0	0.011
8.0	0.169	28.0	0.062	48.0	0.029	68.0	0.058	88.0	0.006
9.0	0.136	29.0	0.072	49.0	0.053	69.0	0.060	89.0	0.002
								90.0	0.000

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MECHANICAL SPECIFICATIONS



Proposal No. **C-70886**
 Date **15-Jun-17**
 Call Letters **WMEA**
 Channel **36**
 Frequency **605 MHz**
 Antenna Type **TFU-18ETT-R S240**

Preliminary Specifications

Top Mounted

With ice TIA-222-G

Basic Wind Speed 100 m/h (160.9 km/h)

Structure Class II

Exposure Category C

Topography Category 3

Height of Crest 200 ft (61 m)

Design Ice 1 in $t_{iz} = 2.74$ in

Wind Speed w/Ice 40 m/h (64.4 km/h)

Mechanical Specifications

		without ice	with ice
Height with Lightning Protector	H4	37.7 ft (11.5m)	
Height less Lightning Protector	H2	33.7 ft (10.3m)	
Height of Center of Radiation	H3	16.85 ft (5.1m)	
Effective Projected Area	(EPA) _S	35.3 ft ² (3.3m ²)	106.7 ft ² (9.9m ²)
Moment Arm	D1	18.6 ft (5.7m)	19.8 ft (6m)

Weight W 5050 lb (2.3t) 8550 lb (3.9t)

Antenna designed in accordance with AISC specifications for design of structural steel as prescribed by TIA-222-G

Prepared by: KLP

Date: 15-Jun-17

ME: SPJC

EE:

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Summary

Proposal No.	C-70886
Date	15-Jun-17
Call Letters	WMEA
Channel	36
Frequency	605 MHz
Antenna Type	TFU-18ETT-R S240

Antenna

		Hpol	
ERP:	42.1 kW	(16.24 dBk)	
Peak Gain*	39.49	(15.97 dB)	

Antenna Input Power	1.1 kW	(0.29 dBk)
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Transmission Line

Type:	Flexline Air	Attenuation:	(2.43 dB)
Size:	3"	Efficiency:	57.1%
Impedance:	50 Ohm		
Length:	595 ft	181.4 m	

Transmitter Output

1.9 kW	(2.73 dBk)
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Transmitter filter losses not included

* Directivity and Gain are with respect to half wave dipole. The gain includes feed system losses

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TABLE I
COMPUTED COVERAGE DATA
FOR THE PROPOSED DTV OPERATION OF
WMEA-TV, BIDDEFORD, MAINE
CHANNEL 36 42.1 KW ERP 231 METERS HAAT
JULY 2017

<u>Radial</u> <u>Bearing</u> (N ° E, T)	<u>Average*</u>	<u>Effective</u> <u>Height</u> meters	<u>Depression</u> <u>Angle</u> degrees	<u>Effective</u> <u>Radiated</u> <u>Power</u> kW	<u>Distance to Contour F(50/90)</u>	
	<u>Elevation</u> <u>3.2 to 16.1 km</u> meters				<u>48 dBu</u> <u>City Grade</u> km	<u>40.858 dBu</u> <u>Noise-Limited</u> km
0	187.9	161.5	0.352	13.20	50.3	58.2
10	167.3	182.1	0.374	15.66	52.4	60.4
20	146.6	202.8	0.394	19.47	54.7	62.8
30	125.9	223.5	0.414	23.68	56.9	65.2
40	105.2	244.2	0.433	29.00	59.2	67.7
50	91.6	257.8	0.445	33.35	60.8	69.3
60	85.1	264.3	0.450	37.20	61.8	70.3
70	78.5	270.9	0.456	38.80	62.4	71.0
80	72.0	277.4	0.461	40.43	63.0	71.7
90	65.4	284.0	0.467	42.10	63.6	72.4
100	66.5	282.9	0.466	40.43	63.4	72.1
110	67.6	281.8	0.465	38.80	63.1	71.8
120	68.8	280.6	0.464	37.20	62.8	71.5
130	69.9	279.5	0.463	33.35	62.1	70.8
140	73.0	276.4	0.461	29.00	61.2	69.9
150	78.1	271.3	0.456	23.68	59.8	68.4
160	83.2	266.2	0.452	19.47	58.5	67.1
170	88.3	261.1	0.448	15.66	57.1	65.6
180	93.4	256.0	0.443	13.20	55.9	64.4
190	92.2	257.2	0.444	12.28	55.6	64.1
200	91.0	258.4	0.445	10.52	54.8	63.4
210	89.8	259.6	0.446	8.15	53.6	62.1
220	88.5	260.9	0.447	4.87	50.9	59.5
230	95.3	254.1	0.442	2.43	47.0	55.5
240	110.0	239.4	0.429	1.36	43.2	51.7
250	124.7	224.7	0.415	2.04	44.5	52.9
260	139.4	210.0	0.401	3.30	46.2	54.5
270	154.1	195.3	0.387	4.31	46.7	54.9

TABLE I
COMPUTED COVERAGE DATA
FOR THE PROPOSED DTV OPERATION OF
WMEA-TV, BIDDEFORD, MAINE
CHANNEL 36 42.1 KW ERP 231 METERS HAAT
JULY 2017

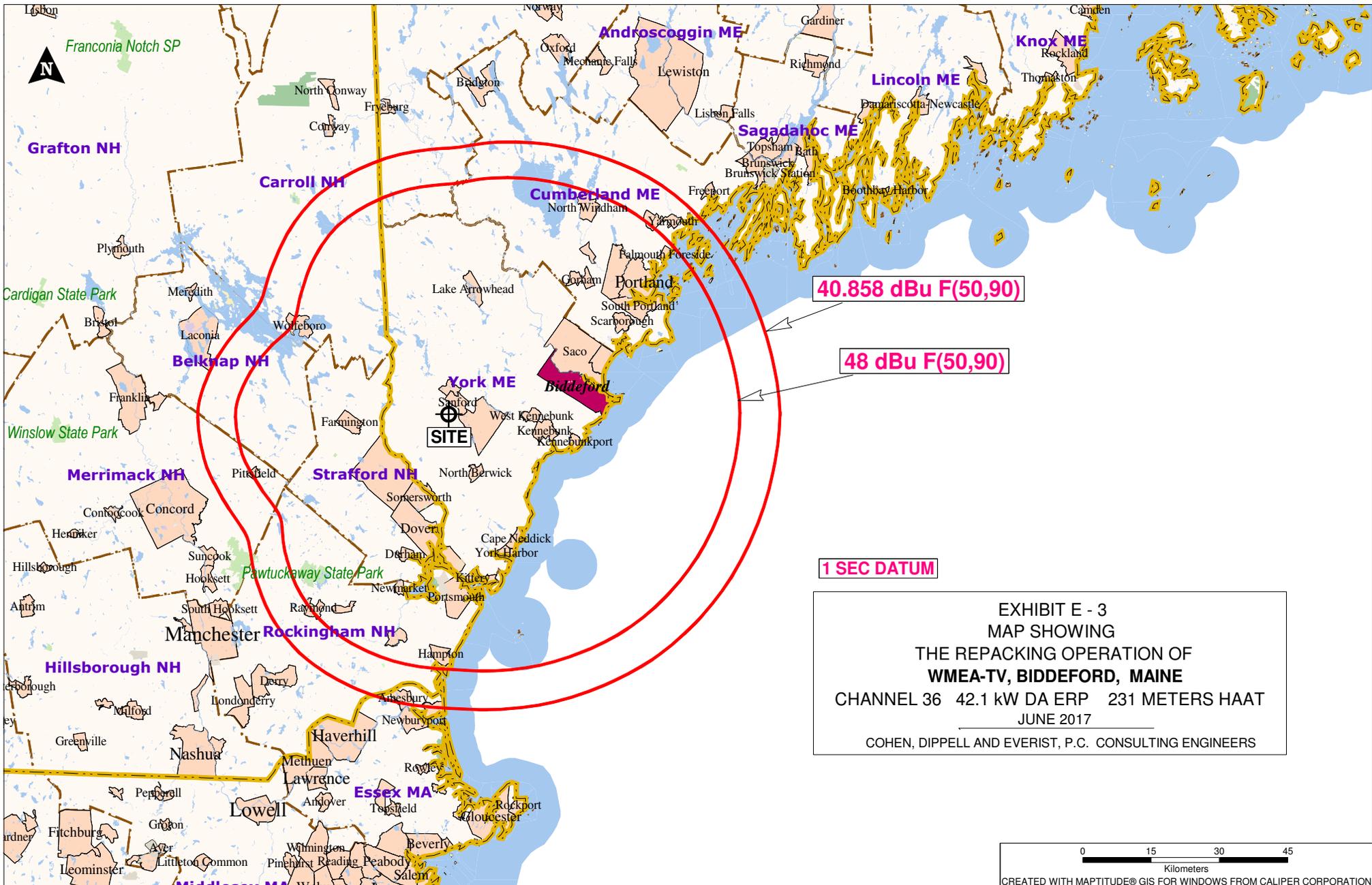
<u>Radial Bearing</u> (N ° E, T)	<u>Average*</u> <u>Elevation</u> <u>3.2 to 16.1 km</u> meters	<u>Effective</u> <u>Height</u> meters	<u>Depression</u> <u>Angle</u> degrees	<u>Effective</u> <u>Radiated</u> <u>Power</u> kW	<u>Distance to Contour F(50/90)</u>	
					<u>48 dBu</u> <u>City Grade</u> km	<u>40.858 dBu</u> <u>Noise-Limited</u> km
280	162.0	187.4	0.379	3.30	44.9	53.2
290	169.8	179.6	0.371	2.04	41.9	50.3
300	177.6	171.8	0.363	1.36	39.3	47.8
310	185.4	164.0	0.355	2.43	41.9	50.2
320	189.2	160.2	0.351	4.87	45.2	53.4
330	188.9	160.5	0.351	8.15	47.8	55.8
340	188.6	160.8	0.351	10.52	49.2	57.1
350	188.2	161.2	0.352	12.28	49.9	57.8

*Based on data from FCC one-second data base.

DTV Channel 36 (602-608 MHz)
 Average Elevation 3.2 to 16.1 km 118 meters AMSL
 Center of Radiation 349.4 meters AMSL
 Effective Radiated Power 42.1 kW (16.2 dBk) Max.
 Antenna Height Above Average Terrain 231 meters

North Latitude: 43° 25' 00"
 West Longitude: 70° 48' 17"

(NAD-27)

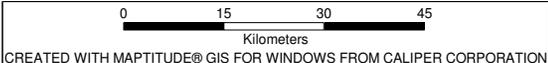


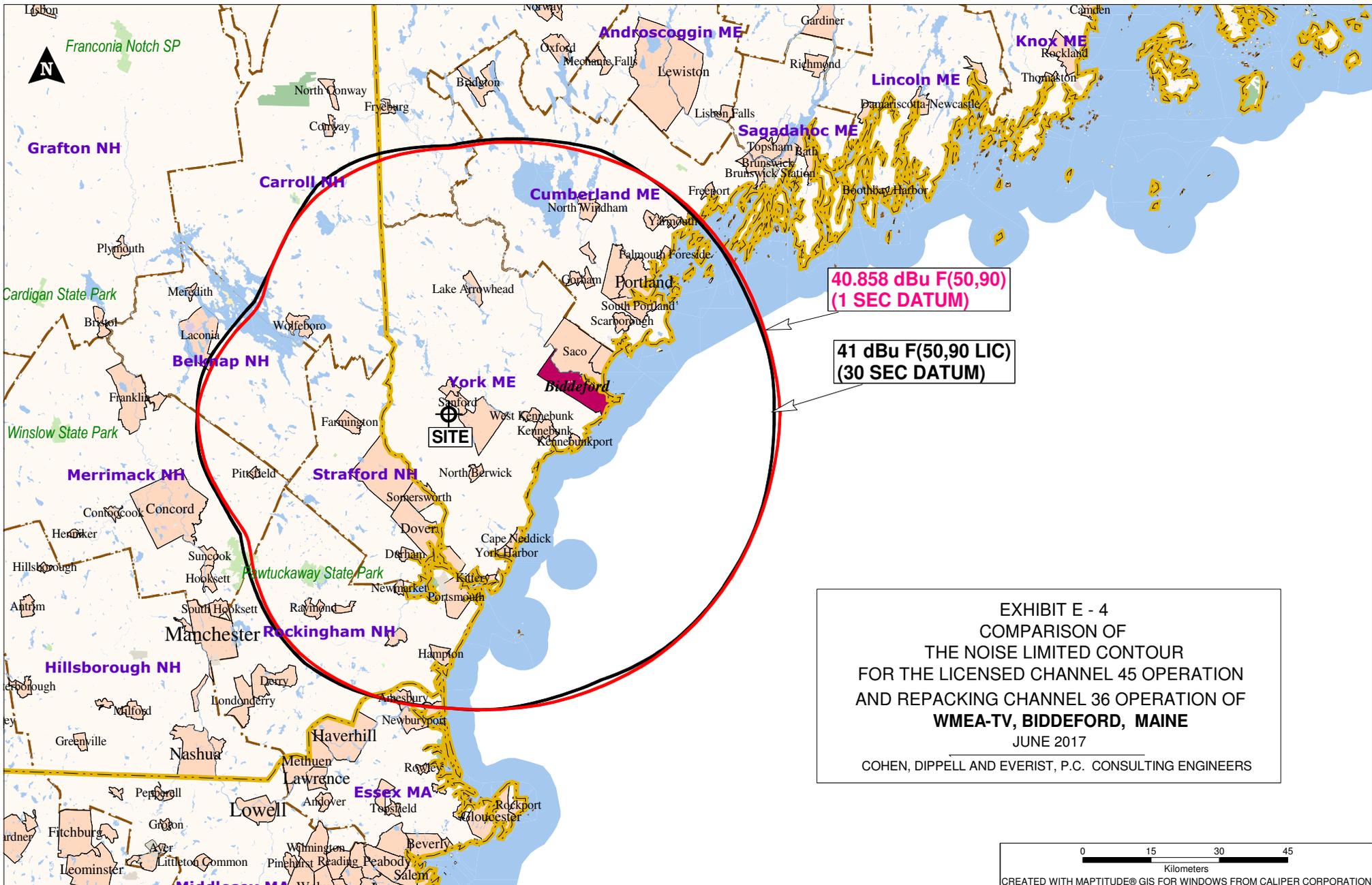
40.858 dBu F(50,90)

48 dBu F(50,90)

1 SEC DATUM

EXHIBIT E - 3
 MAP SHOWING
 THE REPACKING OPERATION OF
WMEA-TV, BIDDEFORD, MAINE
 CHANNEL 36 42.1 kW DA ERP 231 METERS HAAT
 JUNE 2017
 COHEN, DIPPELL AND EVERIST, P.C. CONSULTING ENGINEERS





40.858 dBu F(50,90)
(1 SEC DATUM)

41 dBu F(50,90 LIC)
(30 SEC DATUM)

EXHIBIT E - 4
COMPARISON OF
THE NOISE LIMITED CONTOUR
FOR THE LICENSED CHANNEL 45 OPERATION
AND REPACKING CHANNEL 36 OPERATION OF
WMEA-TV, BIDDEFORD, MAINE
JUNE 2017
COHEN, DIPPELL AND EVERIST, P.C. CONSULTING ENGINEERS

