

# Comprehensive Engineering Statement

prepared for

## **Maine Public Broadcasting Corporation**

WMEM(FM) Presque Isle, ME

Facility ID 39661

Ch. 291C0 90 kW 344 m HAAT

*Maine Public Broadcasting Corporation* (“MPB”) is the licensee of WMEM(FM), Channel 291C, Presque Isle, Maine, (FCC Facility ID 39661, FCC File Number BMLED-20020725AAZ). MPB herein proposes to correct the coordinates of the WMEM(FM) transmitter site to specify 46° 33’ 02.7” N Latitude and 67° 48’ 32.7” W Longitude (NAD83), increase the antenna height on the same tower, and change the Station Class from a Class C to a Class C0 as a minor modification per Section 73.3573 (a)(1)(ii) of the Commission’s Rules. A Height Above Average Terrain (“HAAT”) of 344 meters is being specified herein.

### HAAT, Class, City of License Coverage and Allotment Point

The coordinate correction represents a horizontal move of 126 meters and a change of 3.4 seconds Latitude and 3.3 seconds Longitude. This is slightly greater than the 3 seconds specified in §73.1690(b)(2) of the rules, requiring a Construction Permit. With the coordinate change, a new HAAT calculation has been performed. **Figure 1A** demonstrates that the proposed transmitter site is located only 1.9 km from the US-Canadian border. The eight standard radials are shown, including the 315 degree radial which crosses through the city of Presque Isle, ME. **Figure 1B** is a closer view of the radials, including 3 km and 16 km circles, demonstrating that the 45, 90 and 135 degree radial segments are completely outside the United States border. Thus, these radials are dropped from the HAAT calculation as described in §73.313(d) of the Rules. The following table summarizes the HAAT calculation.<sup>1</sup> As shown, the new HAAT calculation rounds to 344 meters above average terrain:

<b>Azimuth (degrees)</b>	<b>3-16 km Ave (m)</b>	<b>HAAT (m)</b>
0	204.4	327.2
180	166.0	365.6
225	174.3	357.3
270	186.5	345.1
315	205.5	326.1

**5 Radial Ave >> 344.3 m**

<sup>1</sup> The full details of each radial calculation can be made available to FCC staff upon request.

## Comprehensive Engineering Statement

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The instant proposal requests 90 kW ERP with an antenna HAAT of 344 meters. According to §73.210(b)(3)(iv) of the Rules, a Class C0 will have a contour distance between 72 km and 83 km. Using the FCC's FM Propagation Curves, the calculated contour distance is 74.6 km. Thus, the proposed facility is a Class C0.

**Figure 2A** shows that both the maximized 70 dB $\mu$  contour *and* the 59.1 km radius<sup>2</sup> contour cover the *entirety* of the city of Presque Isle, CO. **Figure 2B** provides a coverage map based on the proposed facility parameters. As demonstrated, the 70 dB $\mu$  contour completely encompasses Presque Isle.

### Allocation Considerations

A fully-spaced allotment point exists in that the same site location specified for operation will also satisfy the spacing requirements for Channel 291 Class C0. The proposed coordinate correction and allotment point is 46° 33' 02.7" N, 67° 48' 32.7" W (NAD83). **Figure 3** depicts the fully-spaced area with the proposed allotment point. There are no domestic short-spacings proposed herein. **Table I** provides a listing of the nearest co-channel and adjacent channel full service facilities. As shown, the proposal is fully spaced to all domestic facilities. Canadian allotment issues are discussed below.

### FCC Monitoring Station, International Considerations

The site is located 1.9 km from Canada and 3,478 km from the Mexican border. Both the license and the proposal are listed as being short-spaced to more than one Canadian allotment. The instant proposal has requested 90 kW at the current antenna height, which is almost exactly equivalent 60 dB $\mu$  coverage as the current license. However, both the first adjacent and co-channel interfering contours are slightly reduced from the current authorization due to the antenna height proposal. It is believed that the proposal should not cause any new interference within Canada. Considering the proposed changes, coordination with Canada appears to be required. International coordination is requested at the earliest possible convenience.

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<sup>2</sup> The 59.1 km class C0 radius was derived using the FCC's FM Curves tool, selecting F(50,50) Service Contour, 100 kW ERP, and 450 meters HAAT for a 70 dB $\mu$  Field strength.

## **Comprehensive Engineering Statement**

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The nearest FCC monitoring station is 254.4 km distant at Belfast, Maine. This distance exceeds the threshold minimum distance specified in Section 73.1030(c)(3) that would suggest consideration of the monitoring station. With respect to AM stations, according to information extracted from the Commission's Media Bureau database, there are no facilities less than 20 km from the proposed site.

### **Environmental Considerations**

*MPB* proposes to increase the antenna height of WMEM(FM) on an existing registered tower (ASR 1305284) located at the coordinates indicated above. The proposed antenna is a Dielectric model DCRM10CFE9R FM Antenna which is a 10-bay, 0.9 wavelength spaced, circularly polarized, omni-directional antenna. **Figure 4** depicts the vertical (elevation) pattern. The antenna will be mounted with a center of radiation at 45.7 m (150 ft) above ground level. The use of existing transmitting locations has been characterized as being environmentally preferable by the Commission, according to Note 1 of §1.1306 of the FCC Rules. Because no change in structure height is proposed, no change in current structure marking and lighting requirements is anticipated. Therefore, it is believed that this application may be categorically excluded from environmental processing pursuant to §1.1306 of the Commission's rules.

### **Human Exposure to Radiofrequency Radiation**

The proposed operation at this site was evaluated for human exposure to radiofrequency energy using the procedures outlined in the Commission's OET Bulletin No. 65 ("OET-65"). OET-65 describes a means of determining whether a proposed facility exceeds the radiofrequency exposure guidelines adopted in Section 1.1310. Under present Commission policy, a facility may be presumed to comply with the limits specified in Section 1.1310 if it satisfies the exposure criteria set forth in OET-65. Based upon that methodology, and as demonstrated in the following, the proposed transmitting system will comply with those guidelines.

The proposed facility will operate with an effective radiated power ("ERP") of 90 kW with the antenna center of radiation 45.7 meters above ground level. It will utilize a 10 bay, 0.9 wavelength, circularly polarized, omni directional antenna. The model DCR antenna is a 4-piece spiral design (EPA Type 5: Three-Piece or Four-Piece Spiral).

## Comprehensive Engineering Statement

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The formula used for calculating FM signal density in this analysis is essentially the same as equation (9) in OET-65.

$$S = (33.4098) (F2) (ERP) / D^2$$

Where:

S	=	power density in microwatts/cm <sup>2</sup>
F	=	relative field factor
ERP	=	total (average) ERP in Watts
D	=	distance in meters

The general population / uncontrolled maximum permitted exposure (“MPE”) limit specified in §1.1310 for 106.1 MHz is 200 µW/cm<sup>2</sup>. Using the FCC’s FM Model tool, the maximum calculated exposure level is 25.5 µW/cm<sup>2</sup>, or 12.75 percent of the general population / uncontrolled maximum permitted exposure (“MPE”) limit specified in §1.1310. At ground level locations away from the base of the tower, the calculated RF power density is even lower due to the increasing distance from the transmitting antenna.

Within 300 meters of the proposed site, the contributions to RF power density of other nearby facilities were also evaluated. Calculations for each facility were based on that facility’s ERP and antenna height above mean sea level as reported in the Commission’s engineering databases and its respective distance from the proposal. For each facility considered, the contribution to power density near the base of the proposal was calculated. The table below supplies a summary of calculated RF contributions from other known, authorized, non-excluded facilities, along with that of the proposal.

Summary of Radiofrequency Radiation Calculations - Nearby Facilities

Station	Channel	ERP (kW)	Polarization	Field	Distance (meters)	S - Calculated (µW/cm <sup>2</sup> )	S - Limit (µW/cm <sup>2</sup> )	% of Limit
WMEM(App)	291C0	90	C	FMM	--	25.5	200.0	12.8
New(FM) (CP)	204C3	1.8	C	FMM	--	6.8	200.0	3.4
WOZI(FM)	270C2	7.9	C	FMM	355	3.9	200.0	2.0
WQHR(FM)	241C	95	C	FMM	355	0.2	200.0	0.1

## Comprehensive Engineering Statement

(Continued)

WMEM-TV*	10	14.5	C	Calc	20.4	55.1	200.0	27.6
WAGM-TV*	28	100	E	Calc	55.6	20.7	371.3	5.6
WWPI-LD	16	15	E	0.26	55.6	25.4	323.3	7.9
<b>Total Calculated Signal Density(%):</b>								<b>59.4</b>

ERP: Effective Radiated Power  
Polarization: C - Circular; H – Horizontal; V – Vertical  
Field: Vertical Plane Field Value (from antenna manufacturer’s data)<sup>2</sup>  
Height: Height of radiation center above ground level  
S-Calculated: Calculated value of signal density at two meters above ground level  
(from formulae in OET-65)  
S-Limit: §1.1310 uncontrolled/general population limit for signal density

\*Notes: WMEM-TV calculations are based on a new application, which proposes to increase the RF exposure levels at 2 meters above ground.

WAGM-TV (application) Channel 28 calculations were included as a worst case since its proposal increases predicted RF exposure at ground levels.

The individual RF contributors are added together to predict a total maximum level of RF electromagnetic field at locations within 300 meters of the proposal. The table above indicates that the total “worst-case” exposure level would be 59.4 percent of the general population/uncontrolled MPE limit at any ground level location within 300 meters of the proposed facility. Since it is expected that these maximum levels would not occur at the same location, the total RF electromagnetic field at any point two meters above ground level would be less than 59.4 percent of the general population / uncontrolled MPE limit. Also, a number of the listed facilities utilize transmitting antennas which are directional in the horizontal plane. If the directional patterns were considered, the total RF power density would be even lower.

As shown, in no case will the human exposure to RF electromagnetic fields exceed the uncontrolled/general population MPE limit specified in §1.1310. Access to the supporting structure will be restricted and appropriate RF exposure warning signs will be posted.

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<sup>2</sup> For simplicity, circular polarization is assumed for FM and for Television facilities with Elliptical polarization. Actual relative field tabulation values, including ERP and distance from the tower were used where available (WMEM-TV and WAGM-TV). Manufacturer data indicates that the maximum relative field value between 5 and 90 degrees for the WWPI-LD antenna is 0.26. The FCC’s FM Model was used to calculate RF exposure levels near the proposal from other nearby FM stations.

## **Comprehensive Engineering Statement**

(Continued)

### **Safety of Tower Workers and the General Public**

Access to the compound, building and tower on which the antenna support structure will be located will be restricted to trained building service and station personnel. Consequently, members of the general public are not exposed to RF levels in excess of the Commission's guidelines. Additionally, appropriate RF exposure warning signs will continue to be posted.

With respect to worker safety, a site exposure policy will continue to be employed protecting maintenance workers from excessive exposure when work must be performed on or near the antenna structures in areas where high RF levels may be present. Such protective measures may include, but will not be limited to, placement of RF exposure warning signs on the antenna support structure, restriction of access to areas where levels in excess of the guidelines may be expected, power reduction, or the complete shutdown of facilities when work or inspections must be performed in areas where the exposure guidelines would otherwise be exceeded. On-site RF exposure measurements may also be undertaken to establish the bounds of safe working areas. The applicant will coordinate exposure procedures with other users of this site.

### **Conclusion**

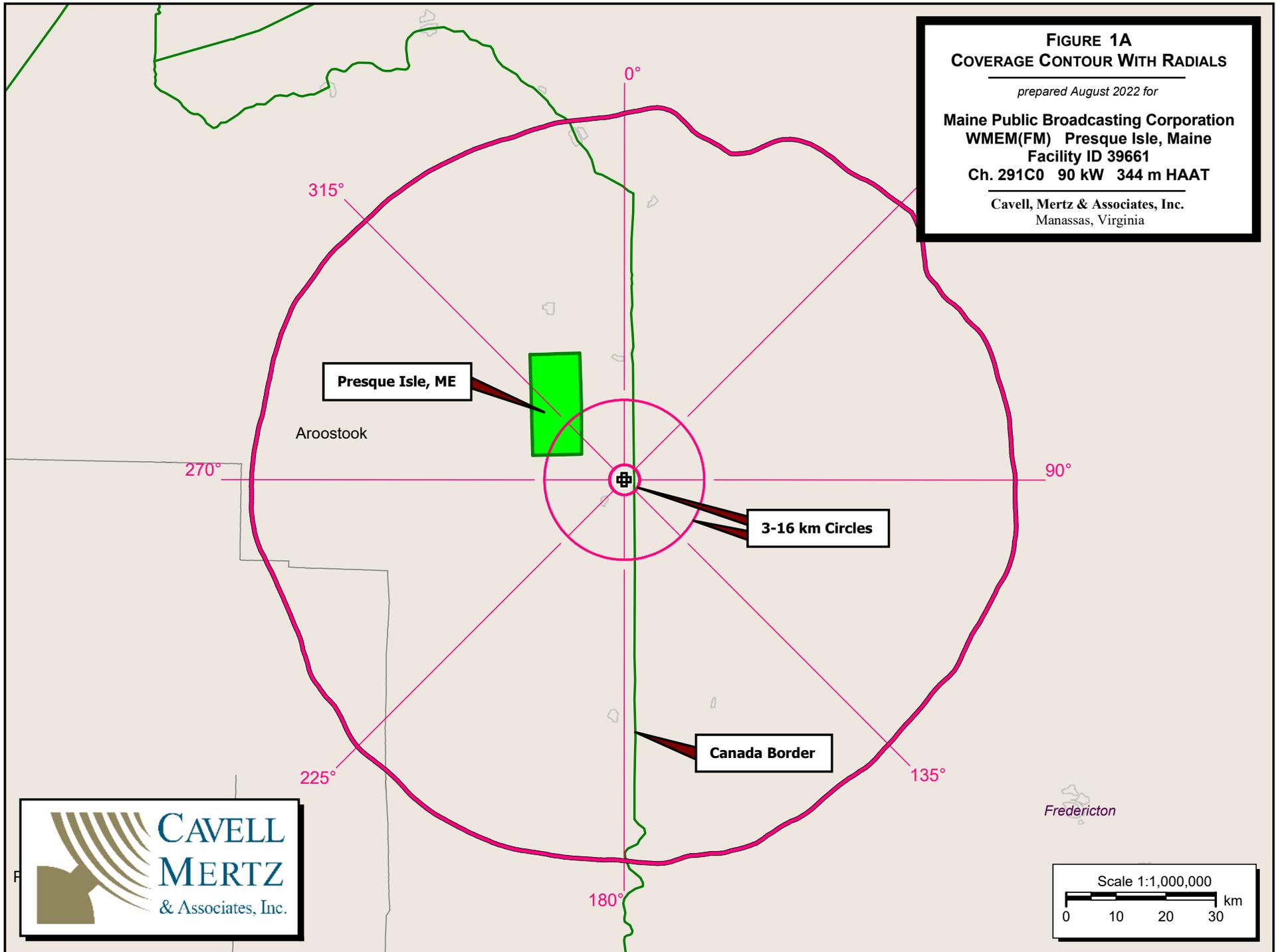
It is therefore believed that the proposed facility satisfies all of the pertinent Commission Rules and Policies now in effect.

**FIGURE 1A  
COVERAGE CONTOUR WITH RADIALS**

*prepared August 2022 for*

**Maine Public Broadcasting Corporation  
WMEM(FM) Presque Isle, Maine  
Facility ID 39661  
Ch. 291C0 90 kW 344 m HAAT**

**Cavell, Mertz & Associates, Inc.  
Manassas, Virginia**

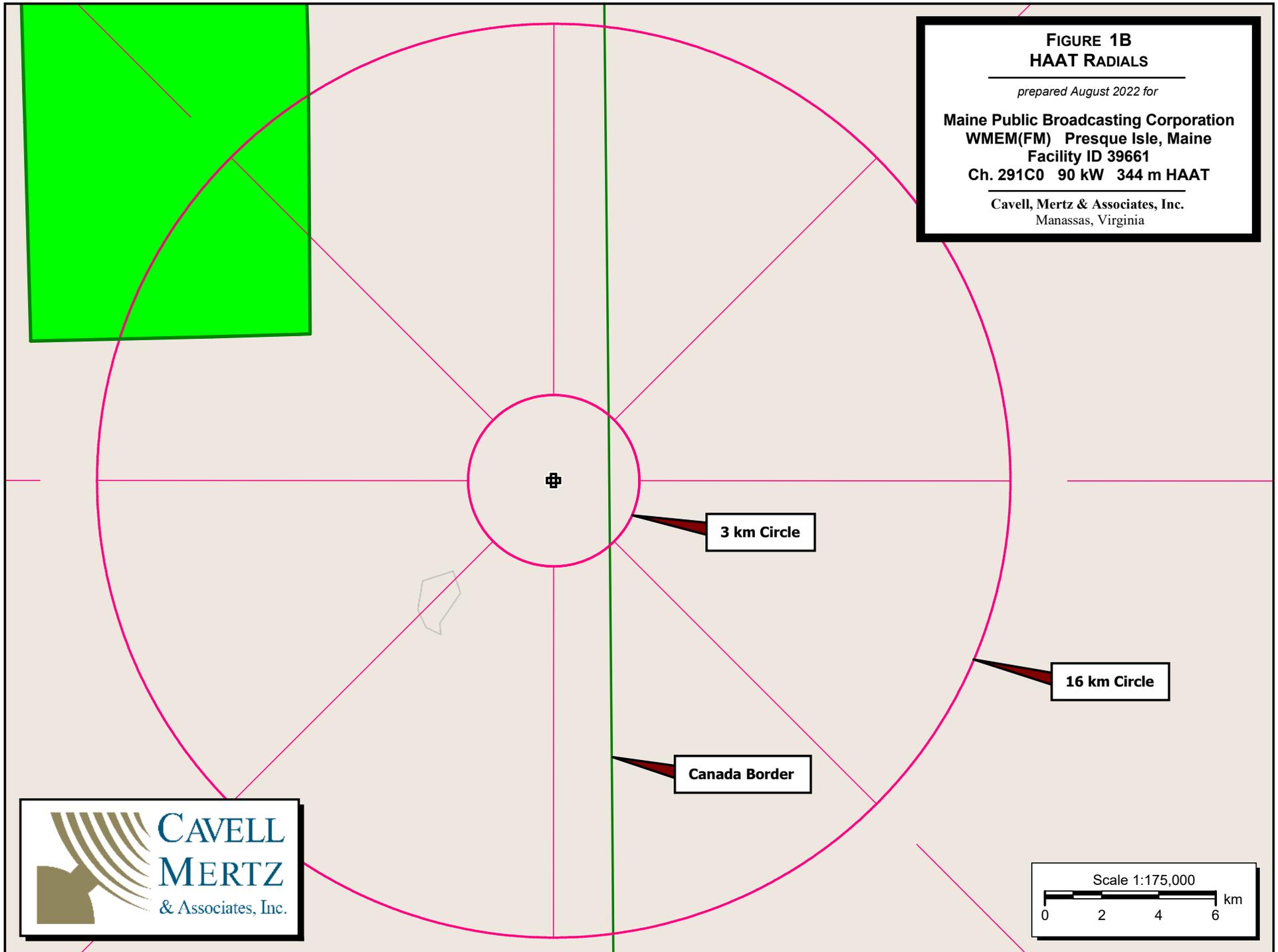


**FIGURE 1B  
HAAT RADIALS**

*prepared August 2022 for*

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WMEM(FM) Presque Isle, Maine  
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Ch. 291C0 90 kW 344 m HAAT**

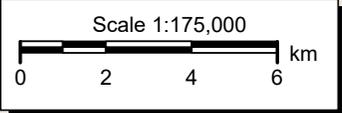
**Cavell, Mertz & Associates, Inc.  
Manassas, Virginia**



**3 km Circle**

**16 km Circle**

**Canada Border**

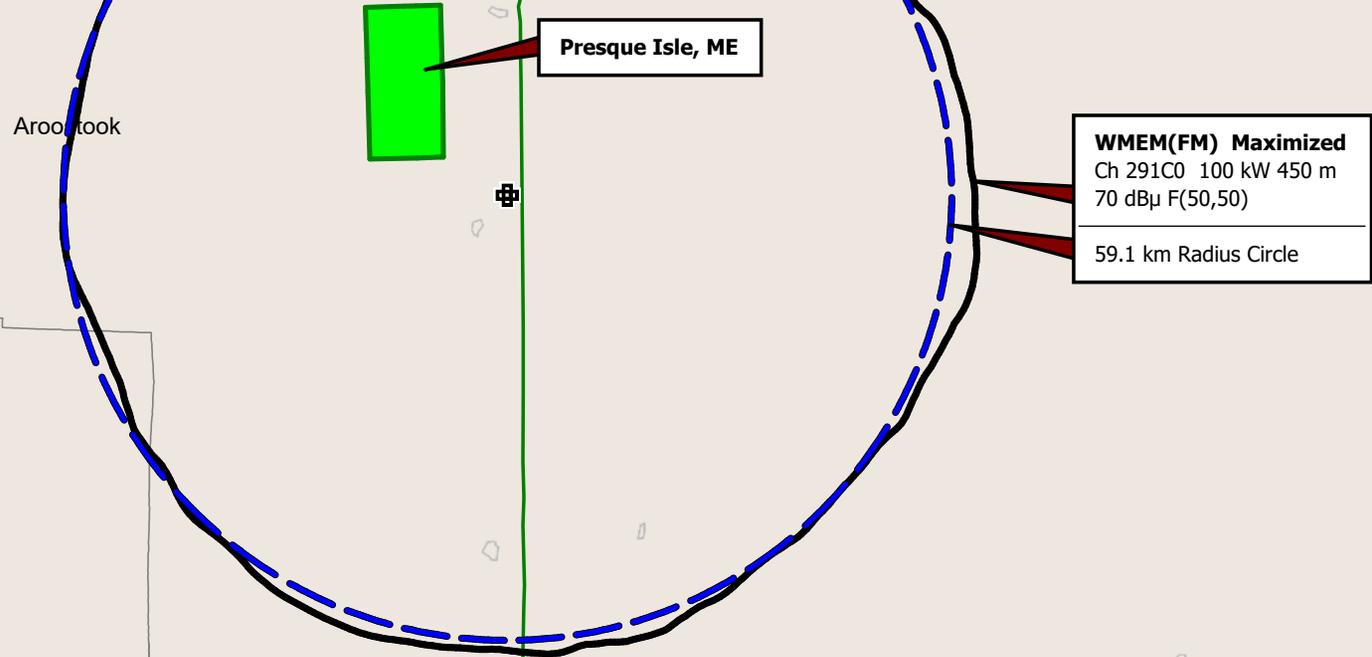


**FIGURE 2A**  
**COMMUNITY OF LICENSE COVERAGE**

*prepared August 2022 for*

**Maine Public Broadcasting Corporation**  
**WMEM(FM) Presque Isle, Maine**  
**Facility ID 39661**  
**Ch. 291C0 90 kW 344 m HAAT**

**Cavell, Mertz & Associates, Inc.**  
Manassas, Virginia

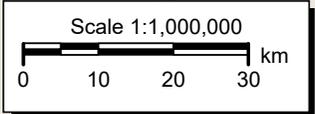


**Presque Isle, ME**

**WMEM(FM) Maximized**  
Ch 291C0 100 kW 450 m  
70 dBμ F(50,50)  
59.1 km Radius Circle



*Fredericton*

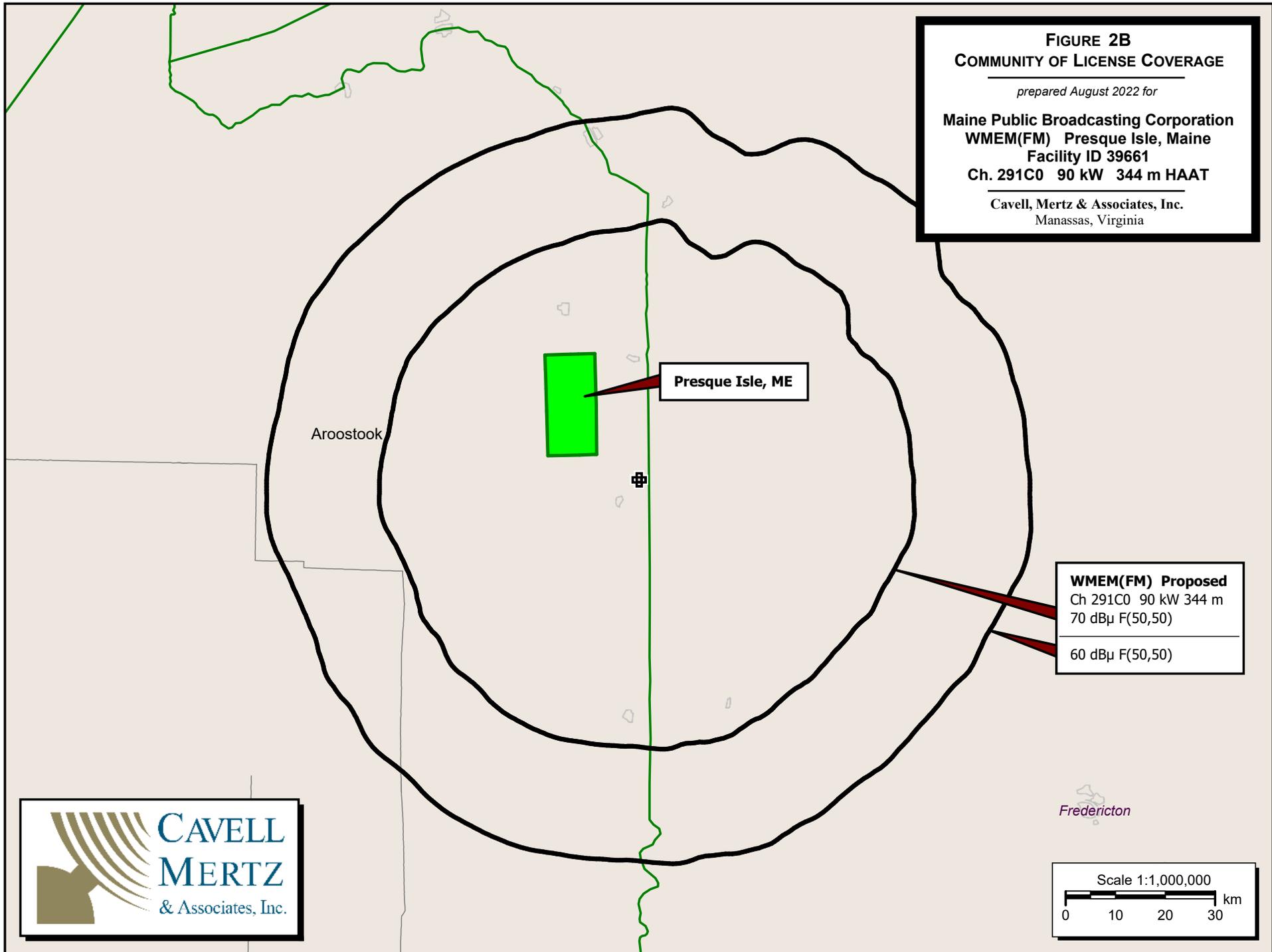


**FIGURE 2B**  
**COMMUNITY OF LICENSE COVERAGE**

*prepared August 2022 for*

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**Facility ID 39661**  
**Ch. 291C0 90 kW 344 m HAAT**

**Cavell, Mertz & Associates, Inc.**  
Manassas, Virginia

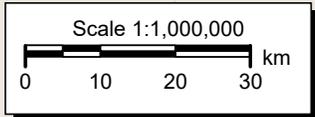


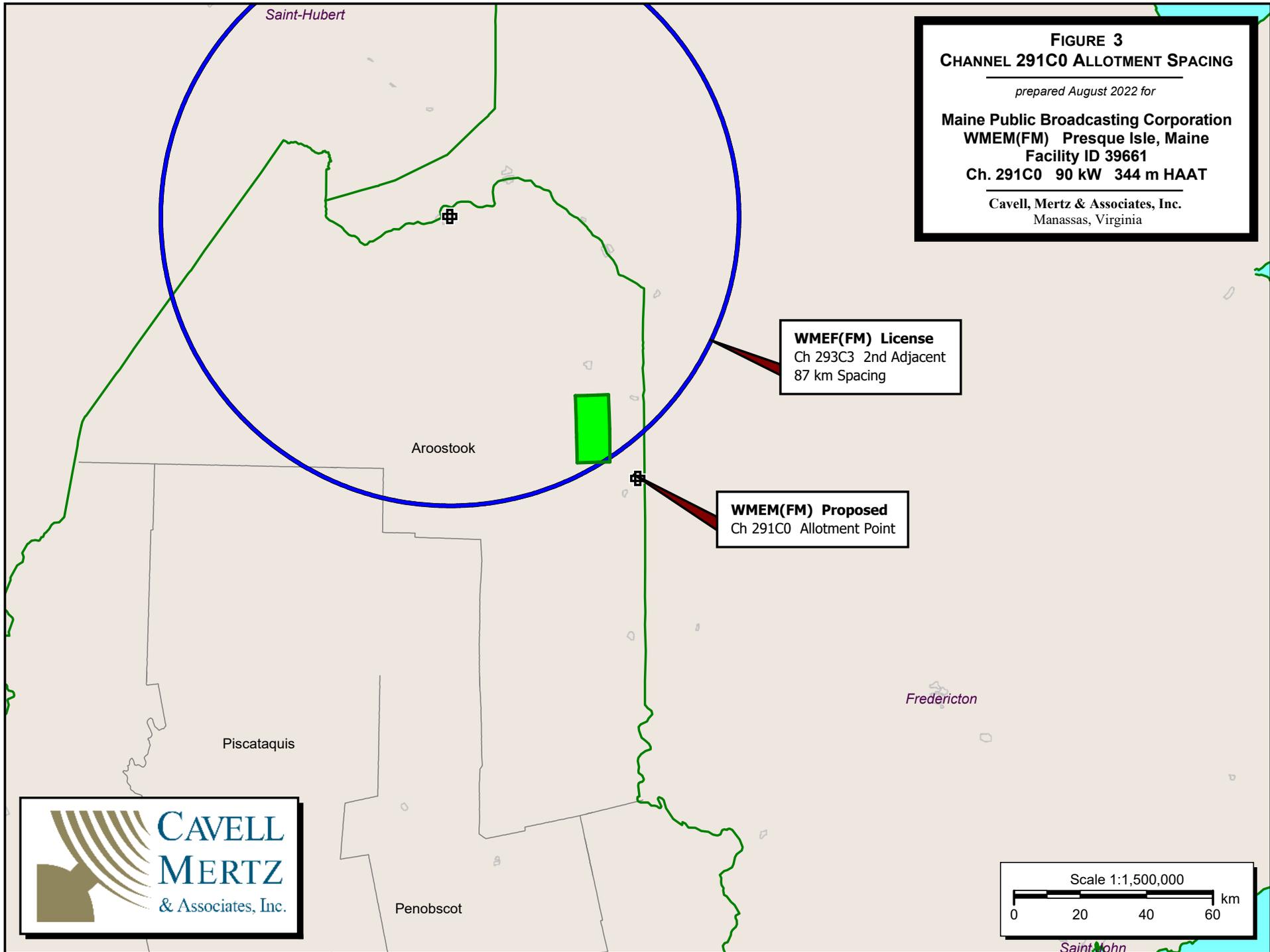
**Presque Isle, ME**

Aroostook

**WMEM(FM) Proposed**  
Ch 291C0 90 kW 344 m  
70 dBµ F(50,50)  
60 dBµ F(50,50)

Fredericton





**FIGURE 3**  
**CHANNEL 291C0 ALLOTMENT SPACING**

*prepared August 2022 for*

**Maine Public Broadcasting Corporation**  
**WMEM(FM) Presque Isle, Maine**  
**Facility ID 39661**  
**Ch. 291C0 90 kW 344 m HAAT**

**Cavell, Mertz & Associates, Inc.**  
Manassas, Virginia

**WMEF(FM) License**  
Ch 293C3 2nd Adjacent  
87 km Spacing

**WMEM(FM) Proposed**  
Ch 291C0 Allotment Point

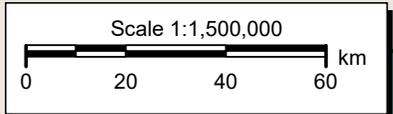


Table I  
**ALLOCATION SPACING SUMMARY FOR WMEM(FM)**

prepared for

**Maine Public Broadcasting Corporation**

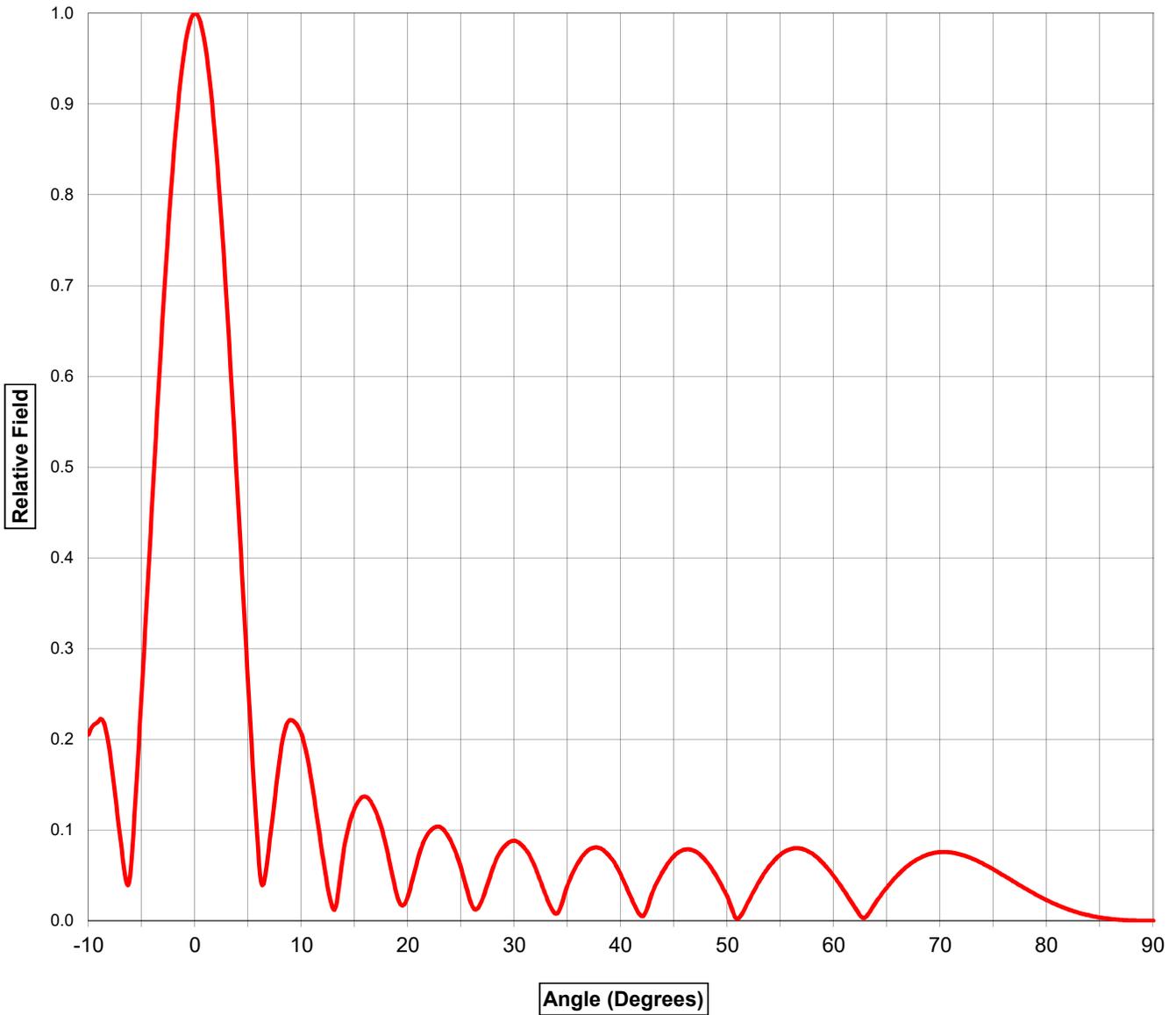
KYGO-FM Presque Isle, Maine

Facility ID 39661

Ch. 291C0 90 kW 344 m HAAT

REFERENCE		CLASS = C0 Int = C				DISPLAY DATES		
46 33 02.70 N.		Current Spacings to 3rd Adj.				DATA	08-26-22	
67 48 32.70 W.		Channel 291 - 106.1 MHz				SEARCH	08-26-22	
Call	Channel	Location	Azi	Dist	FCC	Margin		
<del>WMEM</del>	<del>LIC 291C</del>	<del>Presque Isle</del>	<del>ME 326.3</del>	<del>0.12</del>	<del>281.0</del>	<del>280.9</del>		
R11527	VAC 291C1	Moncton	NB 100.4	228.14	302.0	-73.9		
AL00395	ALO 290AA	Matapedia	QC 18.7	168.94	182.0	-13.1		
AL8921	VAC 290A	Matapedia	QU 18.7	168.94	182.0	-13.1		
R16467	VAC 292A1	St-stephen	NB 164.1	156.81	162.0	-5.2		
WMEF	LIC 293C3	Fort Kent	ME 324.4	97.17	87.0	10.2		
CBZW-FM+	USE-? 237D	Woodstock	NB 154.2	46.20	29.0	17.2		
R11993	VAC 288A	St-quentin	NB 18.1	118.96	101.0	18.0		
R10921	VAC 291C1	Yarmouth	NS 154.7	320.34	302.0	18.3		
AL08062	ALO 289AA	Degelis	QC 330.0	128.74	110.0	18.7		
AL9951	VAC 289A	Degelis	QU 330.0	128.74	110.0	18.7		
R13104	VAC 238A1	Woodstock	NB 154.1	46.22	26.0	20.2		
AL01021	ALO 292AA	Causapscal	QC 12.0	204.66	182.0	22.7		
AL9799	VAC 292A	Causapscal	QU 12.0	204.66	182.0	22.7		
AL06754	ALO 291AA	O'leary	PE 85.2	275.62	247.0	28.6		
AL6701	DEL 291A	O'leary	PE 85.2	275.62	247.0	28.6		

**Relative Field Pattern**



**FIGURE 4**  
**ANTENNA VERTICAL (ELEVATION)**  
**PLANE RADIATION PATTERN**

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