

Comprehensive Engineering Statement

prepared for

Lutheran Church-Missouri Synod

K224FT St. Louis, MO

Facility ID 202990

Channel 224D 0.1 kW 233 m AMSL

Lutheran Church-Missouri Synod (“*Lutheran*”) is the licensee of fill-in translator K224FT (file no. 0000166610) on Channel 224D utilizing a directional antenna. K224FT is a fill-in translator for Standard Broadcast Station KFUE(AM), 850 kHz, Clayton, Missouri. *Lutheran* proposes to move to a registered tower, ASRN 1225623, located at 38° 45’ 07.3”N, 90° 37’ 22.6”W (NAD 83) as part of a minor modification. A different directional antenna at a height of 91.4 meters above ground, and an ERP of 0.1 kW (100 Watts) is being specified. A Mattoon Waiver is being requested as part of the instant application.

Nature of the Proposal

The antenna system for the proposed translator is a Shively model SLV-4-.82SS antenna, a 4-bay, 0.82 wavelength spaced directional antenna which will be side-mounted on an existing antenna support structure. No change in structure overall height is necessary to carry out this proposal. Since no change to the structure’s overall height is proposed, no change to structure marking/lighting requirements will result. **Figure 1** provides a graphical representation of the proposed antenna azimuth pattern. A tabulation of the pattern is provided in the engineering sections of the form.

A Mattoon waiver is requested herein because the proposed contour does not have contour overlap to the current license, as normally required in a minor modification. Mattoon waiver requests are limited to translators for AM broadcast stations, with four specific constraints: (1) No history of filing serial modifications; (2) Proposed site is mutually exclusive to the Licensed site; (3) No impact to LPFM; and (4) Efficient use of Spectrum. As discussed below, the instant application complies with all of these requirements.

Constraint 1: No history of filing serial modifications. The current K224FT license is the first license for this facility. **Constraint 2:** The proposal must be Mutually Exclusive. To demonstrate the proposal’s qualifications under the Mattoon waiver, **Figure 2** depicts the K224FT licensed and proposed contours. As shown, while the 60 dB μ contours do not overlap, the 40 dB μ

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co-channel interfering contours do have significant overlap into the other contour, constituting in a mutually exclusive relationship. **Constraint 3:** No impact to LPFM. Please see the “Allocation” discussion below. **Constraint 4:** Efficient use of spectrum. By moving coverage to St. Charles city, the contour area can be increased due to reduced protection limitations, thereby improving the population reached. The licensed K224FT has a 60 dB μ contour area of 9 square kilometers with a population of 7,694 persons, while the proposed facility will have an area of 195.6 square kilometers and a 2020 Census population of 174,868 persons. The instant proposal represents a significant improvement in the use of the Channel 224 spectrum for this region.

Figure 3 depicts the proposed contour, the parent station KFUO(AM) 2 mV/m contour, and the 40 km (25 mile) radius from the KFUO(AM) transmitter site. As shown, the contour of the proposed facility within the greater of the 2 mV/m contour and the 40 km radius of the parent station, KFUO(AM), thus complying with §74.1201(g).

Allocation Considerations

A study of nearby FM facilities on co-channel, adjacent-channel, and intermediate frequencies was conducted to identify which stations require further study to demonstrate compliance under §74.1204. **Table I** provides a listing of nearby co-channel, first, second and third adjacent facilities to be considered. The listing was developed by specifying K224FT as a Class A, thus resulting in a list of stations and translators that should be considered for contour protection. Contour protection for pertinent co-channel and first adjacent stations is demonstrated in **Figure 4**. The nearest co-channel channel full service station is WMAY(FM) (Ch. 224B1, Taylorville, IL) and the nearest co-channel LPFM is KFTN-LP, (Ch. 224L1, Fenton, MO) at 29.93 km. The nearest first adjacent channel stations are KWRH-LP (Ch. 225L1, Webster Groves, MO) at 25.93 km, and full service KGRC(FM) (Ch. 225C1, Hannibal, MO) at 130.25 km. As shown, no prohibited contour overlap from the proposed facility will exist to nearby co-channel or first adjacent facilities.

Figure 5 depicts the protected contours of pertinent second and third adjacent facilities near the proposal. The proposed facility is just outside the 60 dB μ contour of the KRTK(FM) license, is inside the 60 dB μ contour of the KRTK(FM) CP, and inside the 60 dB μ contour of WIL-FM (Ch. 222C0, St. Louis, MO). **Figure 5A (Detail)** provides a greatly expanded view of the proposed

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100 dB μ interfering contour in relation to the KR TK(FM) license. As shown, the proposed interfering contour does not overlap the protected contour of the KR TK(FM) license. Protection of WIL-FM and the KR TK(FM) CP is achieved pursuant to §74.1204(d) by demonstrating that the proposed translator's interfering contour does not reach populated areas. The proposed K224FT facility will be located just inside the WIL-FM 77 dB μ F(50,50) contour (not shown), and just inside the 63.7 dB μ contour of the KR TK(FM) CP as depicted in **Figure 5A (Detail)**. Thus, based on the 40 dB interfering-to-protected contour ratio for second and third adjacent facilities, the worst-case interfering contour is the 103.7 dB μ contour.

Based on the -40 dB desired-to-undesired ratio specified in §74.1204(a)(3), the appropriate second-adjacent interfering signal level at this location is 103.7 dB μ . The proposed facility's antenna will be mounted at 91.4 meters above ground level. Utilizing the proposed manufacturer's elevation pattern (a 4-bay, 0.82 wavelength spaced antenna), calculations were performed at two meters above the ground out to 1,000 meters from the proposed transmitter site. **Figure 6** provides a graphical representation of the proposed antenna's elevation pattern. As demonstrated in **Figure 7**, the greatest signal strength at two meters above ground near the tower is 100.6 dB μ at a distance of 75 meters from the tower. Thus, the proposed translator's interfering signal does not exceed the level of 103.4 dB μ that would be considered interference to surrounding population at ground level or nearby buildings. The nearest IF relationship (53 or 54 channels removed) facility near the proposal is KLOU(FM) (Ch. 277C1, St. Louis, MO) at a distance of 32.54 km. As shown on **Table I**, the FCC spacing requirement is 22.0 km, demonstrating compliance.

The proposed site is located more than 700 km from the Canadian and Mexican borders, well beyond the 320 km coordination distance required for translators specified in §74.1235(d). The nearest FCC monitoring station is 582.1 km distant at Allegan, MI. This distance exceeds the threshold minimum distance specified in §73.1030 that would suggest consideration of the monitoring station.

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

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Environmental Considerations

The proposed facility will operate with a circularly-polarized ERP of 100 Watts with a four-bay, 0.82 wavelength spaced, directional antenna, at 91.4 meters AGL on registered tower, ASRN 1225623, which also provides support for at least one other broadcast facility. 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 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 meets the radiofrequency exposure guidelines adopted in §1.1310. Under present Commission policy, a facility may be presumed to comply with the limits specified in §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 the cited adopted guidelines.

The general population/uncontrolled maximum permitted exposure ("MPE") limit specified in §1.1310 for the entire FM broadcast band is $200 \mu\text{W}/\text{cm}^2$. For the purpose of this study, "public access" will be considered at the base of the tower at a location two-meters above ground.

Using the FCC's FM Model program and an EPA Type 3 ("Opposed U Dipole") antenna it was determined that the proposed facility would contribute a worst-case RF power density of $0.013 \mu\text{W}/\text{cm}^2$ at two meters above ground level near the antenna support structure, or 0.0065 percent of the general population/uncontrolled limit.

§1.1307(b)(3) states that facilities at locations with multiple emitters are categorically excluded from responsibility for taking any corrective action in the areas where their contribution is less than five percent of the pertinent MPE limit. Since the instant situation meets the five percent exclusion test at all ground level areas, the impact of any other facilities near this site may be

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considered independently from this proposal. Accordingly, it is believed that the impact of the proposed operation should not be considered to be a factor at ground level as defined under §1.1307(b).

Safety of Tower Workers and the General Public

As demonstrated herein, excessive levels of RF energy will not be caused by the proposal at publicly accessible areas at ground level near the antenna supporting structure. Consequently, members of the general public will not be exposed to RF levels in excess of the Commission's guidelines. Nevertheless, tower access will continue to be restricted and controlled through the use of a locked fence. According to information provided by the applicant, appropriate RF exposure warning signs are posted. In the event that maintenance or other workers gain access to the tower, power output of the translator will be decreased or shut off to protect workers.

With respect to worker safety, it is believed that based on the preceding analysis, excessive exposure would not occur in areas at ground level. A site exposure policy will be employed protecting maintenance workers from excessive exposure when work must be performed on the tower in areas where high RF levels may be present. Such protective measures may include, but will not be limited to, 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 all pertinent stations. Based on the preceding, it is believed that the instant proposal may be categorically excluded from environmental processing under §1.1306 of the Rules, hence preparation of an Environmental Assessment is not required.

Conclusion

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

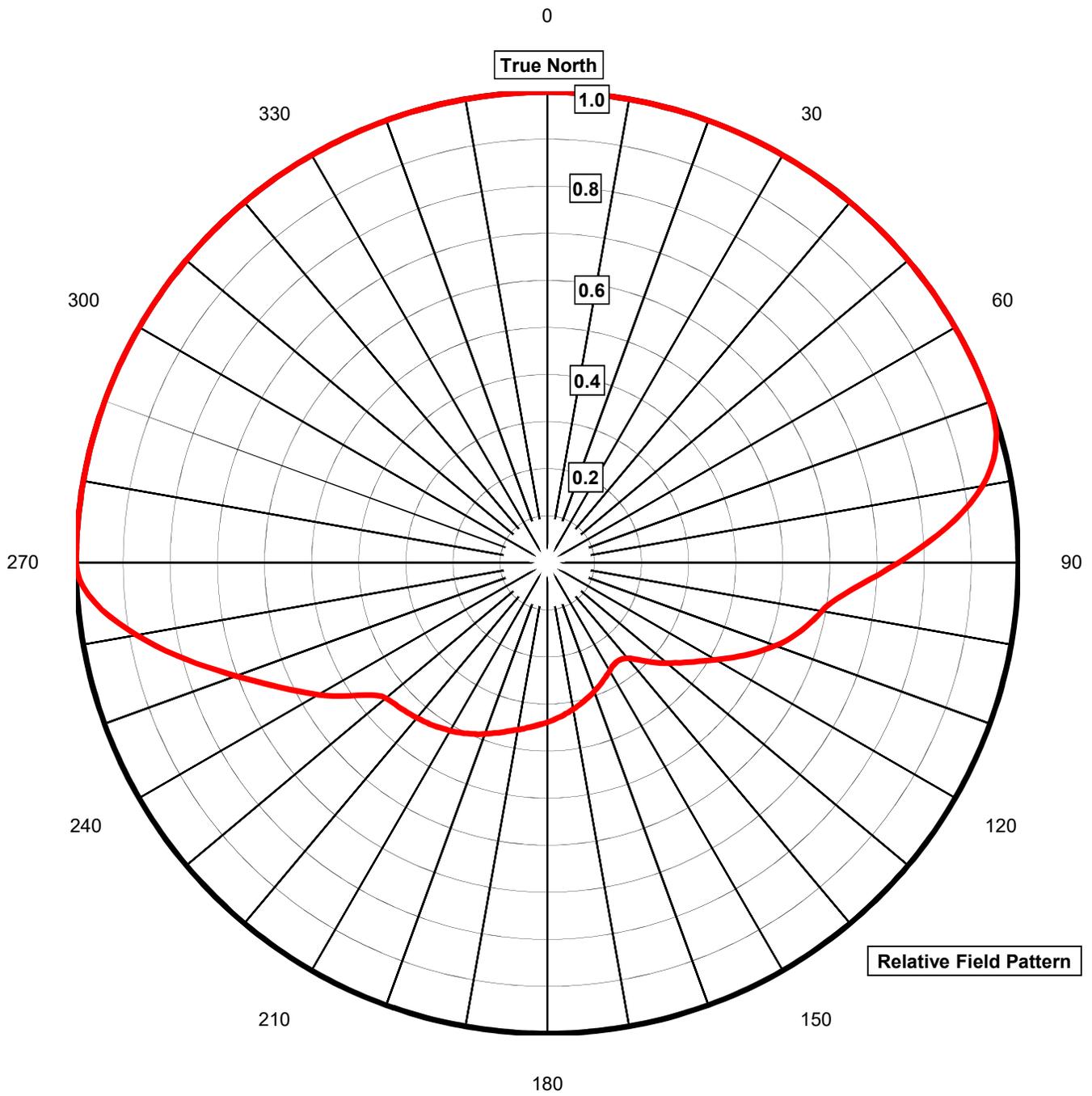


FIGURE 1
**ANTENNA HORIZONTAL PLANE
 RADIATION PATTERN (ENVELOPE)**

prepared September 2022 for
Lutheran Church-Missouri Synod
 K224FT St. Louis, Missouri
 Facility Id 202990
 Ch. 224D 0.1 kW 233 m AMSL

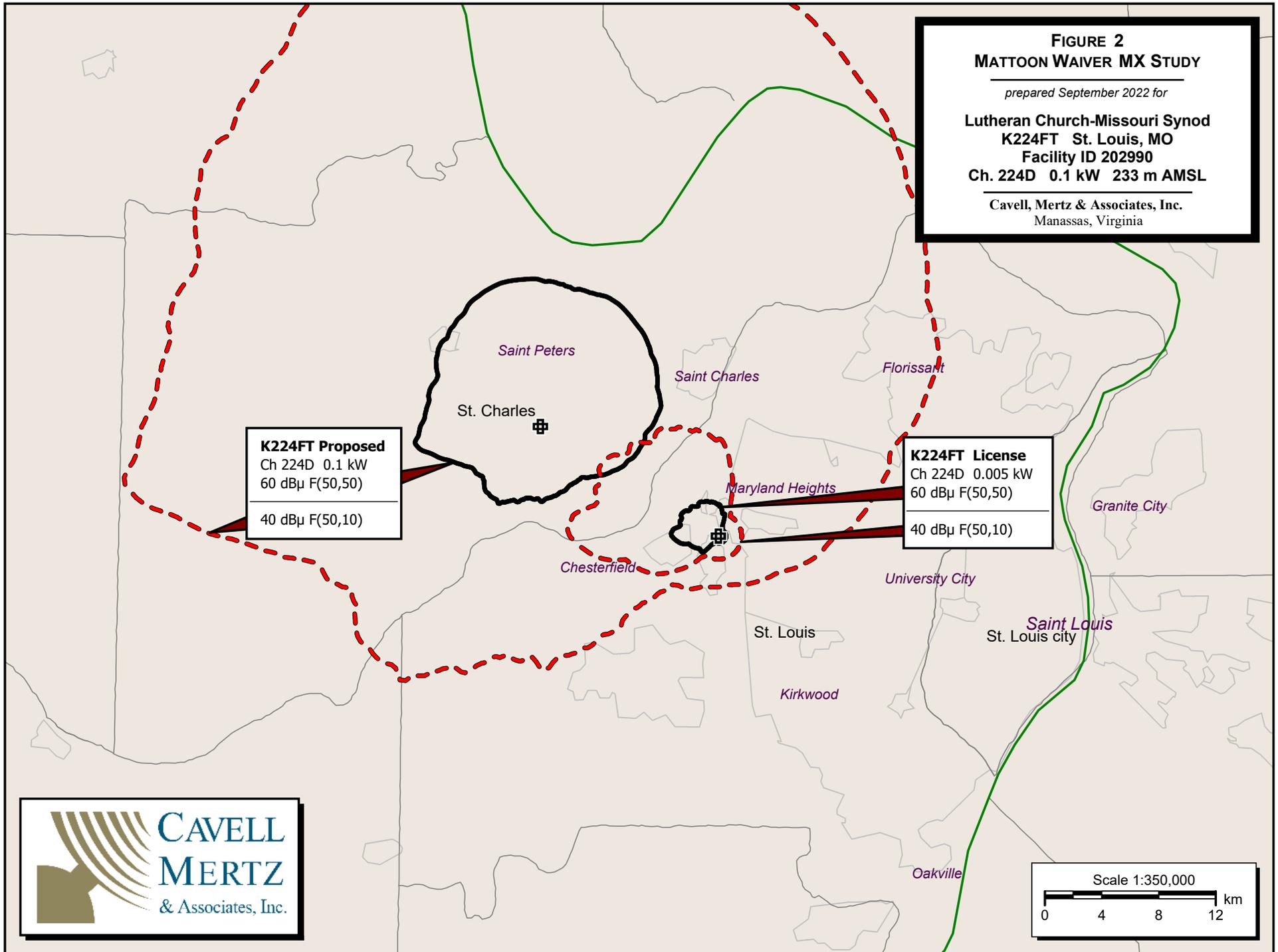
Cavell, Mertz & Associates, Inc.
 Manassas, Virginia

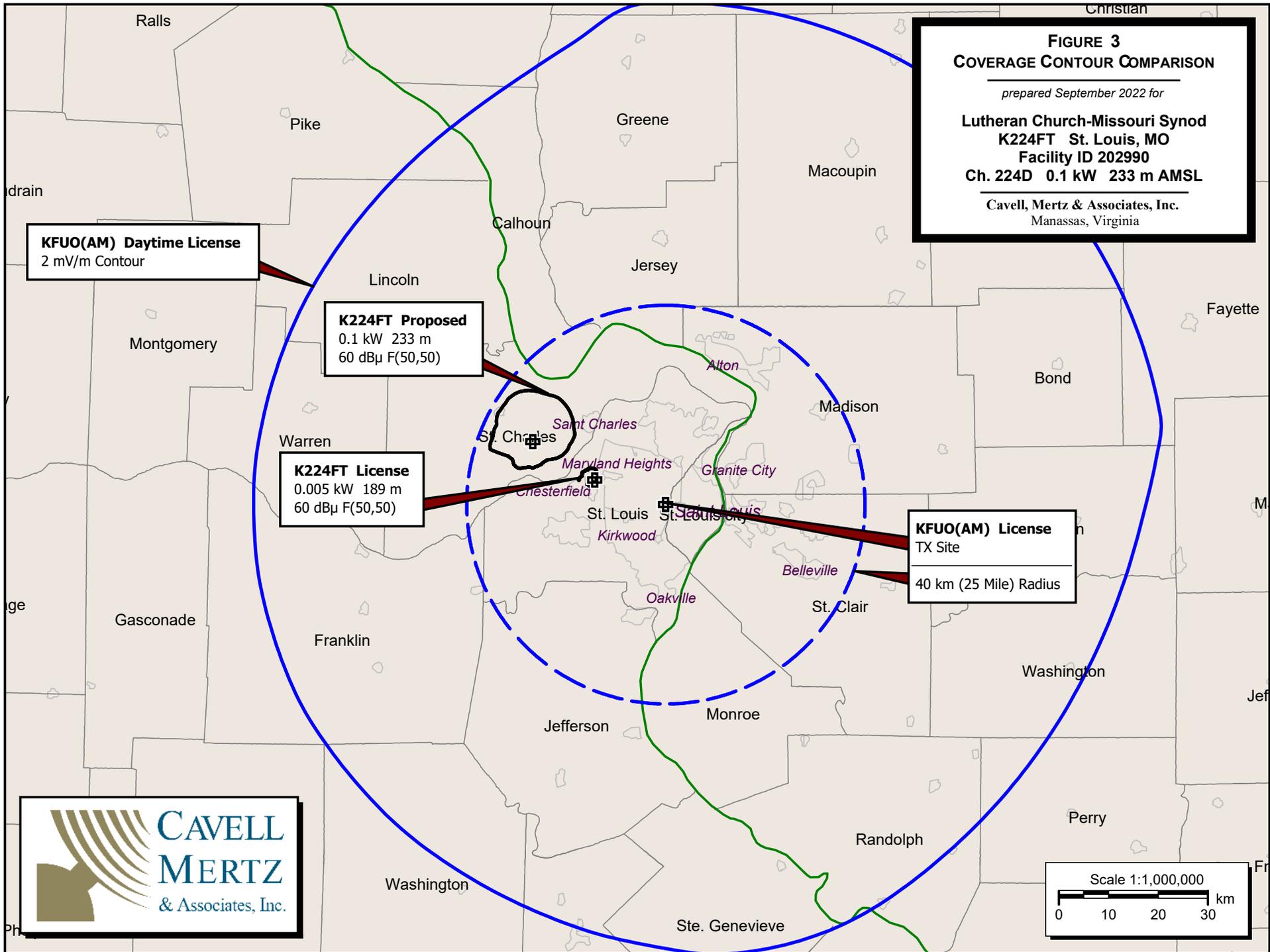
FIGURE 2
MATTOON WAIVER MX STUDY

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**FIGURE 3
COVERAGE CONTOUR COMPARISON**

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Ch. 224D 0.1 kW 233 m AMSL**

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

KFUO(AM) Daytime License
2 mV/m Contour

K224FT Proposed
0.1 kW 233 m
60 dBµ F(50,50)

K224FT License
0.005 kW 189 m
60 dBµ F(50,50)

KFUO(AM) License
TX Site
40 km (25 Mile) Radius

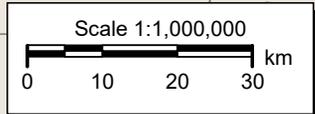


Table I
ALLOCATION SPACING SUMMARY FOR K224FT
 prepared for
Lutheran Church-Missouri Synod
 K224FT St. Louis, Missouri
 Facility ID 202990
 Ch. 224D 0.1 kW 233 m AMSL

REFERENCE								DISPLAY DATES
38 45 07.31 N.				CLASS = A				DATA 09-01-22
90 37 22.61 W.				Current Spacings to 3rd Adj.				SEARCH 09-01-22
----- Channel 224 - 92.7 MHz -----								
Call	Channel	Location		Azi	Dist	FCC	Margin	
-----	-----	-----		-----	-----	-----	-----	-----
WIL-FM	LIC 222C0	St. Louis		MO 146.9	35.77	86.0	-50.2	
KFTN-LP	LIC 224L1	Fenton		MO 156.7	28.35	67.0	-38.7	
K224FT	LIC-D 224D	St. Louis		MO 121.7	14.64	47.0	-32.4 ¹	
KWRH-LP	LIC 225L1	Webster Groves		MO 127.0	29.95	56.0	-26.1	
KRTK	CP -N 227C2	Hermann		MO 279.6	44.65	55.0	-10.4	
KRTK	LIC-N 227C2	Hermann		MO 270.4	45.39	55.0	-9.6	
WMAY-FM	LIC 224B1	Taylorville		IL 43.6	137.75	143.0	-5.3	
KGRC	LIC 225C1	Hannibal		MO 328.5	127.87	133.0	-5.1	
K224EZ	LIC-D 224D	Union		MO 230.6	47.16	47.0	0.16	
W224DC	LIC-D 224D	Caseyville		IL 104.2	54.93	47.0	7.9	
KLOU	LIC 277C1	St. Louis		MO 127.3	32.54	22.0	10.5	

¹ K224FT is the current License which is being modified by the instant proposal.

FIGURE 4
CO & 1ST ADJACENT PROTECTION

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WMAY-FM License
 Co-Channel 224B1
 57 dBμ F(50,50)

KGRC(FM) License
 1st Adjacent 225C1
 60 dBμ F(50,50)

K224FT Proposed
 Ch 224D 0.1 kW
 60 dBμ F(50,50)
 37 dBμ F(50,10) (Class B1)
 54 dBμ F(50,10)
 40 dBμ F(50,10)

KFTN-LP License
 Co-Channel 224L1
 60 dBμ F(50,50)

W224DC License
 Co-Channel Ch 224D
 60 dBμ F(50,50)

K224EZ License
 Co-Channel 224D
 60 dBμ F(50,50)

KWRH-LP License
 1st Adjacent 225L1
 60 dBμ F(50,50)

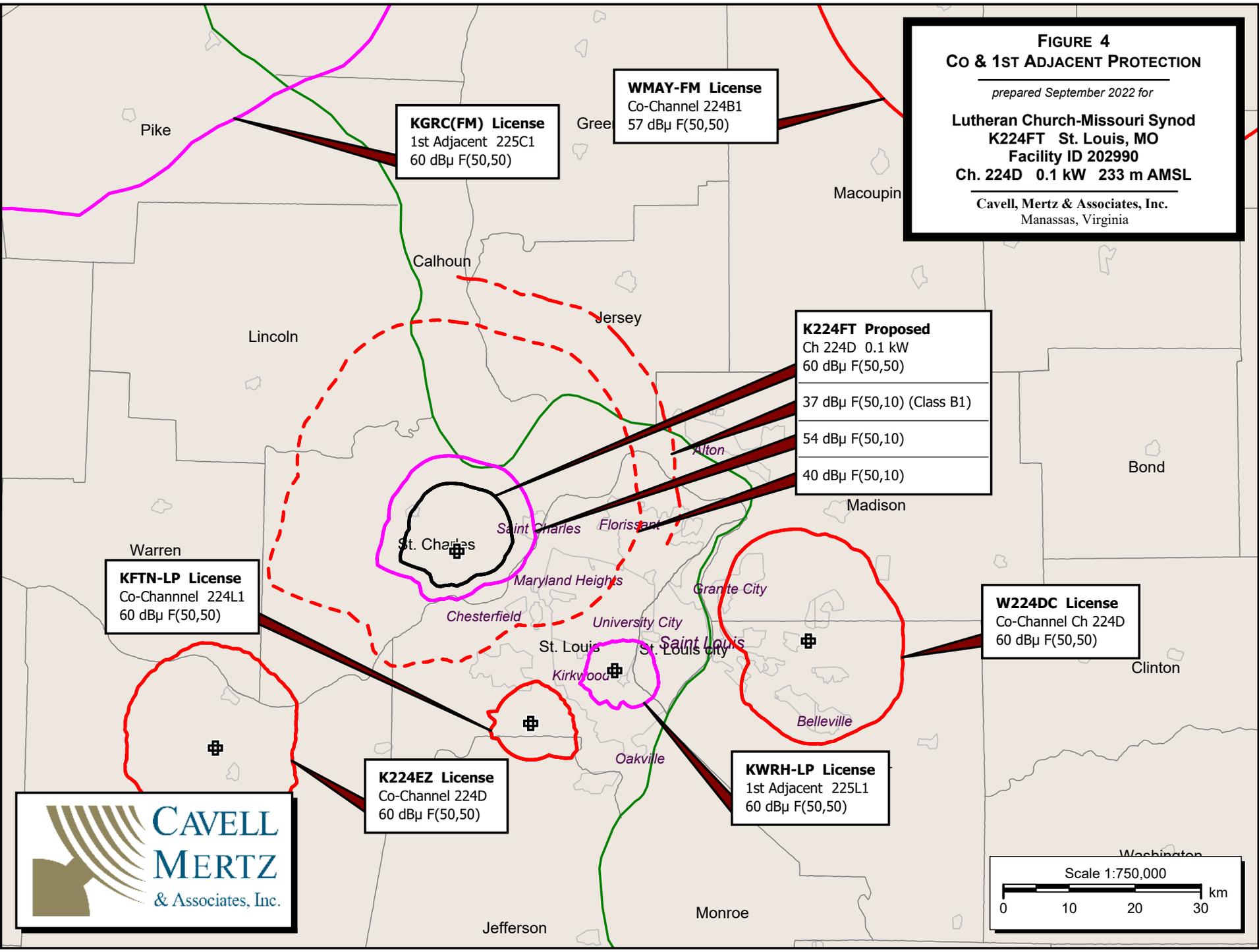
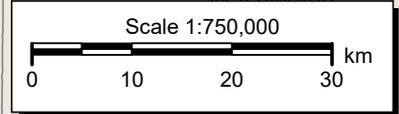
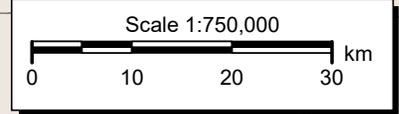
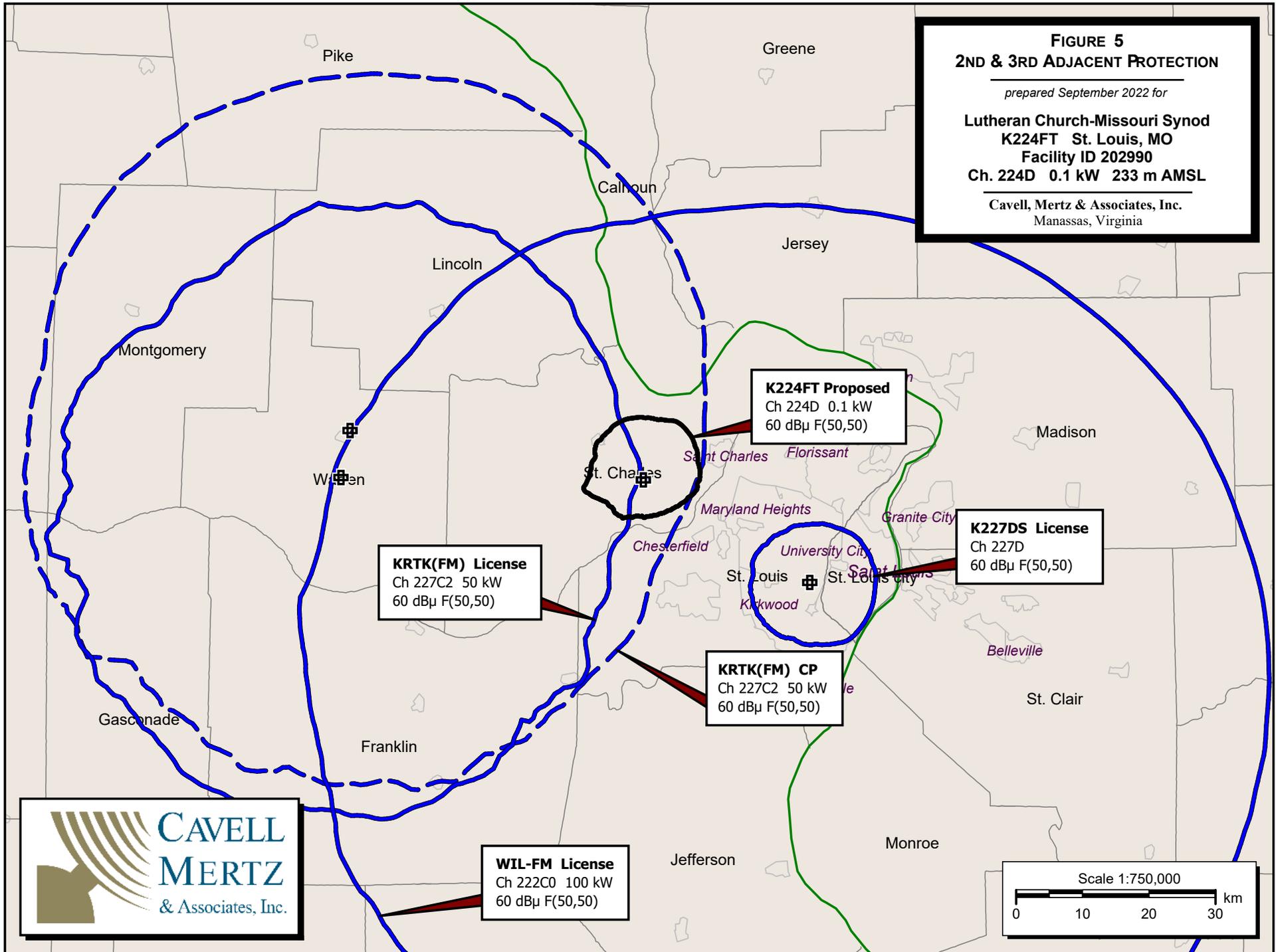


FIGURE 5
2ND & 3RD ADJACENT PROTECTION

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Facility ID 202990
Ch. 224D 0.1 kW 233 m AMSL

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**FIGURE 5 (DETAIL)
2ND & 3RD ADJACENT PROTECTION**

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**Cavell, Mertz & Associates, Inc.
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KRTK(FM) License
3rd Adjacent Ch 227C2
60 dB μ F(50,50)

K224FT Proposed
Ch 224D 0.1 kW
100 dB μ F(50,10)

KRTK(FM) CP
3rd Adjacent Ch 227C2
63.7 dB μ F(50,50)

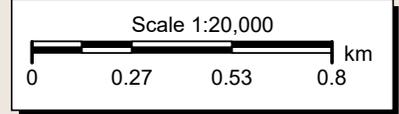


FIGURE 6
ANTENNA ELEVATION PATTERN

prepared September 2022 for

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K224FT St. Louis, MO
Facility ID 202990
Ch. 224D 0.1 kW 233 m AMSL

Cavell, Mertz & Associates, Inc.
Manassas, Virginia

Antenna Mfg.: Shively Labs
Antenna Type: SLV-4-.82SS
Station: K224FT
Frequency: 92.7
Channel #: 224
Figure: Figure 6

Beam Tilt
Gain (Max)
Gain (Horizon)

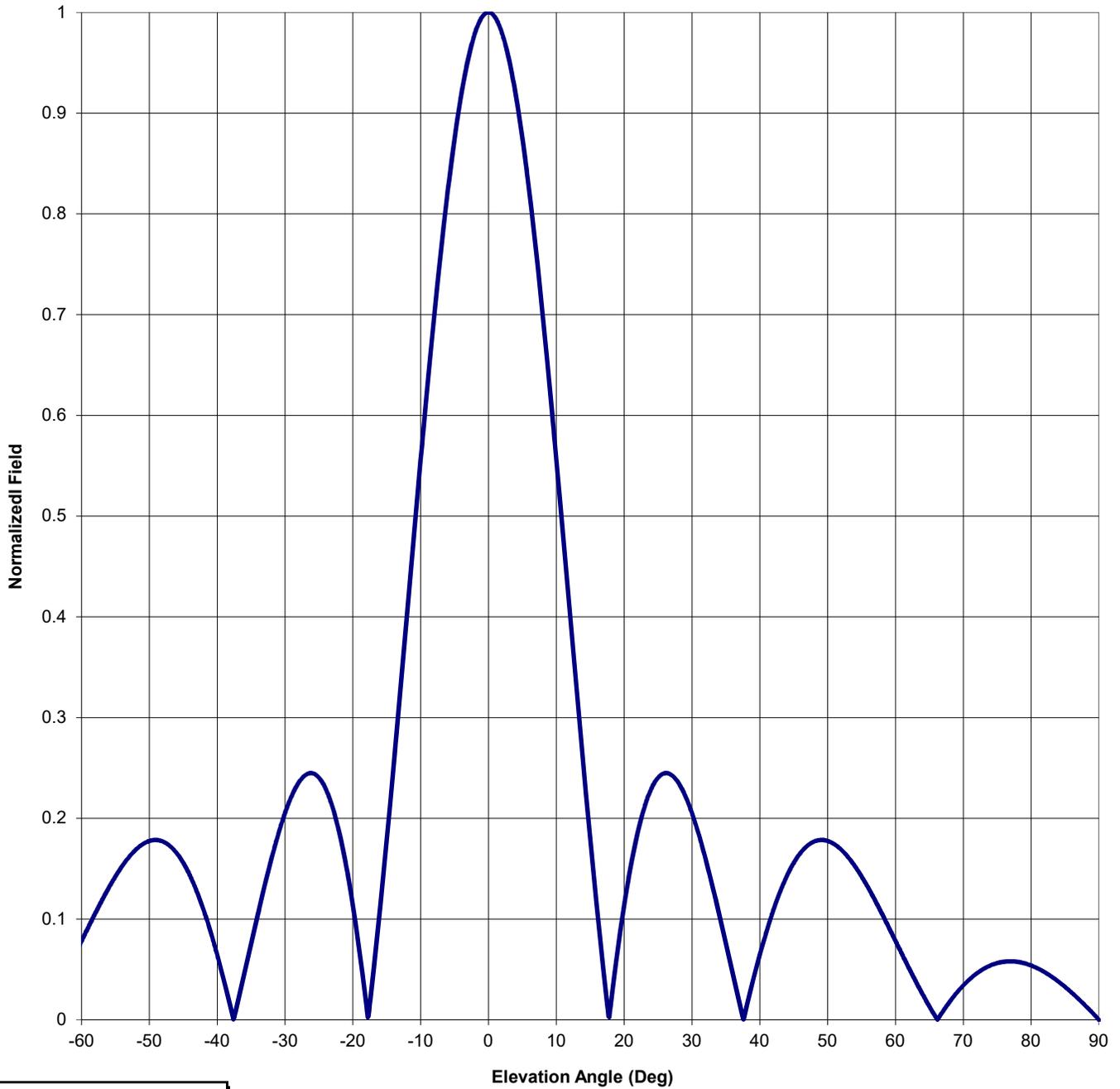


FIGURE 7
SIGNAL STRENGTH AT 2M ABOVE GROUND

prepared September 2022 for

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