



Noise Model Report

7/29/2025

Coles Wind

Coles Wind, LLC

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1.0 Introduction

Coles Wind, LLC (Applicant) is constructing a 311.1 MW wind power project in Coles County, Illinois (Project) in an area just south of the Douglas County line, west of Rardin, and on the east and west sides of Illinois Route 130 (N County Road 1600E). Paxwood Acoustics was retained by the Applicant to conduct sound propagation modeling for the Project which, as discussed in Section 2.0, is an update to the noise assessment provided with the Project's Special Use Permit Application.

Based on the information provided in this report, the Project is expected to produce sound levels that are below the Illinois Pollution Control Board noise limits meeting the noise requirements of the Coles County Amended Ordinance.

This report includes:

- A description of the Project,
- A discussion of noise standards,
- Sound propagation modeling procedure and results, and
- Conclusions

In addition, an introduction to acoustics is provided in Appendix A, supporting information is provided in Appendices B through D, and information about Paxwood Acoustics is provided in Appendix E.

2.0 Project Updates & Description

A sound report was previously completed by RSG, Inc. in January 2025 (January Report¹) that was included in the Coles Wind, LLC Special Use Permit Application for the Project. Coles County approved the Special Use Permit for the Project on July 1, 2025. The January Report included sound modeling for 62 turbine locations and two turbine models. Paxwood Acoustics is providing this updated and simplified noise model report (July Report) that reflects the 51 turbine locations that will be built with the GE 158 turbine model. Since the January Report, the Project has dropped 11 turbine locations from consideration, identified the 51 turbine locations to be constructed, and there have been two minor shifts to turbines (Turbines 39a and 47a both shifted 59 and 65 feet respectively). Additionally, in compliance with Condition 8 of the approved Special Use Permit, this July Report also includes sound modeling for the receptor north of RE00031; that receptor is a church and identified as CB00197 in this July Report.

This report includes the results of the sound modeling for the 51 turbine locations to be constructed using the GE 6.1-158 turbine model (GE 158) and the two transformers to be located at the Project substation. Based on this modeling, the Project is sited in compliance with the Coles County Amended Ordinance² (Ordinance).

A map of the Project showing the 51 turbine locations, the Project substation, and the surrounding area is provided in Figure 1.

¹ RSG, Inc., *Coles Wind Sound Modeling*, Apex Clean Energy, 3 January 2025.

² Coles County Amended Ordinance: Standards for Wind Energy Conversion Systems over 500 kW, 9 May 2023.

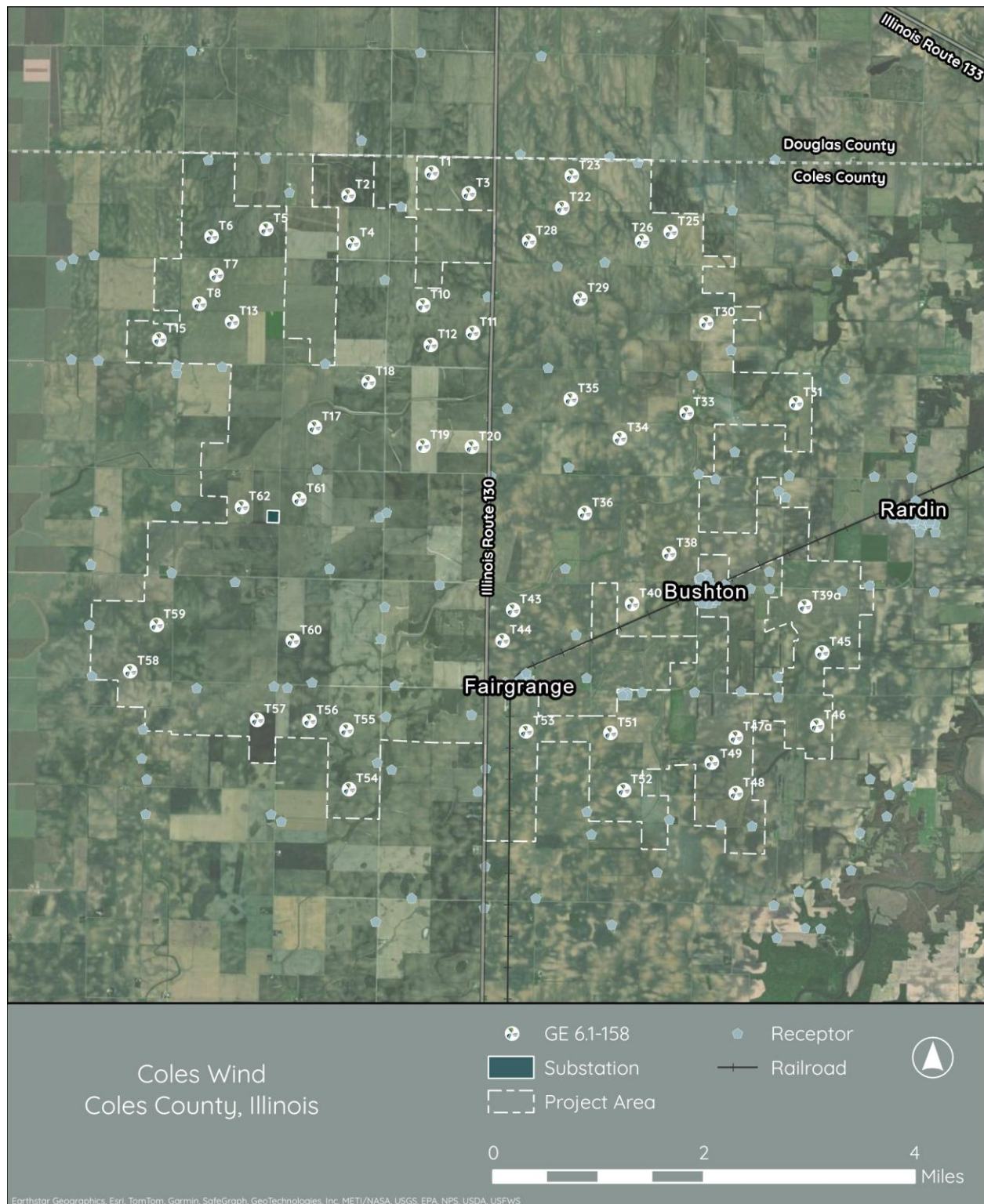


Figure 1: Map of the Project and Surrounding Area

3.0 Noise Standard

The Coles County Amended Ordinance² requires that the Project comply with the applicable Illinois Pollution Control Board (IPCB) regulations including the IPCB noise limits. The Ordinance also requires that Coles Wind demonstrate compliance through the use of a qualified professional. Paxwood Acoustics is well qualified to conduct this work with Principal Consultant, Eddie Duncan, who is Board Certified through the Institute of Noise Control Engineering, having conducted noise analyses on over 120 wind power projects. Additional information on Paxwood Acoustics is provided in Appendix E.

The relevant IPCB noise regulations are contained in Parts 900, 901, and 910 of Title 35, Subtitle H of the Illinois Administrative Code. Sound level limits that are applicable to the Project are defined in Section 901.102. The limits are specified by the emitting land classification to the receiving land classification, by daytime and nighttime periods, and by octave band center frequency. The Project equipment that emits sound is described in the regulation as property-line noise sources. For this Project, the property-line noise sources would be located on Class C land as defined in Appendix A of Part 901, and nearby residential land use is defined as Class A. Given this, the Class C to Class A limits are provided here in Table 1.

Table 1: IPCB Sound Level Limits (L_{eq}) for Class C to Class A Lands

Octave Band Center Frequency	Daytime Limit (dB)	Nighttime Limit (dB)
31.5 Hz	75	69
63 Hz	74	67
125 Hz	69	62
250 Hz	64	54
500 Hz	58	47
1 kHz	52	41
2 kHz	47	36
4 kHz	43	32
8 kHz	40	32

The limits in Table 1 are based on the equivalent continuous sound pressure level or L_{eq} as defined in Part 900.

In addition to the specific limits by octave band frequency, Section 901.106 of the regulations prohibit prominent discrete tones. A prominent discrete tone is defined by the following conditions:

- A 1/3 octave band with a center frequency between 500 Hz and 10 kHz that exceeds the arithmetic average of the sound pressure levels of the two adjacent 1/3 octave bands by 5 dB.
- A 1/3 octave band with a center frequency between 160 Hz and 400 Hz that exceeds the arithmetic average of the sound pressure levels of the two adjacent 1/3 octave bands by 8 dB.
- A 1/3 octave band with a center frequency between 25 Hz and 125 Hz that exceeds the arithmetic average of the sound pressure levels of the two adjacent 1/3 octave bands by 15 dB.

However, the regulation provides that the prohibition of prominent discrete tones does not apply if the one-third octave band sound pressure level is 10 dB or more below the corresponding octave band sound pressure level limits from Table 1.

Lastly, sound from construction of the Project is exempt from these limits per Section 901.107(d) of the regulations.

4.0 Sound Propagation Modeling

4.1 Modeling Procedure & Settings

Sound propagation modeling was completed using the modeling software CadnaA made by DataKustik GmbH. CadnaA implements the international sound propagation standard, ISO 9613-2 “Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.” Both CadnaA and the ISO 9613-2 standard are used by noise control professionals across the United States and are regularly relied upon by local and state jurisdictions. The model takes into account source sound emissions, topography, receptor locations, and several other factors. It calculates sound levels for meteorological conditions that are favorable for sound propagation, assuming that all receptors are downwind of the sound sources.

Like the modeling in the January Report, the modeling conducted for this report followed the ANSI/ACP wind turbine sound modeling standard³ including a +2 dB factor added to the turbine sound power level and using a ground factor of $G=0.5$.

For this assessment, USGS terrain data was used for the Project to create the three-dimensional topography throughout the surrounding area. Other site features, including the proposed locations of equipment and nearby receptors, were provided by the Applicant.

Model input data and parameters are provided in Appendix B.

The model was used to calculate sound levels (L_{eq}) throughout the area at a grid of receptors that were spaced every 50 feet (15.24 meters). Each receptor was modeled at 13 feet (4 meters) above ground level. Based on the grid of receptors, sound level iso-lines are generated throughout the area so that the projected sound levels can be shown throughout the surrounding area including residential land uses. In addition to the grid of receptors used to generate sound level iso-lines, discrete receptors were modeled at 196 residences⁴ and one church (CB00197) near the Project.

³ ANSI/ACP Standard 111-1, *Wind Turbine Sound Modeling*, American National Standards Institute, 2022.

⁴ The IPCB limits apply not only to the residential structures, but also to the surrounding residential land use. As such the surrounding residential land use for each receptor that approached the IPCB limits was checked to ensure that sound levels are below the IPCB limits. Detailed model results for receptors with the highest model results (within 1 dB of the IPCB limit) in the 1 kHz octave band are provided in Appendix C, showing that the limit is met throughout the residential area surrounding the receptor.

4.2 Modeled Sound Sources

The model included sound emissions from 51 wind turbines (GE 158) and two high voltage transformers at the Project substation, one 175 MVA/1300 kV BIL and one 222 MVA/1050 kV BIL. The specified sound levels for the transformers was provided by the Applicant. The 175 MVA transformer is listed as 86 dBA with cooling fans operating (ONAF⁵) and 83 dBA with the cooling fans no operating (ONAN⁶). The 222 MVA transformer is listed as 87 dBA ONAF. These are the sound levels that would be measured within one to six feet of the transformer per IEC 60076-10⁷. The sound power level for the ONAF setting for each transformer was calculated and used in the sound propagation model. The modeled sound power levels for the transformers is provided in Appendix B.

For wind turbine sound emissions, the manufacturer sound power levels by 1/3 octave band were used in the sound propagation model. Of the 51 turbines, nine were modeled as using noise reduced operations (NRO), specifically NRO 102, to meet the nighttime IPCB Class C to Class A limit.

4.3 Model Results

Model results for each octave band center frequency are presented in map format in Appendix C and tabular format for each discrete receptor in Appendix D. The highest projected sound level for each octave band at all receptors is presented in Table 2 with a comparison to the IPCB Class C to Class A nighttime limits. The closest the model results come to the nighttime IPCB limits is in the 1 kHz octave band with a projected sound level of 40 dBZ and an IPCB limit of 41 dBZ.

Table 2: Highest Model Results by Octave Band

	Full Octave Band Center Frequency								
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1kHz	2 kHz	4 kHz	8 kHz
Highest Model Result (dBZ)	62	58	50	47	45	40	33	13	<1
IPCB Class C to Class A Nighttime Limits (dBZ)	69	67	62	54	47	41	36	32	32

⁵ Oil Natural, Air Forced

⁶ Oil Natural, Air Natural

⁷ IEC 60076-10, Power Transformers – Part 10: Determination of Sound Levels

4.4 Tonality

As indicated in the January Report, sound emissions from the GE 158 do not meet the IPCB-specified criteria to be considered tonal.

High voltage transformers like those to be located at the Project substation can be tonal at 120 Hz and potentially at the harmonic of 240 Hz. For this Project however, the projected full octave band sound levels at 125 Hz and 250 Hz at the nearest receptors from the substation transformers are at least 10 dB below the IPCB octave band limits, as shown in Table 3. Given this, the prominent discrete tone clause of the IPCB regulations does not apply.

Table 3: Projected Sound Levels (dBZ) at 125 Hz and 250 Hz of Transformer Sound at Receptors Closest to the Substation

Receptor	Sound Pressure Level (dBZ) by Full Octave Band Center Frequency	
	125 Hz	250 Hz
RE00041	39	39
RE00084	37	37
RE00104	37	37
IPCB Class C to Class A Nighttime Limits (dBZ)	62	54

5.0 Conclusions

Paxwood Acoustics conducted sound propagation modeling for Coles Wind which is an update to the modeling that was provided in the January Report¹. The model updates included:

- The 51 turbines planned for construction using the GE 6.1-158 turbine model,
- Minor shifts to Turbines 39a and 47a as discussed in Section 2.0,
- Inclusion of Receptor CB00197, a church that is just north of RE00031,
- An update to the transformer rating of one of the high voltage transformers at the Project substation, and
- Reduction of the use of NRO to nine turbines instead of seventeen that were modeled in the January Report, due to the reduction in the number of turbines being modeled.

Like the overall conclusions of the January Report, this update finds that the projected sound levels from the Project will be below the nighttime IPCB Class C to Class A sound level limits for each octave band for every receptor and the residential use area around each receptor. Detailed model results are provided in Appendices C and D.

With this, the Project is expected to meet the noise requirements of the Coles County Amended Ordinance².

Appendix A: Introduction to Acoustics

Sound, Sources, and Perception

Sound in air is caused by fluctuations in air pressure which can be due to a variety of sources. The sources of sound can generally be grouped into three major categories: anthropogenic, biogenic, and geophonic. Anthropogenic sounds are human caused sounds such as voices, instruments, vehicles, and mechanical and electrical equipment. Biogenic sounds are those that are caused by organisms such as animal calls or animal interaction with the environment. And lastly geophonic sounds are those caused by the environment itself such as waves hitting a shoreline or wind interacting with plants or other objects.

There are three primary characteristics of sound that affect human perception: frequency which may also be referred to as pitch or tone, amplitude which relates to perceived loudness or volume, and temporal fluctuations, which is to say that sound can change with time.

Frequency

Humans can hear sound over a range of frequencies typically from 20 Hz to 20,000 Hz. While not strictly defined, this range can be divided into three subranges which are described as low frequency (20 Hz to around 250 Hz), mid frequency (around 250 Hz to around 4,000 Hz), and high frequency (around 4,000 Hz to 20,000 Hz). The mid frequency range is where most human speech occurs. More defined ranges of frequency are divided into octave bands (31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 16 kHz), or even further into 1/3 octave bands which are three smaller bands within each octave band. Sound below 20 Hz is referred to infrasound and is not typically audible to the human ear. Sound above 20,000 Hz is referred to as ultrasound and is also not audible to the human ear.

Most sounds are broadband in nature and contain energy at a range of frequencies. If however, a sound contains notably more energy at a specific frequency compared to the adjacent frequencies, then the sound can be perceived as a tone, such as a note in music.

Amplitude

Humans can hear sound over a wide range of pressures, from approximately 20 micropascals to over 20 million micropascals. Sound can occur outside of this range, but below 20 micropascals is typically inaudible to humans and above 20 million micropascal can cause pain. In acoustics, this wide range of audible sound pressures is compressed using a logarithmic scale to create a range of sound pressure levels from 0 dB (20

micropascals) to 120 dB (20 million micropascals). It is in this logarithmic scale, denoted as decibel or dB, that acousticians and environmental regulations quantify the amplitude of sound.

Temporal Changes

Both frequency and amplitude can change with time. A sound may be constant in both frequency and level, but this is fairly uncommon. If one considers the fluctuation in sounds from people having conversations, birds chirping, or vehicles passing by, it becomes apparent how much sound can change from one instance to the next. It is for this reason that acousticians use a variety of metrics to define and describe sound. These metrics are discussed further below.

Weighting Networks, Sound Pressure Level, and Metrics

Weighting Networks

Humans are most sensitive to sound between 500 Hz and 5 kHz. Our sensitivity with sound decreases below 500 Hz and above 5 kHz. In order to account for this varying sensitivity, the A-weighting network or filter was developed to mimic the sensitivity of the human ear and how we perceive loudness. A-weighting discounts sound in varying degrees by frequency below 500 Hz and above 5,000 Hz. Between 1,000 Hz and 4,000 Hz, the A-weighting network amplifies sound slightly to account for the increased sensitivity of the human ear in that range. Since the A-weighting network accounts for human sensitivity at difference frequencies, it is widely used in environmental acoustics and most environmental regulations. When a sound level is A-weighted, an “A” is typically added to the end of the abbreviation for decibel: dBA.

There are other weighting networks with different purposes, such as C, G, or Z, but A-weighting is most used in environmental acoustics. If a sound is not weighted or sometimes referred to as unweighted, it is considered Z-weighted or dBZ.

Sound Pressure Level

As was discussed previously, in acoustics, the amplitude of sound is often referred to in terms of sound pressure level. Representative sound pressure levels of some common sound sources and environments are shown in Figure 2. The sound levels presented in Figure 2 are meant to be illustrative, so any specific source or environment may be similar to or fall outside of the ranges shown in the graphic.

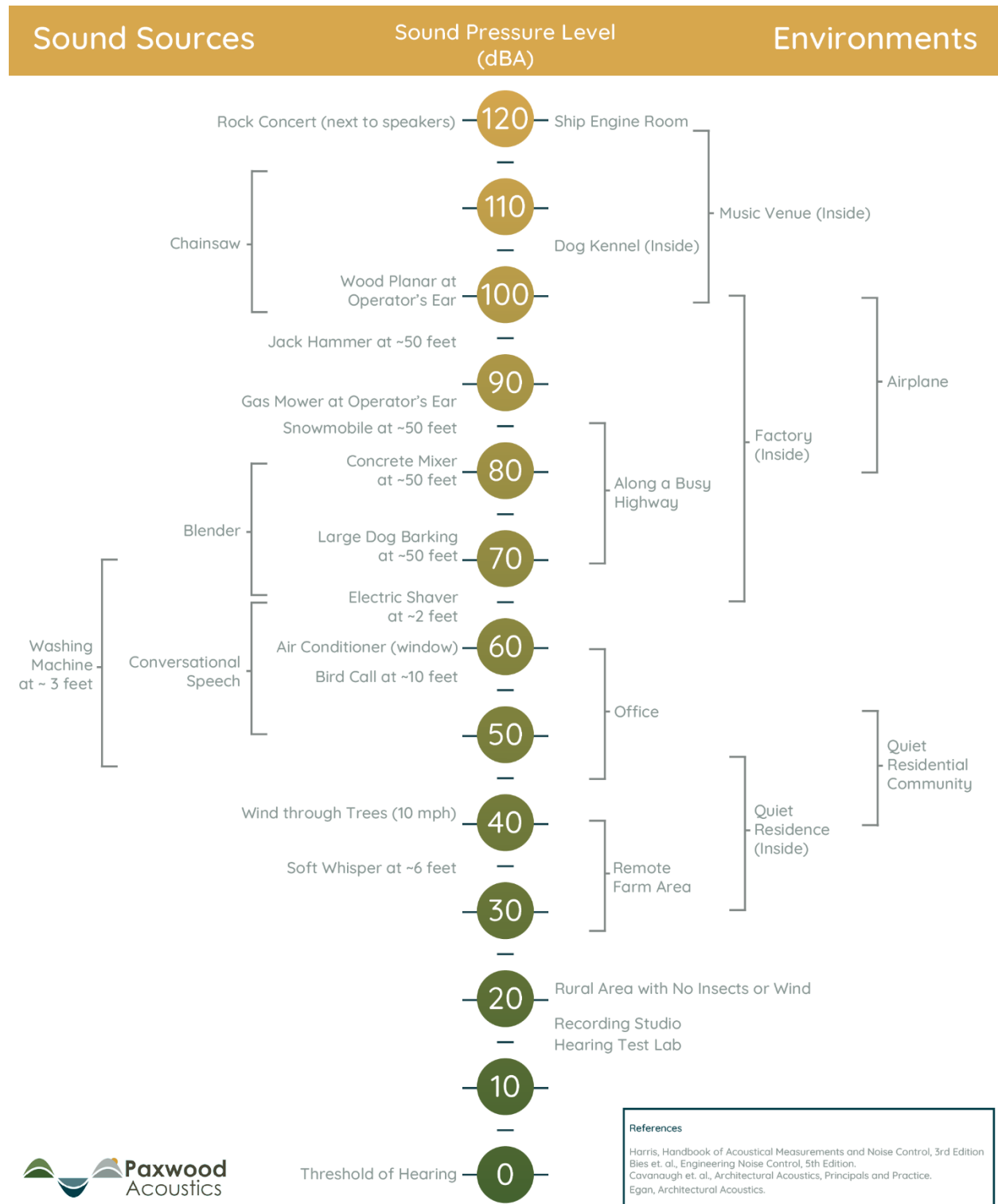


Figure 2: Representative Sound Pressure Levels (dBA) of Common Sound Sources & Environments

Since sound is a logarithmic function, one cannot use regular arithmetic operations to add and subtract sound levels. So, for example, conversational speech typically occurs at a level between 55 dBA and 65 dBA. If one person is speaking at a level of 60 dBA and another person is also speaking at a level of 60 dBA, the total sound level is not 120 dBA. (And a good thing too, otherwise, two people talking at the same time would quickly approach the threshold of pain, 120 dBA.) Instead, two voices at the same level only causes an increase of 3 dB, so 60 dBA plus 60 dBA equals 63 dBA.

In terms of perception of sound level there are two helpful rules of thumb to be aware of:

1) A change in broadband sound level of 10 dB is perceived as a halving or doubling of loudness, depending on if the amplitude of the sound decreased or increased, and 2) Changes in sound level of less than 3 dB are generally considered not perceptible.

Sound Level Metrics

With sound levels in an environment continuously changing, different sound level metrics are used to describe the sound level versus time. Some common sound level metrics are briefly described below:

- **Equivalent Continuous Sound Level (L_{eq}):** The L_{eq} is the level of the average sound pressure over a specified period of time. It takes into account quieter, long-term sound levels along with louder, short-duration sound levels to provide an overall sound level for a given time period. The louder sound levels, even with a short-duration, can have a strong influence on the L_{eq} . The L_{eq} is often used in environmental acoustics to convey an average representation of the acoustical environment, even though it is influenced more strongly by higher sound levels that occur over the specified interval. An L_{eq} may be as short as 1-second or up to an hour or more depending on the purpose of the quantification.
- **Statistical Sound Levels (L_n):** Statistical sound levels or percentile sound levels describe the level that is exceeded for a specified percentage of time. The L_{10} , for example, is the level that is exceeded 10% of the time. The L_{50} , is the median sound level: half the time the sound level is above the L_{50} and half the time the sound level is below the L_{50} . And the L_{90} is the sound level that is exceeded 90% of the time.
- **Maximum Sound Level (L_{max}):** The phrase “maximum sound level” may be used to describe the maximum L_{eq} or L_n over a given time period, but it can also be used to describe the sound level over a very short-duration typically using either a 1-second time constant which is referred to as slow-response, or a 125-millisecond time constant which is referred to as a fast-response. If the L_{max} metric is being used, it is good practice to note which time constant is being applied by adding the

notation S or F to the abbreviation: L_{Smax} or L_{Fmax} . The most appropriate time constant to use depends on the specific context of the quantification.

- Day-Night Level (L_{dn}): The L_{dn} is similar to the L_{eq} except that it is specifically applied over an entire day or 24-hour period with a 10 dB penalty applied to sound levels between 10 PM and 7 AM to account for greater sensitivity at night.

Appendix B: Model Settings & Input

Table 4: Sound Propagation Model Settings

Model Parameter	Setting
Ground Attenuation	ISO 9613-2 spectral ground attenuation with a ground factor of 0.5 in accordance with ANSI/ACP Standard 111-1. ³
Topography	USGS terrain.
Foliage Attenuation	No attenuation due to forest was taken into account in the model.
Atmospheric Attenuation	Based on 70% relative humidity and 10° C.
Search Radius	5 miles (8,000 meters).
Receptor Grid	50 feet by 50 feet (15 meters by 15 meters) throughout the Project and surrounding area at a height of 13 feet (4 meters).

Table 5: Modeled Point Source

Source	Equipment	Relative Height (m)	Coordinates (NAD83 Z16N)		Elevation (m)
			X (m)	Y (m)	
Transformer 1	175 MVA Transformer	3.9	395653	4384285	209
Transformer 2	222 MVA Transformer	3.6	395653	4384315	209
T1	GE 6.1-158	117	398075	4389586	323
T2	GE 6.1-158	117	396799	4389240	324
T3	GE 6.1-158	117	398641	4389266	325
T4	GE 6.1-158	117	396869	4388505	326
T5	GE 6.1-158	117	395549	4388723	325
T6	GE 6.1-158	117	394712	4388608	326
T7	GE 6.1-158	117	394790	4388019	327
T8	GE 6.1-158	117	394528	4387578	328
T10	GE 6.1-158	117	397947	4387557	330
T11	GE 6.1-158	117	398700	4387138	328
T12	GE 6.1-158	117	398058	4386951	328
T13	GE 6.1-158	117	395024	4387306	328
T15	GE 6.1-158	117	393915	4387041	326
T17	GE 6.1-158	117	396287	4385695	320
T18	GE 6.1-158	117	397107	4386387	324
T19	GE 6.1-158	117	397944	4385415	324
T20	GE 6.1-158	117	398687	4385394	327
T22	GE 6.1-158	117	400069	4389048	328
T23	GE 6.1-158	117	400215	4389534	325

Source	Equipment	Relative Height (m)	Coordinates (NAD83 Z16N)		Elevation (m)
			X (m)	Y (m)	
T25	GE 6.1-158	117	401727	4388677	334
T26	GE 6.1-158	117	401288	4388538	334
T28	GE 6.1-158	117	399559	4388537	330
T29	GE 6.1-158	117	400347	4387659	330
T30	GE 6.1-158	117	402271	4387292	324
T31	GE 6.1-158	117	403641	4386065	319
T33	GE 6.1-158	117	401967	4385916	320
T34	GE 6.1-158	117	400951	4385527	326
T35	GE 6.1-158	117	400197	4386126	326
T36	GE 6.1-158	117	400415	4384382	321
T38	GE 6.1-158	117	401702	4383765	320
T39a	GE 6.1-158	117	403775	4382962	320
T40	GE 6.1-158	117	401137	4382996	321
T43	GE 6.1-158	117	399314	4382904	322
T44	GE 6.1-158	117	399156	4382442	323
T45	GE 6.1-158	117	404040	4382257	322
T46	GE 6.1-158	117	403959	4381140	323
T47a	GE 6.1-158	117	402721	4380961	322
T48	GE 6.1-158	117	402723	4380104	324
T49	GE 6.1-158	117	402352	4380577	323
T51	GE 6.1-158	117	400802	4381024	325
T52	GE 6.1-158	117	401007	4380156	325
T53	GE 6.1-158	117	399517	4381050	324
T54	GE 6.1-158	117	396811	4380171	322
T55	GE 6.1-158	117	396772	4381070	324
T56	GE 6.1-158	117	396208	4381215	322
T57	GE 6.1-158	117	395409	4381231	324
T58	GE 6.1-158	117	393472	4381968	325
T59	GE 6.1-158	117	393872	4382679	327
T60	GE 6.1-158	117	395952	4382435	326
T61	GE 6.1-158	117	396053	4384599	322
T62	GE 6.1-158	117	395175	4384479	321

Table 6: Modeled Sound Power Level (dBZ) by Octave Band Frequency⁸

Source	Full Octave Band Center Frequency (Hz)									Overall Sound Power Level	
	31.5	63	125	250	500	1000	2000	4000	8000	dBA	dBZ
T1, ONAF (175 MVA)	100	94	111	111	113	101	92	86	81	111	117
T2, ONAF (222 MVA)	101	95	112	112	113	102	93	86	82	112	118

⁸ Spectral levels for the transformers were derived from the *Handbook of Acoustical Measurements and Noise Control, Third Edition*, Cyril M. Harris (ed.), 1998.

Appendix C: Model Result Maps

Appendix C contains the model results in map format for each octave band center frequency. In each map, sound levels are represented by sound level isolines in 5 dB intervals represented by solid color lines. The line that represents the IPCB limit for each octave band is represented as a yellow dashed line.

At the end of Appendix C are a zoomed-in maps for receptors with the highest model results (within 1 dB of the IPCB limit) in the 1 kHz octave band, showing that the limit is met throughout the residential area surrounding the receptor.

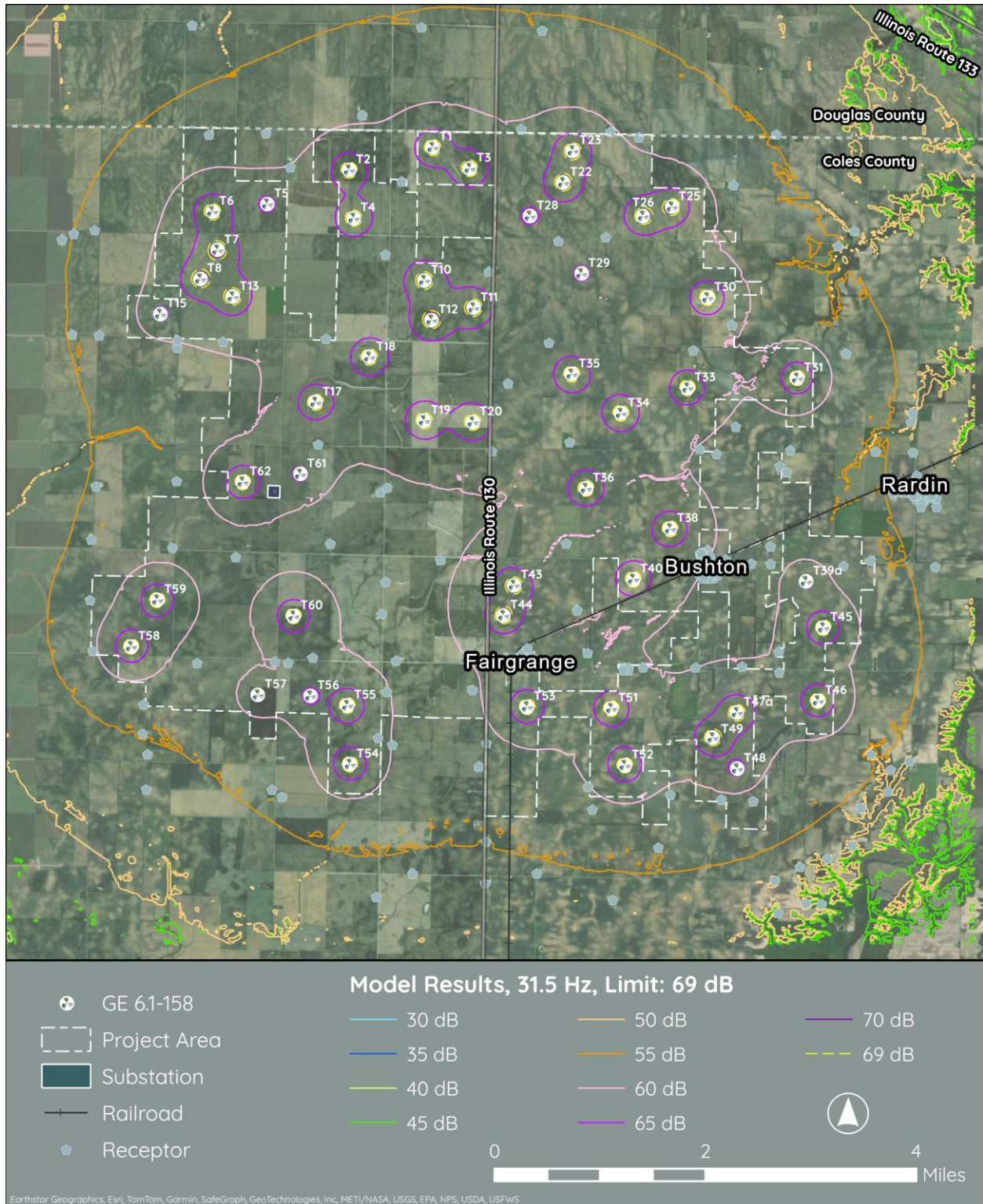


Figure 3: Model Results Map for the 31.5 Hz Octave Band

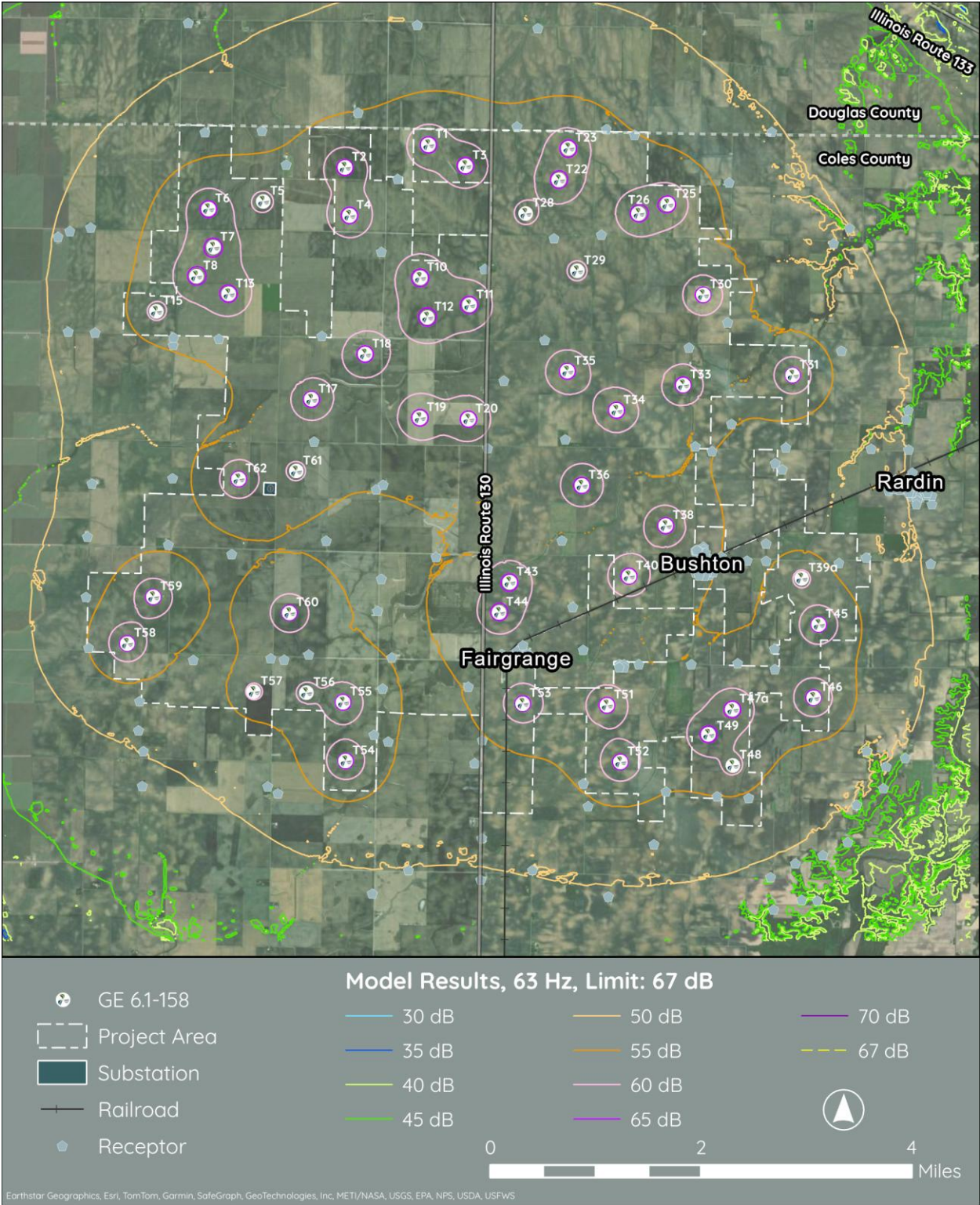


Figure 4: Model Results Map for the 63 Hz Octave Band

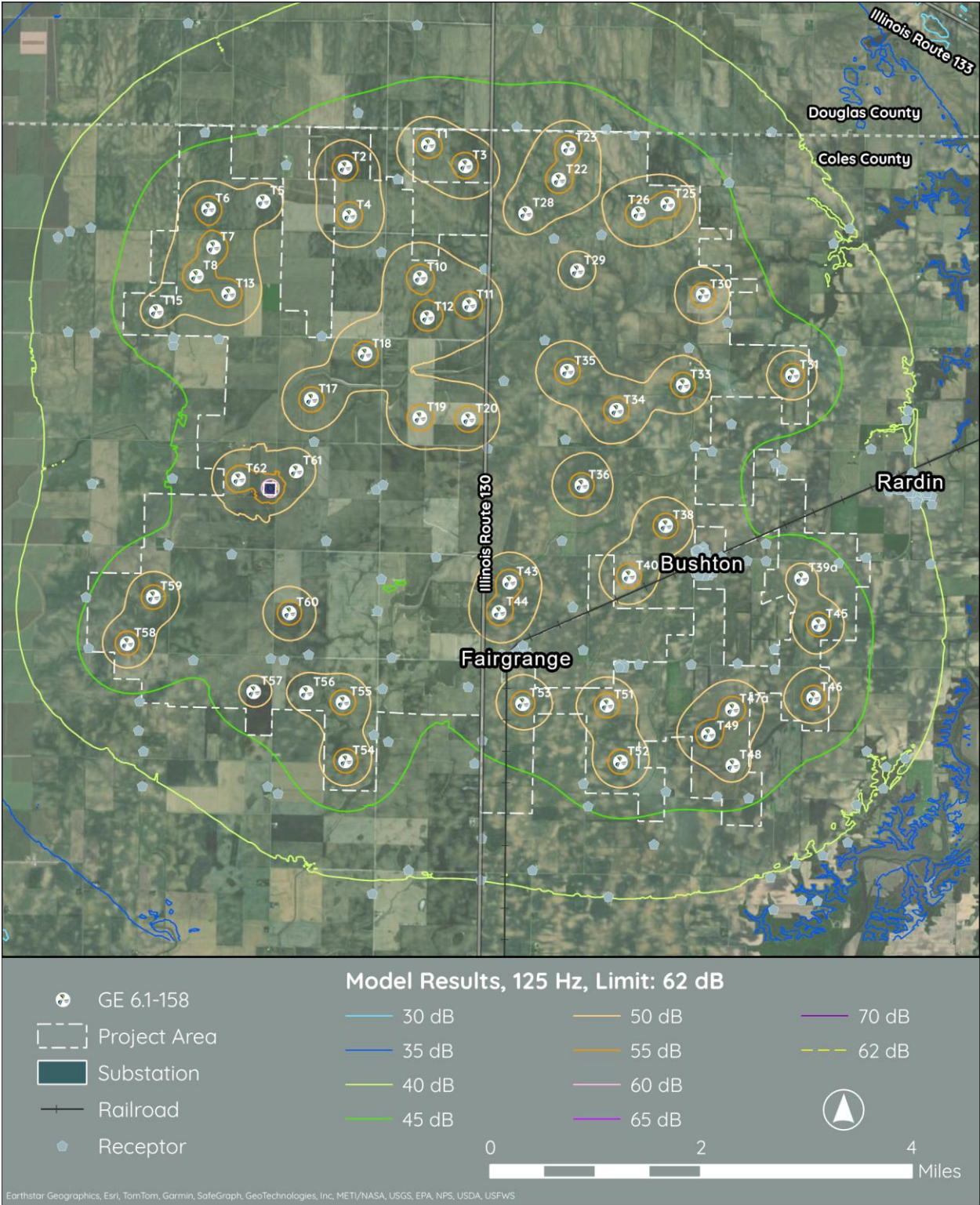


Figure 5: Model Results Map for the 125 Hz Octave Band

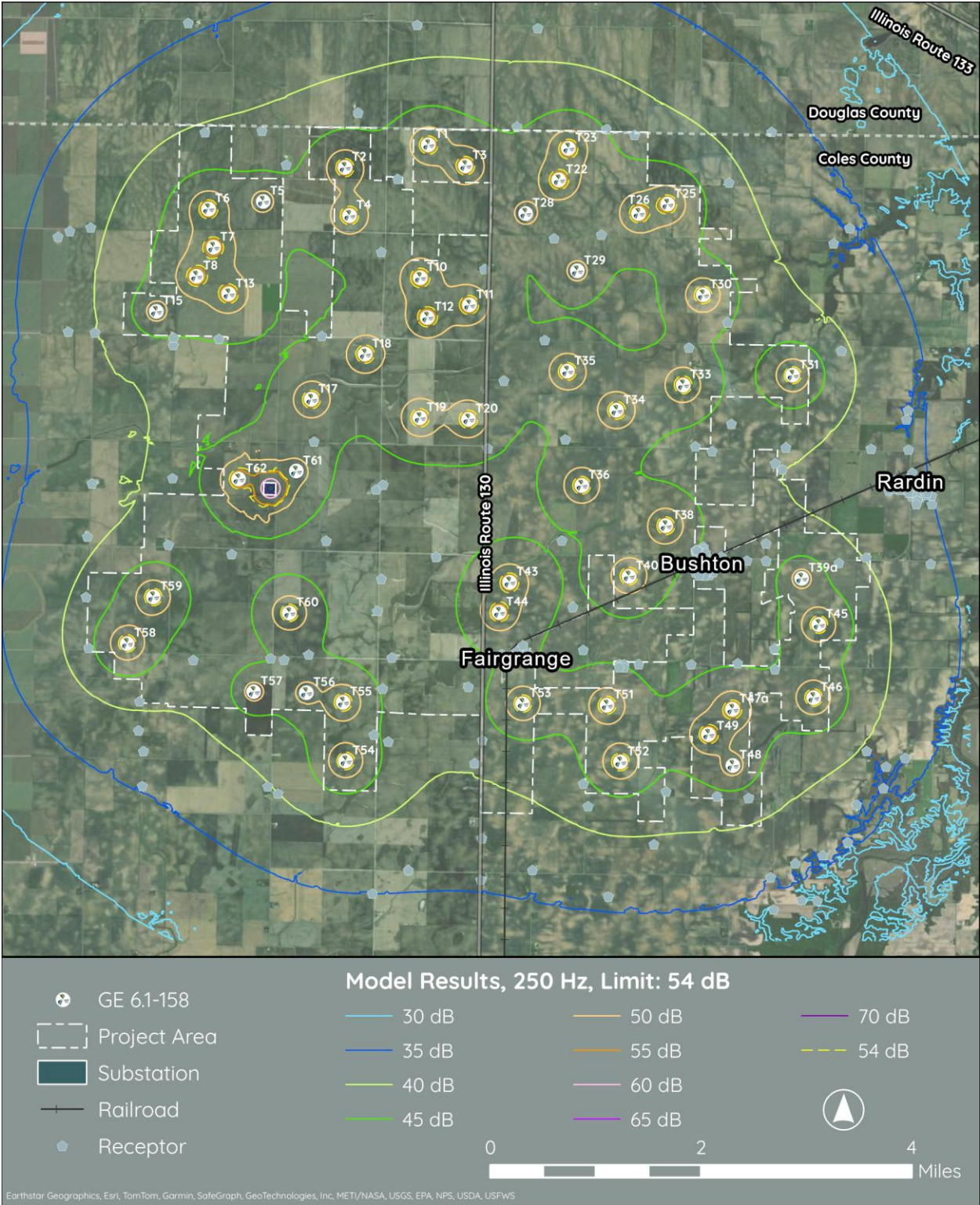


Figure 6: Model Results Map for the 250 Hz Octave Band



Figure 7: Model Results Map for the 500 Hz Octave Band

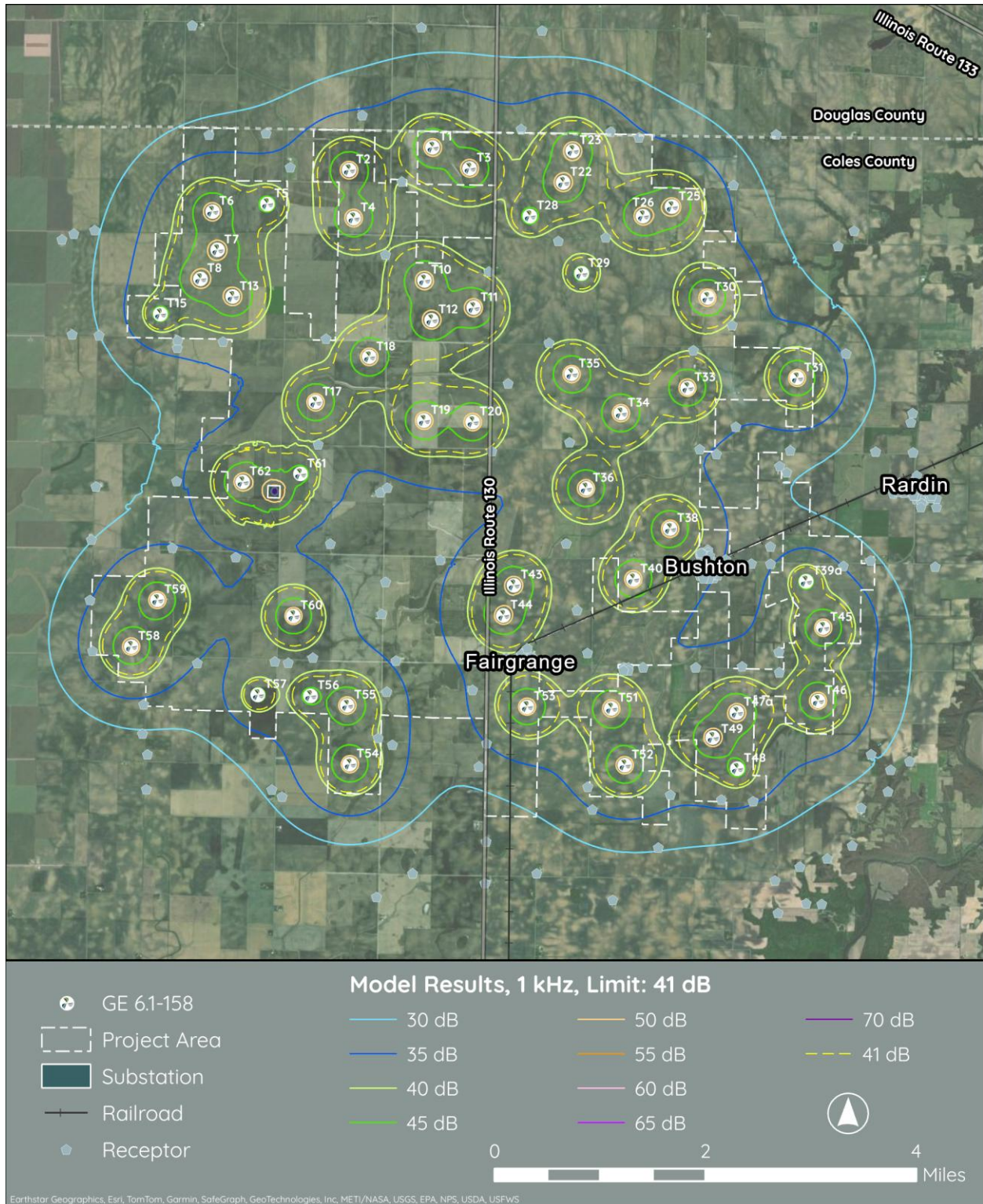


Figure 8: Model Results Map for the 1 kHz Octave Band

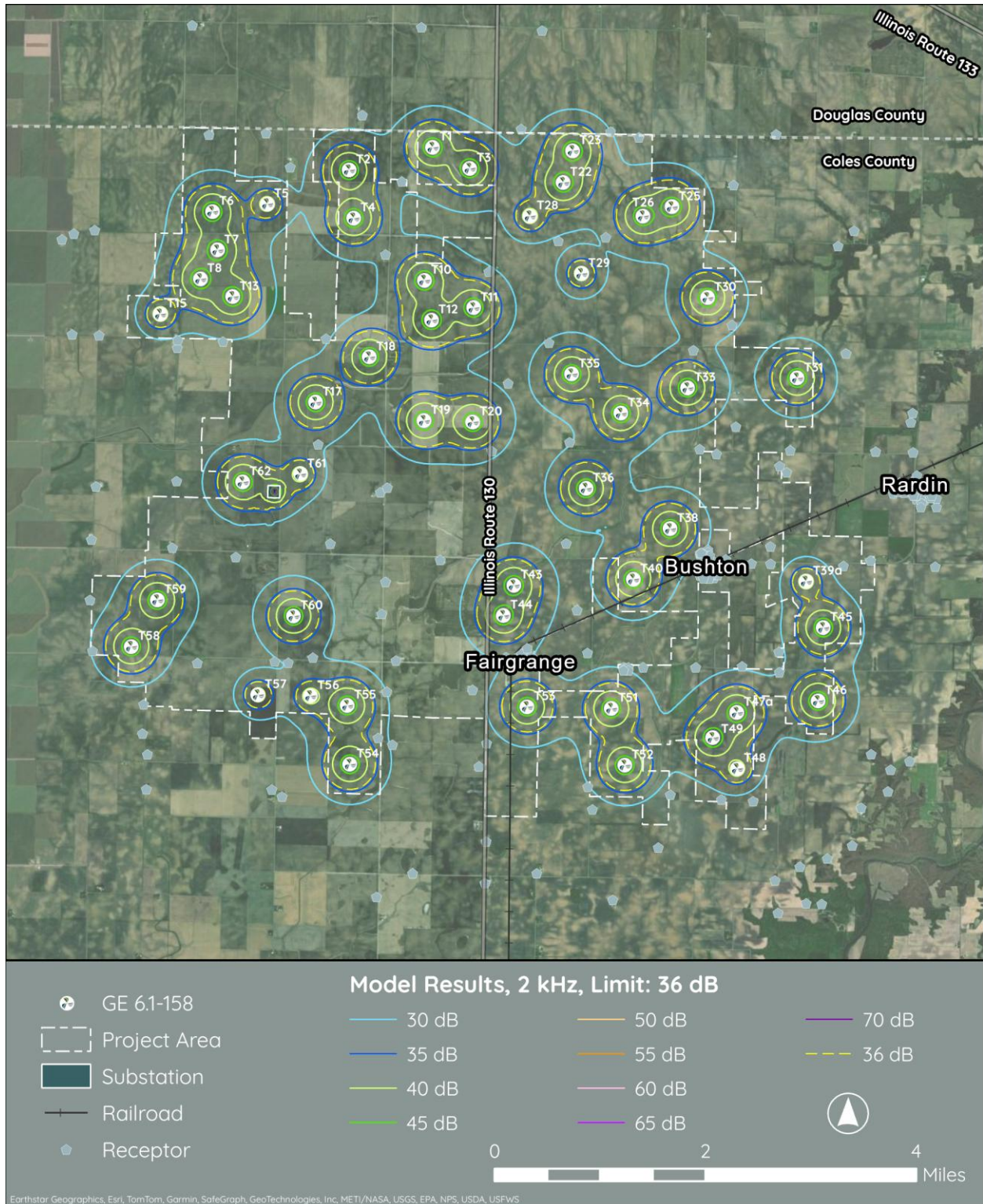


Figure 9: Model Results Map for the 2 kHz Octave Band

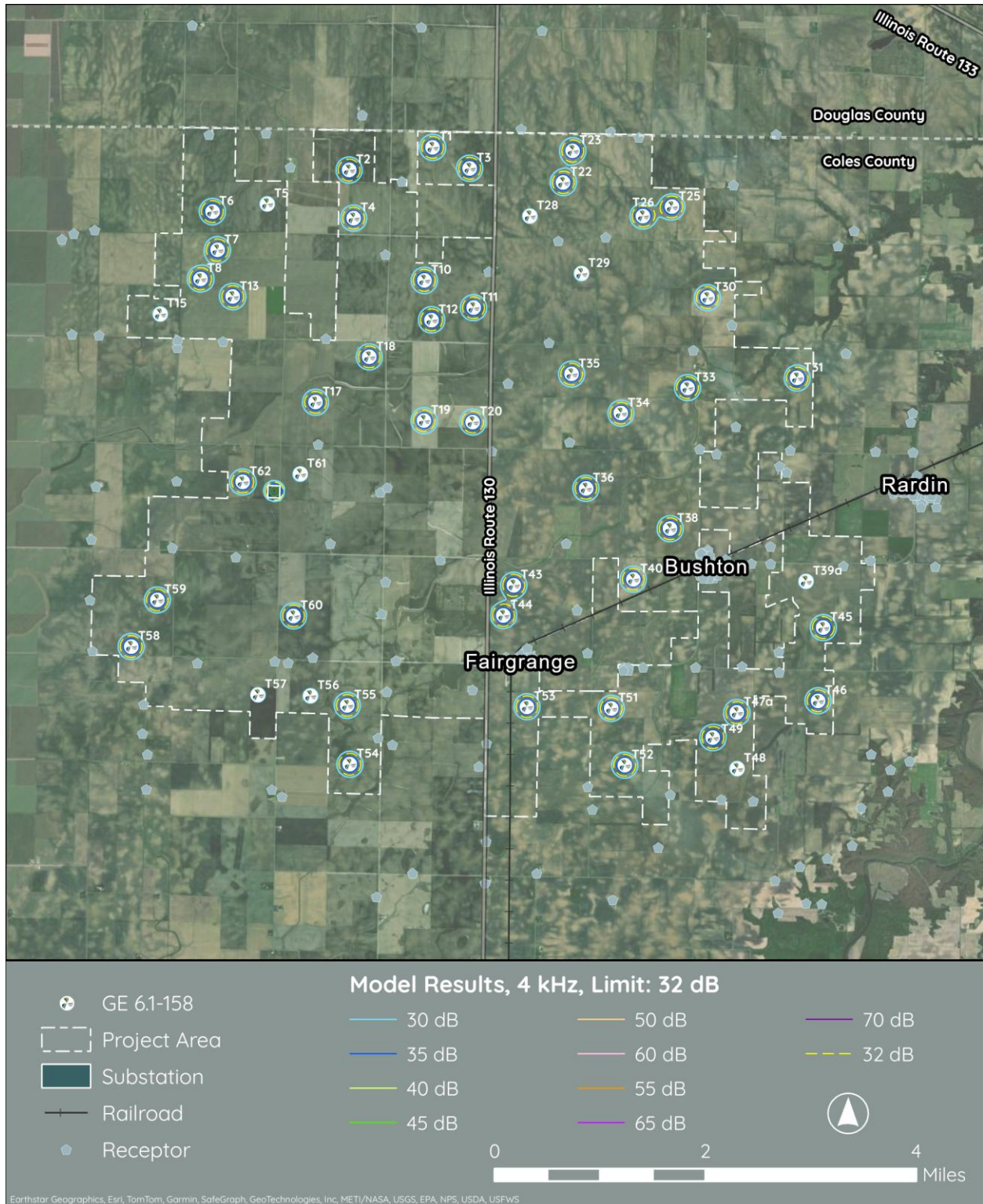


Figure 10: Model Results Map for the 4 kHz Octave Band

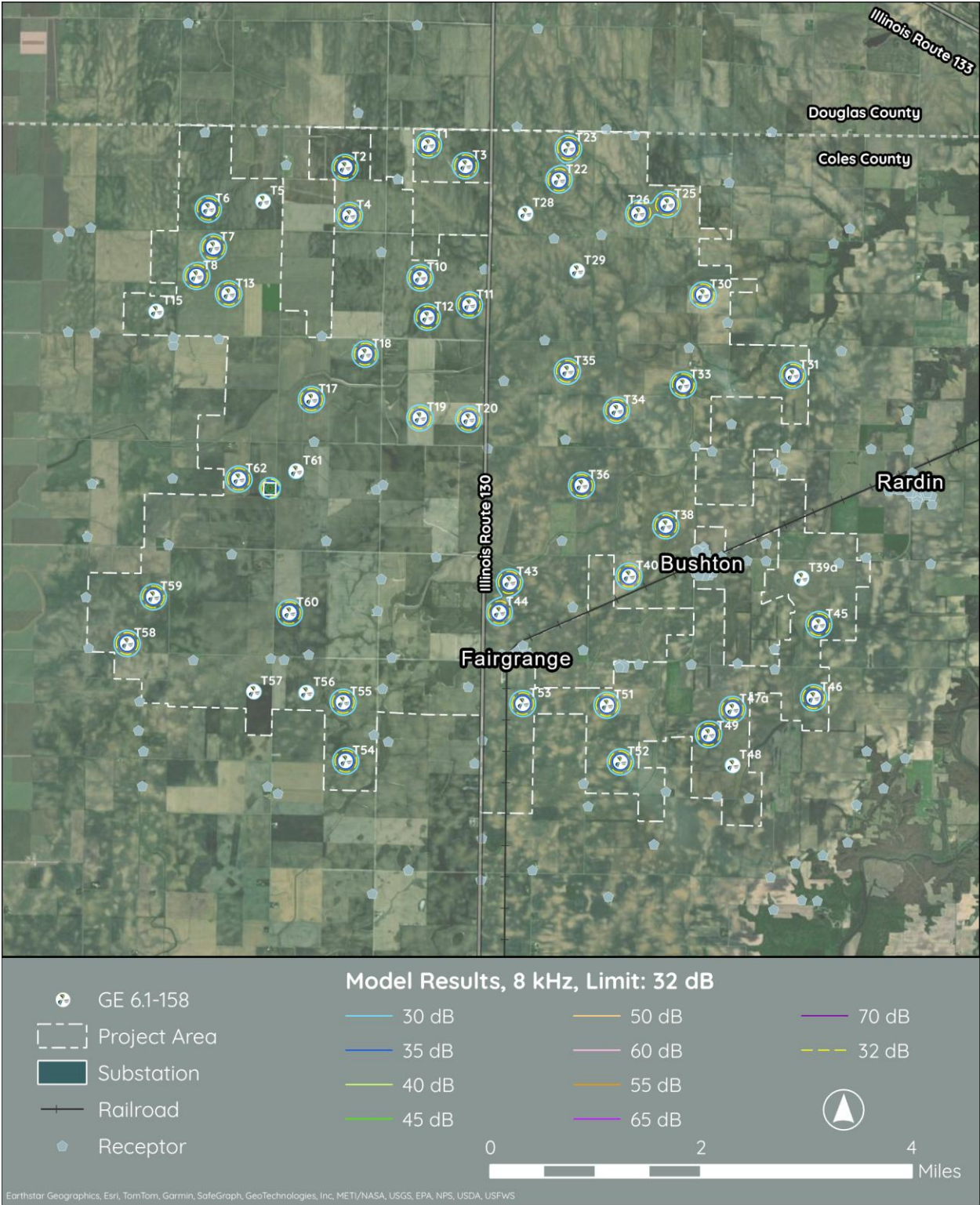


Figure 11: Model Results Map for the 8 kHz Octave Band



Figure 12: Detailed Model Results Map for the 1 kHz Octave Band, RE00013

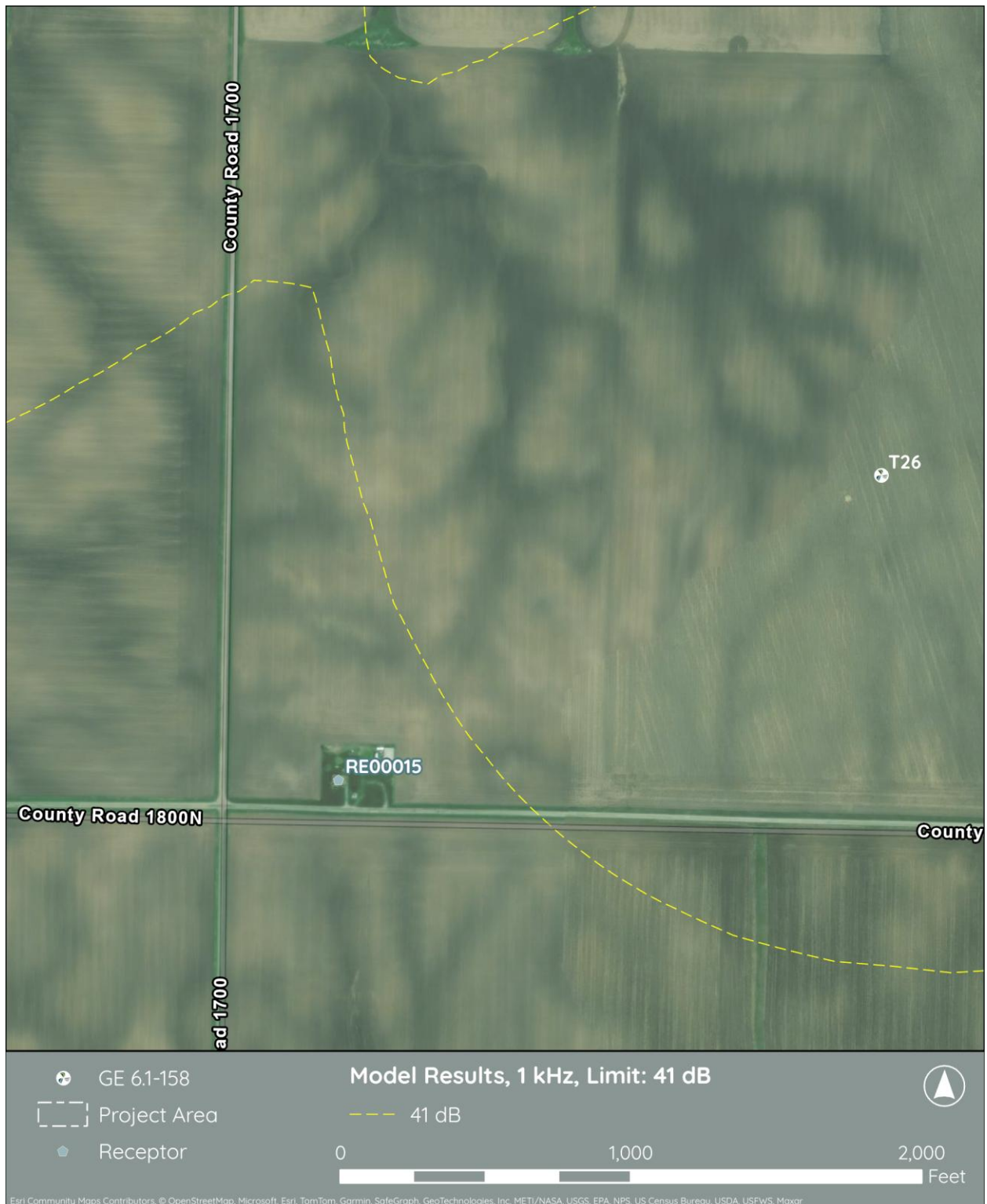


Figure 13: Detailed Model Results Map for the 1 kHz Octave Band, RE00015

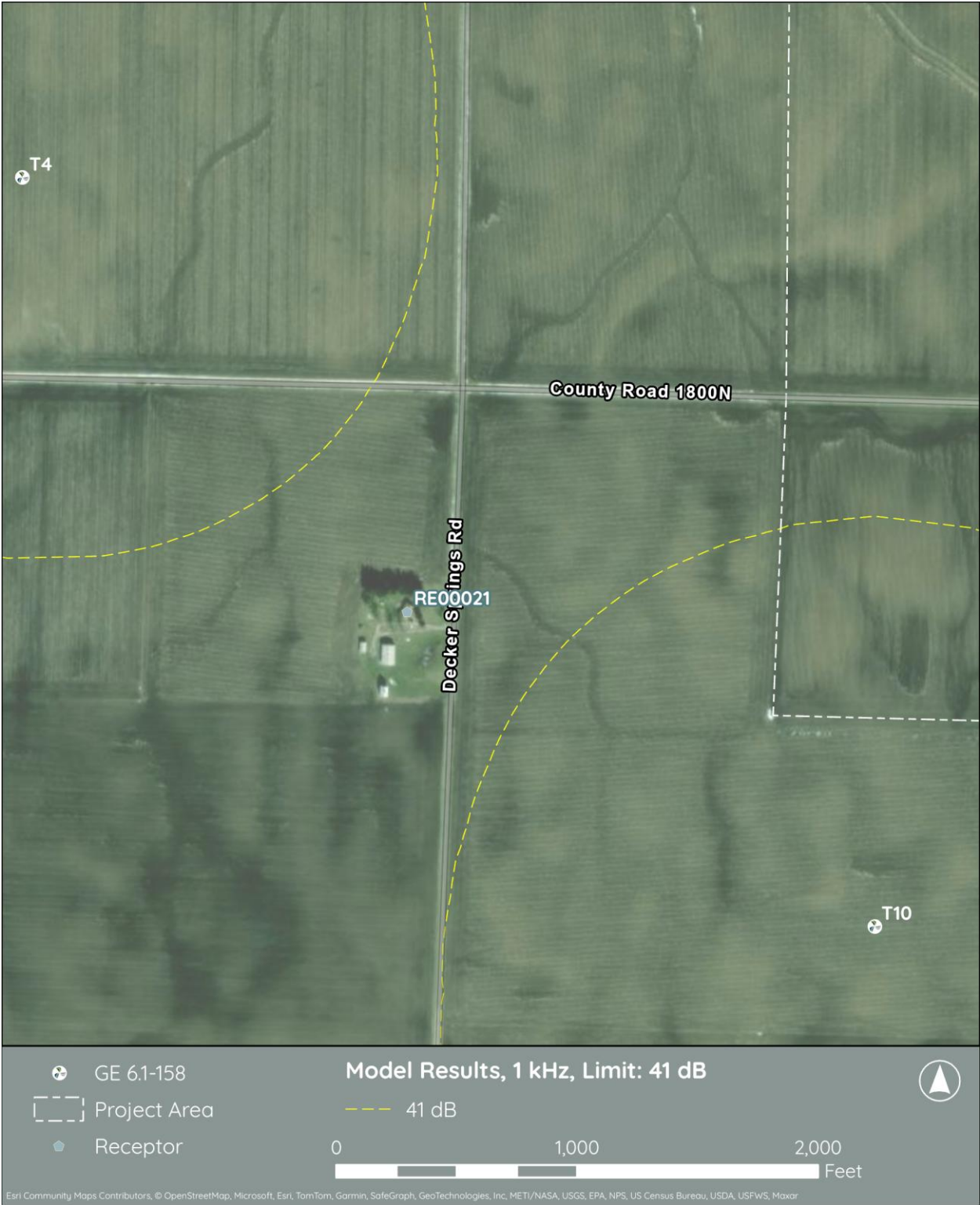


Figure 14: Detailed Model Results Map for the 1 kHz Octave Band, RE00021

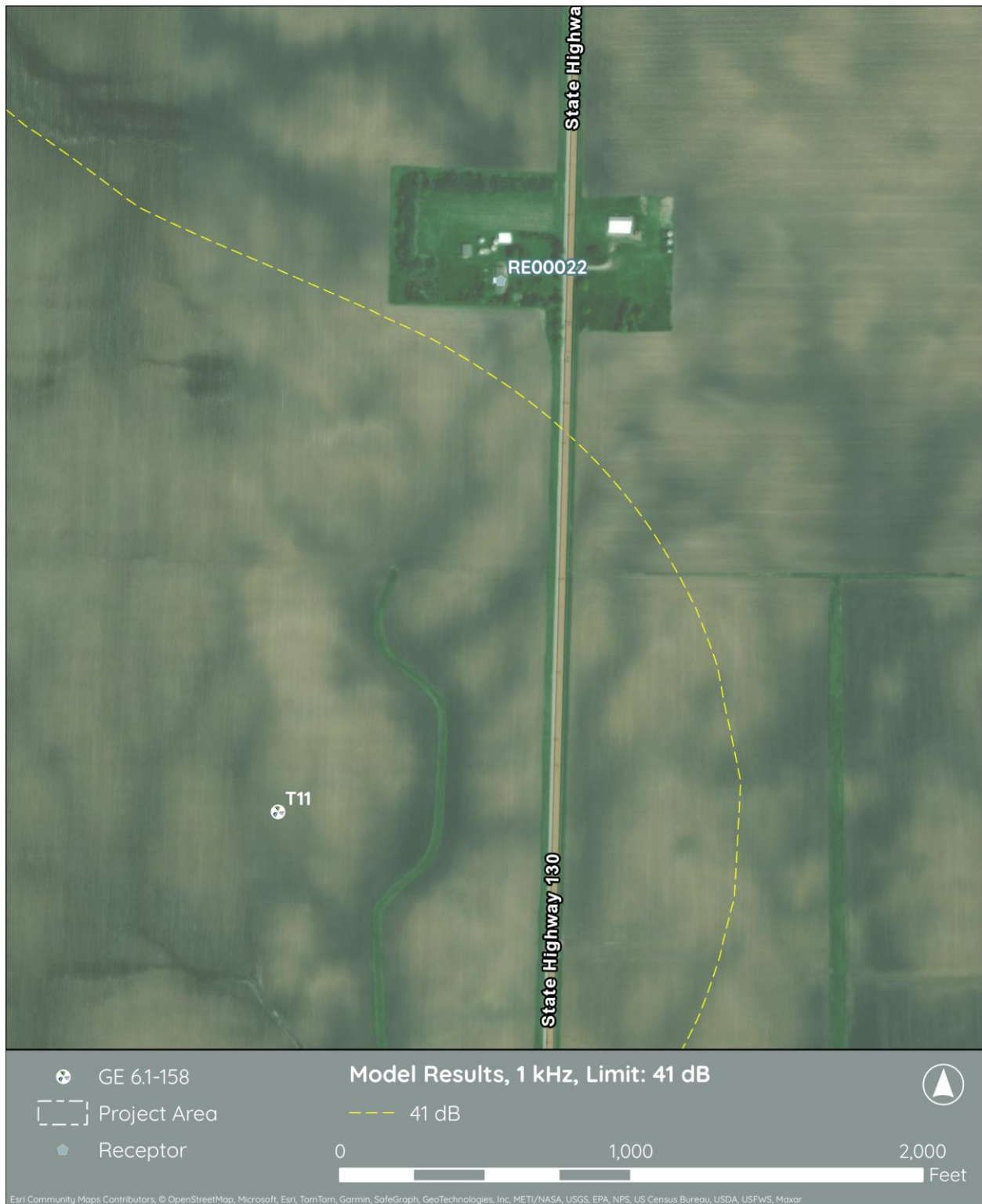


Figure 15: Detailed Model Results Map for the 1 kHz Octave Band, RE00022

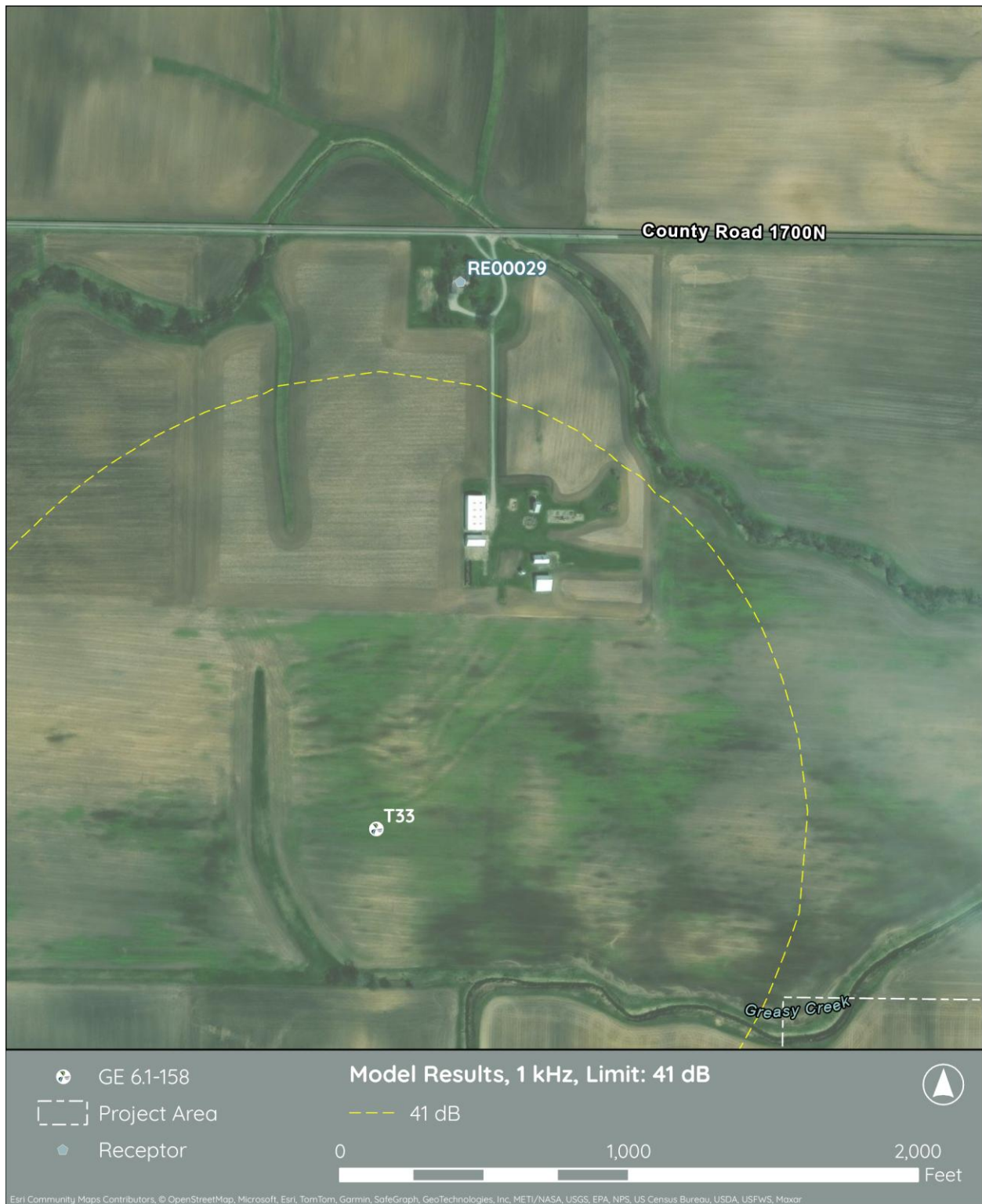


Figure 16: Detailed Model Results Map for the 1 kHz Octave Band, RE00029

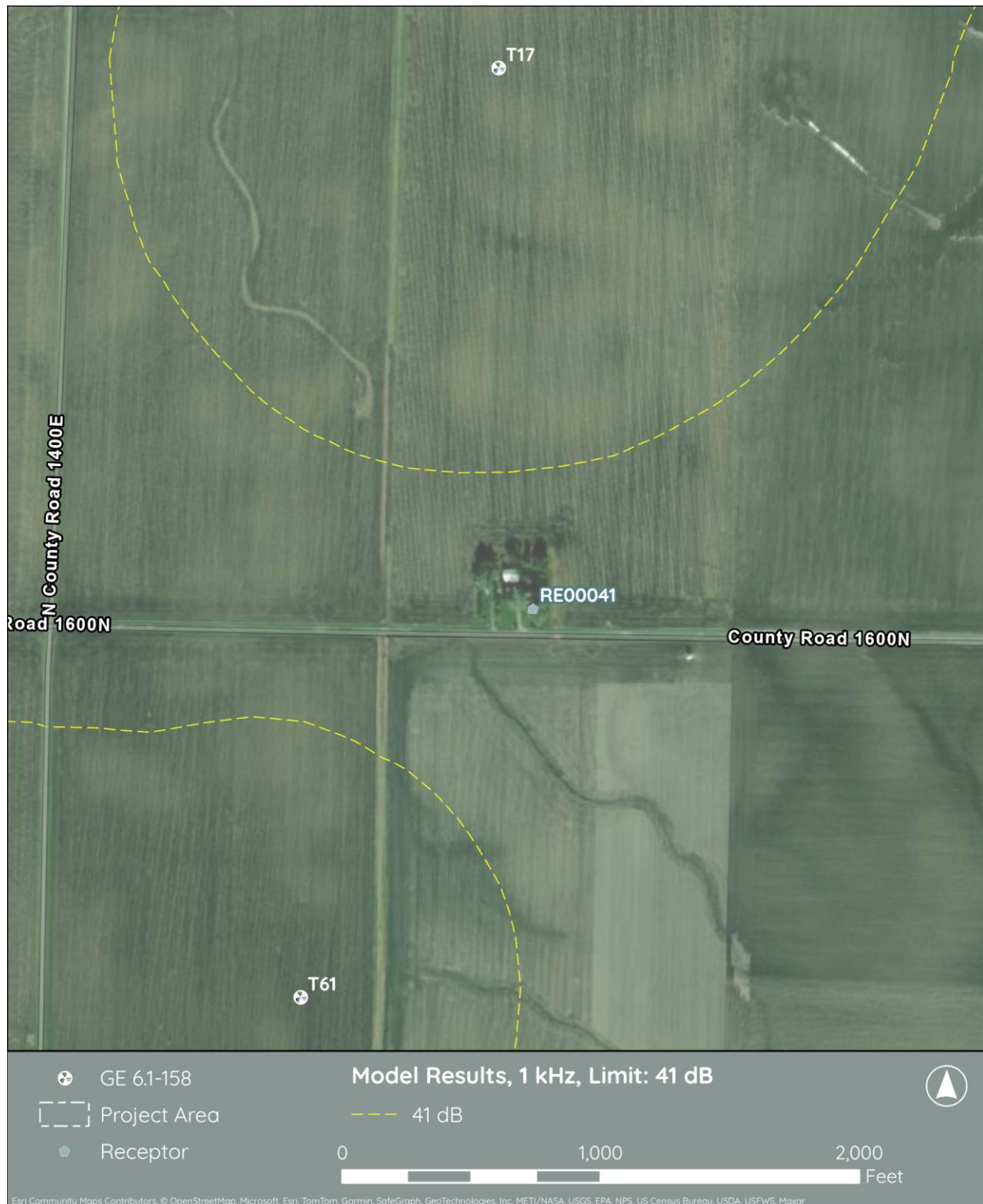


Figure 17: Detailed Model Results Map for the 1 kHz Octave Band, RE00041

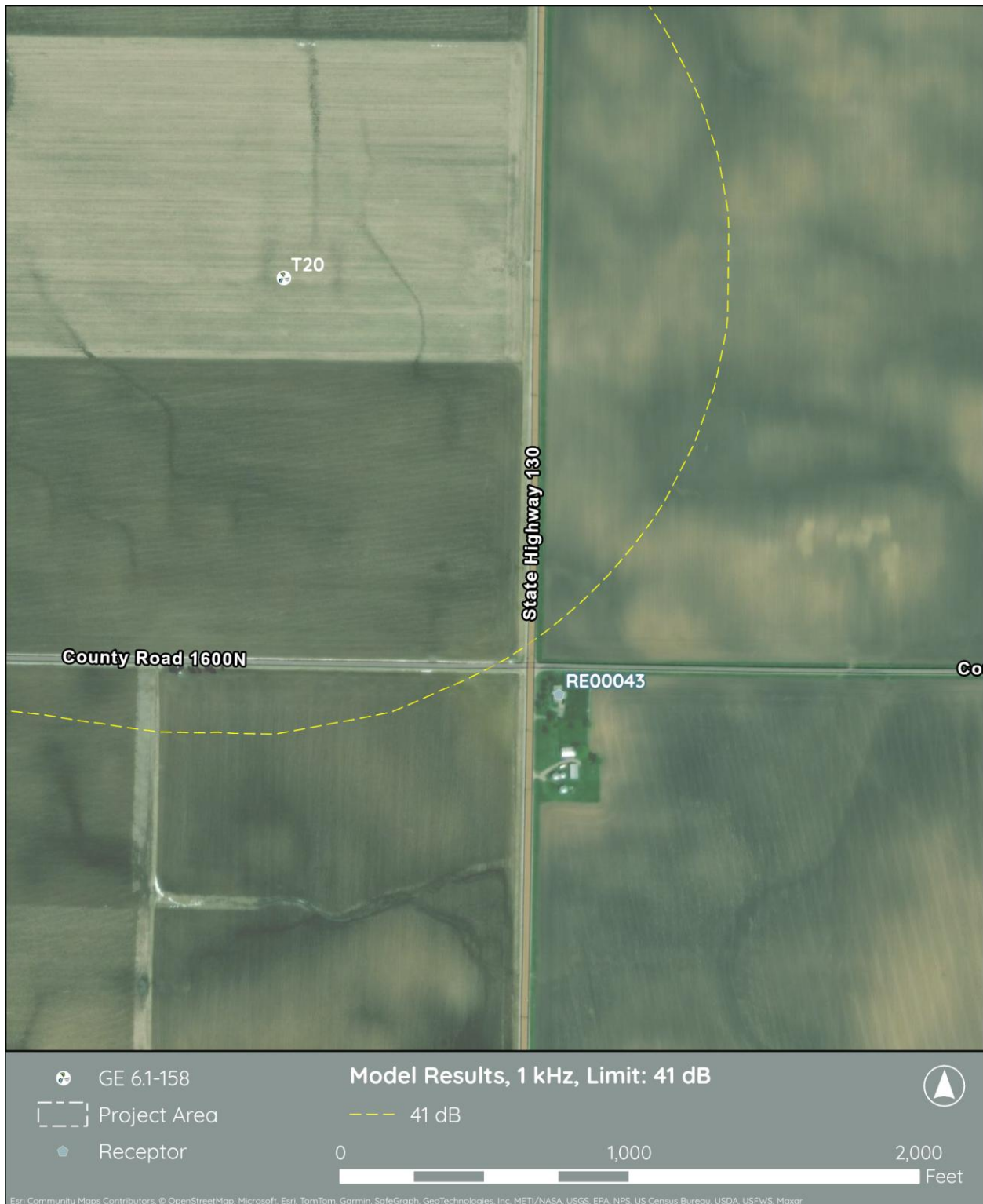


Figure 18: Detailed Model Results Map for the 1 kHz Octave Band, RE00043

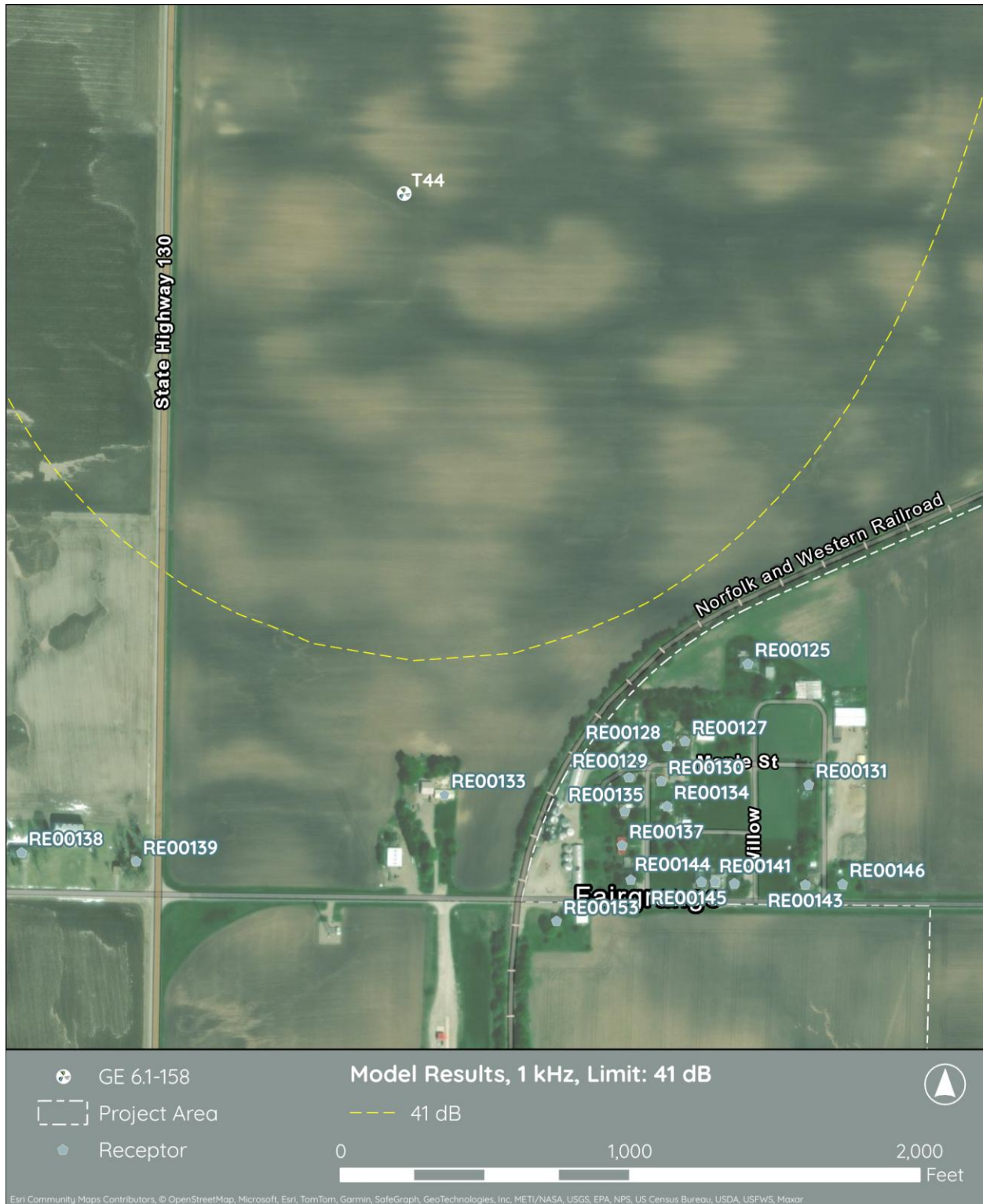


Figure 19: Detailed Model Results Map for the 1 kHz Octave Band, RE000125, RE000127 to RE00129, RE000133, and Other Receptors in Fairgrange

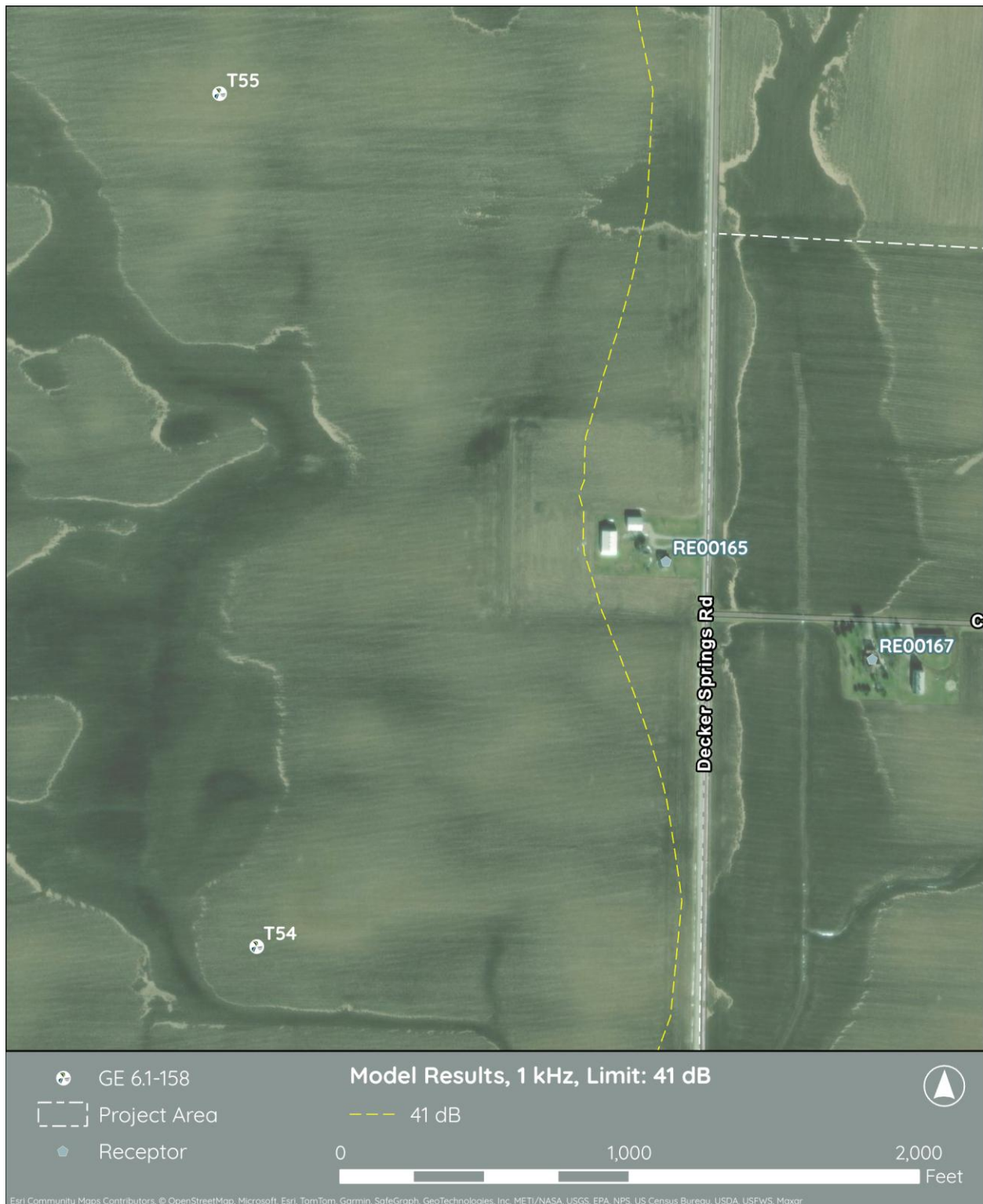


Figure 20: Detailed Model Results Map for the 1 kHz Octave Band, RE000165

Appendix D: Tabular Model Results & Receptor Maps

Table 7: Tabular Model Results for Each Discrete Receptor⁹

Receptor ID	Sound Pressure Level (dBZ) by Full Octave Band Center Frequency (Hz)									Coordinates (NAD83 Z16N)		Elevation (m)
	31.5	63	125	250	500	1000	2000	4000	8000	X (m)	Y (m)	
RE00001	56	51	42	38	33	27	10	<1	<1	397903	4391423	205
RE00002	53	49	39	34	29	21	<1	<1	<1	394405	4391453	205
RE00003	56	51	42	38	33	27	10	<1	<1	399746	4391372	205
RE00004	59	55	46	43	40	36	26	<1	<1	397002	4390082	210
RE00005	61	56	48	45	42	38	28	<1	<1	399427	4389872	211
RE00006	60	56	48	45	42	38	30	7	<1	400792	4389831	213
RE00007	55	50	41	37	32	26	9	<1	<1	403319	4389790	218
RE00008	59	55	46	43	40	36	25	<1	<1	401224	4389743	214
RE00009	58	54	45	42	38	33	20	<1	<1	395532	4389807	210
RE00010	57	53	44	41	37	32	20	<1	<1	394659	4389784	210
RE00011	60	56	47	44	41	37	27	2	<1	395901	4389288	210
RE00012	58	54	45	41	38	34	23	<1	<1	402668	4389014	221
RE00013	62	58	49	46	43	40	31	6	<1	397605	4389070	212
RE00014	54	50	40	36	31	24	5	<1	<1	404507	4388318	204
RE00015	62	58	49	46	43	40	31	8	<1	400718	4388219	221
RE00016	56	52	43	39	35	29	15	<1	<1	392915	4388328	213
RE00017	55	51	42	38	33	27	11	<1	<1	392597	4388273	213
RE00018	62	57	49	46	43	39	29	7	<1	399992	4388162	220
RE00019	55	51	41	37	32	26	8	<1	<1	404265	4388084	202
RE00020	55	50	41	37	32	26	9	<1	<1	392415	4388185	214
RE00021	62	58	50	47	44	40	31	6	<1	397355	4387956	216
RE00022	62	58	50	47	44	40	31	9	<1	398933	4387694	219
RE00023	61	57	48	45	43	39	32	11	<1	402647	4386878	211
RE00024	55	51	42	38	34	27	11	<1	<1	392571	4386737	211
RE00025	61	57	49	46	43	39	29	4	<1	396447	4386671	213
RE00026	56	52	43	40	36	30	17	<1	<1	392982	4386722	212
RE00027	62	58	49	46	43	39	31	9	<1	399852	4386608	213
RE00028	61	57	48	45	43	38	30	5	<1	394874	4386627	213
RE00029	62	58	49	46	43	40	32	10	<1	402056	4386494	211
RE00030	58	53	44	41	38	34	25	<1	<1	404385	4386445	206
RE00031	60	55	47	44	41	36	27	5	<1	394176	4386532	213

⁹ Maps of the receptor locations showing the receptor IDs are provided following the table.

Receptor ID	Sound Pressure Level (dBZ) by Full Octave Band Center Frequency (Hz)									Coordinates (NAD83 Z16N)		Elevation (m)
	31.5	63	125	250	500	1000	2000	4000	8000	X (m)	Y (m)	
RE00032	62	57	49	46	42	38	28	<1	<1	399227	4385987	213
RE00033	49	45	38	34	29	24	9	<1	<1	405403	4385536	200
RE00034	52	47	40	35	30	23	7	<1	<1	405376	4385395	205
RE00035	59	55	46	43	40	35	25	<1	<1	402705	4385328	207
RE00036	61	57	49	46	43	39	30	3	<1	400166	4385091	216
RE00037	55	51	42	37	33	27	12	<1	<1	404839	4384948	208
RE00038	58	54	45	41	37	32	21	<1	<1	403535	4384965	208
RE00039	60	56	47	44	40	36	25	<1	<1	402153	4384985	205
RE00040	54	50	40	36	31	24	6	<1	<1	405410	4384935	205
RE00041	61	57	49	47	45	40	31	10	<1	396327	4385058	210
RE00042	59	55	46	43	39	35	23	<1	<1	402407	4384911	208
RE00043	62	58	49	46	43	40	32	13	<1	398977	4384956	214
RE00044	58	54	44	41	37	31	18	<1	<1	403374	4384727	210
RE00045	57	53	44	40	36	31	16	<1	<1	403480	4384631	213
RE00046	54	50	40	36	30	23	4	<1	<1	405470	4384583	206
RE00047	54	50	40	36	31	23	4	<1	<1	405455	4384536	206
RE00048	55	50	41	36	31	24	6	<1	<1	405205	4384475	207
RE00049	54	50	40	36	31	24	5	<1	<1	405376	4384461	207
RE00050	53	49	41	36	31	25	7	<1	<1	405126	4384455	207
RE00051	54	50	40	36	31	24	5	<1	<1	405360	4384426	207
RE00052	53	49	41	36	31	25	7	<1	<1	405122	4384428	207
RE00053	55	51	41	37	32	25	7	<1	<1	405084	4384427	207
RE00054	55	50	41	36	31	24	5	<1	<1	405301	4384418	207
RE00055	54	50	40	36	31	24	5	<1	<1	405374	4384415	207
RE00056	55	50	41	36	31	24	6	<1	<1	405222	4384416	207
RE00057	54	50	40	36	30	23	3	<1	<1	405529	4384377	208
RE00058	54	50	40	36	31	23	4	<1	<1	405458	4384373	207
RE00059	53	49	40	35	30	23	3	<1	<1	405586	4384368	208
RE00060	54	50	40	36	31	24	5	<1	<1	405338	4384369	207
RE00061	55	50	41	37	32	25	6	<1	<1	405176	4384338	206
RE00062	54	50	41	36	31	24	5	<1	<1	405325	4384333	207
RE00063	58	54	46	43	43	34	23	<1	<1	394166	4384498	208
RE00064	54	50	40	36	31	24	5	<1	<1	405375	4384330	207
RE00065	55	50	41	36	31	24	6	<1	<1	405271	4384320	207
RE00066	55	51	41	37	32	25	7	<1	<1	405107	4384307	206
RE00067	54	50	40	36	31	24	5	<1	<1	405415	4384279	207
RE00068	54	49	40	35	30	22	2	<1	<1	405695	4384275	208
RE00069	54	50	40	36	31	23	4	<1	<1	405458	4384278	208

Receptor ID	Sound Pressure Level (dBZ) by Full Octave Band Center Frequency (Hz)									Coordinates (NAD83 Z16N)		Elevation (m)
	31.5	63	125	250	500	1000	2000	4000	8000	X (m)	Y (m)	
RE00070	60	55	47	43	40	34	21	<1	<1	397382	4384397	217
RE00071	52	48	39	35	30	22	2	<1	<1	405677	4384238	208
RE00072	54	49	40	35	30	22	2	<1	<1	405766	4384230	207
RE00073	54	50	40	36	31	23	4	<1	<1	405518	4384231	210
RE00074	55	51	42	38	35	27	9	<1	<1	392935	4384414	207
RE00075	54	50	40	36	31	24	4	<1	<1	405460	4384220	208
RE00076	54	49	40	35	30	23	3	<1	<1	405586	4384208	210
RE00077	59	55	46	43	40	34	20	<1	<1	397277	4384327	217
RE00078	54	49	40	36	30	23	4	<1	<1	405544	4384157	208
RE00079	54	49	40	36	31	23	4	<1	<1	405530	4384101	208
RE00080	54	49	40	35	30	22	2	<1	<1	405767	4384101	206
RE00081	61	57	48	45	41	38	27	<1	<1	400113	4383547	209
RE00082	58	54	45	42	38	33	22	<1	<1	403233	4383499	209
RE00083	56	52	43	39	35	30	17	<1	<1	392864	4383605	209
RE00084	59	54	46	43	40	33	20	<1	<1	396513	4383543	215
RE00085	60	56	48	45	41	38	29	7	<1	402276	4383452	208
RE00086	60	56	48	44	41	38	29	6	<1	402277	4383411	208
RE00087	61	57	48	45	42	39	31	10	<1	402161	4383400	208
RE00088	61	57	48	45	42	38	30	8	<1	402192	4383398	208
RE00089	61	57	48	45	42	39	31	9	<1	402177	4383398	208
RE00090	61	57	48	45	42	39	31	9	<1	402161	4383365	208
RE00091	60	56	47	44	41	37	29	4	<1	402278	4383362	208
RE00092	60	56	47	44	41	37	28	3	<1	402305	4383360	208
RE00093	59	55	46	43	40	35	26	<1	<1	394101	4383480	211
RE00094	56	52	43	40	36	31	20	<1	<1	404763	4383286	209
RE00095	59	55	46	43	39	35	24	<1	<1	402551	4383303	209
RE00096	60	56	47	44	41	37	28	2	<1	402289	4383304	208
RE00097	60	56	47	44	40	36	27	<1	<1	402336	4383292	209
RE00098	61	56	48	45	41	38	29	6	<1	402184	4383295	208
RE00099	59	55	46	43	39	35	25	3	<1	403234	4383236	208
RE00100	59	54	46	42	38	33	22	<1	<1	402942	4383239	208
RE00101	54	50	40	36	31	25	8	<1	<1	405748	4383192	208
RE00102	59	55	46	43	39	34	21	<1	<1	398190	4383294	211
RE00103	58	54	45	42	39	35	26	3	<1	404347	4383201	208
RE00104	59	55	46	43	41	35	23	<1	<1	395068	4383338	214
RE00105	60	55	47	43	40	36	25	<1	<1	402375	4383194	209
RE00106	60	56	47	44	40	36	27	<1	<1	402270	4383170	208
RE00107	60	55	47	43	40	36	25	<1	<1	402370	4383164	209

Receptor ID	Sound Pressure Level (dBZ) by Full Octave Band Center Frequency (Hz)									Coordinates (NAD83 Z16N)		Elevation (m)
	31.5	63	125	250	500	1000	2000	4000	8000	X (m)	Y (m)	
RE00108	60	56	47	44	41	37	27	<1	<1	402219	4383165	209
RE00109	60	56	47	44	41	37	28	1	<1	402159	4383130	208
RE00110	60	55	47	43	40	36	25	<1	<1	402322	4383121	208
RE00111	60	56	47	44	40	36	27	<1	<1	402221	4383103	208
RE00112	60	55	47	43	40	35	25	<1	<1	402336	4383071	208
RE00113	59	55	46	43	39	35	24	<1	<1	402425	4383063	208
RE00114	60	56	47	44	40	36	26	<1	<1	402213	4383063	208
RE00115	60	56	47	44	41	37	27	<1	<1	402153	4383058	208
RE00116	59	55	46	43	39	35	24	<1	<1	402366	4383017	208
RE00117	60	56	47	44	40	36	26	<1	<1	402209	4383014	208
RE00118	60	55	47	43	40	35	25	<1	<1	402294	4383009	208
RE00119	59	54	45	42	38	32	17	<1	<1	397355	4382959	215
RE00120	58	54	45	42	39	35	25	<1	<1	392843	4382684	210
RE00121	60	56	48	44	41	37	27	<1	<1	400280	4382529	214
RE00122	59	54	46	42	38	33	19	<1	<1	397298	4382470	213
RE00123	52	48	38	34	29	23	5	<1	<1	391317	4382510	208
RE00124	60	56	48	45	42	38	29	2	<1	403361	4381892	214
RE00125	62	58	49	46	43	40	32	9	<1	399518	4381947	212
RE00126	60	56	47	44	41	37	26	<1	<1	400439	4381875	212
RE00127	62	58	49	46	43	40	31	8	<1	399452	4381865	211
RE00128	62	58	49	46	43	40	31	8	<1	399433	4381860	211
RE00129	62	57	49	46	43	40	31	7	<1	399393	4381827	211
RE00130	62	57	49	46	43	39	31	7	<1	399427	4381823	211
RE00131	61	57	48	45	42	39	30	5	<1	399582	4381820	211
RE00132	59	55	47	44	41	38	31	9	<1	392883	4381906	213
RE00133	62	57	49	46	43	40	31	8	<1	399198	4381809	212
RE00134	62	57	49	46	43	39	31	6	<1	399433	4381797	211
RE00135	62	57	49	46	43	39	31	7	<1	399388	4381792	211
RE00136	61	57	48	46	43	39	31	8	<1	396247	4381804	212
RE00137	61	57	49	46	43	39	31	7	<1	399385	4381756	211
RE00138	60	56	47	44	41	37	28	<1	<1	398753	4381748	209
RE00139	61	57	48	45	41	38	29	3	<1	398874	4381739	210
RE00140	59	55	46	43	39	34	23	<1	<1	397514	4381759	210
RE00141	61	57	49	46	43	39	31	7	<1	399483	4381717	211
RE00142	61	56	48	45	42	38	29	4	<1	402799	4381671	209
RE00143	61	57	49	46	43	39	31	7	<1	399578	4381714	211
RE00144	62	57	49	46	43	39	31	7	<1	399395	4381719	211
RE00145	62	57	49	46	43	39	31	7	<1	399469	4381717	211

Receptor ID	Sound Pressure Level (dBZ) by Full Octave Band Center Frequency (Hz)									Coordinates (NAD83 Z16N)		Elevation (m)
	31.5	63	125	250	500	1000	2000	4000	8000	X (m)	Y (m)	
RE00146	61	57	48	45	42	39	31	6	<1	399618	4381715	211
RE00147	61	57	49	46	43	39	31	7	<1	399504	4381716	211
RE00148	60	56	47	44	41	37	26	<1	<1	402090	4381655	210
RE00149	60	56	48	45	42	38	30	7	<1	395664	4381746	214
RE00150	60	56	47	44	41	37	27	<1	<1	401290	4381655	209
RE00151	61	57	48	45	42	38	29	5	<1	401063	4381654	209
RE00152	61	57	48	45	42	38	30	6	<1	400991	4381655	209
RE00153	61	57	49	46	43	39	31	7	<1	399316	4381676	212
RE00154	61	57	48	45	42	39	30	7	<1	395870	4381726	213
RE00155	61	57	48	45	42	38	30	6	<1	401020	4381645	209
RE00156	59	54	46	43	39	35	24	<1	<1	394483	4381721	217
RE00157	61	57	48	45	42	39	30	4	<1	403368	4381581	211
RE00158	61	57	48	45	42	39	30	8	<1	401020	4381615	209
RE00159	61	57	48	45	42	38	30	7	<1	401063	4381609	209
RE00160	61	57	48	45	42	39	30	8	<1	400990	4381610	209
RE00161	60	55	47	43	40	36	26	<1	<1	398684	4381311	211
RE00162	60	56	48	45	41	38	30	7	<1	397375	4381284	210
RE00163	57	53	44	41	38	34	24	<1	<1	393663	4381091	214
RE00164	55	51	42	38	35	30	17	<1	<1	393646	4380645	213
RE00165	61	57	49	46	43	40	33	11	<1	397243	4380578	211
RE00166	59	55	46	43	39	35	26	<1	<1	398898	4380496	212
RE00167	60	56	47	44	41	38	29	4	<1	397460	4380474	209
RE00168	56	51	43	39	36	31	20	<1	<1	404770	4380330	209
RE00169	54	50	40	37	32	27	12	<1	<1	405358	4380224	207
RE00170	55	50	41	37	33	27	12	<1	<1	393719	4380326	213
RE00171	54	50	41	37	33	28	14	<1	<1	405066	4380092	209
RE00172	58	53	44	41	37	32	20	<1	<1	398782	4380143	214
RE00173	60	56	47	44	41	38	30	7	<1	400444	4379833	213
RE00174	46	42	37	32	28	24	9	<1	<1	405026	4379761	195
RE00175	59	55	47	44	40	37	27	<1	<1	401705	4379711	213
RE00176	57	52	43	40	36	31	19	<1	<1	395619	4379791	213
RE00177	53	49	40	35	31	24	6	<1	<1	393704	4379796	212
RE00178	59	55	47	44	41	37	28	7	<1	402483	4379636	214
RE00179	59	54	46	43	40	36	27	6	<1	402968	4379612	213
RE00180	57	52	43	40	36	32	20	<1	<1	395775	4379681	211
RE00181	54	50	41	37	33	27	11	<1	<1	404617	4379511	209
RE00182	58	54	45	42	39	35	26	<1	<1	400514	4379487	214
RE00183	50	46	40	35	29	23	4	<1	<1	404481	4378936	208

Receptor ID	Sound Pressure Level (dBZ) by Full Octave Band Center Frequency (Hz)									Coordinates (NAD83 Z16N)		Elevation (m)
	31.5	63	125	250	500	1000	2000	4000	8000	X (m)	Y (m)	
RE00184	55	51	42	37	33	26	8	<1	<1	398890	4378997	213
RE00185	56	52	43	39	35	31	17	<1	<1	401520	4378905	215
RE00186	50	45	39	35	30	23	5	<1	<1	404100	4378739	211
RE00187	52	48	40	36	31	25	7	<1	<1	403681	4378611	217
RE00188	55	50	41	37	32	25	7	<1	<1	399664	4378511	214
RE00189	54	50	40	36	31	25	8	<1	<1	397769	4378510	212
RE00190	52	47	39	35	31	24	7	<1	<1	403303	4378403	217
RE00191	54	50	40	36	30	23	2	<1	<1	398874	4378362	213
RE00192	52	48	40	36	31	24	7	<1	<1	400825	4378105	216
RE00193	52	48	38	34	29	22	<1	<1	<1	403778	4378054	214
RE00194	53	49	40	35	30	23	6	<1	<1	397218	4378151	211
RE00195	52	48	38	34	28	21	<1	<1	<1	404015	4378044	211
RE00196	52	48	39	34	29	22	<1	<1	<1	403347	4377907	213
CB00197	60	56	48	45	42	38	29	9	<1	394183	4386647	213
Maximum Results	62	58	50	47	45	40	33	13	<1			
IPCB Class C to Class A Nighttime Limit	69	67	62	54	47	41	36	32	32			

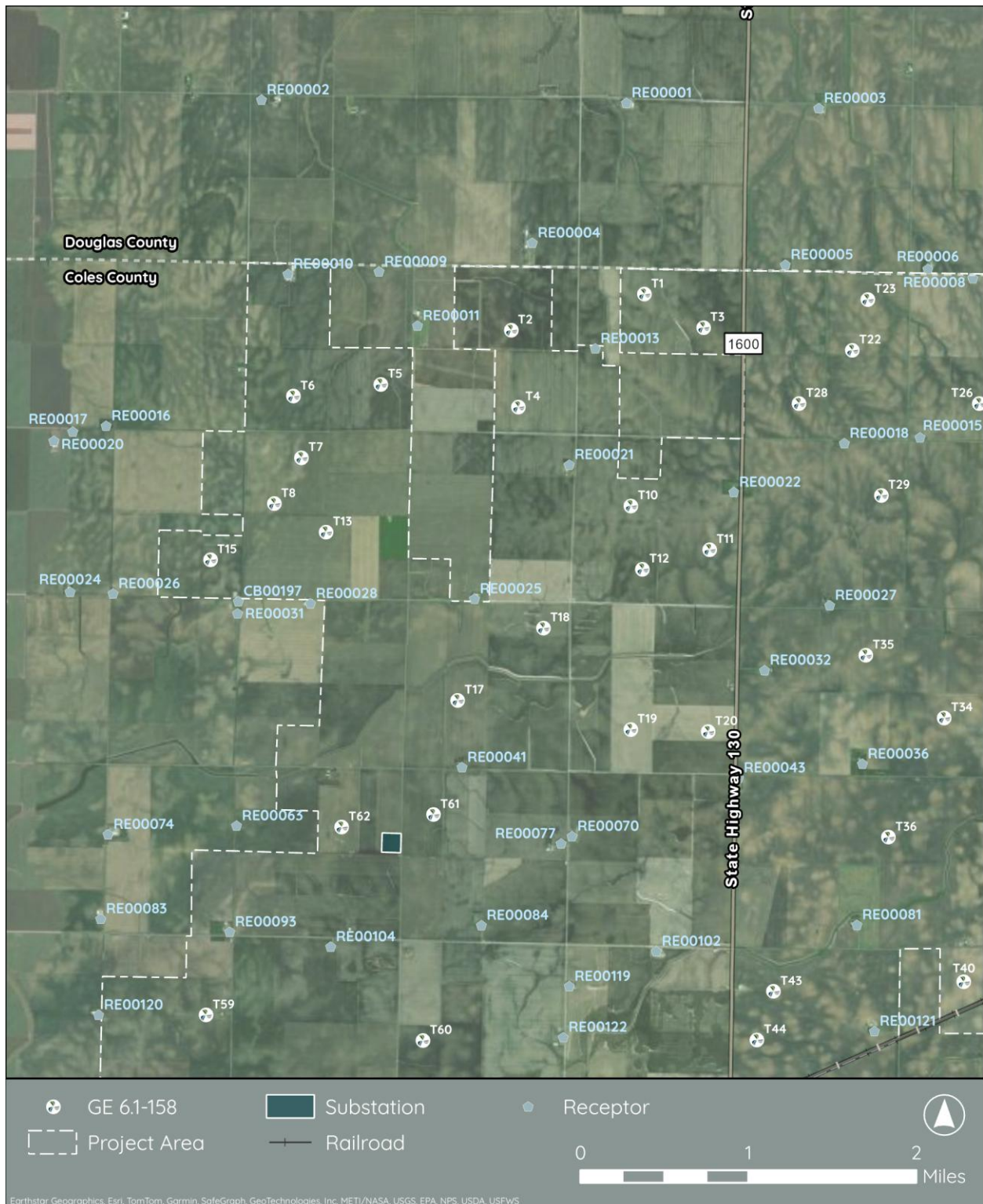


Figure 21: Receptor Map, Northwest Quadrant

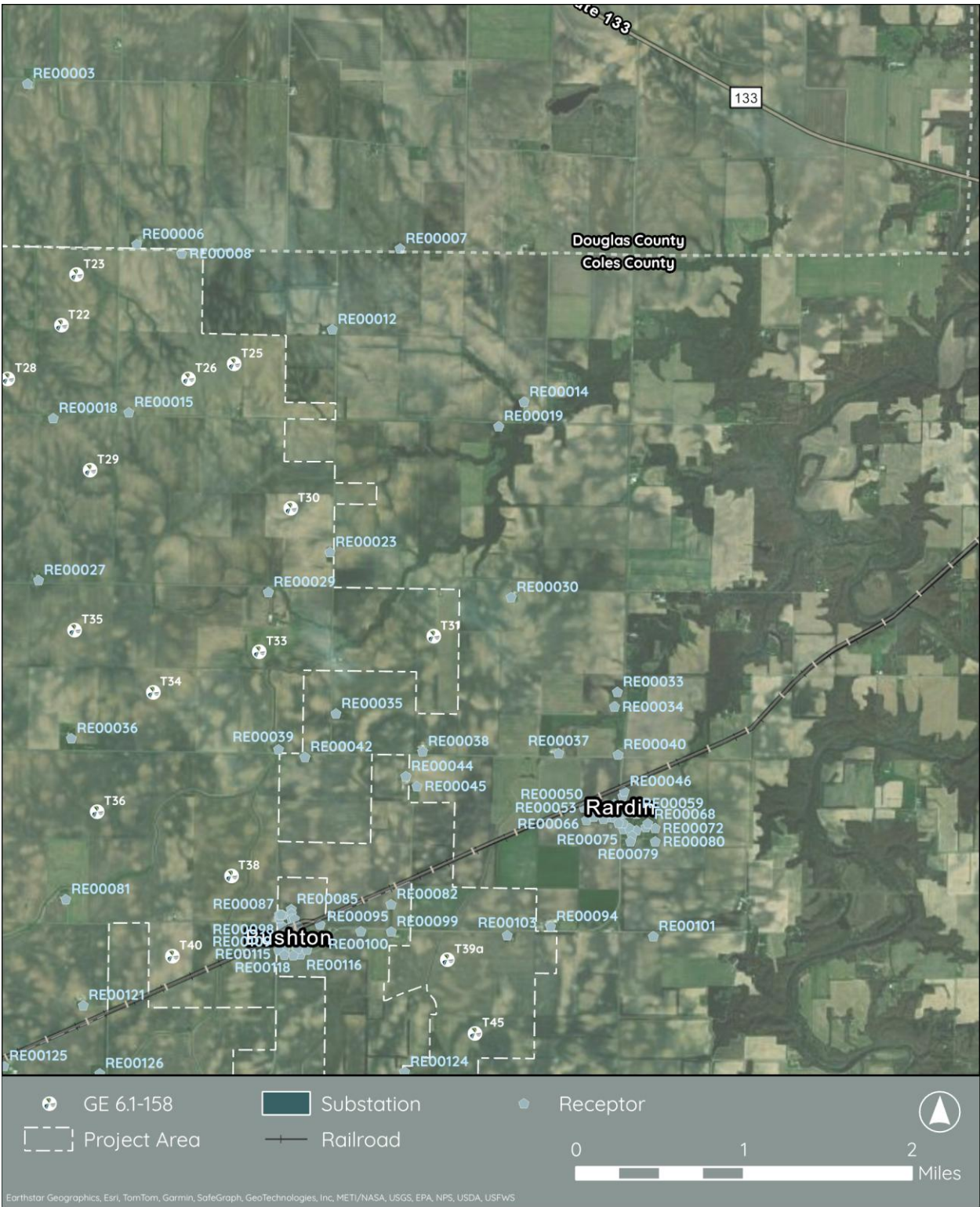


Figure 22: Receptor Map, Northeast Quadrant



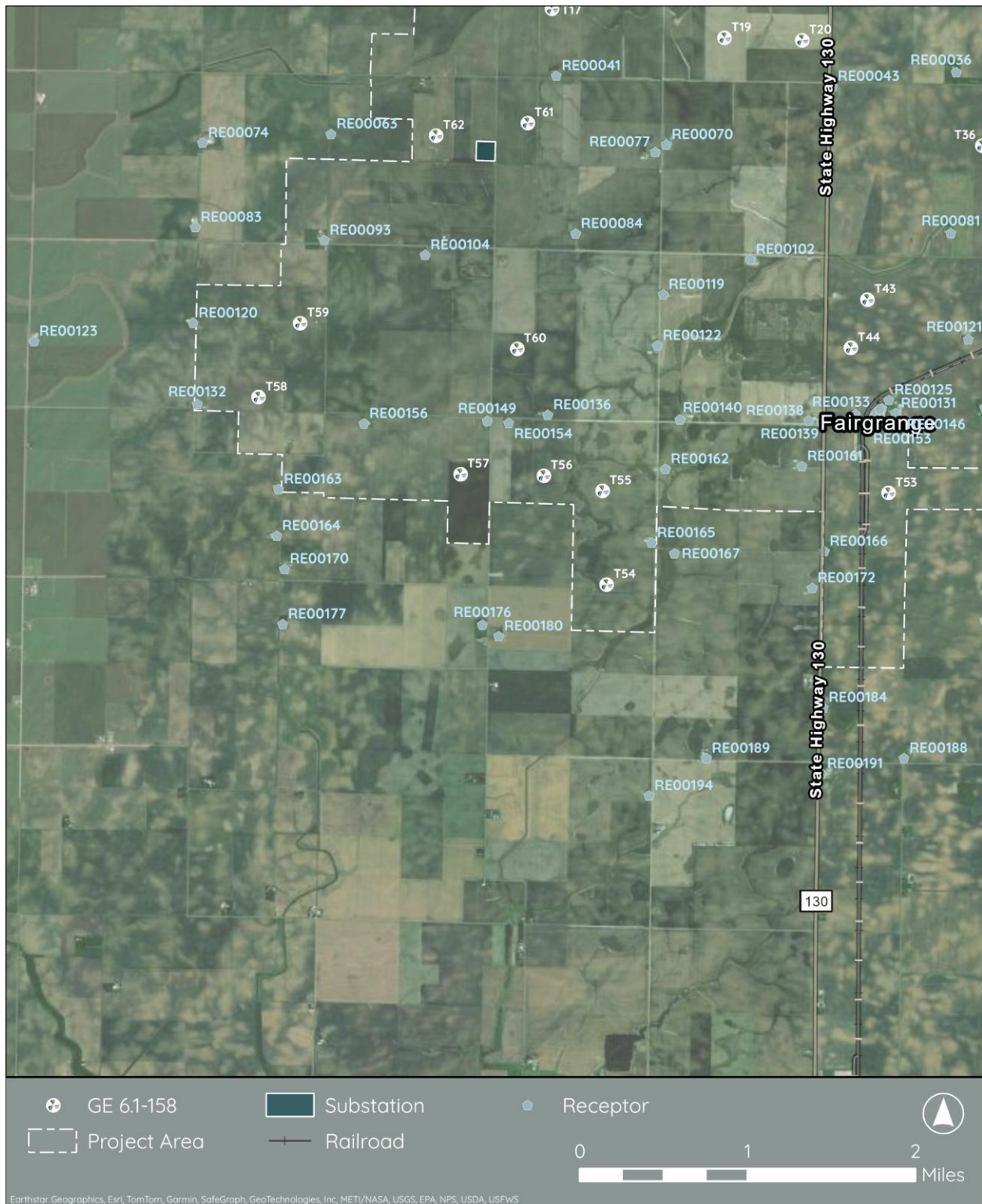


Figure 24: Receptor Map, Southwest Quadrant

Appendix E: Qualifications

Paxwood Acoustics provides professional consulting services in acoustics and noise control engineering with a focus on environmental permitting and compliance. Eddie Duncan, Principal Consultant, is a Board-Certified Noise Control Engineer (#09002) through the Institute of Noise Control Engineering and is a member of the Acoustical Society of America. Mr. Duncan has been practicing acoustic consulting for over 20 years. In that time, he has managed over 400 acoustics projects and has worked on 120+ wind power projects, 85+ solar projects, and 70+ transmission projects. He has also managed noise assessments for a growing portfolio of BESS projects which have often been a component of other renewable energy projects.

