CRAB RUN
SOLAR PROJECT

Exhibit D

Noise Assessment Report

Crab Run Solar Project

Noise Assessment Report

PREPARED FOR
Crab Run Solar Project, LLC

DATE
November 2025

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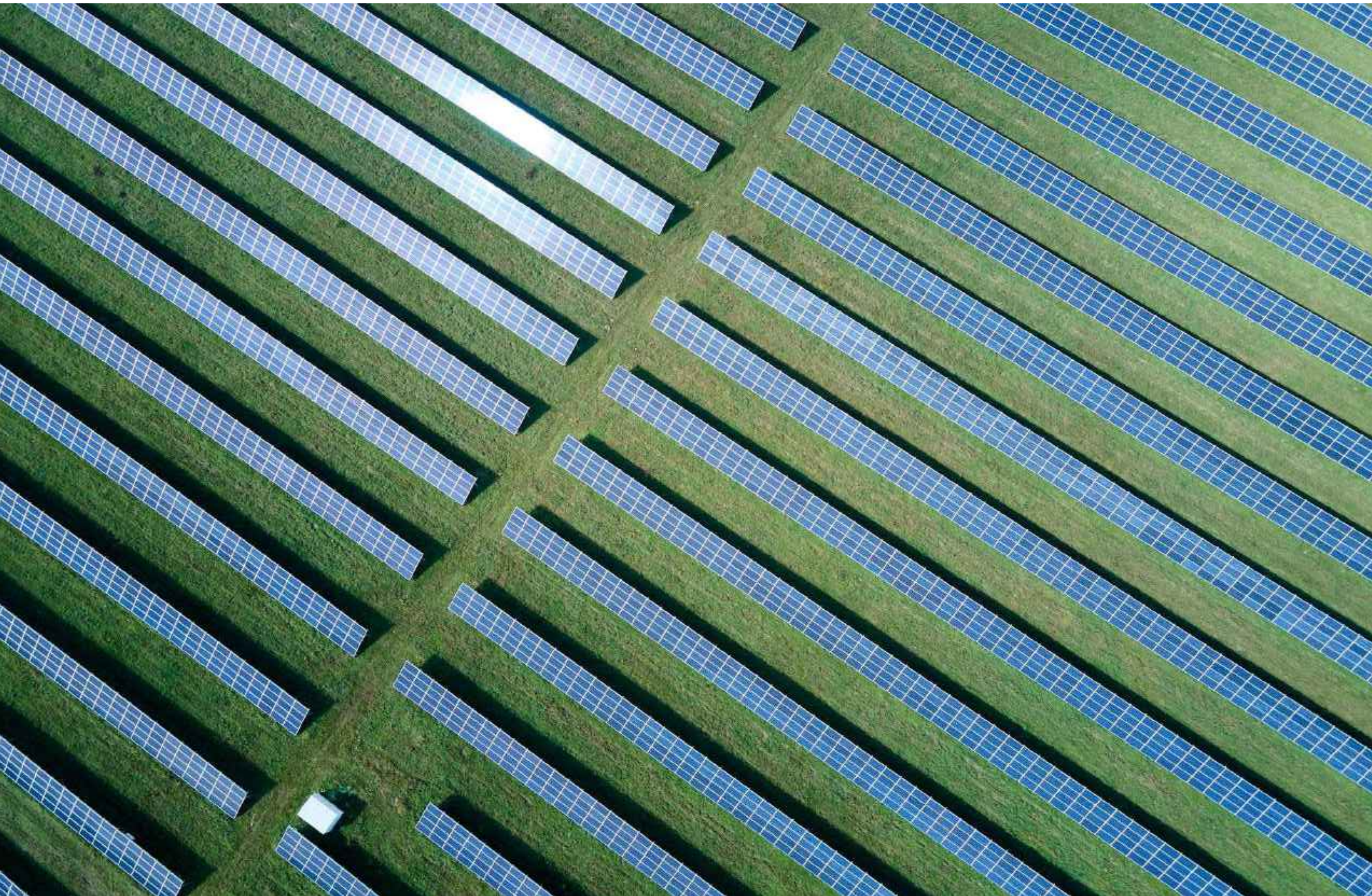
0787671



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Crab Run Solar Project

Noise Assessment Report

0787671

Joshua Adams
Partner

Tony Agresti
Technical Consulting Director

Ellen Mullins

Ellen Mullins
Project Manager

ERM Indianapolis Office
8425 Woodfield Crossing Blvd.
Suite 560-W
Indianapolis, Indiana
T +1 317 706 2000

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ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
CadnaA	Computer Aided Noise Abatement (modeling software)
dB	Unweighted decibels
dBA	A-weighted decibels
ERM	Environmental Resources Management, Inc.
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
Hz	Hertz
ISO	International Organization for Standardization
L_{dn}	Day-Night Average Sound Level
L_{eq}	Equivalent Sound Level
L_{max}	The maximum noise level
L_w	Sound Power Level, a measure of the total acoustic energy emitted by a source
MVA	Megavolt-Ampere
MWac	Megawatts Alternating Current
NSA	Noise Sensitive Area
Project	Crab Run Solar Project

1. INTRODUCTION

This report presents the results of a noise assessment conducted for the Crab Run Solar Project (Project) in Marion County, Kentucky. This report has been undertaken by Environmental Resources Management, Inc. (ERM) and includes the results of operational noise predictions. The noise assessment was carried out to understand the noise levels that would be generated from the construction and operation of the Project. This report also provides general information on noise and comparisons of the expected Project noise levels to estimated existing ambient conditions and guidelines.

1.1 General Information on Noise

Noise is defined as unwanted sound. Excessive noise can cause annoyance and adverse health effects. Annoyance can include sleep disturbance and speech interference. It can also distract attention and make activities more difficult to perform (EPA, 1978).

The range of pressures that cause the vibrations that create noise is large. Noise is therefore measured on a logarithmic scale, expressed in decibels (dB). The frequency of a sound is the "pitch". The unit for frequency is hertz (Hz), or cycles per second. Most sounds are composed of a composite of frequencies. The human ear can usually distinguish frequencies from 20 Hz (low frequency) to about 20,000 Hz (high frequency), although people are most sensitive to frequencies between 500 and 4000 Hz. The individual frequency bands can be combined into one overall dB level.

Noise is typically measured on the A-weighted scale (dBA). The A-weighting scale has been shown to provide a good correlation with the human response to sound and is the most widely used descriptor for community noise assessments (Harris, 1991). The faintest sound that can be heard by a healthy ear is about 0 dBA, while an uncomfortably loud sound is about 120 dBA. In order to provide a frame of reference, ERM has listed some common sound levels below.

Pile Driver at 100 feet	90 to 100 dBA
Chainsaw at 30 feet	90 dBA
Truck at 100 feet	85 dBA
Noisy Urban Environment	75 dBA
Lawn Mower at 100 feet	65 dBA
Average Speech	60 dBA
Average Office	50 dBA
Rural Residential During the Day	40 dBA
Quiet Suburban nighttime	35 dBA
Soft Whisper at 15 feet	30 dBA

Common terms used in this noise analysis are defined below.

- L_{eq} – The equivalent noise level over a specified period of time (i.e., 1-hour). It is a single value of sound that includes all the varying sound energy in a given duration.
- L_{dn} – the day-night noise level, is the A-weighted L_{eq} sound level over a 24-hour period with an additional 10 dB penalty imposed on sounds that occur between 10 p.m. and 7 a.m. to account for the increased sensitivity to noise during these periods.

1.2 Applicable Noise Standards

1.2.1 Noise Ordinances and Standards

No local noise ordinances or Commonwealth of Kentucky noise standards applicable to the Project were identified.

1.2.2 United States Environmental Protection Agency Guidelines

In 1974, the U.S. Environmental Protection Agency (EPA) published its document entitled "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin on Safety" (EPA, 1974). This publication evaluated the effects of environmental noise with respect to health and safety. The EPA recommended in the document that environmental noise levels should not exceed a day-night sound level (Ldn) of 55 dBA. A 55 dBA Ldn noise level equates to a continuous sound level of 48.6 dBA (i.e., a facility that does not exceed a continuous noise level of 48.6 dBA for a 24-hour period will not exceed 55 dBA Ldn). This level was developed for "outdoor residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use". The EPA considers this level as protective of the public health and welfare from the effects of environmental noise and notes that this criterion was developed without regard to technical or economic feasibility and contains a margin of safety.

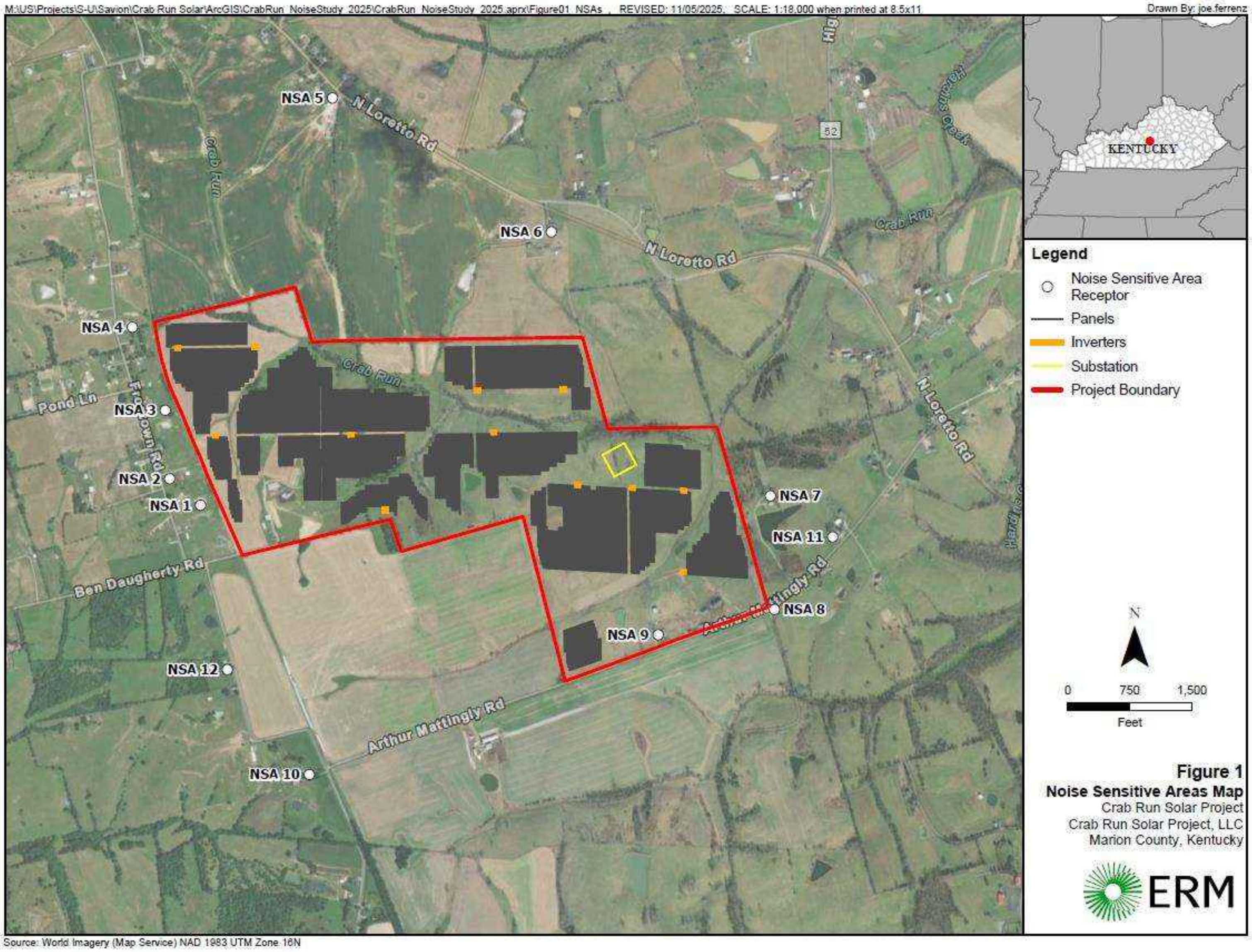
1.3 Project Description and Noise Sensitive Areas

The Project evaluated herein would be capable of generating approximately 45 megawatts alternating current (MWac) of electricity and would consist of 110,052 photovoltaic modules located on approximately 412 acres (array) within an overall project evaluation area of 245 acres (Project Boundary). The main noise generating components during the operational phase of the project include 12 Solar Inverter Skids operating at >90% load, and one 48 megavolt-amperes (MVA) main step-up transformer. Noise sensitive areas (NSAs) consist of light density residential uses around the Project Boundary. A review of aerial photography identified 12 NSAs in proximity to the Project that were evaluated in the noise assessment. NSA receptor locations, distances/directions from the property line of participating landowners, and distances to the nearest Project Boundary limits, solar panel, inverter, and substation are provided in Table 1 and depicted on Figure 1.

Table 1. Noise Sensitive Areas

Receiver	Land Use Type	Approximate Distance (feet) to Nearest Project Structure			
		Project Boundary	Panel	Inverter	Substation
NSA 1	Residential	221	340	854	4892
NSA 2	Residential	440	515	752	5236
NSA 3	Residential	168	342	668	5308
NSA 4	Residential	272	412	592	5883
NSA 5	Residential	2327	2908	3148	5402
NSA 6	Residential	1276	1373	1900	2695
NSA 7	Residential	393	468	1039	1664
NSA 8	Residential	86	500	1182	2417
NSA 9	Residential	135	696	810	1980
NSA 10	Residential	2762	3052	3316	5148
NSA 11	Residential	982	1061	1844	2527
NSA 12	Residential	1392	1788	2702	5219

Figure 1. Noise Sensitive Areas Map



2. EXISTING CONDITIONS

Existing sources of noise in the area likely include vehicular traffic noise from Kentucky Route 49 (N. Loretto Road), vehicular traffic on other roadways in the area, agricultural equipment used in the area, and natural sounds (e.g., birds and insects). Existing ambient noise levels in the area were estimated by evaluating the land uses in the area and the aforementioned noise sources. General ambient noise levels by land use have been estimated by the EPA (EPA 1978). However, a more detailed estimate is provided in American National Standards Institute (ANSI) standard 12.9-2013/Part 3 (ANSI 2013). The standard provides estimates of existing noise levels based on detailed descriptions of land use categories. The levels are in general agreement with those published by EPA. The ANSI standard noise estimation divides land uses into six (6) distinct categories. These categories, their descriptions, and the estimated existing daytime and nighttime L_{eq} sound levels, are provided in Table 2.

Table 2. Estimated Existing Sound Levels in the Area

Category	Land Use	Description	Estimated Existing Daytime L_{eq}	Estimated Existing Nighttime L_{eq}
1	Noisy Commercial and Industrial Areas	Very heavy traffic conditions, such as in busy downtown commercial areas, at intersections of mass transportation and other vehicles, including trains, heavy motor trucks and other heavy traffic, and street corners where motor buses and heavy trucks accelerate.	66	58
2	Moderate Commercial and Industrial Areas, and Noisy Residential Areas	Heavy traffic areas with conditions similar to Category 1 but with somewhat less traffic, routes of relatively heavy or fast automobile traffic but where heavy truck traffic is not extremely dense, and motor bus routes.	61	54
3	Quiet Commercial, Industrial Areas, and Normal Urban and Noisy Residential Areas	Light traffic conditions where no mass transportation vehicles and relatively few automobiles and trucks pass, and where these vehicles generally travel at low speeds. Residential areas and commercial streets and intersections with little traffic comprise this category.	55	49
4	Quiet Urban and Normal Residential Areas	These areas are similar to Category 3 above but, for this group, the background is either distant traffic or is unidentifiable.	50	44

Category	Land Use	Description	Estimated Existing Daytime L_{eq}	Estimated Existing Nighttime L_{eq}
5	Quiet Suburban Residential Areas	Isolated areas, far from significant sources of sound.	45	39
6	Very Quiet, Sparse Suburban or Rural Areas	These areas are similar to Category 5 above but are usually in unincorporated areas and, for this group, there are few if any near neighbors.	40	34

Source: ANSI 2013

Existing ambient noise levels at the NSAs in the area were estimated utilizing the ANSI standard. Based upon a review of the land uses, the NSAs in the area are conservatively estimated to fall into a Category 5 land use (quiet suburban residential areas), with estimated daytime L_{eq} sound levels of 45 dBA and nighttime L_{eq} sound levels of 39 dBA.

3. NOISE MODELING

3.1.1 Operational Noise Modeling Methodology

ERM performed computer modeling to calculate noise levels that will be generated during Project operation and used the commercially available CadnaA model developed by DataKustik GmBH (2025) for the analyses. The software has the ability to account for spreading losses, ground and atmospheric effects, shielding from barriers and buildings, and reflections from surfaces. The software is standards-based. ERM used the International Organization for Standardization (ISO) 9613 standard for air absorption and other noise propagation calculations (ISO 2024). ERM assumed a partially acoustically reflective ground surface (0.5 setting in the model). A setting of "0" corresponds to an acoustically reflective surface, such as pavement or water, while a setting of 1.0 corresponds to loose soils and grassy surfaces. ERM also included area topography. ERM did not take credit for any intervening buildings, structures, vegetation or foliage in order to develop a conservative assessment.

Modeling was conducted with Project sources in operation at full load conditions. Discrete model receptors were placed at the location of the NSA locations. Noise contours were also produced such that noise levels at any location, including along the property line of participating landowners, could be visualized.

ERM has provided a summary of the equipment sources included in the noise modeling assessment and their height above grade in Table 3. Table 4 provides the noise emission sound power level (L_w) data at maximum load and the derivation of each.

Table 3. Equipment Source Listing

Equipment	Number of Each	Height Above Grade (feet)
Inverter	12	9.5
48 MVA Main Step-Up Transformer	1	10

Table 4. Noise Emissions Derivation for Project Sources

Equipment	Noise Emissions Data (L_w)	Data Source/Vendor
Inverter	91 dBA	Sungrow Model No. SG4400UD
48 MVA Main Step-Up Transformer	93 dBA	EEI[a]

[a.] Emissions data developed utilizing the methodology provided in the reference document "Electric Power Plant Environmental Noise Guide" using the maximum transformer MVA rating.

3.2 Operational Noise Model Results

Model results for Project operation at all NSA locations with Project sources operating simultaneously at full load conditions for both daytime and nighttime conditions are provided in Table 5. The modeled levels are also compared to the estimated existing ambient conditions and to the EPA's impact guideline. While the EPA guideline is not a regulatory requirement, it is useful as a guide to evaluate potential noise impacts.

Table 5. Noise Modeling Results

Receiver	Modeled Daytime Noise Level (dBA)	Estimated Daytime Ambient Condition (dBA)	Modeled Nighttime Noise Level (dBA)	Estimated Nighttime Ambient (dBA)	EPA Recommended Protective Guideline (dBA) [a]
NSA 1	32	45	15.2	39	48.6
NSA 2	32.9	45	14.4	39	48.6
NSA 3	35.7	45	14.3	39	48.6
NSA 4	34.6	45	13	39	48.6
NSA 5	22.5	45	14.1	39	48.6
NSA 6	28.2	45	21.6	39	48.6
NSA 7	32.5	45	26	39	48.6
NSA 8	30.2	45	22.7	39	48.6
NSA 9	33	45	24.7	39	48.6

Receiver	Modeled Daytime Noise Level (dBA)	Estimated Daytime Ambient Condition (dBA)	Modeled Nighttime Noise Level (dBA)	Estimated Nighttime Ambient (dBA)	EPA Recommended Protective Guideline (dBA) [a]
NSA 10	21.8	45	14.7	39	48.6
NSA 11	28	45	22.1	39	48.6
NSA 12	24.1	45	14.6	39	48.6
Project Boundary [b]	44.3	45	28.2	39	48.6

[a] EPA guideline is for this level to occur on a continuous basis.

[b] Highest modeled noise level for any location along the Project boundary line. No NSAs are present in these areas.

As provided in Table 5, daytime operational noise levels at the NSA locations are shown to range from 21.8 dBA to 35.7 dBA, well below the estimated existing daytime ambient noise levels (45 dBA). Nighttime Project noise levels, with only the transformers in operation, ranged from 13 dBA to 26 dBA, also below the estimated existing nighttime ambient noise levels (39 dBA). Project generated noise levels for daytime and nighttime operation are well below the EPA's recommended protective noise level of 48.6 dBA for 24-hour operation at the NSA locations.

The highest noise level modeled for any location along the Project Boundary is 44.3 dBA. All modeled noise levels assume Project sources operating at full load conditions. There will often be times when sources are operating at lower loads, with subsequently lower noise levels at the NSAs and the property line.

Noise contour maps depicting the modeled noise levels for daytime and nighttime operating conditions are provided in Figures 2 and 3, respectively.

Figure 2. Operational Noise Contours – Daytime Map

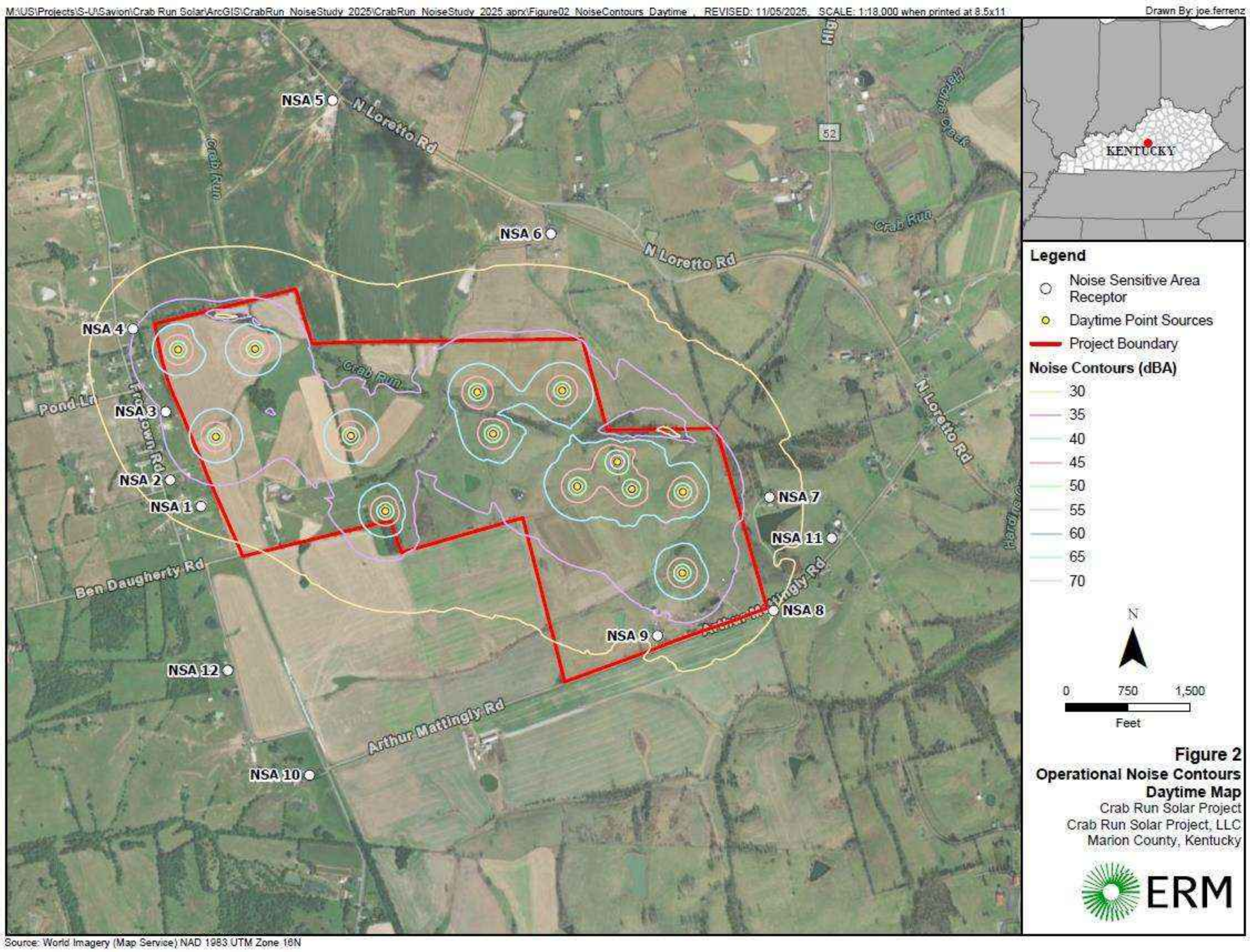
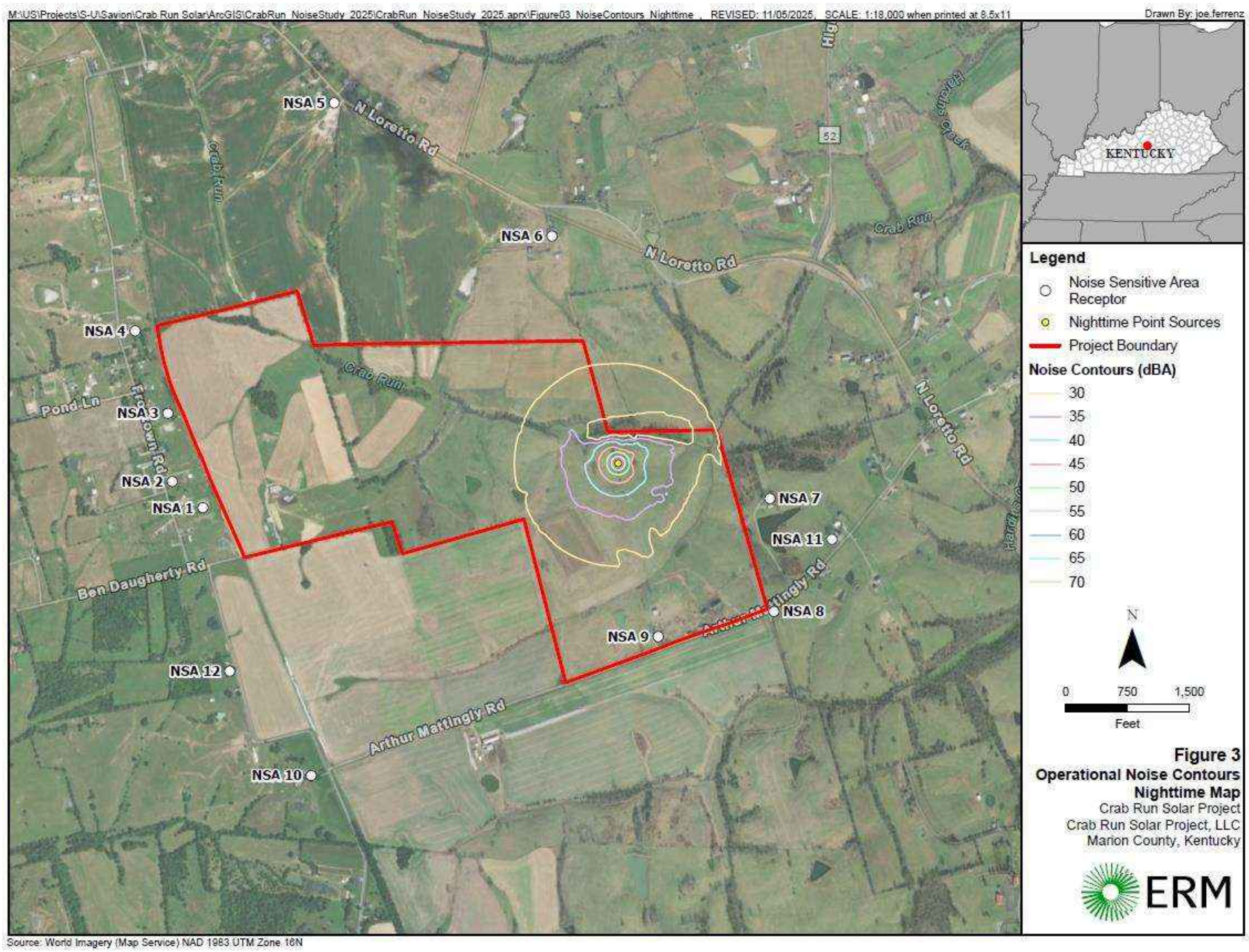


Figure 3. Operational Noise Contours – Nighttime Map



3.3 Construction Noise

3.3.1 Pile Driving

A total of approximately 10,000 piles will be installed to support the solar panels. The installation of each pile occurs very quickly, typically requiring 60 seconds or less per pile. It is estimated that pile driving will occur over an 8-to-12-week period, six days per week during daylight hours.

Maximum sound level (Lmax) pile driving noise levels of 95 dBA at 50 feet were obtained from the Federal Highway Administration's Roadway Construction Noise Model (FHWA 2006). No usage factors were incorporated into the analysis so that sound levels would be calculated at maximum levels rather than time-averaged sound levels.

Pile driving noise levels were modeled using the same methodology as utilized for the operational noise modeling, including the existing topographic features in the area. The modeled expected pile driving noise level at each NSA is provided in Table 6. The noise levels presented are for the nearest approach any one single pile driver will be to the respective NSA.

As provided in Table 6, pile driving noise levels are shown to be above the estimated existing ambient condition at all NSA locations, but only when pile driving is occurring at the nearest approach to the NSA. Pile driving activity will occur over a very large area, and no individual NSA will experience the same or a constant noise level. As piles are quickly installed, noise levels will decrease as piles are installed at greater distances away from an NSA. As a noise mitigation measure, no nighttime pile driving will be conducted, with pile driving scheduled to only occur between the hours of 8 a.m. and 8 p.m. Additionally, residential landowners located within 1,500 feet of where pile driving will occur will be notified prior to commencing construction.

Table 6. Maximum Expected Pile Driving Noise from Nearest Pile Driver (dBA)

Receiver	Maximum Pile Driving Noise from Nearest Pile Driver
NSA 1	76.5
NSA 2	72.5
NSA 3	76.5
NSA 4	74.8
NSA 5	55.5
NSA 6	63.8
NSA 7	73.5
NSA 8	72.9
NSA 9	70.0
NSA 10	55.4
NSA 11	66.3

Receiver	Maximum Pile Driving Noise from Nearest Pile Driver
NSA 12	61.2

3.3.2 General Construction

The construction equipment utilized will differ from phase to phase but may include dozers, pile drivers, cranes, cement mixers, dump trucks, and loaders. Noise is generated during construction primarily from diesel engines, which power the equipment. Exhaust noise usually is the predominant source of diesel engine noise, which is the reason that maintaining functional mufflers on all equipment will be a requirement.

Table 1 provided the closest distance any NSA would be to a panel. However, the Project Boundary covers a large area. The actual sound levels that will be experienced by NSAs surrounding the site during construction will be a function of distance and which type of equipment are in operation. As such, no single existing NSA will be exposed to the same sound levels over an extended period of time, as construction progresses through the site.

Construction noise transmitted from the site will be attenuated by a variety of mechanisms. The most significant of these mechanisms are the divergence of the sound waves with distance (attenuation by divergence) and the additional reductions in noise are achieved through absorption by the atmosphere. Topographic features, which will further reduce construction noise levels, were not included in the calculations.

Noise levels of construction equipment that may be used for the Project are summarized in Table 7 (FHWA 2006). Provided in Table 8 are the calculated noise levels for the range of construction equipment presented at each NSA location. The upper range for general construction related noise levels at each NSA includes the equipment listed in Table 7 operating at the nearest panel location to each NSA while the lower range includes the equipment operating at the furthest panel location to each NSA.

Table 7. Construction Equipment Noise Levels (dBA)

Equipment Type	Maximum Sound Level [a] 50 Feet
Cement Trucks	79
Front End Loaders	79
Graders	85
Dozers	82
Pickup Trucks	55
Backhoes	78
Concrete Mixers	79
Air Compressor	78
Dump Trucks	77
Cranes	81
Flatbed Trucks	74

[a] Source: FHWA, 2006

Table 8. General Construction Equipment Noise Assessment (dBA)

Receiver	Range of Construction Equipment Noise Levels Operating at NSA
NSA 1	43 to 80
NSA 2	20 to 68
NSA 3	18 to 63
NSA 4	18 to 67
NSA 5	15 to 44
NSA 6	17 to 54
NSA 7	17 to 65
NSA 8	16 to 64
NSA 9	19 to 61
NSA 10	21 to 44
NSA 11	15 to 57
NSA 12	20 to 51

As noted above, the Project Boundary covers a large area, and the noise levels experienced at any NSAs will vary depending on what areas of the site are being constructed at any given time. It is important to note that all of the equipment listed is not used in all phases of construction. Further, the equipment used generally is not operated continuously, nor is the equipment always operated simultaneously or at full-load conditions.

Construction is a temporary activity, and there are no known noise limits applicable to construction. Exhaust noise from diesel engines that power the equipment is usually the predominant source of construction equipment noise. Accordingly, maintaining functional mufflers on all diesel-powered equipment will be a mitigation measure and a requirement of the project. As an additional mitigation measure, construction will only occur during daytime hours (8 a.m. to 8 p.m.).

4. CONCLUSION

This report presents the results of the noise assessment ERM conducted for the Crab Run Solar Project in Marion County, Kentucky. The assessment included noise modeling of the construction equipment and major facility noise generating equipment operating under full load conditions during both daytime and nighttime operating conditions. ERM evaluated the operational noise model results against estimated existing ambient conditions and the EPA protective noise guidance.

The construction noise assessment, conducted for both pile driving and general construction activity, revealed that pile driving noise levels would be above the estimated existing ambient condition at all NSA locations, but only when pile driving is occurring at the nearest approach to the NSA. Similar to pile driving, general construction related noise levels could be above ambient conditions when equipment is operated at the nearest approach to any NSA.

The operational noise assessment revealed that Project-generated noise levels would be well below estimated existing conditions at all identified NSA locations during daytime hours with all equipment in operation at full load. Much lower operational noise levels, well below the estimated ambient condition, would occur during nighttime hours when the Project inverters are not in operation. Modeled levels were also shown to be well below the EPA recommended protective noise level at all nearby NSAs during both daytime and nighttime operating conditions.

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