Exhibit K
Pre-Construction Sound Analysis

Hankard Environmental, Inc.

October 27, 2020

Dickinson Wright PLLC

Pre-Construction Noise Analysis

for the proposed

Yellow Wood Solar Energy Center

October 27, 2020

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Executive Summary

This report describes the results of an analysis of the noise levels that are expected to be generated from the construction and operation of the Yellow Wood Solar Energy Center (Project or Facility). The Project is a photovoltaic solar electric generation facility to be located in Clinton County, Ohio, approximately 35 miles northeast of Cincinnati. The Project has a maximum generating capacity of 300 megawatts. During construction the Project will generate noise from the operation of typical equipment such as bulldozers and pile drivers. Sources of noise from the operation of the Facility include inverters, transformers, and cooling systems.

Noise emissions from the Project are subject to the provisions of the Ohio Administrative Code, Chapter 4906-4, which requires the Project to (1) measure existing ambient (background) noise levels prior to construction, and (2) predict noise levels from the construction and operation of the Project at sensitive receptor locations. The maximum noise level from Project operations at noise-sensitive receptors (e.g., residences) located within one mile of the Project is limited to the measured ambient noise level plus five A-weighted decibels (dBA).

Ambient noise levels were measured in September 2020 at eight locations near the proposed Facility. The average daytime and nighttime noise levels were 42 dBA and 33 dBA, respectively. This results in daytime and nighttime noise level limits of 47 dBA and 38 dBA, respectively (ambient plus 5 dBA).

Noise levels from the operation of the Facility were predicted at each of the 264 noise-sensitive receptors identified within one-half mile of the Project. Noise levels at more distant receptors will be lower than those reported herein, and well below the established limits. The primary sources of noise from the operation of the Facility would be the solar inverters located throughout the Facility and the primary step-up transformers located at the substation. The loudest operational noise level of 43 dBA is predicted to occur at a participating residence in the western portion of the Project and at a non-participating residence in the southern portion of the Project. All predicted levels are below the 47 dBA daytime standard. Nighttime noise levels for all receptors were modeled with the substation step-up transformers as the only noise sources, as inverters and their cooling systems do not operate at night. The loudest predicted level among non-participating residences under this condition is 33 dBA, which is below the 38 dBA nighttime limit.

Noise levels from the construction of the Facility were predicted at each of the 264 noise-sensitive receptors identified within one-half mile of the Project and also at one worst-case location along the Project boundary. During construction predicted noise levels at noise-sensitive receptors range from 37 to 84 dBA, with the loudest levels predicted for pile driving. At the Project boundary construction noise levels are predicted to be as high as 93 dBA during pile driving. Note that these are the levels expected when construction equipment is nearby and fully operational. Construction will be limited to daytime hours to the extent practicable, will take place for approximately 12 to 18 months, and will occur near any one receptor location for only a few weeks at a time.

1. Introduction

This report describes the results of a pre-construction noise analysis conducted by Hankard Environmental for the proposed Yellow Wood Solar Energy Center (Facility or Project). The general location of the Project is shown in Figure 1-1. The Project's maximum generating capacity is 300 megawatts. This analysis demonstrates that the Project satisfies the requirements of Chapter 4906-4 of the Ohio Administrative Code, *Certificate Applications for Electric Generation Facilities*, which require the Project to provide a study of pre-construction (existing) noise levels, a description of construction and operational noise levels at the nearest property boundary and at all noise-sensitive receptors located within approximately one mile of the Project boundary, and the measures that will be taken by the Project to mitigate noise emissions.

The following sections describe in more detail the noise regulation applicable to the Project, the Project site and the location of noise sensitive receptors, the results of the pre-construction ambient noise study, the methods and data used to predict construction and operational noise emissions, the predicted construction and operational noise levels, and the mitigative measures to be employed.

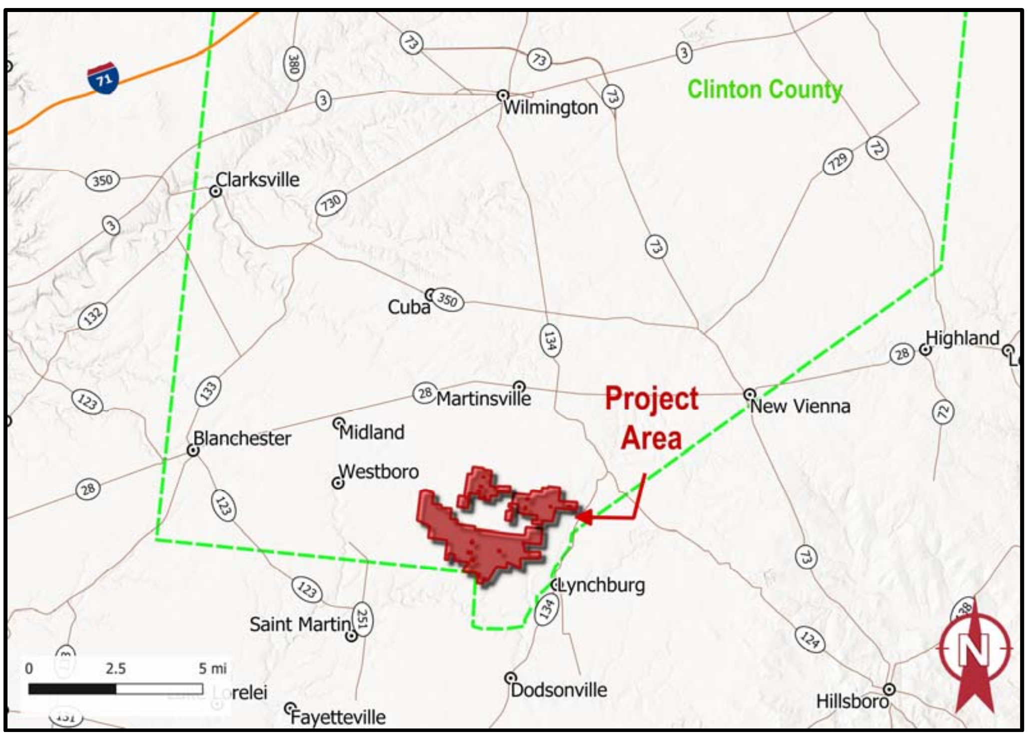

Figure 1-1. General Location of the Proposed Yellow Wood Solar Energy Center

2. Applicable Noise Regulation

Chapter 4906-4 of the Ohio Administrative Code, *Certificate Applications for Electric Generation Facilities,* sets forth the rules governing standard certificate applications for electric generation facilities. Section 4906-4-08, *Health and Safety, Land Use and Ecological Information*, describes the noise-related information required as part of a certificate application. Specifically, Paragraph (A)(3) requires:

(3) The applicant shall provide information on noise from the construction and operation of the facility.

- (a) Describe the construction noise levels expected at the nearest property boundary. The description shall address:
  - (i) Blasting activities. (there is no blasting anticipated on this Project)
  - (ii) Operation of earth moving equipment.
  - (iii) Driving of piles, rock breaking or hammering, and horizontal directional drilling.
  - (iv) Erection of structures.
  - (v) Truck traffic.
  - (vi) Installation of equipment.

- (b) Describe the operational noise levels expected at the nearest property boundary. The description shall address:
  - (i) Operational noise from generation equipment. In addition, for a wind facility, cumulative operational noise levels at the property boundary for each property adjacent to or within the project area, under both day and nighttime operations. The applicant shall use generally accepted computer modeling software (developed for wind turbine noise measurement) or similar wind turbine noise methodology, including consideration of broadband, tonal, and low-frequency noise levels.
  - (ii) Processing equipment.
  - (iii) Associated road traffic

- (c) Indicate the location of any noise-sensitive areas within one mile of the proposed facility, and the operational noise level at each habitable residence, school, church, and other noise-sensitive receptors, under both day and nighttime operations. Sensitive receptor, for the purposes of this rule, refers to any occupied building.

- (d) Describe equipment and procedures to mitigate the effects of noise emissions from the proposed facility during construction and operation, including limits on the time of day at which construction activities may occur.

- (e) Submit a preconstruction background noise study of the project area that includes measurements taken under both day and nighttime conditions.

While there are no specific noise limits for solar farms in the Ohio Administrative Code, the Project has chosen to adhere to the limits outlined in Chapter 4906-4-09 *Regulations Associated with Wind Farms* Section F, Part 2, which states:

> *The facility shall be operated so that the facility noise contribution does not result in noise levels at any non-participating sensitive receptor within one mile of the project boundary that exceed the project area ambient nighttime average sound level (L_{eq}) by five A-weighted decibels (dBA). During daytime operation only (seven a.m. to ten p.m.), the facility may operate at the greater of: the project area ambient nighttime L_{eq} plus five dBA; or the validly measured ambient L_{eq} plus five dBA at the location of the sensitive receptor.*

As described in Section 4, ambient noise levels were measured for approximately two weeks at four representative locations within the Project area. From this data an average daytime and nighttime L_{eq} were determined. As described in Section 7, predicted noise levels from the operation of the Facility at all nearby noise-sensitive receptors were compared to limits of the measured daytime noise level plus five decibels and the measured nighttime noise level plus five decibels.

3. Project Site

The Project is located in Clinton County, Ohio. Figure 3-1 shows the Project site, including the locations of the solar panels and inverters, the substation, and the Project boundary. The site is bordered to the north by Mud Switch Road, to the south by Turner Road, to the east by Route 134, and to the west by Chaney Road. Figure 3-1 also shows the location of the 264 noise-sensitive receptors identified within approximately one-half mile of the Project. The noise-sensitive receptors include 263 residences and one church. The land use immediately surrounding the Project is a mix of agricultural and rural residential. Noise levels at receptors located beyond one-half mile will be less than those reported herein.

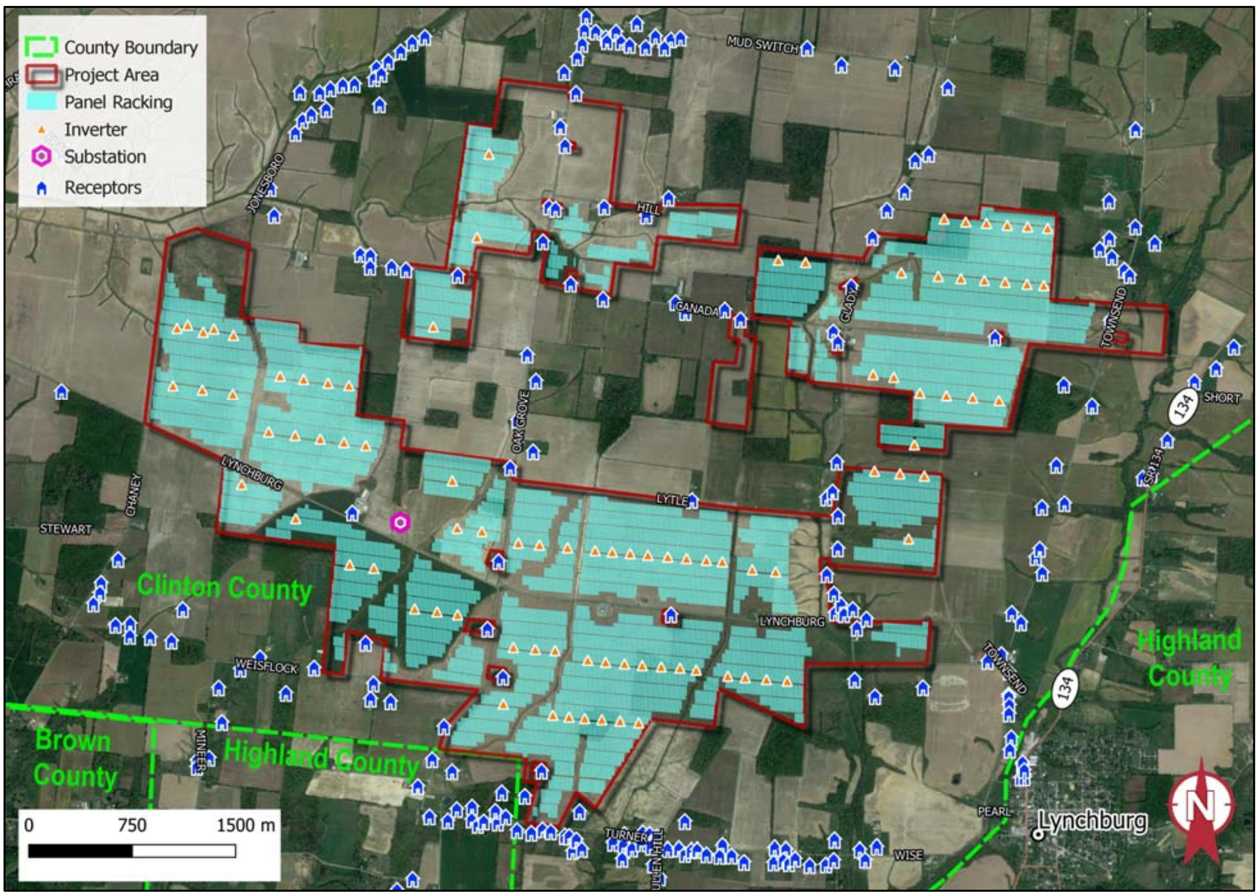

Figure 3-1. Proposed Yellow Wood Solar Energy Center Layout

4. Pre-Construction Background Noise Study

A pre-construction background sound (noise) level survey was conducted in the Project area in September 2020. The purposes of the survey were to measure and document existing sound levels, assess the character of the existing sound environment, and provide data for use in determining the applicable noise limit for the Project.

Measurement Locations

The Project area includes open farmland, farmsteads, rolling hills, forested areas, paved rural and higher speed county roads, and one state highway. Sources of existing sound include natural sources such as wind, birds, and insects, as well as man-made sources such as traffic, farming equipment, and aircraft overflights. Noise levels were measured continuously at four locations (designated herein as long-term (LT)) and periodically at four other locations (designated herein as short-term (ST)). Selection of monitoring locations considered several factors, including proximity to the proposed Project, proximity to roadways, farm and non-farm settings and their local activities and sources, and equipment security. A goal of the site selection process was to achieve a relatively even geographical distribution of measurement locations across the Project area. Refer to Figure 4-1 for detail on the measurement locations. Photographs of each long-term measurement location are shown in Appendix A.

LT1 is located at a residence in the northeast portion of the Project area approximately two miles north of Lynchburg. Specifically, measurements were taken approximately 70 feet west of Townsend Road. This area contains scattered residential properties, farmlands, and some forested areas. The immediate area around the measurement location is exposed with minimal trees. Wind speed and direction were measured at this location.

LT2 is located at a residence in the southeast portion of the Project area approximately one mile northwest of Lynchburg. Specifically, measurements were taken approximately 130 feet east of Lynchburg Road. The site is surrounded by farmlands and a cluster of residences directly to the north. Lynchburg Road is a low-volume connector road primarily utilized by local residents and farm equipment. Meteorological measurements at this location included wind speed, wind direction, temperature, relative humidity, and precipitation.

LT3 is located at a future residence in the central portion of the Project area approximately 100 feet west of Oak Grove Road. Scattered residences are located to the north and south. This location has moderate exposure to local traffic and is located near a large agricultural operation roughly one-half mile to the southwest. Wind speed and direction were measured at this location.

LT4 is located at a residence in the north-central portion of the Project area approximately 200 feet south of Canada Road and 270 feet west of Glady Road. This location was selected because it was centrally located in the Project and away from higher levels of traffic noise found in the eastern and western regions of the Project area. Wind speed and direction were measured at this location.

ST1 is located northeast of the Project. This area was selected to represent residences along Townsend Road near the Project boundary. Land use in the area includes a mix of farming and residences. This site is exposed (not near any trees) and on flat terrain.

ST2 is located in the south-central portion of the Project at the intersection of Weisflock and Oak Grove Roads. This site was selected for its general southern location. Land use in the area consists of farming and residences. Similar to ST1, there are no trees near this site.

ST3 is located near the western boundary of the Project area at the intersection of Jonesboro and Canada Roads. This site was selected for its general western location. The primary land use in the area is farmland, with some forested areas.

ST4 is located in the north-central portion of the Project at the intersection of Oak Grove and Hill Roads. This area was selected for its general northern location. The primary land use in the area is farmland with some residences along Oak Grove Road.

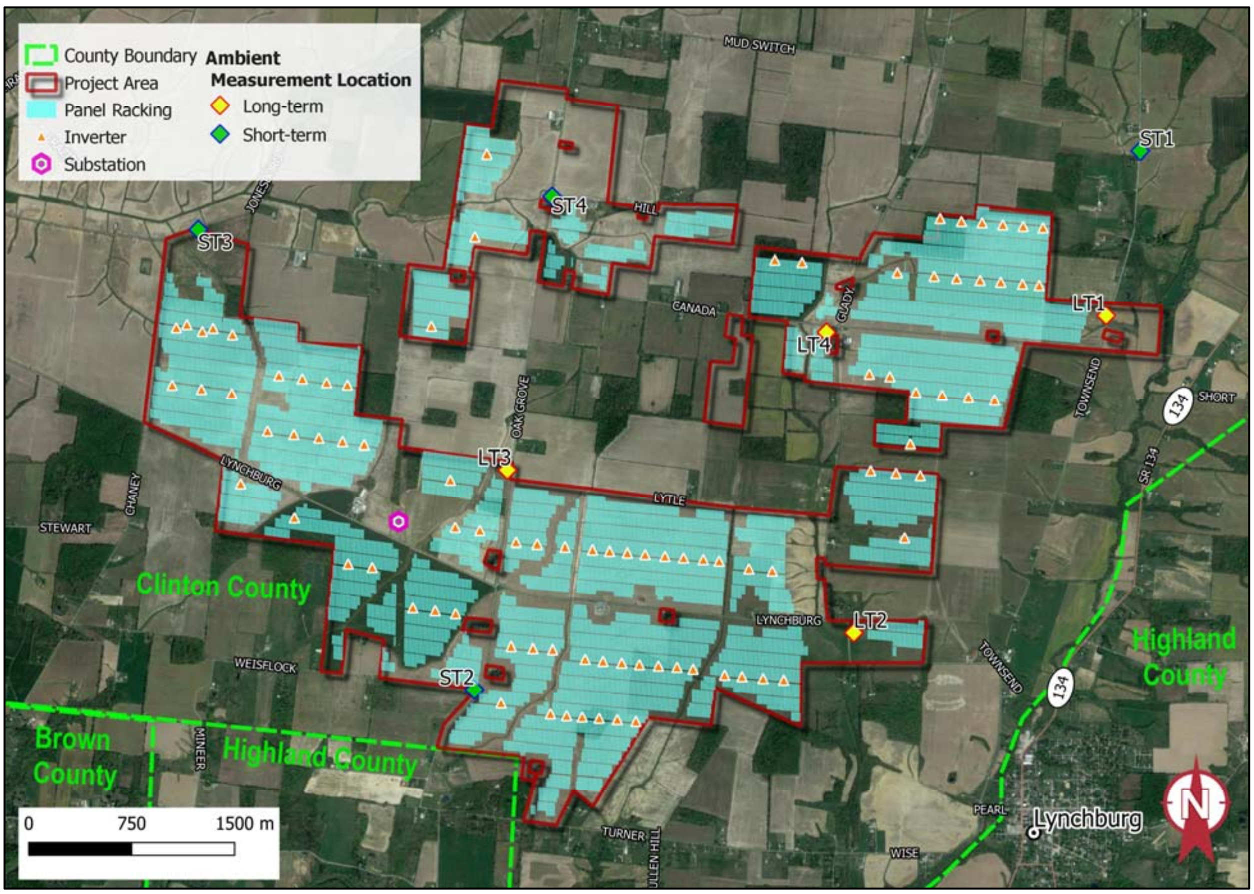

Figure 4-1. Background (Ambient) Noise Measurement Locations

Measurement Duration

Data were collected at the long-term sites for approximately two weeks (September 8 through September 21, 2020). Ten-minute measurements were conducted at each short-term site during the early morning and evening hours on two occasions between September 7 and 9, 2020. A total of 16 short-term measurements were made, four at each short-term site.

Measurement Equipment

Table 4-1 lists the instruments that were employed for the ambient sound survey. The acoustic instruments meet the Type 1 provisions of IEC 61672-1 Class 1, ANSI S1.4 Type 1, and/or ANSI S1.43. Specifications for the sound level monitors indicate ranges of ambient conditions from -10°C to +50°C temperature and 10% to 90% relative humidity (non-condensing), and a measurement range of 25 dBA to 138 dBA with an inherent noise floor of 18 dBA.

The sound level monitors were field calibrated just prior to and directly following each series of measurements. The drift in the measured noise level was minimal (-0.1 to +0.2 dB) over the measurement period and within accepted limits (±0.5 dB per ANSI S12.9). In addition, the instruments were calibrated by an accredited laboratory within the 18 months prior to their use. Each microphone was covered with hydrophobically-treated seven-inch diameter 80 pores-per-inch density windscreens (ACO Pacific model WS7-80T) to reduce the potential influence of wind-induced noise. The microphones were mounted on a tripod and positioned five feet above the ground per ANSI S12.9 and at least 25 feet away from acoustically reflective surfaces.

Wind speed was measured at each long-term measurement location using either a Vaisala WXT536 or WMT52 sensor mounted at an elevation of six feet above the ground. The vendor specifications for the wind data logging system include: accuracies of ±2% from 0 to 10 mph and ±2.5% for 10 to 100 mph; and environmental conditions of -60°F to +140°F and 0% to 100% relative humidity. Wind speeds were measured at the short-term locations using a Kestrel 3000 anemometer.

Table 4-1. Noise and Meteorological Measurement Equipment

Measurement Location	Sound Level Monitor	Frequency Range (Hz)	Noise Floor (dBA)	Anemometer
LT1	Larson Davis 831	6.3 - 20k	18	Vaisala WMT52
LT2	Larson Davis 831	6.3 - 20k	18	Vaisala WXT536
LT3	Larson Davis 831C	6.3 - 20k	18	Vaisala WMT52
LT4	Larson Davis 831C	6.3 - 20k	18	Vaisala WMT52
ST1 - ST4	Larson Davis 831	6.3 - 20k	18	Kestrel 3000

Measurement Parameters

The sound level meters were configured to continuously measure and record both the 10-second and 10-minute averages of the overall L_{eq} and L_{90}, as well as one-third octave band L_{eq} and L_{90} levels (6.3 Hz to 20 kHz). One-third octave band levels were used to re-calculate ANS-weighted overall levels using the procedures outlined in ANSI S12.100. The ANS-weighting removes excess high frequency biogenic noise that would not be present in colder times of the year.

Short-term Measurement Results

Table 4-2 lists the results of the short-term (attended) measurements. Shown are the L_{eq} and L_{90} levels measured at each site, as well as the sources of noise. Daytime ANS-weighted ambient noise levels, taken between approximately 7:00 and 9:00 a.m., ranged from 44 to 58 dBAi (L_{eq}) and 23 to 47 dBAi (L_{90}). Evening ANS-weighted ambient noise level, taken between approximately 3:00 and 5:00 p.m., ranged from 44 to 58 dBAi (L_{eq}) and 19 to 43 dBAi (L_{90}).

Table 4-2. Short-Term Noise Measurement Results

Location	Measurement	$L_{eq\text{-}10min}$ (dBAi)	$L_{90\text{-}10min}$ (dBAi)	Audible Sounds
ST1	Day, Sept 8	58	24	local traffic, planes overhead, insects, birds, voices/conversation to S/SW
	Day, Sept 9	44	39	planes overhead, insects, birds, farming/mechanical noise to east, dog barking
	Evening, Sept 7	54	35	farm equipment to the west, insects, wind, local traffic, plane overhead
	Evening, Sept 8	58	34	mechanical noise to NW, voices/conversation to S/SW, insects, birds, traffic
ST2	Day, Sept 8	49	23	insects, local traffic, birds, distant train horns
	Day, Sept 9	45	41	insects, birds, distant and local traffic, planes overhead
	Evening, Sept 7	55	32	distant traffic, insects, breezy, local traffic, distant mechanical/farming noise
	Evening, Sept 8	44	31	local traffic, insects, calm winds
ST3	Day, Sept 8	52	29	wind, insects, birds, distant and local traffic, planes overhead
	Day, Sept 9	57	47	insects, birds, local and distant traffic, dog barking to the east, distant mechanical noise, calm winds
	Evening, Sept 7	51	43	wind dominant, gusts over 5 m/s, wind speeds 3-5 m/s, some insect noise, almost all wind
	Evening, Sept 8	54	19	insects, birds, planes overhead, local traffic, breezy
ST4	Day, Sept 8	44	23	birds, insects, distant and local traffic, distant train horns, plane overhead, winds calm
	Day, Sept 9	45	44	birds, roosters, insects, fan hum/whine to the east, distant traffic, winds calm
	Evening, Sept 7	45	30	insects, wind, wind through trees dominant, distant mechanical noise, local traffic
	Evening, Sept 8	48	20	insects, birds, distant mechanical noise, calm winds

Long-Term Measurement Results

Noise levels were measured continuously and unattended for approximately two weeks. Figure 4-2 shows a representative plot of one week of noise and wind speed data at LT1. Plots of all measured data at each site are provided in Appendix D. Note that while 10-minute L_{eq} samples were used to calculate overall ambient levels, figures in Appendix D plot one-hour L_{eq} noise levels for a cleaner visual representation. The data were analyzed as follows:

- Data samples were excluded for periods of rain as indicated in the plots provided in Appendix B.
- Data samples were excluded for periods when the measured ground wind speed exceeded 5 m/s.
- Data samples contaminated by anomalies such as levels greater than 70 dB were excluded as these are indicative of transient noise events.
- The effect of biogenic noise (insects, birds, frogs) was minimized by removing the 2,000 to 8,000 Hertz octave band levels (these frequencies are where biogenic noise presents itself) and recalculating the overall ANS-weighted noise level (dBAi) per ANSI S12.1.
- One-third octave band noise level data were analyzed according to ANSI S12.9-2005 Part 4 – Annex C *Sounds with Tonal Content*. No consistent man-made tonal sources were observed. Brief periods recognizable as machinery at LT2 (farming activity) were recorded, but were not extensive enough to influence long-term average noise levels.
- The data were divided into daytime (7:00 am to 10:00 pm) and nighttime (10:00 pm to 7:00 am) periods.
- For each site the remaining noise level samples were used to determine the range and average L_{eq}. The results are listed in Table 4-3. Average levels were determined as the arithmetic average of all valid 10-minute samples after filtering. The average site-wide ambient noise levels are 42 dBAi during the daytime and 33 dBAi during the nighttime.

Table 4-3. Summary of 10-minute Noise Levels from Long-Term Monitoring

Monitor	Time	L_{eq} Average (dBAi)	L_{eq} Minimum (dBAi)	L_{eq} Maximum (dBAi)
LT1	Day	46	23	65
LT2	Day	41	24	67
LT3	Day	43	18	68
LT4	Day	37	19	62
Site Average		42	21	66
LT1	Night	38	18	54
LT2	Night	32	20	50
LT3	Night	32	18	52
LT4	Night	29	18	51
Site Average		33	19	52

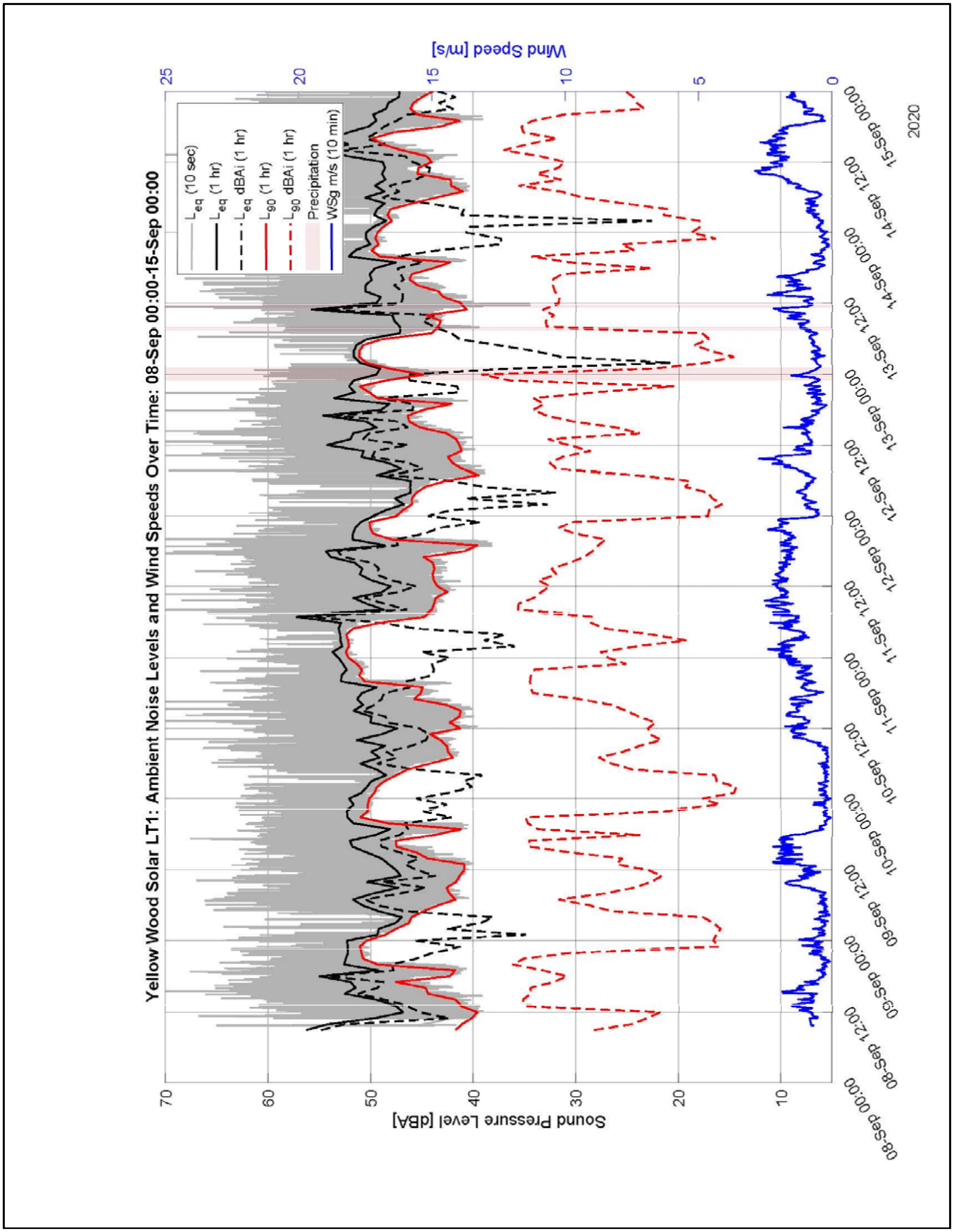

Figure 4-2. Measured Background Noise Levels at Location LT1 (September 8 – 15, 2020)

5. Noise Modeling Method

Noise levels from the operation of the proposed Project were predicted using the International Organization for Standardization (ISO) Standard 9613-2:1996, *Attenuation of Sound During Propagation Outdoors - Part 2: General method of calculation*. The calculations were implemented using the SoundPLAN v8.2 acoustical modeling software program. There are a number of parameters in the ISO 9613-2:1996 method, including the locations of the noise sources and receivers, noise source spectral characteristics, terrain and ground type, and atmospheric propagation conditions. The ISO method assumes optimal acoustic propagation in all directions, specifically that a "well-developed, moderate ground-based temperature inversion" is present or, equivalently, that all receptors are downwind of all noise sources at all times. The sections below describe the specific ISO 9613-2:1996 settings used in this analysis to predict noise from operations.

Terrain and Ground Effect

The terrain in the acoustic model was defined using Digital Elevation Model (DEM) data from the U.S. Geological Survey (USGS) National Elevation Dataset. The acoustical effect of the ground was modeled using the ISO 9613-2:1996 General Method. This method requires the selection of ground factors for the ground near the source, near the receiver, and in between. A ground factor of 0.0 represents a completely reflective surface such as pavement, which would result in a higher level of sound reaching a receiver. A ground factor of 1.0 represents absorptive ground such as thick grass or fresh snow, resulting in a lower level of sound reaching a receiver. Modeling for this Project used a ground factor of 0.5 because the site will be planted with native grasses after construction.

Atmospheric Conditions

The air temperature, relative humidity, and atmospheric pressure were set to standard-day conditions of 10°C, 70%, and 1 atmosphere, respectively. Per ISO 9613-2:1996, these values result in the least amount of atmospheric sound absorption and the highest levels of sound reaching the receivers.

Receptors

In the SoundPLAN model, prediction points (receptors) were located at the 264 noise-sensitive receptors within approximately one-half mile of the Project boundary. Of these receptors, 263 are residences and one is a church. Prediction locations are shown in Figures 5-1 to 5-3. In accordance with ISO 9613-2:1996, the height above the ground for each receptor was set to five feet.

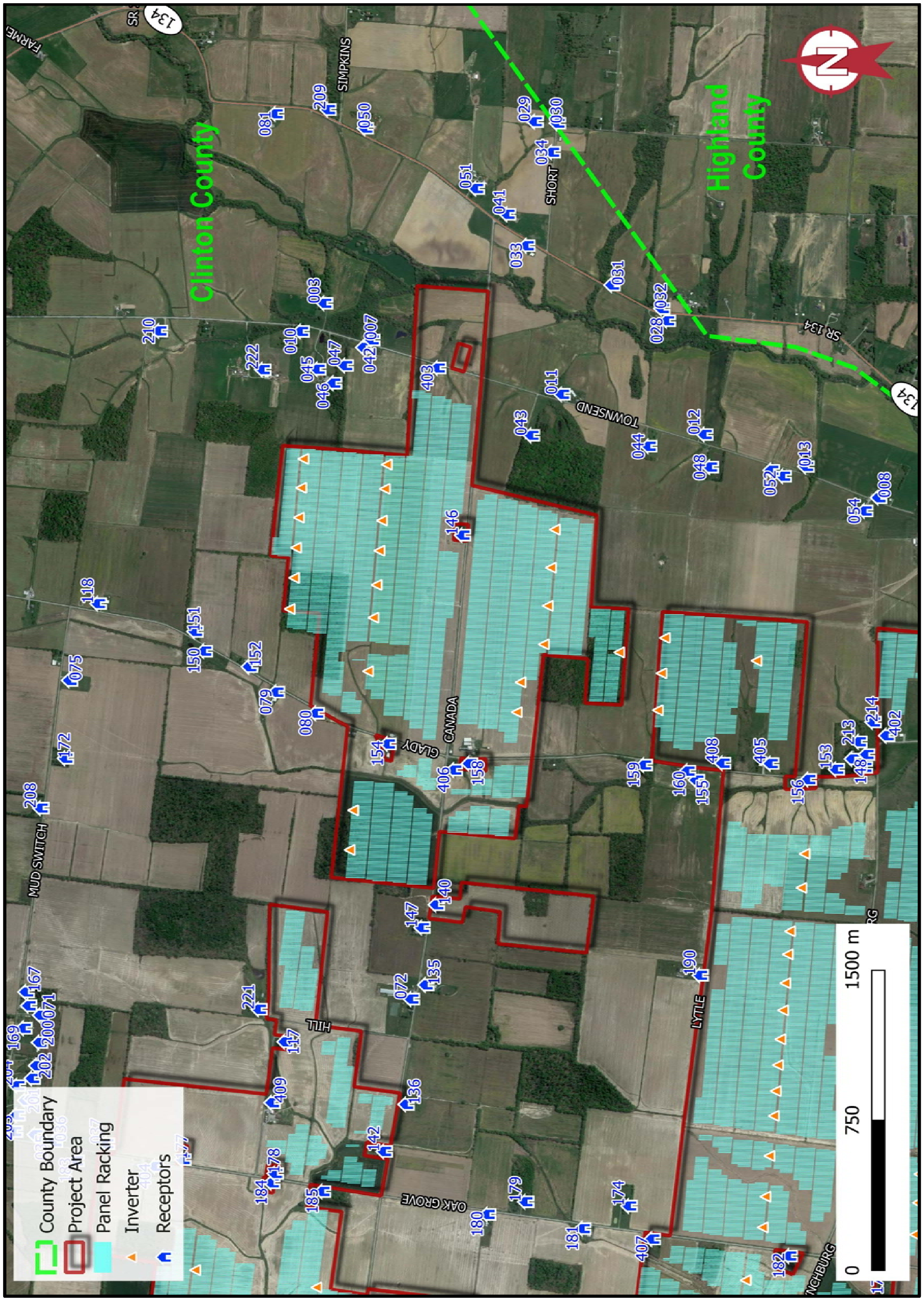

Figure 5-1. Noise-Sensitive Receptors – Northern Area

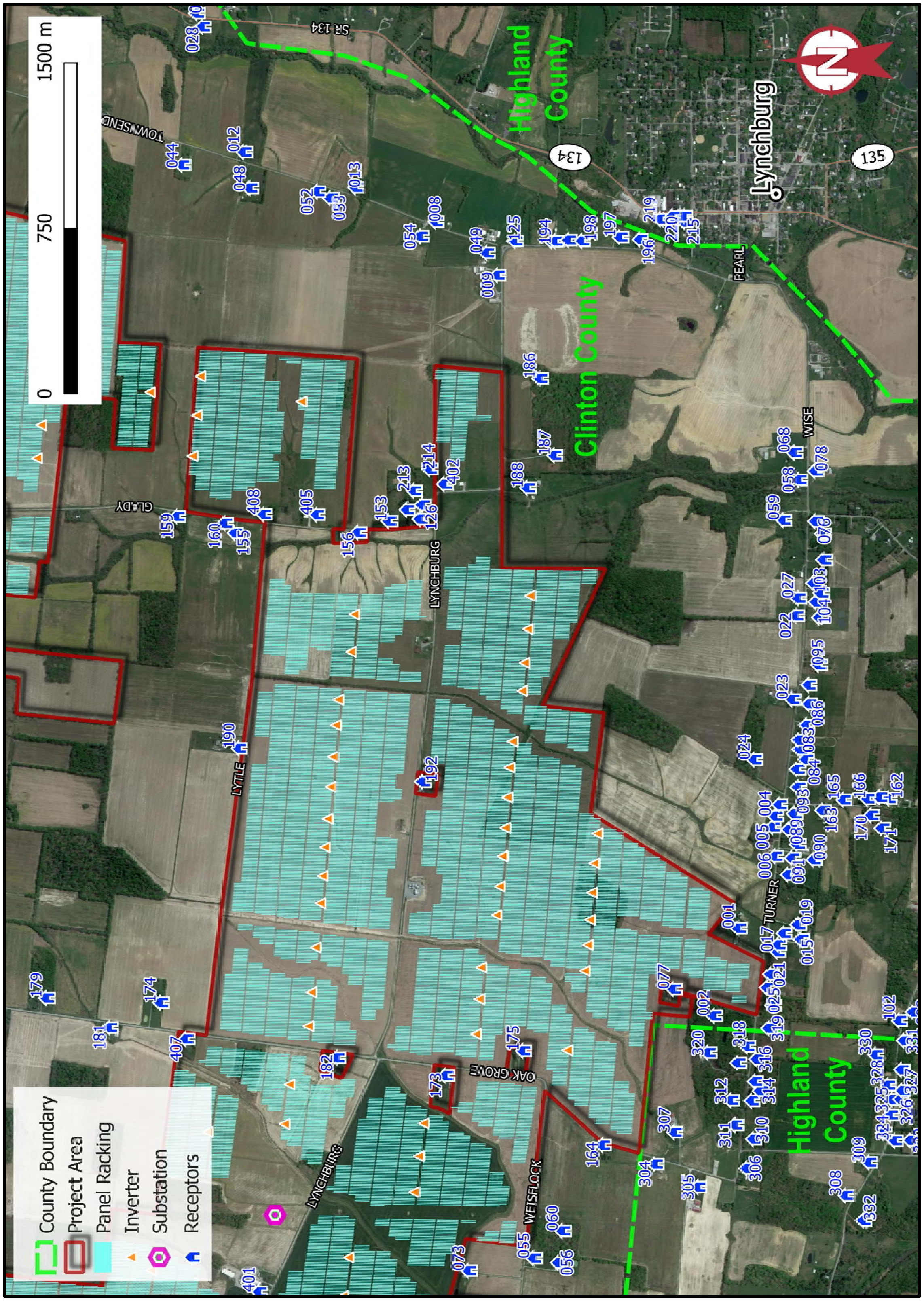

Figure 5-2. Noise-Sensitive Receptors – Southern Area

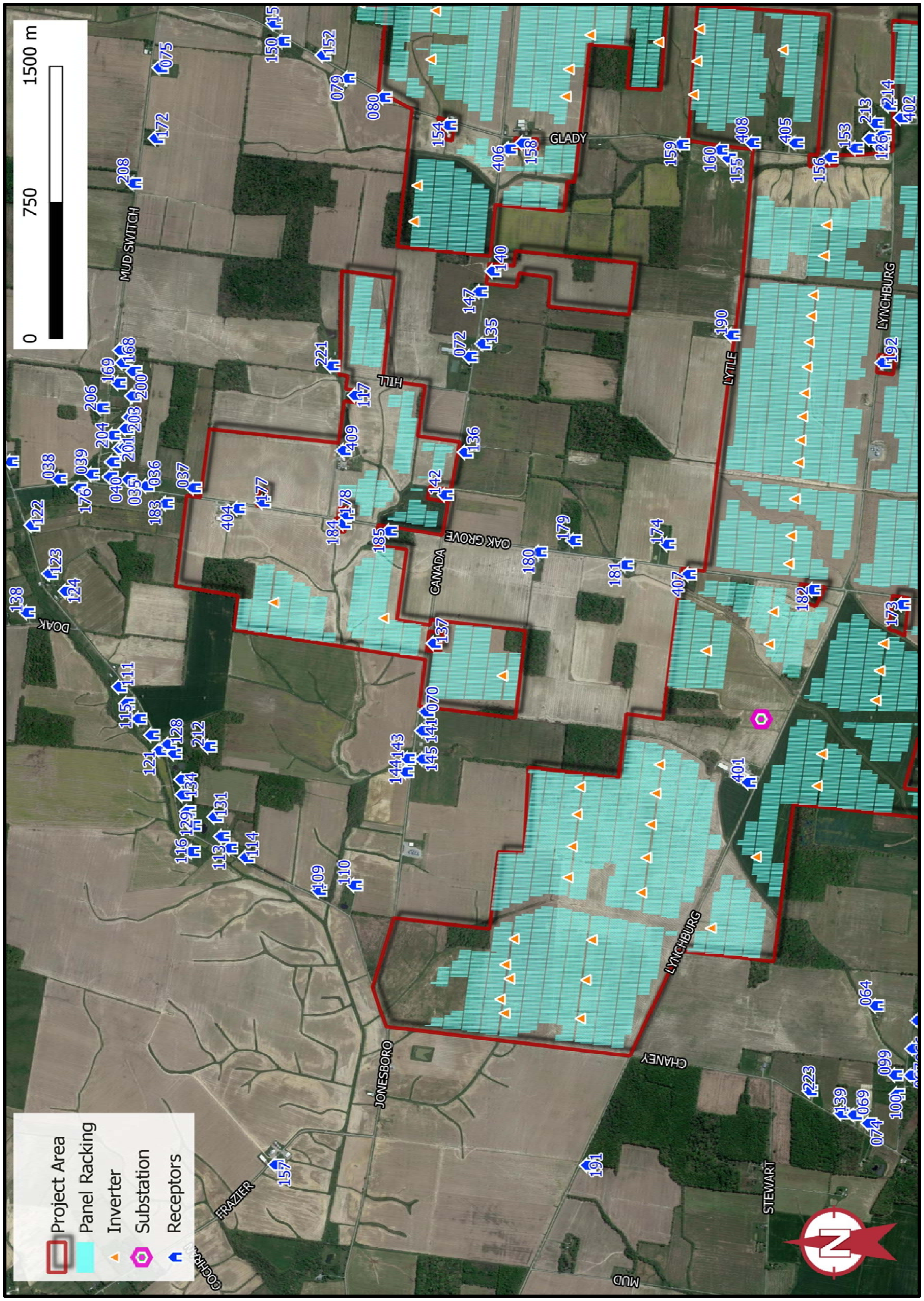

Figure 5-3. Noise-Sensitive Receptors – Western Area

Construction Noise Sources

Noise levels were predicted using the Federal Highway Administration's (FHWA) Roadway Construction Noise Model v1.1 for the five phases of construction: site preparation, civil work, pile driving, mechanical assembly, and electrical work. Table 5-1 lists the equipment associated with each phase, as well as the number of units to be employed, the sound power level of each unit, and the percentage of time that each piece of equipment is expected to be used at full capacity (the usage factor). Construction noise source levels were generally based on measurements of construction equipment made by Hankard Environmental on previous projects. The usage factors were taken from the RCNM. All construction noise sources were modeled at 10 feet above the ground.

Table 5-1. Noise Source Characteristics of Construction Equipment

Phase	Equipment Type (quantity)	Usage Factor (%)	Octave Band Sound Power Level (dB) 31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz	Overall Sound Power Level (dBA)
1 Site Preparation	Bulldozer (1)	40%	116	111	116	116	105	107	104	95	85	112
	Excavator (2)	40%	103	112	112	107	99	97	95	92	85	104
	Motor Grader (2)	40%	100	99	110	104	101	110	103	94	89	112
	Water Truck (1)	40%	103	107	112	103	106	104	98	94	85	108
	Dump Truck (1)	40%	98	112	105	103	97	98	96	90	82	103
2 Civil Work	Roller (1)	40%	--	138	128	115	101	98	97	94	90	116
	Dump Truck (1)	40%	98	112	105	103	97	98	96	90	82	103
	Excavator (2)	40%	103	112	112	107	99	97	95	92	85	104
	Trencher (1)	50%	109	114	114	108	105	102	101	95	87	108
	Motor Grader (2)	40%	100	99	110	104	101	110	103	94	89	112
	Water Truck (1)	40%	103	107	112	103	106	104	98	94	85	108
3 Pile Driving	Pile Driving (1)	20%	128	130	132	121	125	126	124	119	111	130
	Pickup Truck (2)	40%	100	114	107	105	99	101	98	92	84	105
	Man Lift (2)	20%	102	108	101	92	92	93	94	87	81	99
	Crane (1)	16%	---	139	117	104	102	100	96	90	85	114
	Backhoe/Loader (1)	40%	105	102	111	101	99	101	99	96	91	106
4 Mechanical Assembly	Pickup Truck (2)	40%	100	114	107	105	99	101	98	92	84	105
	Man Lift (2)	20%	102	108	101	92	92	93	94	87	81	99
	Crane (1)	16%	---	139	117	104	102	100	96	90	85	114
	Backhoe/Loader (1)	40%	105	102	111	101	99	101	99	96	91	106
5 Electrical Work	Pickup Truck (2)	40%	100	114	107	105	99	101	98	92	84	105
	Flatbed Truck (1)	40%	100	114	107	105	99	101	98	92	84	105
	Man Lift (1)	20%	102	108	101	92	92	93	94	87	81	99
	Small Generator (1)	50%	103	110	108	108	105	104	103	102	98	110
	Compressor (1)	40%	106	113	111	111	108	107	106	105	101	113

Operational Noise Sources

The model of noise emissions from the Project included 90 inverters and two primary step-up transformers located at the Facility's substation. Note that noise from solar tracking motors was not included as it has been found to be inaudible off-site based on measurements made at existing solar facilities. The inverters were modeled at a height of six feet above ground. The substation step-up transformers were modeled at a height of ten feet above ground. The inverters and substation step-up transformers were all assumed to operate at full acoustic output during the daytime. Only the step-up transformers were assumed to operate at night (at full acoustic output).

Table 5-2 lists the sound power levels for each source. The Project proposes to use the TMEIC Ninja 4.2 kW model inverter or a similar substitute. The solar inverter levels shown in the table are based on field measurements of a TMEIC 3.3 kW model in operation at an existing solar farm. The model to be deployed at the Project is expected to have a substantially similar noise profile to the one presented in the table, particularly since the majority of noise created by inverters is attributable to cooling systems that will be the same or similar between inverter models. The sound power level of the step-up transformers was estimated using the procedures outlined in the "Electric Power Plant Environmental Noise Guide" from the Edison Electric Institute (EEI, 1984).

Table 5-2. Noise Emission Levels of Operational Equipment

Equipment Type	Equipment Quantity	Octave Band Sound Power Level (dB)									Overall Sound Power Level (dBA)
		31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz	
Solar Inverter	90	99	95	99	98	95	86	79	73	69	95
Transformer (178 MVA)	1	97	103	105	100	100	94	89	84	77	100

6. Predicted Construction Noise Levels

The construction noise analysis was conducted using the FHWA's Roadway Construction Noise Model (RCNM) v1.1. This computer software program includes construction noise source sound pressure levels and equipment usage factors. Noise levels from each of the five phases of construction of the Facility were predicted at each of the receptor locations identified within the Project Study Area and at one worst-case location along the Project boundary. These phases include site preparation (clearing); civil work (grading and the construction of access roads); pile driving (use of small specialty pile driving units); mechanical assembly of the solar panels, racks, and modules; and electrical work, which consists of connecting all the equipment. Some of this work will be conducted concurrently in different areas of the site. The total duration of construction is approximately 18 months.

The ranges of predicted construction noise levels ($L_{eq(1hr)}$) for each phase of construction at all of the receptors are provided in Table 6-1. For pile driving, the expected worst-case maximum levels (L_{max}) are presented because this activity can be the most noticeable when nearby, even though this source may not be operating continuously. These values assume that all of the equipment for each phase of work is operating at its expected hourly usage-factor. Predicted construction noise levels for all of the receptor and project boundary locations are provided in Appendix B.

Table 6-1. Predicted Construction Noise Levels at Receptors

Construction Phase	Range of Noise Levels ($L_{eq\text{-}1hr}$ (dBA))	
	Minimum	Maximum
1 – Site Preparation	44	77
2 – Civil Work	44	76
3 – Pile driving	55(1)	84(1)
4 – Mechanical Assembly	38	71
5 – Electrical Work	37	69

(1) Maximum instantaneous noise level shown

Mitigation measures for construction noise, if necessary, include the use of ambient controlled broadband backup alarms versus tonal alarms, using well-maintained equipment (particularly with respect to mufflers), and maintaining communication with affected residents.

7. Predicted Operational Noise Levels

The primary noise sources associated with the operation of the Project include 90 pad-mounted inverters located throughout the Project area and the two 178 MVA step-up transformers located at the substation. This analysis assumed that all of the equipment would operate simultaneously at full acoustic output during the daytime, but only the substation step-up transformers would operate at night (at full acoustic output). Operational noise levels were predicted at the 264 noise-sensitive receptors located within approximately one-half mile of the Project boundary. Noise levels at more distant receptors will be less than those described herein.

The noise levels predicted from daytime and nighttime operation of the Facility are depicted graphically in Figures 7-1 and 7-2, respectively. Shown are the 47 dBA and 38 dBA noise level contours which represent the daytime and nighttime noise level limits, respectively. The predicted noise levels for daytime operation range from 23 to 43 dBA, with 98% of the receptors having levels of 40 dBA or less. All of the levels are less than the daytime limit of 47 dBA. The loudest levels (43-42 dBA) are predicted at a residence on Lynchburg Road in the western portion of the Project area (R401), a residence on Oak Grove Road in the southern portion of the Project area (R182), two residences in the southern portion of the Project area, also on Oak Grove Road (R175 and R173), and a residence on Lynchburg Road in the southern portion of the Project area (R192). See Appendix C for a list of predicted daytime operational noise levels at all receptors.

The predicted noise levels for nighttime operation range from 10 to 33 dBA for non-participating residences, all of which are below the limit of 38 dBA established for the Project. At one participating residence (R401), the nighttime predicted noise level is 41 dBA.

Along the Project boundary, the predicted worst-case operational noise levels could exceed 47 dBA, but only in areas adjacent to agricultural or undeveloped land uses which are not considered noise-sensitive.

8. Noise Mitigation Measures

The Project has minimized operational noise levels at off-site receptors through the appropriate siting of equipment. No additional noise mitigation measures are considered necessary, provided the equipment ultimately selected has sound power levels equal to or less than those listed in Table 5-2. All maintenance activities should be conducted using well-maintained and properly muffled vehicles and equipment.

Regarding construction, mitigation measures for construction noise, if necessary, include the use of ambient controlled broadband backup alarms versus tonal alarms, using well-maintained equipment (particularly with respect to mufflers), and maintaining communication with affected residents.

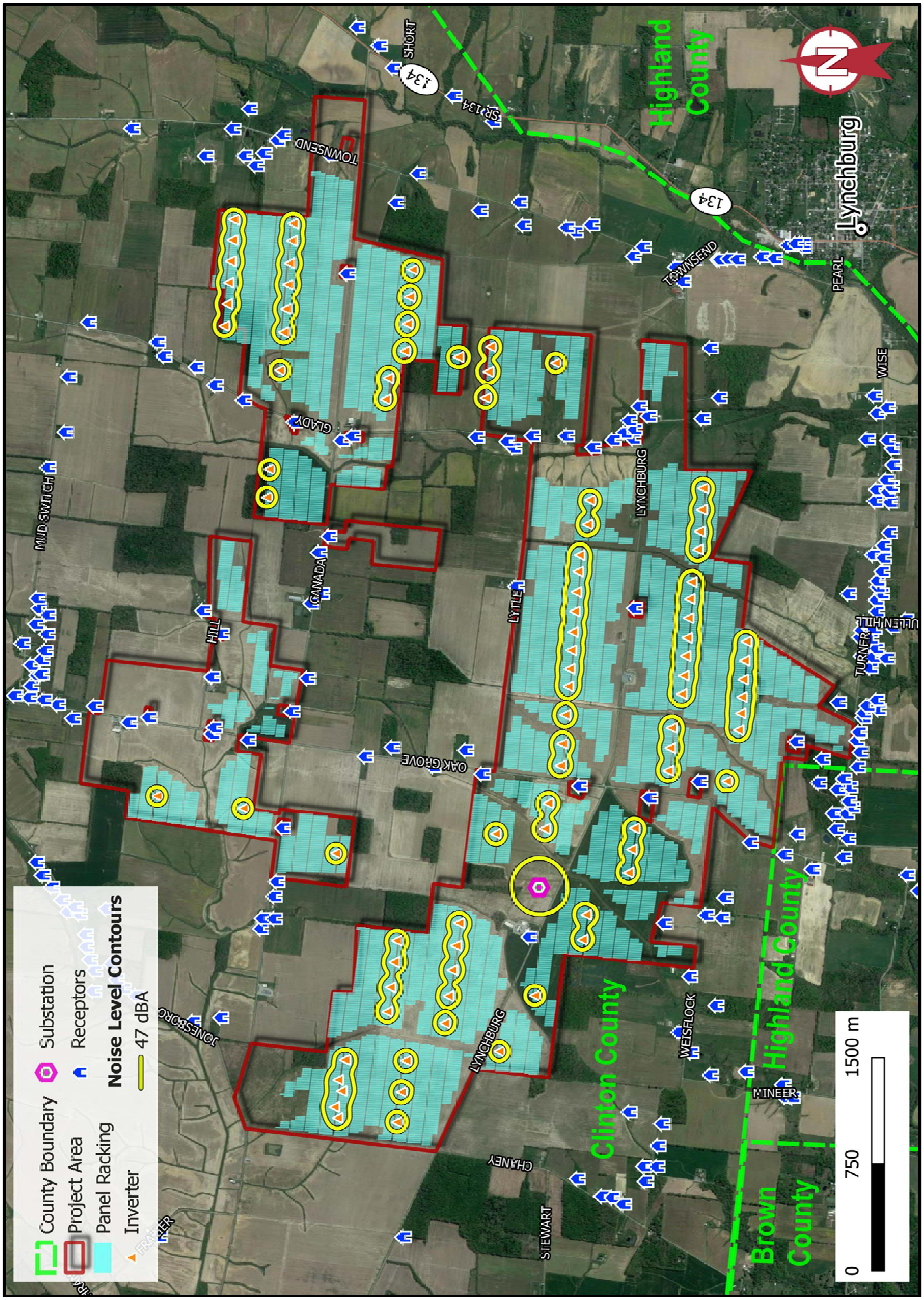

Figure 7-1. Predicted Daytime Operational Noise Level Contours

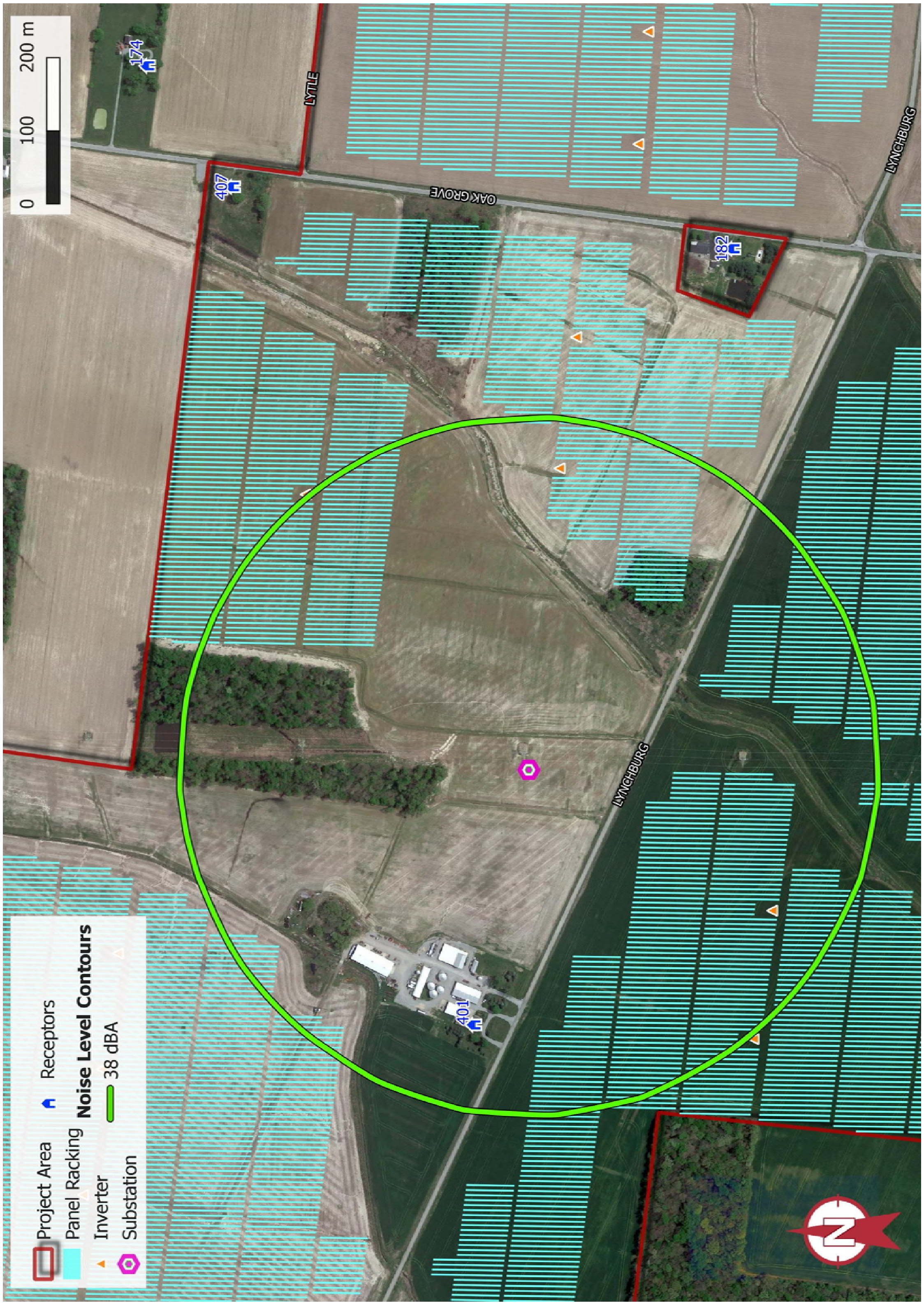

Figure 7-2. Predicted Nighttime Operational Noise Level Contours

Appendix A: Photographs of Measurement Locations

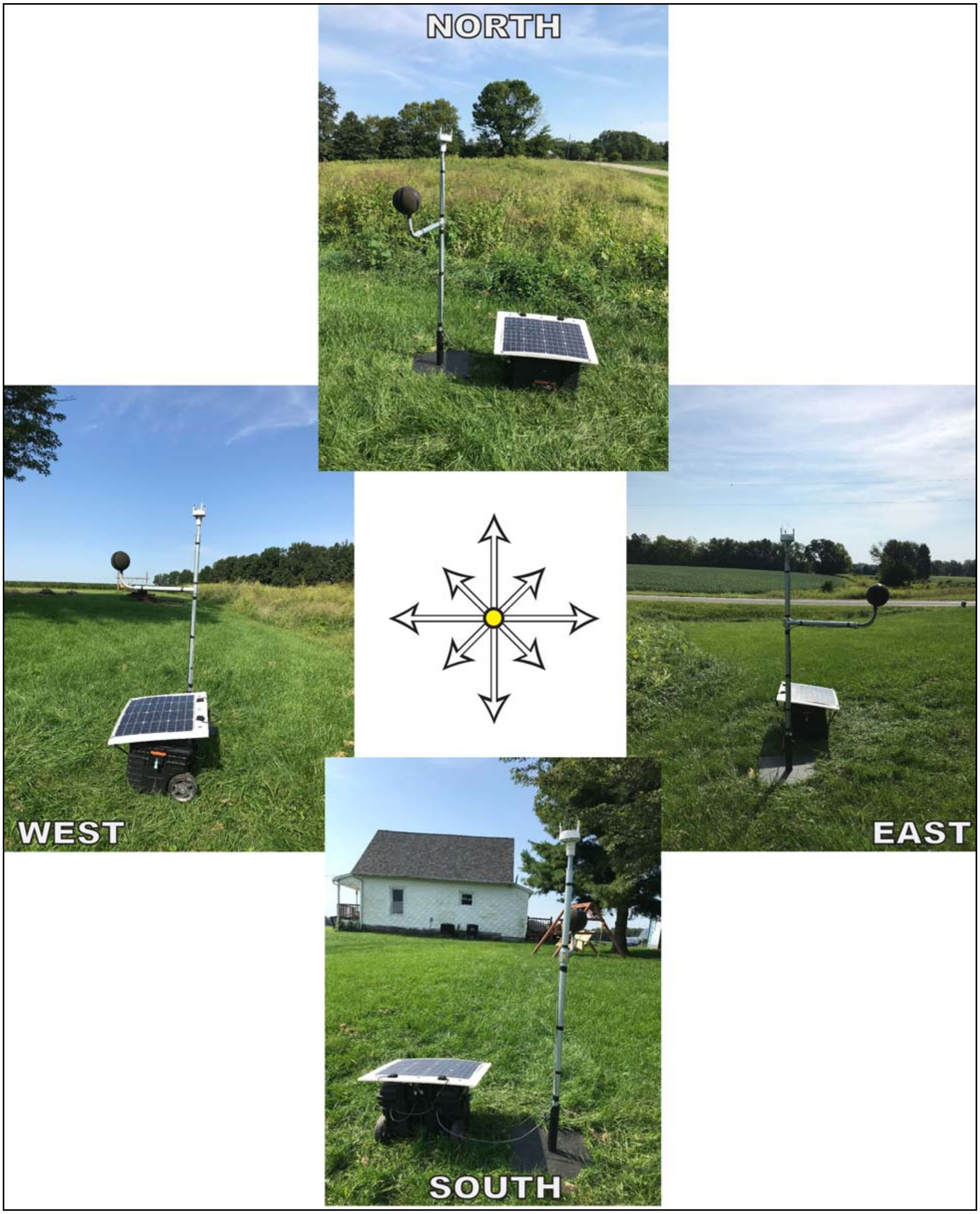

Figure A-1. Photographs of Location LT1

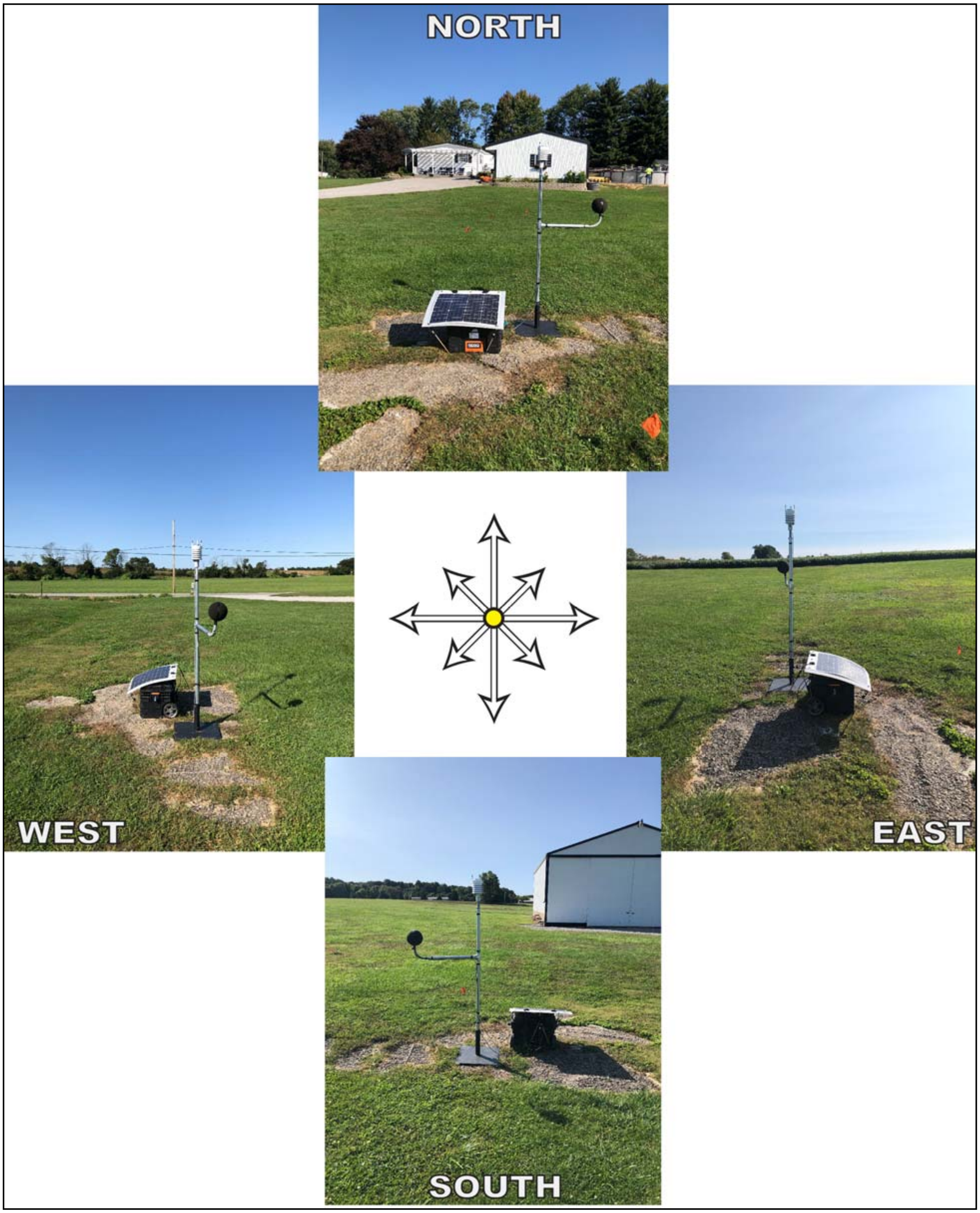

Figure A-2. Photographs of Location LT2

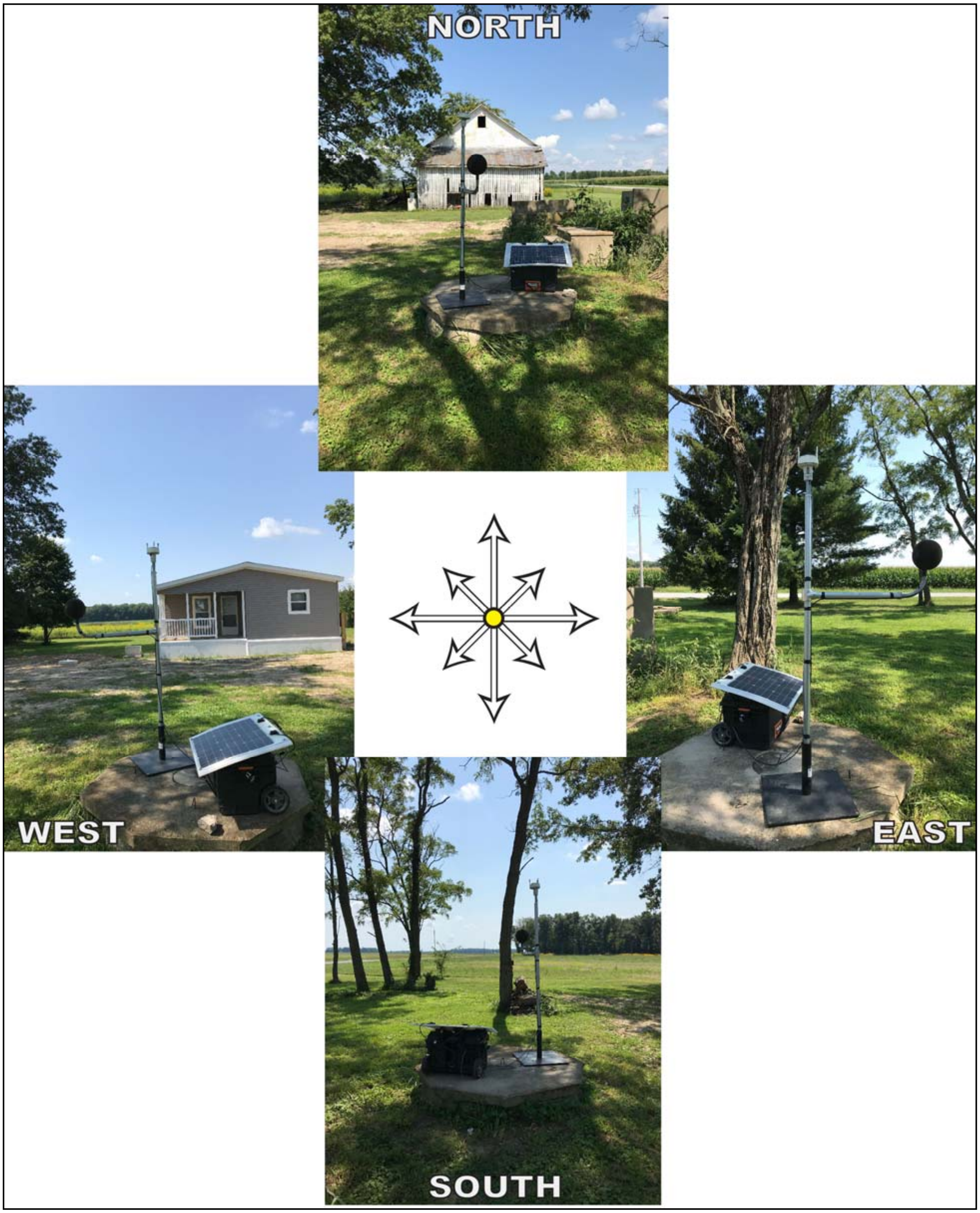

Figure A-3. Photographs of Location LT3

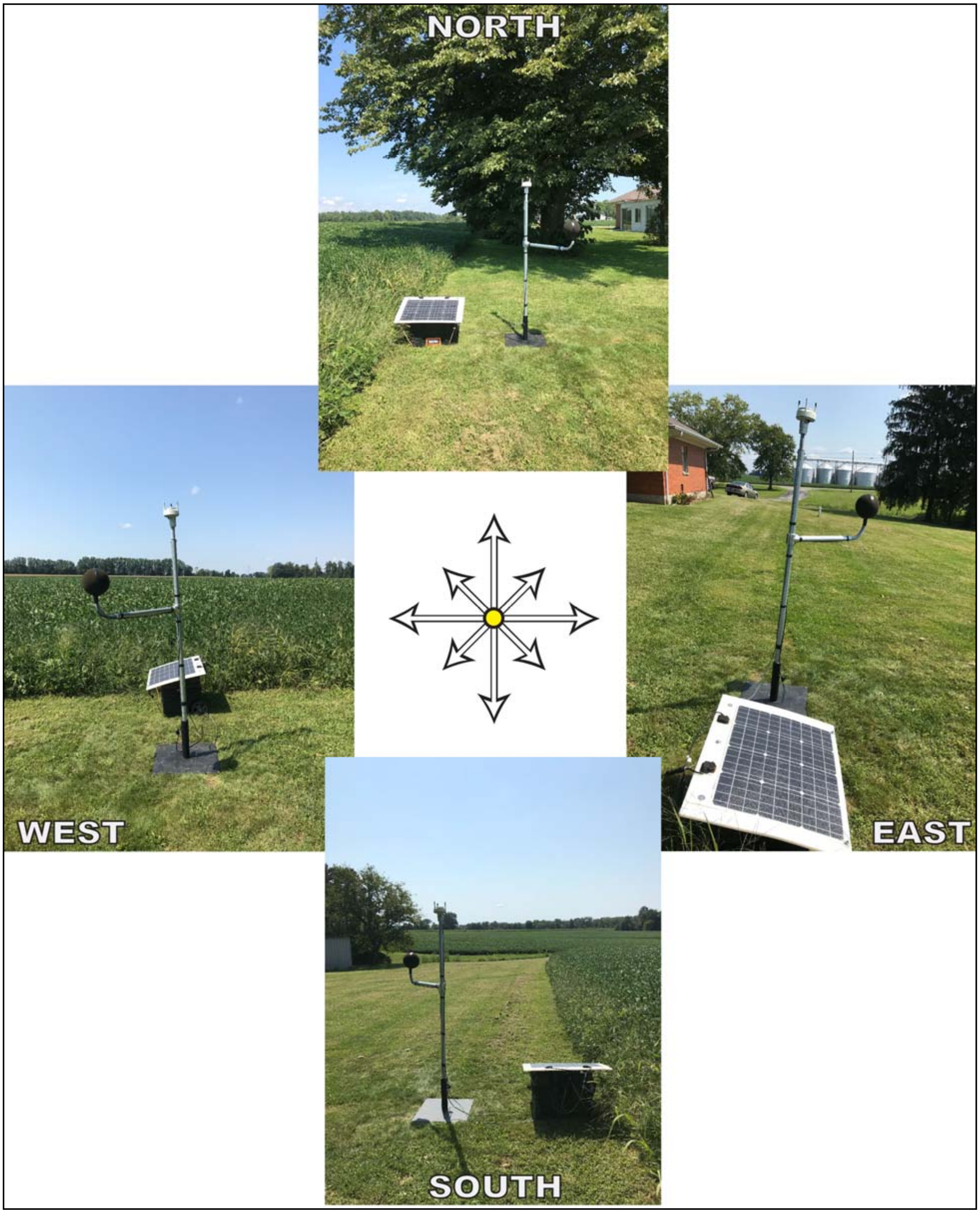

Figure A-4. Photographs of Location LT4

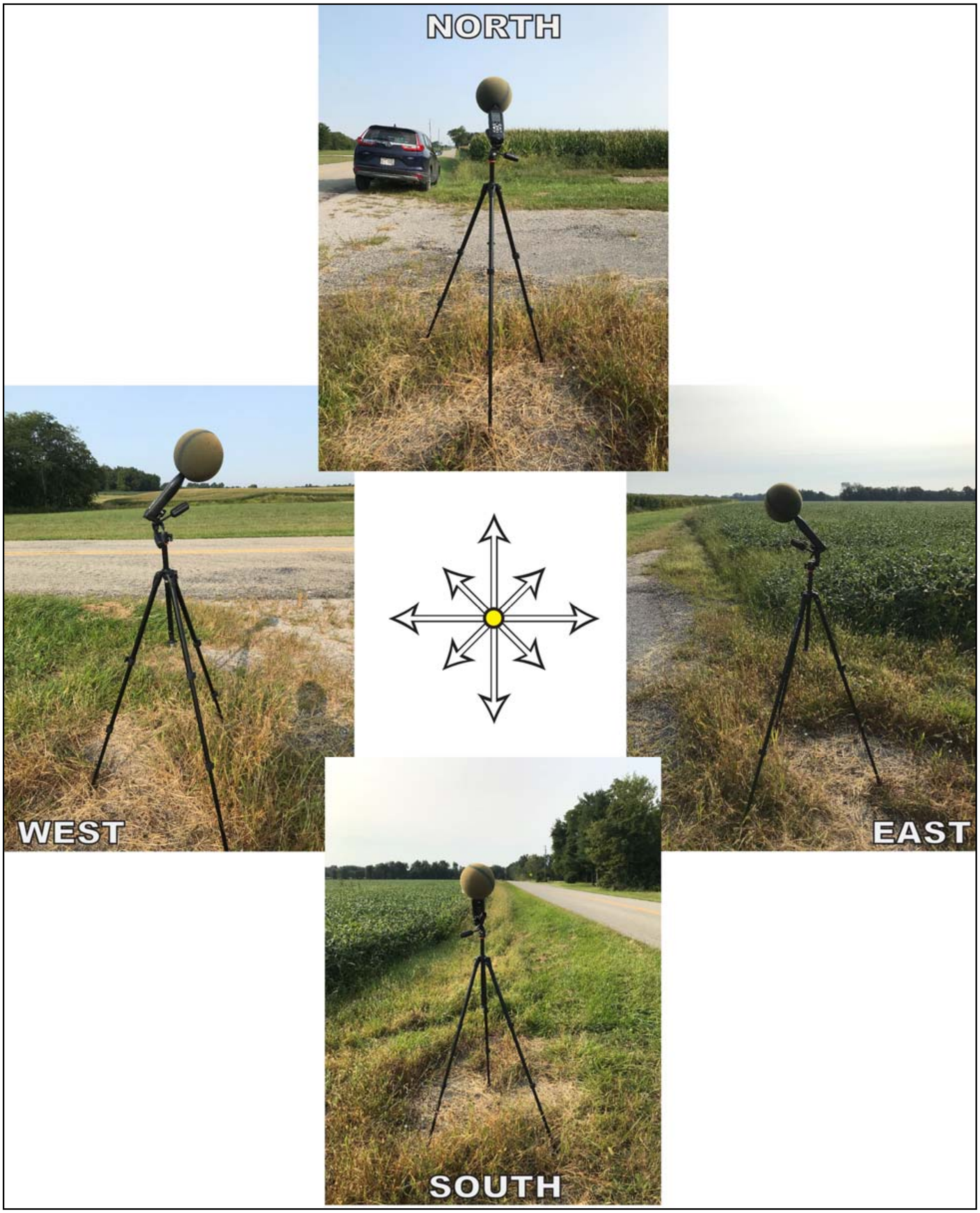

Figure A-5. Photographs of Location ST1

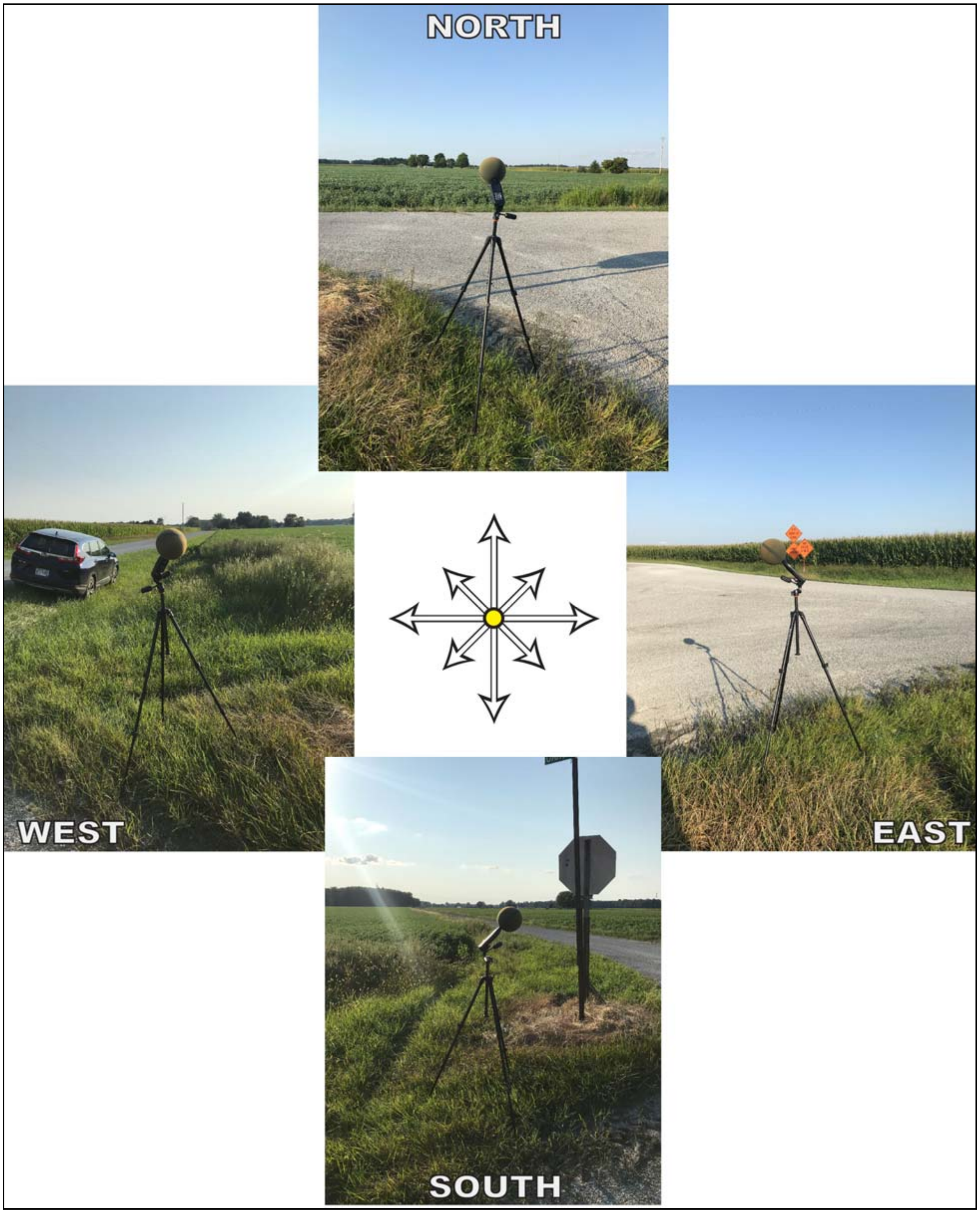

Figure A-6. Photographs of Location ST2

Figure A-7. Photographs of Location ST3