BEFORE THE OHIO POWER SITING BOARD

In the Matter of the Application of Big Plain Solar, LLC for a Certificate of Environmental Compatibility and Public Need to Construct a Solar-Powered Electric Generation Facility in Madison County, Ohio	))))))	Case No. 19-1823-EL-BGN

<u>NOTICE REGARDING MODIFICATION OF PROJECT FOOTPRINT</u>

Pursuant to Ohio Adm.Code 4906-3-11(A)(6), Big Plain Solar, LLC ("Big Plain Solar") is submitting this notice of footprint modification to allow for a change in the location of the collection substation. The purpose of this modification is to minimize impacts to state jurisdictional wetlands. As shown in Exhibit A (Figure 1), the substation has been moved approximately 0.4 mile northwest. As a result of this shift, minor shifts to the collection line were required. No other changes are being proposed to the project footprint.

As further explained in Exhibit B (Summary of Project Modification), there are no material new impacts as a result of this modification. The relocation of the substation and collection line shifts will all occur within the project area identified in the Application and will not result in the introduction of new landowners. The shift in location remains within the original study area for Big Plain Solar's evaluation of local wildlife and area cultural or historic resources. The shift in location is expected to decrease impacts to wetlands by 0.06 acre, as further detailed in Exhibit B.

Because the modification consists of changing the location of the substation, Big Plain Solar conducted updated analyses for noise and visual impacts to ensure there were no increases. According to the updated noise impact assessment for the relocated substation, attached as Exhibit C, there are no additional increase in noise compared to the information presented in the

Application. Also, according to the updated viewshed analysis, attached as Exhibit D, the shift in the location of the substation results in a 6.2% reduction in substation visibility within the two-mile visual study area compared to the results in the Application.

Big Plain Solar intends to present all information in this notice at the evidentiary hearing in this matter and has discussed this change with Staff. No new adjacent landowners are being added through this change, and Big Plain Solar will send notice of this footprint modification to public officials and adjacent landowners to the substation property.

Respectfully submitted,

/s/ Michael J. Settineri
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Attorneys for Big Plain Solar, LLC

CERTIFICATE OF SERVICE

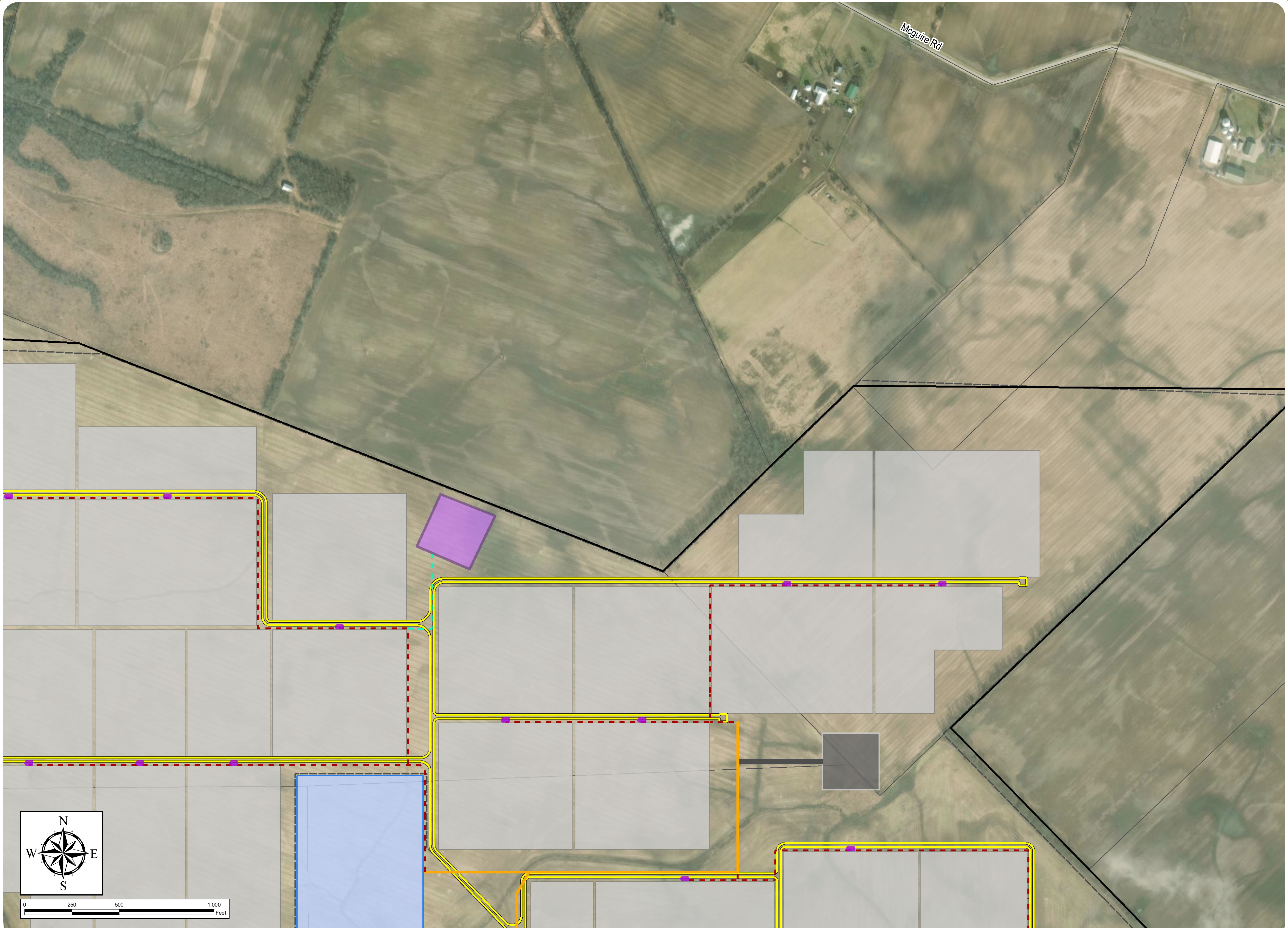
The Ohio Power Siting Board's e-filing system will electronically serve notice of the filing of this document on the parties referenced on the service list of the docket card who have electronically subscribed to the case. In addition, the undersigned certifies that a courtesy copy of the foregoing document is also being served (via electronic mail) on the 30th day of November, 2020 upon all persons/entities listed below:

Jodi Bair *Counsel for Staff of the Ohio Power Siting Board*	jodi.bair@ohioattorneygeneral.gov
Robert Dove *Counsel for Thomas A Coughlin and TDC Farms, LLC*	rdove@keglerbrown.com

/s/ Anna Sanyal
Anna Sanyal (0089269)

EXHIBIT A TO NOTICE OF FOOTPRINT MODIFICATION

CASE NO. 19-1823-EL-BGN

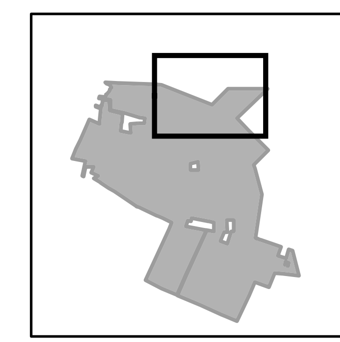


Madison Solar Project

Fairfield and Oak Run Township, Madison County, Ohio

Figure 1. Updated Facility Layout

- Access Road
- New Underground Collection Line
- Certificate Application Underground Collection Line
- Eliminated Overhead Collection Line
- Overhead Collection Line
- Fence Line
- Inverter
- PV Panel
- Relocated Collection Substation
- Certificate Application Collection Substation
- Laydown Yard
- Project Area



Notes: 1. Basemap:ESRI ArcGIS Online "World Imagery" map service. **2.** This map was generated in ArcMap on November 6, 2020. **3.** This is a color graphic. Reproduction in grayscale may misrepresent the data.**4.** Map Scale 1:6,000.

First Solar.

edr

www.edrdpc.com

EXHIBIT B TO NOTICE OF FOOTPRINT MODIFICATION

CASE NO. 19-1823-EL-BGN

To:	Big Plain Solar, LLC	**EDR Project No:**	18191
From:	Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C.		
Date:	November 30, 2020		
Reference:	Madison Solar Farm OPSB Case No. 19-1823-EL-BGN Summary of Project Footprint Modification		

Comments:

The following technical memo presents a summary of the Project Footprint Modification resulting from the relocation of the proposed Madison Solar Farm collection substation. Big Plain Solar, LLC is submitting a notice of a footprint modification for the Madison Solar Farm (the Facility). The purpose of this modification is to minimize impacts to state jurisdictional wetlands. The Certificate Application for this Facility was submitted to the Ohio Power Siting Board (OPSB) on April 27, 2020 (Case No. 19-1823-EL-BGN). The modification is described in more detail below.

Relocation of the Collection Substation and Subsequent Collection lines

In the Certificate Application, the collection substation was located at the intersection of three parcels (see Figure 3-2 of Certificate Application). The substation has been moved approximately 0.4 mile northwest, and will be located 0.6 mile southeast of McGuire Road, and 1.5 miles east of the McGuire Road – Hume Lever Road intersection on parcel 07-00179.000. Due to the relocation of the collection substation, minor shifts to the collection line route were required. These changes include the elimination of approximately 445 feet of overhead collection line from the photovoltaic (PV) panels and inverters to the previous collection substation and the addition of 520 feet of underground collection line to connect the proposed collection substation to the PV panels and inverters. These changes are depicted on Figure 1.

Impacts of modification

No new impacts will be created as a result of this modification. Relocation of the substation and minor collection line shifts will all occur within the Project Area presented in the Certificate Application and will not result in the introduction of new landowners. The substation location will be closer to one non-participating residence (DP-2) by 500 feet, but with negligible operational noise increase (30.7 dBA to 31 dBA). No additional impacts to cultural or natural resources are anticipated due to this move. Given that the modification includes movement of the collection substation, updated analyses were conducted for noise and visual impacts. Results of those analyses are provided below.

Noise

Hessler Associates, Inc. (Hessler) prepared an updated Noise Impact Assessment for the relocated substation (Attachment 1). Construction noise, location of noise-sensitive receptors, mitigation of noise emissions during construction and operation, pre-construction residual background noise levels (L_{90}) , and modeled noise levels for the relocation substation are consistent with the information presented in the Certificate Application. In addition to the L_{90} levels, Hessler measured average daytime and nighttime ambient levels (L_{eq}) which were 33 dBA and 26 dBA, respectively. All sensitive receptors within 1 mile were modeled to experience sound levels less than 30 dBA during daytime, except one receptor which was modeled at 31 dBA due to the relocated substation. These results are consistent with the Noise Impact Study submitted in the Original Certificate Application. Additionally, nearest non-participating residence to an inverter (540 feet), represented by Design Point 3 in Attachment 1, would experience sound levels of 29 dBA.

Visual

Environmental Design and Research, Landscape Architecture, Engineering, and Environmental Services, D.P.C. (EDR) has prepared an updated viewshed analysis to evaluate changes in visual impacts as a result of the relocated collection substation (Attachment 2). A revised digital surface model (DSM) viewshed analysis was conducted for the relocated substation using the same methodology described in the Visual Resource Assessment (VRA) included as Exhibit T in the Certificate Application. Results of the updated DSM viewshed analysis showed a 6.2% reduction in substation visibility within the 2-mile Visual Study Area (VSA) compared to results presented in the Certificate Application. In the Certificate Application, potential views of the substation were possible from 35.8% of the VSA. As a result of the substation relocation, visibility decreases to 29.6% of the VSA. Therefore, visual impacts will be less with the newly proposed substation location than for the substation location included in the Certificate Application.

Wetlands

No wetlands were identified during delineation surveys for the areas of the relocated substation or underground collection line. Based on these changes, impacts to wetlands will decrease. Specifically, proposed impacts to wetland WB-31 will decrease by 0.06 acre due to the substation relocation and the elimination of the overhead collection line associated with the original substation location. For additional context, see Table 08-5, Wetland and Stream Impacts, of the Original Certificate Application.

Updated impact tables

Updated tables that correspond with the tables in the Certificate Application are provided below. The changes to impacts as a result of the relocated substation and minor shifts in collection lines include the following:

- Impacts to ecological communities decreased within agricultural and grass/pasture/hay/swale land cover. Total disturbance to agricultural land cover decreased by 5.9 acres. Total disturbance to grass/pasture/hay/swale ecological communities decreased by 0.1 acre.
- One non-participating parcel is now within 250 feet of the collection substation
- Land use impacts (all to agricultural land) decreased by 3.5 acres for overhead collection lines and 3.5 acres for temporary disturbance of underground collection lines. Though the underground collection line route increased 520 feet to connect the PV panels to the collection substation (which resulted in a temporary impact area less than 0.1 acre), improved impact analyses accounting for colocations of collection lines and access roads resulted in an overall decrease in total disturbance that was presented in the Certificate Application. The collection substation footprint remains the same; however, it will be located exclusively on one parcel designated as 'Agricultural Vacant' rather than three parcels, two of which were 'Agricultural Vacant' and one of which was 'Cash Grain or General Farm'.

Table 08-4. Impacts to Ecological Communities

Community	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Impacts (acres)
Agricultural	1,177.5	41.8	1,135.7
Grass/Pasture/Hay/Swale	22.5	1.0	21.5

Table 08-9. Parcels Within 250 Feet of an Associated Facility

Parcel ID	Distance	Associated Facility	Anticipated Lease Status
07-00088.000	49.5 feet	Collection Substation	Non-Participating

Table 08-11. Land Use Impacts

Facility Component	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Loss (acres)
Agricultural (100)			
Buried Electrical Collection Cable	19.2	19.2	0.0
Overhead Electrical Collection Cable	6.5	0.0	6.5

Table 08-15. Impacts to Agricultural Land Uses

Facility Component	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Disturbance (acres)
Agricultural Vacant (100 or 110)	*22.0*	*17.8*	*4.2*
Buried Electrical Collection Cable	*13.8*	*13.8*	*0.0*
Overhead Collection Line	*4.2*	*0.0*	*4.2*
Collection Substation	*4.0*	*0.0*	*4.0*
Cash Grain or General Farm (101 or 111)	*3.5*	*3.5*	*0.0*
Buried Electrical Collection Cable	*3.5*	*3.5*	*0.0*
Collection Substation	*0.0*	*0.0*	*0.0*
Other Agricultural Use (199)	*4.2*	*1.9*	*2.3*
Buried Electrical Collection Cable	*1.9*	*1.9*	*0.0*
Overhead Collection Line	*2.3*	*0.0*	*2.3*

Table 08-16. Impacts to CAUV

Current Agricultural Use Value Lands	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Disturbance (acres)
Buried Electrical Collection Cable	19.2	19.2	0.0
Overhead Collection Line	6.5	0.0	6.5

EXHIBIT C TO NOTICE OF FOOTPRINT MODIFICATION

CASE NO. 19-1823-EL-BGN

5096 N Silver Cloud Drive
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TECHNICAL REPORT

Title:	Existing Conditions Background Sound Survey and Noise Impact Assessment
Project:	Madison Solar
Location:	Big Plain, Madison County, OH
Prepared For:	Big Plain Solar, LLC
Prepared By:	David M. Hessler, P.E., INCE
Revision:	G
Issue Date:	November 11, 2020
Reference No:	TM-2164-120519-G
Attachments:	**Table T-2164-120419-0** Transformer and Inverter Sound Power Level Derivations **Plot 1-1** Project Sound Emissions Contour Map – Daytime **Plot 2-1** Project Sound Emissions Contour Map - Nighttime

1.0 Introduction

A study has been carried out for Big Plain Solar, LLC to evaluate the sound emissions from the proposed Madison Solar Energy Project located just west of Big Plain in Madison County, Ohio in order to identify and quantitatively evaluate any possible community noise issues. Compared to other types of power generation facilities, potential noise impacts from a photovoltaic solar energy project are relatively few, relatively mild and, moreover, have the unusual characteristic of mainly occurring during the daylight hours when noise is much less likely to be an issue in the first place. In this case, any possible concerns about noise are largely confined to the step-up transformer in the new substation, electrical inverters within the various solar fields and some short-lived activities during construction. In an effort to methodically evaluate the potential impact of the project, a field survey was conducted to establish the current levels of background sound within the site area so that projections of future transformer and inverter sound could be evaluated within an appropriate context. This report summarizes the findings from that field survey and discusses the potential noise impacts associated with the project.

1.1 Executive Summary

A field survey of the existing ambient sound levels within the Madison Solar project area has been carried out to quantify the baseline environmental conditions. The as-measured survey results were elevated due to seasonal, late summer insect activity and unrepresentative of the year round sound level. Consequently, the results were adjusted in general accordance with ANSI/ASA S12.100-2014 to delete the high frequency content. Omitting the windy periods, the average daytime and nighttime L90(ANS) levels, after the application of this correction, were 25 and 20 dBA, respectively. The average (Leq) sound levels after adjustment for high frequency contamination were significantly higher at 33 dBA day and 26 dBA night. What these levels generally indicate is that the area is fairly quiet, at least when there is no insect activity and the winds are light, and that there would be very little masking of the project sound emissions by pre-existing natural sounds during such conditions.

The sound power level of the step up transformer associated with the proposed substation was conservatively calculated from its expected maximum MVA rating of 210 OFAF and the inverter sound level has been derived from field measurements of the model that either will be used or that is representative of the model that will eventually be selected. The daytime sound levels throughout the project area, due to substation and inverter operation, have been modeled and the results indicate that extremely low, essentially inaudible sound levels of 31 dBA, or, in most cases, less can be expected at all of the nearest residences, with lower levels occurring at all more distant receptors out to the boundaries of the 1 mile study area. Since the maximum predicted project sound level of 31 dBA is less than the daytime Leq(ANS) background level of 33 dBA, the project certainly meets the common design objective of Leq plus 5 dBA. Although solar projects are for, all intents and purposes, operational only during the day, the substation transformer remains energized at night at a low, back feed throughput. The potential sound from this has been evaluated by very conservatively assuming that the transformer is operating in its normal daytime mode with all radiator fans on. While the sound emissions at the nearest residence to the substation are calculated to exceed the nighttime background by 5 dBA (31 dBA project vs. 26 dBA Leq (ANS) night), this prediction is most likely a gross overestimation of the transformer's actual sound emissions and, in any event, all sounds below about 35 dBA are so quiet in absolute terms that no disturbance is anticipated, if the substation is even audible at all.

A frequency analysis of the daytime and nighttime sound levels at the nearest residences to the substation was carried out using the modified Composite Noise Rating (CNR) methodology. This approach compares the frequency spectra of the existing background level to that of the proposed project to essentially gauge its audibility relative to the near-minimum L90(ANS) natural environmental sound level. Additional adjustments are made for such factors as time of day, tonal content and the community attitude towards to the project. The results of this analysis suggest that no reaction is expected at the nearest houses or at any other more distant locations.

In contrast to other forms of power generation, sound emissions during construction are expected to be dramatically lower in magnitude and duration. Some unavoidable disturbance is possible when the mounting posts are driven in, but this activity will be fairly short-lived in any particular location. Other sounds from trenching and road building will also be brief in duration and will progress from place to place avoiding prolonged exposure at any specific location.

In general, the potential noise impacts from all aspects of the project are expected to minimal.

2.0 Existing Conditions Sound Survey

In order to quantitatively evaluate the potential noise impact of the project, sound monitoring equipment was set up at two locations within the site area to measure the existing baseline ambient sound level, including its frequency content, for later comparison to the predicted sound levels from the substation and other equipment. The survey was carried out over a 7 day period from September 29th through October 7th, 2019 using continuously recording sound monitors in general accordance with ANSI S12.9-R2013 "Quantities and Procedures for Description and Measurement of Environmental Sound. Part 2: Measurement of Long-term, Wide-Area Sound".

2.1 Measurement Locations

Two measurement locations, illustrated in Figure 2.1.1, were selected as being representative of the general site area: one primary position (Position 1) at the center of the site and close to (what was) the nearest residence to the substation and a secondary location (Position 2) in the western part of the site area. It is important to note that the site layout illustrated in Figure 2.1.1 was the plan at the time of the field sound survey but has since changed. In particular, the substation has moved to the new location further from any homes in order to further minimize any potential noise impacts.

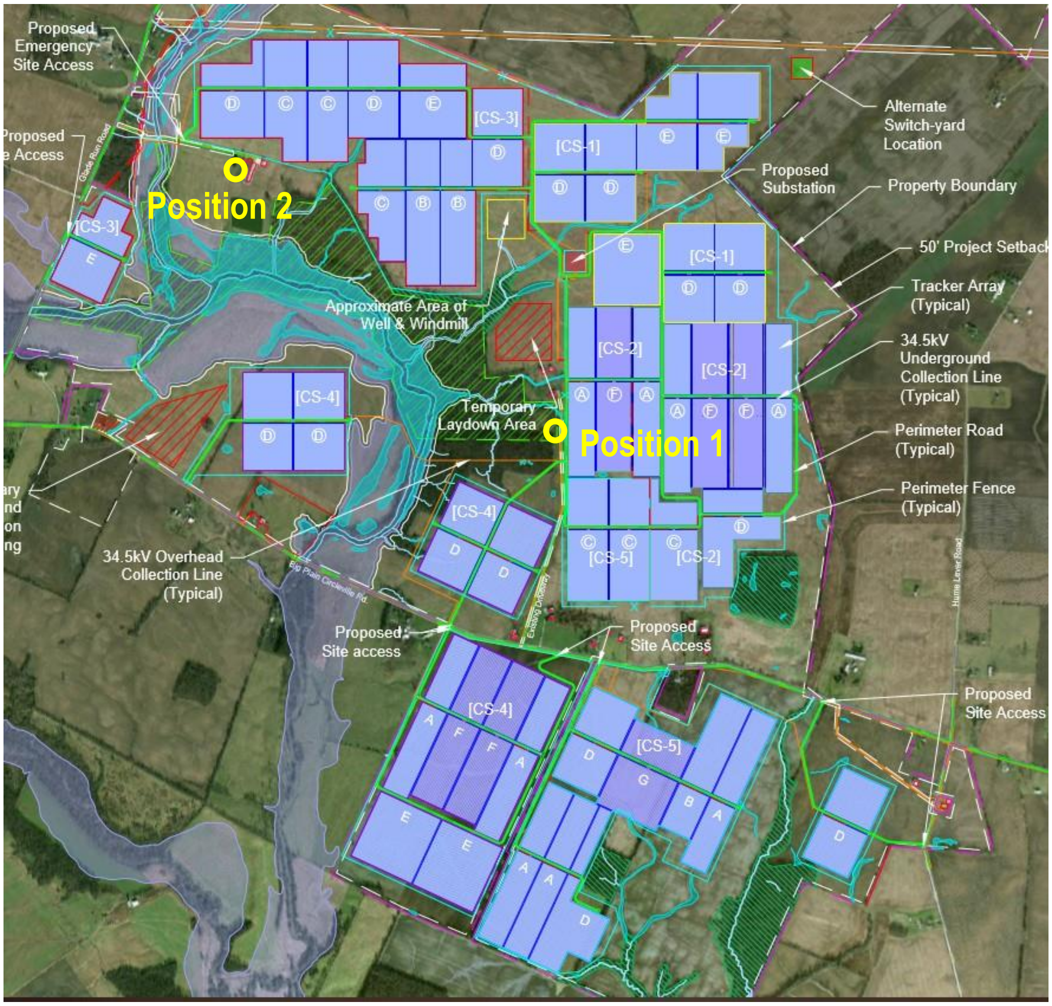


Figure 2.1.1
Preliminary Site Plan as it Existed at the Time of Survey
Showing Background Sound Monitoring Locations

Figure 2.1.2 is a more detailed view of Position 1 and its surroundings and Figure 2.1.3 shows the instrumentation set up.

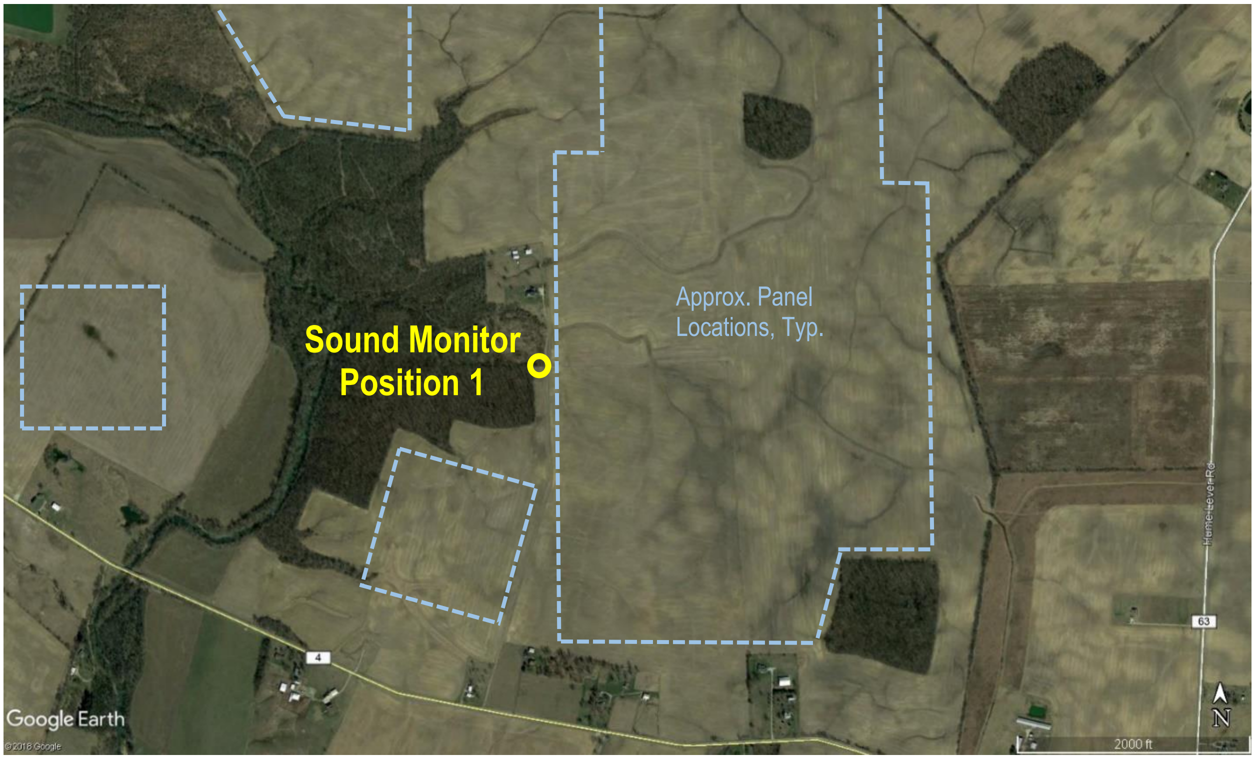


Figure 2.1.2
Sound Measurement Position 1 and Vicinity

Figure 2.1.3
Test Instrumentation at Position 1 Looking N towards Nearest Residence

As illustrated in Figure 2.1.3, a frequency analyzer, along with a back-up unit, were set up as continuous sound monitors at the edge of a field just south of the nearest residence to the project substation, which will be located about 1800 ft. north of the house. In general, Position 1 is centrally located within the project area and is far removed from any local roads making it a conservative test position that is exposed to minimal man-made noise.

Figure 2.1.4 shows test Position 2 in the western part of the site and Figure 2.1.5 shows the meter and microphone mounted on a pre-existing fence post in the backyard of the residence. Like Position 1 this location is several thousand feet from the nearest public road.

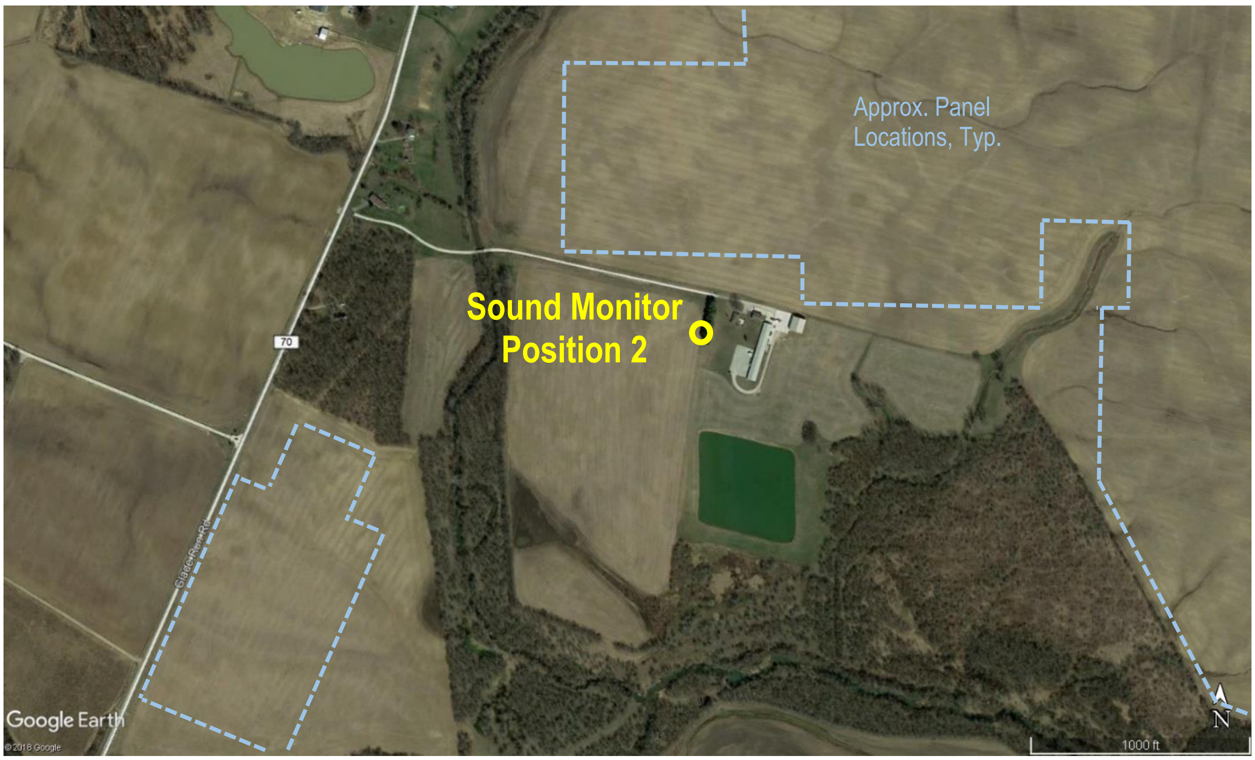


Figure 2.1.4
Sound Measurement Position 2 and Vicinity

Figure 2.1.5
Test Instrumentation at Position 2 Looking ENE towards Nearest Residence

2.2 Survey Equipment and Measurement Parameters

A Norsonic N-140, ANSI S1.4-1983(R2006) Type 1 precision, 1/3 octave band frequency analyzer was used at the primary measurement location along with a Rion Model NL-22, ANSI Type 2, environmental sound monitor for redundancy. A Rion Model NL-22 was used alone at Position 2.

All instruments were field calibrated with a Brüel and Kjær Type 4230, ANSI S1.40-1984(R1990) Type 1 calibrator at the beginning and end of the survey and exhibited only a small amount of drift within the -0.2 to +0.1 dB range. Weather-treated 7 in. diameter windscreens were used to minimize self-generated distortion from wind. The microphones were fixed to metal posts at a standard height of about 1.2 m above local grade.

A variety of statistical sound levels, such as the minimum, average, maximum, etc. were measured in 10 minute increments over the 7 day survey period; however, the parameter of primary relevance and importance to this kind of survey is the "residual" or L90 percentile level, which is the sound level exceeded 90% of the time over each measurement period. Put another way, this level captures the quietest (not necessarily consecutive) 1 minute of each 10 minute interval making it a conservative measure of the near-minimum background sound level.

2.3 Survey Conditions

The weather conditions over the survey period were generally mild, dry and conducive to the survey but there were three periods with high winds that adversely affected the readings on 9/29, 10/3-4 and 10/6. These periods are shown in the result plots discussed below and all data collected during these periods have been omitted from any subsequent averaging calculations.

3.0 Survey Results

The survey results at Position 1, in terms of both the average (Leq(10 min.)) and residual (L90(10 min.)) sound levels are plotted below in Figure 3.0.1.

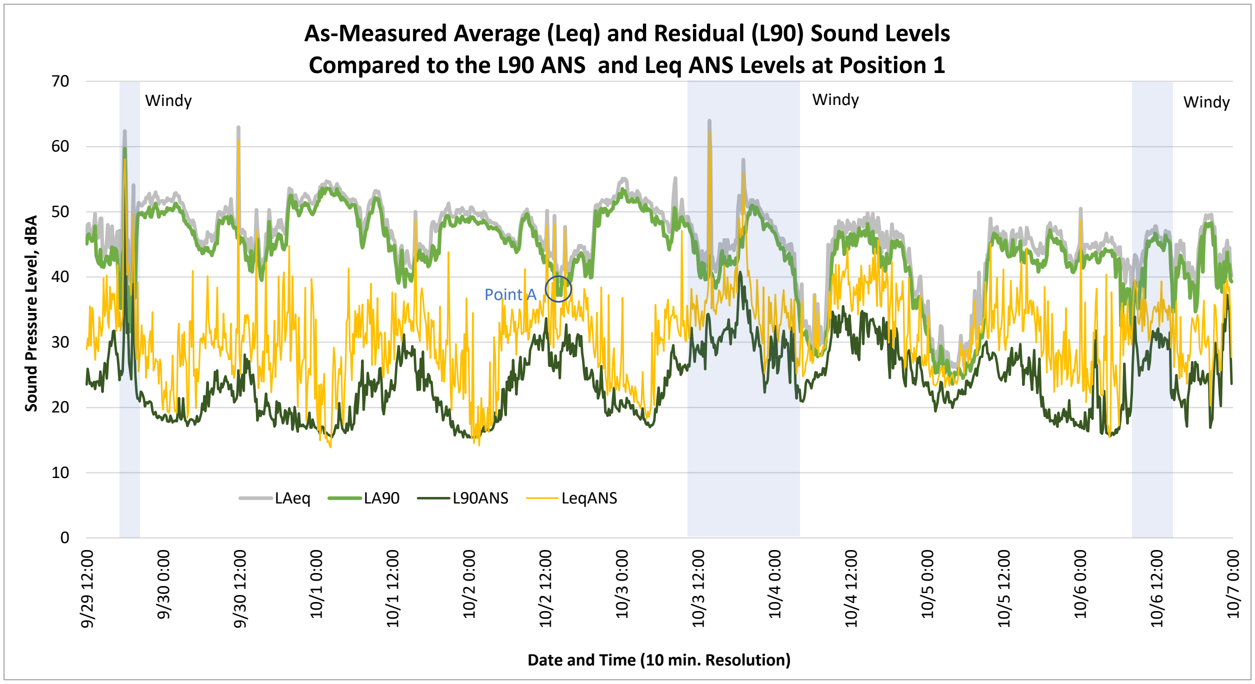


Figure 3.0.1

The measurements, at least during the first several days of the survey, generally show that the ambient sound level is highest at night and lowest in the afternoon, which is indicative of seasonal insect and cricket noise. The frequency content of the sound confirms this. For example, the A-weighted 1/3 octave band spectrum recorded at 2:30 p.m. on Oct. 2 during one of the quietest periods of the survey is plotted below in Figure 3.0.2. Even during this minimum (designated as Point A in Figure 3.0.1), the measured sound level is completely dominated by high frequency insect noise centered around 8000 Hz.

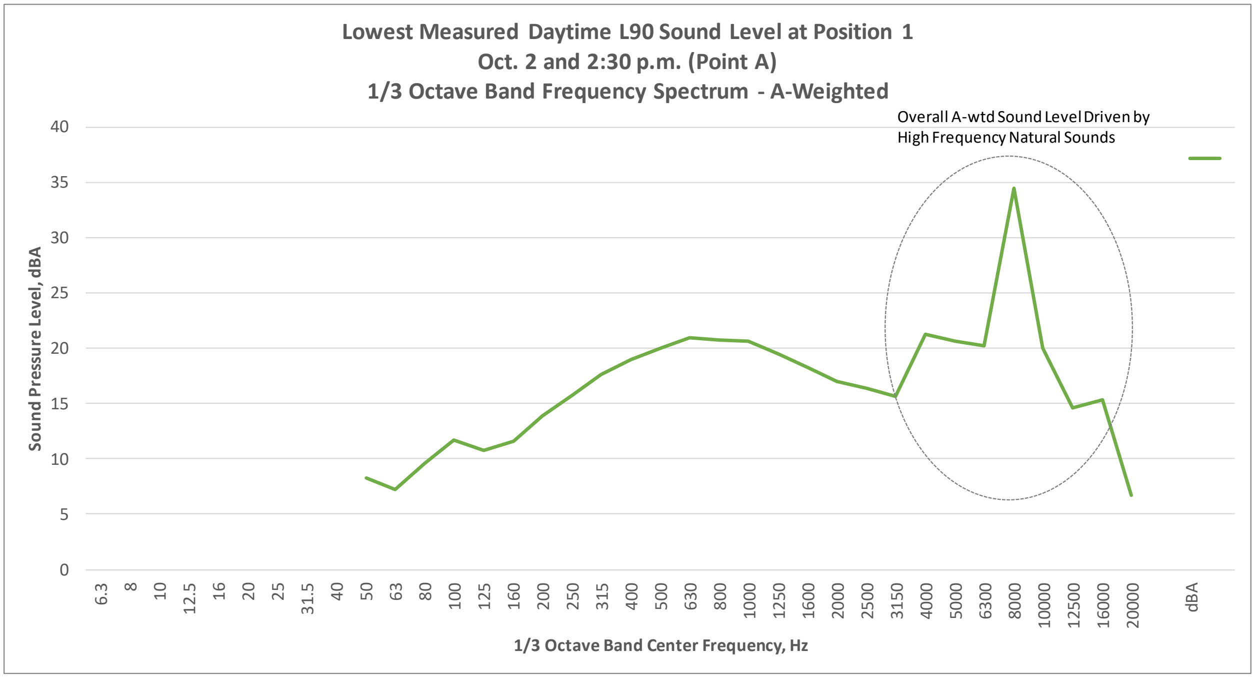


Figure 3.0.2

While the elevated sound levels recorded during the survey are an accurate representation of the environmental sound levels that were occurring in the site area in late September and early October, they're not necessarily representative of the level that might be observed in the winter when all such insect noise is absent. Consequently, the measurements cannot be taken at face value as being representative of the year-round ambient. Since this is a common occurrence in summer and autumn surveys, a methodology has been developed and standardized in ANSI/ASA S12.100-2014[1] to delete this seasonal 'contamination' from what is termed high frequency natural sounds (HFNS) by eliminating all data above 1000 Hz and recalculating the overall A-weighted sound level based on only remaining spectrum below 1000 Hz. This adjustment is called ANS-weighting, or noise sensitive A-weighting, and the recalculated average (Leq(ANS)) and residual (L90(ANS)) sound levels are shown in Figure 3.0.1 as the traces below the as-measured results. As can be seen, this correction greatly reduces the overall sound levels and restores the expected day-night pattern where it is quieter at night than during the day. Omitting the windy periods, the daytime and nighttime L90 levels, after the application of this correction, average out to 25 and 20 dBA, respectively, and the Leq levels are significantly higher at 33 dBA day and 26 dBA night. What this generally indicates is that the area is fairly quiet, at least when there is no insect activity and the winds are light, and that there would be no significant masking of the project sound emissions by pre-existing natural sounds during such conditions.

The as-measured sound levels at Position 2 are plotted below.

[1] ANSI/ASA S3/SC1.100-2014/ANSI/ASA S12.100-2014, *Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas*, 2014.

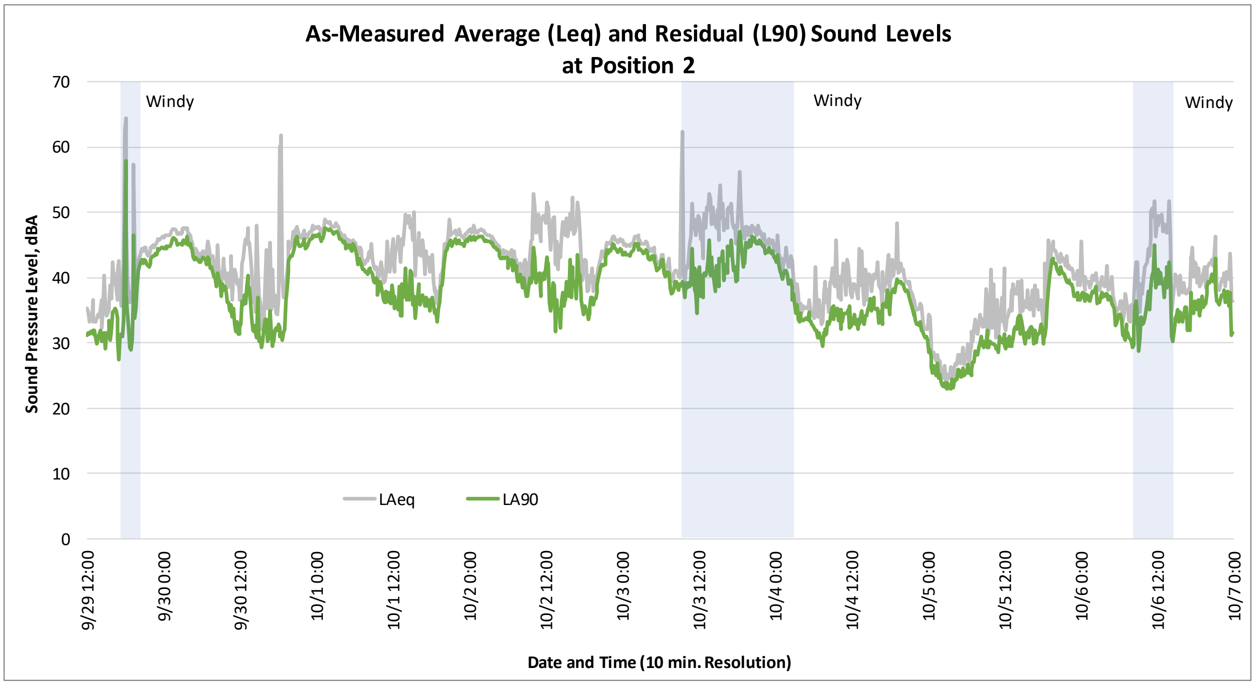


Figure 3.0.3

These levels exhibit the same trend as the as-measured Position 1 results where it is often louder at night than during the day; consequently, these levels are only valid for the season during which they were measured and cannot be used to represent year-round conditions. Because the frequency content was not recorded at this, generally informational, test location, ANS-weighting cannot be applied but it can be safely assumed that very low L90 sound levels in the 20's dBA would be derived if this adjustment could be applied. For analysis purposes the ANS-weighted results at Position 1 will be assumed as the year-round baseline background level representing the general project area.

4.0 Sound Emissions from the Facility

4.1 Transformer Sound Level

The input sound power level for the main step-up transformer in the project substation has been conservatively estimated in octave bands in **Table T-2164-120419-0** based on the unit's maximum expected MegaVolt Ampere (MVA) rating of 210 during OFAF (oil forced air forced) operation using empirically derived algorithms from the "Electric Power Plant Environmental Noise Guide[2]"

[2] "Electric Power Plant Environmental Noise Guide", Prepared by Bolt Beranek and Newman for the Edison Electric Institute, 2nd Ed., 1984.

published by the Edison Electric Institute (EEI). Numerous transformers over a wide range of sizes and manufacturers were measured in the EEI study to develop a formulaic relationship between the MVA rating and sound power. The precise transformer model, rating and manufacturer for this project have not yet been finalized, but the best estimate at this time is for a 127/168/210 (ONAN/ONAF/OFAF) MVA unit.

For this size transformer, the EEI methodology nominally predicts a near field sound pressure level of 83 dBA and an associated sound power level (Lw) of 103 dBA re 1 pW[3]. Experience suggests, however, that this prediction methodology is highly conservative for modern transformers, since the EEI study was carried out over 40 years ago, and a substantially lower sound power level from the actual transformer is very likely. In cases where the actual measured performance has been determined, a sound level about 6 dB lower than the calculated EEI value has been observed. Nevertheless, to be conservative, the as-calculated sound power level without modification, tabulated below, has been used in the modeling analysis.

Table 4.1.1
Estimated 210 MVA Transformer Sound Power Level (Lw) Spectrum

OBCF, Hz	31.5	63	125	250	500	1k	2k	4k	8k	**dBA**
Lw, dB re 1 pW	100	106	108	103	103	97	92	87	80	**103**

4.2 Inverter Sound Level

The inverter make and model for this project has not yet been completely finalized, but a likely/representative candidate is the 2700kVA TMEIC Model PVH-L2700GR-EG (Figure 4.2.1).

3 Sound power level is an essentially intangible quantity, used only for modeling purposes, that is calculated from the measured sound pressure level and the radiating wave front area at the point of the measurement. It is expressed in units of Watts and the designation "re 1 pW", or 'with reference to one picoWatt', is used by convention to distinguish power levels from pressure levels, which are measured in units of pressure, Pascals.

Figure 4.2.1
TMEIC Model PVH-L2700GR-EG DC-AC Inverter

Since no detailed sound information was available from the manufacturer, a field measurement survey was carried out at an existing solar project site to quantify the sound emissions from this model of inverter. Incremental, walk-away measurements were taken out to a distance of 100 m; however, the overall sound level flattened at the prevailing background level of 35 dBA at only 30 m away and did not decrease with additional distance. Figure 4.2.2 shows the 1/3 octave band frequency spectra close to the unit and at distances of 30 and 100 m.

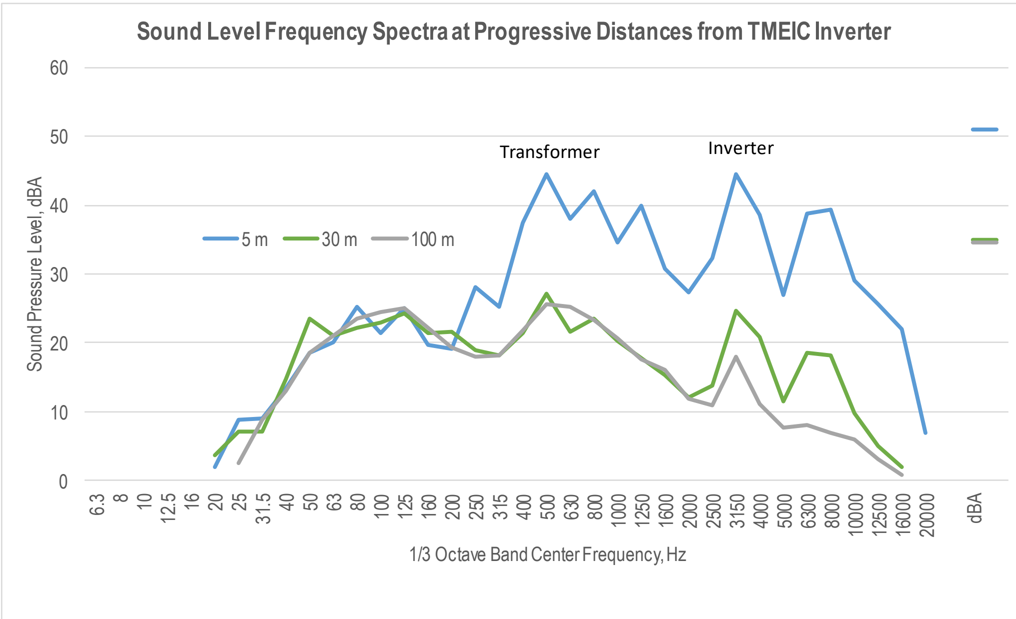


Figure 4.2.2

Close to the unit, which consists of an inverter section and an integral, skid-mounted transformer, tones and harmonics are clearly audible from the transformer, with a fundamental at 480 Hz, and from the inverter, primarily at 3150 Hz. The magnitude and prominence of these tones diminishes quickly and at 30 m the transformer sound is no longer distinctly audible and the inverter buzz, while still subjectively identifiable, drops to a very faint level of only 25 dB. At 100 m the inverter tone at 3150 Hz is only detectable with instruments at an extremely low level of 18 dB, which is near the noise floor of most sound level meters.

For modeling purposes, the 1/1 octave band sound power level of this inverter was derived in Table T-2164-120419-0 from measurements at 5, 10 and 20 m where the signal to noise ratio still supports the accurate quantification of the inverter, at least at all frequencies above about 200 Hz. Below that frequency the measurements are simply recording the general ambient sound level apparently associated with very distant highway noise because the sound levels in all the lower frequency bands do not decrease with distance from the source, as seen in Figure 4.2.2. It is important to note that the tested unit was not operating at full power at the time of the test due to a thin layer of clouds and, in order to compensate for this, the design sound power level has been scaled up by 6.6 dB[4] from the observed operating point of 22% to 100%. It is believed that this adjustment may overestimate the actual sound level during full load operation, since the site personnel indicated that the sound from the inverter during the test was generally similar to the sound at any other operating point. In any event, the derived model input sound power level spectrum for each inverter, based on the best available current knowledge, is tabulated below.

[4] Assuming that the sound is logarithmically proportional to the load, 10 log (100/22), dB.

Table 4.2.1
Estimated TMEIC Inverter Sound Power Level (Lw) Spectrum at 100% Load

OBCF, Hz	31.5	63	125	250	500	1k	2k	4k	8k	**dBA**
Lw, dB re 1 pW	75	73	70	67	78	72	63	73	71	**79**

4.3 Modeling Assumptions

Based on the sound power level spectra above, the normal, sunny day sound emissions from the project have been modeled in strict accordance with ISO 9613-2 *Acoustics –Attenuation of Sound during Propagation Outdoors*[5].

In this instance, a mid-range, somewhat conservative ground absorption coefficient (Ag from ISO 9613-2) of 0.5 (on a scale of 0 to 1) has been used to represent the site vicinity, which mainly consists of open fields. Normally, farm fields would be considered more acoustically absorptive and would warrant a higher coefficient than 0.5. There are no appreciable undulations in the area topography, so a flat plane is assumed along with ISO “standard day” conditions (10 deg. C/70% RH).

4.4 Model Results – Overall A-weighted Sound Levels

The anticipated overall A-weighted sound emissions from the project during normal daytime operations are shown in **Plot 1-1** relative to all the nearest structures (i.e. both houses and outlying barns, sheds, etc.), whether participating or not. The contours are mathematically plotted out to a very low level of 35 dBA for informational purposes; however, any sound level below about 40 dBA, irrespective of the background level, is generally regarded as largely insignificant, even in a quiet rural area, and rarely results in any kind of complaint or disturbance. As can be seen from the graphic, all potentially sensitive receptors within the 1 mile study area are generally expected to experience negligible sound levels well below 35 dBA with only one above 30 dBA - Design Point 2 at 31 dBA. This kind of sound level is typically described as being similar to the level in a very quiet library or bedroom. The sound level at DP-3 the nearest non-participating residence to any inverter (about 540 ft. away) is 29 dBA.

Since the maximum predicted project sound level of 31 dBA is less than the daytime Leq(ANS) background level of 33 dBA, the project certainly meets the common design objective of Leq plus 5 dBA. Although solar projects are for, all intents and purposes, operational only during the day,

[5] *Acoustics – Attenuation of Sound during Propagation Outdoors*, Part 2, “A General Method of Calculation,” ISO 9613-2, International Organization for Standardization, Geneva, Switzerland, 1989.

the substation transformer remains energized at night at a low, back feed throughput. The potential sound from this has been evaluated by very conservatively assuming that the transformer is operating in its normal daytime mode with all radiator fans on, as illustrated in **Plot 2-1**. While the sound emissions at the nearest residence to the substation are calculated to exceed the nighttime background by 5 dBA (31 dBA project vs. 26 dBA Leq (ANS) night), this prediction is most likely a gross overestimation of the transformer's actual sound emissions and, in any event, all sounds below about 35 dBA are so quiet in absolute terms that no disturbance is anticipated, if the substation is even audible at all.

4.5 Frequency Analysis

Because the sound emissions from transformers and inverters are typically characterized by hums and tones, at least at short distances, it is important to consider the frequency content of the sound in addition to its overall magnitude. An assessment approach that uses the frequency spectrum of the source and the background to evaluate potentially intrusive noise and predict community reaction is the modified Composite Noise Rating, or CNR, method.

The first step in the evaluation process is to plot the octave band frequency spectrum of the predicted project-only sound level at points of interest against a set of curves that generally map the perceptibility of the sound as a function of frequency. In this case, the points of maximum exposure to potential sound from the project are Design Points 1, 2 and 3 illustrated in Plot 1-1. The predicted spectra at these locations during normal daytime operation of the facility are plotted in Figure 4.5.1 below. A lower-case initial classification letter, applicable to the regions between each curve, is assigned according to the highest region that each spectrum touches.

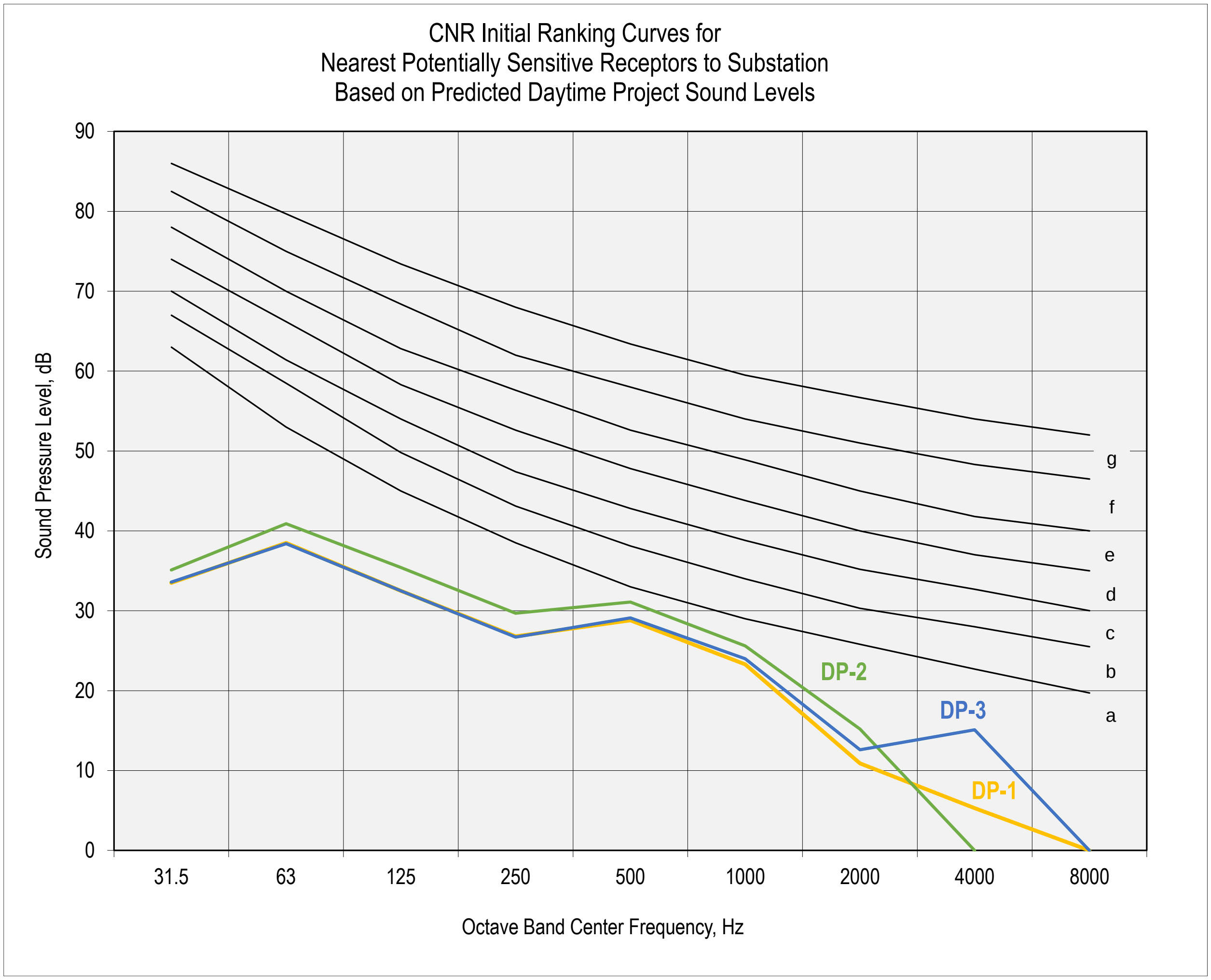


Figure 4.5.1

The initial ranking for the design points is "**a**" for normal daytime operation with the substation and all inverters running normally. At night the inverters go completely silent while the substation transformer may continue to generate some sound. As a result, the project sound levels at all design points would generally be less than the daytime level. Thus, the initial ranking of "a" would in theory be the same irrespective of time of day. It should be noted, however, that project sound at locations remote from the substation, such as at DP-1 and DP-3, would be inconsequential at night and even the ranking of "a" overstates the influence of the project.

Starting from these baseline rating classifications a series of corrections and adjustments are made to estimate the final classification, which, in turn, gives an indication of the potential community reaction.

The first principal correction is for background masking noise. A second chart of curves is used to determine how well or how poorly the background sound level frequency spectrum would act to mask the project sound level. The highest region intercepted determines the correction factor. Figure 4.5.2 plots the average daytime and nighttime L90(ANS) sound levels measured over seven days at DP-1, which may be taken to very conservatively represent the ambient sound level in the general site area. These spectra only include sound levels up to 1000 Hz, since all high frequency content has been omitted to filter out high frequency natural sounds (HFNS).

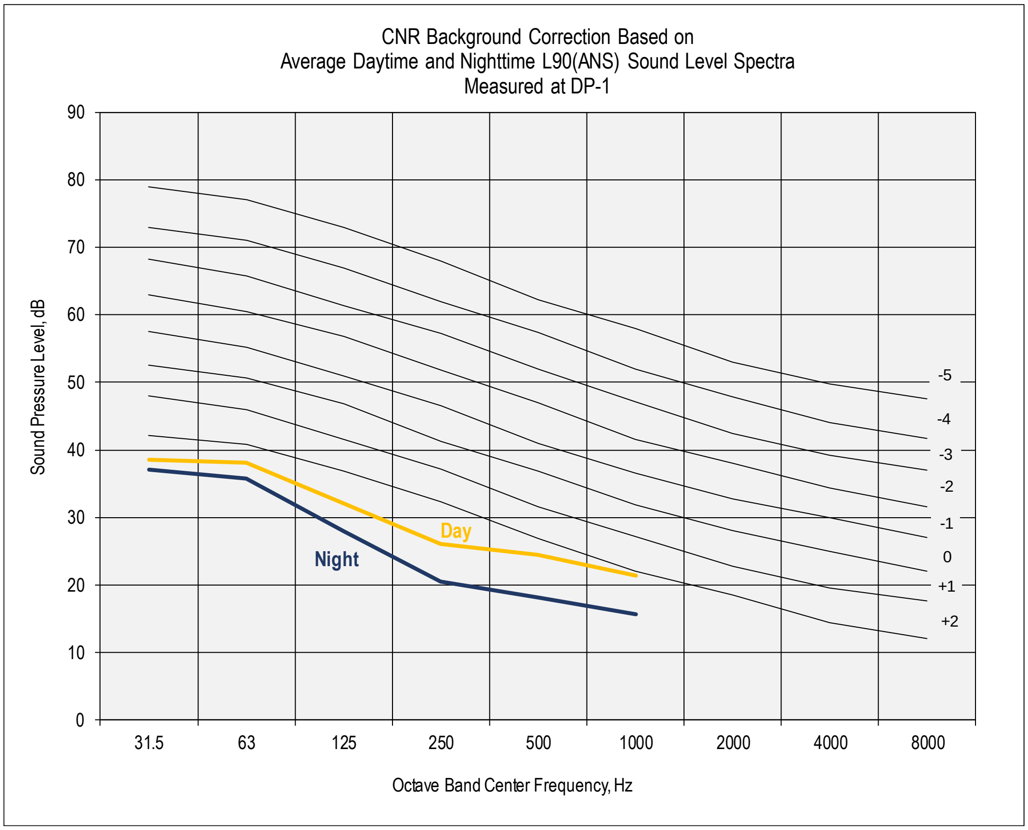


Figure 4.5.2

This chart indicates that the very low background sound level in this rural setting, or at least what's left of it after the deletion of all high frequency content, results in the maximum possible correction of **+2**. In general, positive corrections are a kind of penalty.

The remaining corrections to the baseline CNR rating relate to the temporal nature of the new noise source, its character, and the general attitude of observers.

The temporal correction accounts for the duration of the ostensibly intruding noise; i.e. when it occurs (during the day or night) and whether it changes with the seasons. No adjustment would be made for nighttime operation, but a -1 correction would be applied if the sound source were only operational during the day. Since the project is generally only active when the sun is shining, a correction of **-1** for daytime only operation would apply. At night, although the project is essentially idle, the transformer in the substation remains energized and may continue to generate some sound. For nighttime conditions, then, a **0** CNR adjustment may be applied that very conservatively assumes no diminution in sound from the transformer at night.

Next, a character correction takes into consideration the fact that noises that contain any kind of tone, impulse or excessive low frequency content are more apt to be considered objectionable than a broadband noise of the same magnitude. A +1 correction would apply if any of these adverse characteristics were expected at the receptor, otherwise no adjustment would be made. In this case, the substation transformer is a tonal noise source, but only within fairly short distances of roughly 500 to 600 ft. or less based on a number of field measurements of similar or larger substations. The distance from the substation to the nearest receptor (DP-2) is about 2600 ft.; consequently, the resulting sound spectrum will not contain any prominent discrete tones from the transformer. The nearest inverter to any non-participating residence is about 900 ft. away. Field measurements of an operational unit during partial load operation showed that the tonal content had become insignificant at about 330 ft. (100 m). Even if the sound at full load were tonal out to double that distance, any inverter sound at the residence would still not have any remaining adverse character at 900 ft. In short, project sound is not expected to be tonal at any receptors, so a **0** correction for tonal, impulsive or low frequency noise is justified.

The final correction factor, ranging from -1 to +1, is associated with previous exposure and attitude as delineated in the following table.

Table 4.5.1
CNR Correction Factors Related to Receptor Attitude

CNR Correction Factor	Previous Exposure and Attitude
-1	Considerable previous exposure and/or good community relations
0	Some previous exposure and good community relations
+1	No previous exposure or some previous exposure and poor community relations

The general community attitude towards this project is not known but there is no reason to believe that community relations are poor; consequently, the fairest interpretation of this factor seems to be a neutral rating of **0**.

The final CNR classification for a specific receptor location is determined by applying the net correction to the baseline letter grade. For example, a baseline rating of “c” with a net correction of -1 would result in a final rating of “B”, or one letter below the starting value. In this case the corrections and final ratings for all three design points are summarized below.

Table 4.5.2
Summary of CNR Correction Factors at the Design Points and Final Ratings

Correction	DP-1		DP-2		DP-3	
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
Initial Rating based on Model Prediction	**a**	**a**	**a**	**a**	**a**	**a**
Background Correction	+2	+2	+2	+2	+2	+2
Temporal/Seasonal Correction	-1	0	-1	0	-1	0
Character Correction	0	0	0	0	0	0
Exposure and Attitude	0	0	0	0	0	0
Net Correction	**+1**	**+2**	**+1**	**+2**	**+1**	**+2**
Final Rating	**B**	**C**	**B**	**C**	**B**	**C**

The nominal meaning of these final ratings is given in the chart below.

Table 4.5.3
Final CNR Ratings and Predicted Reactions

Final CNR Rating	Significance
A	No Reaction
B	No Reaction
C	No Reaction to Sporadic Complaints
D	Sporadic Complaints
E	Widespread Complaints or Single Threat of Legal Action
F	Several Threats of Legal Action or Strong Appeals to Local Officials to Stop the Noise
G	Several Threats of Legal Action or Strong Appeals to Local Officials to Stop the Noise
H	Several Threats of Legal Action or Strong Appeals to Local Officials to Stop the Noise
I	Vigorous Action

The ratings of **B** and **C** generally indicate that “no reaction” is anticipated at either of the design points during the day and that, statistically speaking, there is only a very small chance that a complaint might occur at night. However, this assumes, first of all, that the transformer sound power level is actually as loud as the historically conservative EEI prediction methodology indicates and that, secondly, the transformer sound emissions do not go down at all at night when no power is being generated and when the radiator fans will probably not be operating. From a realistic perspective this assessment is highly conservative, so the possibility of any actual disturbance is considered extremely low. This is especially true at Design Points 1 and 3 that are remote from the substation and have predicted overall sound levels below 30 dBA at night. The final rating of C at these locations is simply a function of the initial "a" rating, which overstates the influence of the project.

Since the sound emissions from the project substation are expected to be minimal at the closest residences, the potential noise impact during normal operation at all more distant receptors will be lower. As shown graphically in Plot 1-1, the project sound levels at all the next nearest residences beyond DP-2 will be well below 31 dBA and therefore of no consequence, if they're even audible at all.

5.0 Sound Emissions during Construction

In contrast to other forms of power generation, the construction phase of a solar energy facility, such as the Madison Solar project, is relatively short and the activities that generate any significant noise are few. Where a fossil or wind project would require extensive earthworks and the pouring of massive concrete foundations over a period of many months, a solar plant only involves the installation of the mounting posts for the panel racks, which generally follow the existing topography, and some trenching and road building activities.

As illustrated in Plot 1, the Madison Solar project is generally located in existing open fields quite some distance from the nearest residences. In fact, there are only a few homes that are closer than about 1000 ft. from the perimeter of the proposed panel layout. Consequently, much of the time construction will be occurring at locations that are thousands of feet from any residences.

The table below gives representative sound levels from construction equipment associated with the different phases of construction relevant to this project. Figures are given at the standard test distance of 50 feet[6] and at distances of 500 and 4000 ft. The 500 ft. distance generally represents the nearest approach of any construction activity to neighboring homes and quantifies the worst-case sound level that might occur from construction near the edges of the project area. The 4000 ft. distance gives the sound levels that would be associated with construction near the center of the project far away from any homes.

[6] U. S. Dept. of Transportation, Federal Highway Administration, *Roadway Construction Noise Model User's Guide*, Table 1, Jan. 2006.

Table 5.0.1
Typical Construction Equipment Sound Levels per the FHWA by Phase

Equipment Description	Typ. Sound Level at 50 ft., dBA	Est. Maximum Total Level at 50 ft. per Phase, dBA[1]	Est. Maximum Total Level at 500 ft. per Phase, dBA	Est. Maximum Total Level at 4000 ft. per Phase, dBA
Earthmoving Road, Substation Construction and Electrical Line Trenching				
Dozer	85	85	63	38
Front End Loader	80			
Grader	85			
Backhoe	80			
Pile (Support Post) Driving				
Vermeer PD10 Pile Driver[2]	84	84	62	37
Truck Traffic Material Delivery and Installation				
Flatbed Truck	84	84	62	37

[1] Not all vehicles are likely to be in simultaneous operation. Maximum level represents the highest level realistically likely at any given time.
[2] Based on manufacturer's information

While the sound levels close to the equipment are significant, as might be expected, the sound levels beyond the site perimeter are likely to be below 40 dBA when the site work is occurring well inside the project perimeter. Such a sound level is extremely low and typically represents the threshold below which any disturbance is highly unlikely When activities occur near the fringe of the project area the higher levels in the 500 ft. column can be anticipated. In both instances, these sound levels would only occur temporarily and intermittently during the construction period.

Concrete foundations are not normally used for the panel arrays. The most common method of installing the support posts is to drive them into ground. This procedure produces a repetitive, metallic impact noise, which will be unavoidably audible for some distance. On the other hand, this activity is short-lived and would proceed fairly quickly, only occurring for a period of days or a couple weeks in any one area of the site.

There is no need for concrete pouring throughout beyond the substation area. The inverters and other electrical equipment will either sit on gravel pads, metal skids or drop-in prefabricated concrete slabs. Concrete pouring is only likely for the transformer base in the substation. A concrete pump truck and its servicing mixers typically generate a sound level of about 82 dBA at 50 feet[7], or roughly at the boundary of the substation. At the nearest residence (Design Point 2),

[7] Ibid.

which is approximately 3100 ft. away, this sound level would decrease to 39 dBA or less and occur only intermittently during the day; probably only for a day or two.

6.0 Conclusions

A field survey of the existing ambient sound levels within the Madison Solar project area has been carried out to quantify the baseline environmental conditions. The as-measured survey results were elevated due to seasonal, late summer insect activity and unrepresentative of the year round sound level. Consequently, the results were adjusted in general accordance with ANSI/ASA S12.100-2014 to delete the high frequency content. Omitting the windy periods, the average daytime and nighttime L90(ANS) levels, after the application of this correction, were 25 and 20 dBA, respectively. The average (Leq) sound levels after adjustment for high frequency contamination were significantly higher at 33 dBA day and 26 dBA night. What these levels generally indicate is that the area is fairly quiet, at least when there is no insect activity and the winds are light, and that there would be very little masking of the project sound emissions by pre-existing natural sounds during such conditions.

The sound power level of the step up transformer associated with the proposed substation was conservatively calculated from its expected maximum MVA rating of 210 OFAF and the inverter sound level has been derived from field measurements of the model that either will be used or that is representative of the model that will eventually be selected. The daytime sound levels throughout the project area, due to substation and inverter operation, have been modeled and the results indicate that extremely low, essentially inaudible sound levels of 31 dBA, or, in most cases, less can be expected at all of the nearest residences, with lower levels occurring at all more distant receptors out to the boundaries of the 1 mile study area. Since the maximum predicted project sound level of 31 dBA is less than the daytime Leq(ANS) background level of 33 dBA, the project certainly meets the common design objective of Leq plus 5 dBA. Although solar projects are for, all intents and purposes, operational only during the day, the substation transformer remains energized at night at a low, back feed throughput. The potential sound from this has been evaluated by very conservatively assuming that the transformer is operating in its normal daytime mode with all radiator fans on. While the sound emissions at the nearest residence to the substation are calculated to exceed the nighttime background by 5 dBA (31 dBA project vs. 26 dBA Leq (ANS) night), this prediction is most likely a gross overestimation of the transformer's actual sound emissions and, in any event, all sounds below about 35 dBA are so quiet in absolute terms that no disturbance is anticipated, if the substation is even audible at all.

A frequency analysis of the daytime and nighttime sound levels at the nearest residences to the substation was carried out using the modified Composite Noise Rating (CNR) methodology. This approach compares the frequency spectra of the existing background level to that of the proposed project to essentially gauge its audibility relative to the near-minimum L90(ANS) natural environmental sound level. Additional adjustments are made for such factors as time of day, tonal content and the community attitude towards to the project. The results of this analysis suggest that no reaction is expected at the nearest houses or at any other more distant locations.

In contrast to other forms of power generation, sound emissions during construction are expected to be dramatically lower in magnitude and duration. Some unavoidable disturbance is possible when the mounting posts are driven in, but this activity will be fairly short-lived in any particular location. Other sounds from trenching and road building will also be brief in duration and will progress from place to place avoiding prolonged exposure at any specific location.

In general, the potential noise impacts from all aspects of the project are expected to minimal.

Table: T-2164-120419-0
Title: Substation Transformer and Inverter Sound Power Level Deriviations
Project: Madison Solar
Revision: 0
Date: 12/11/19

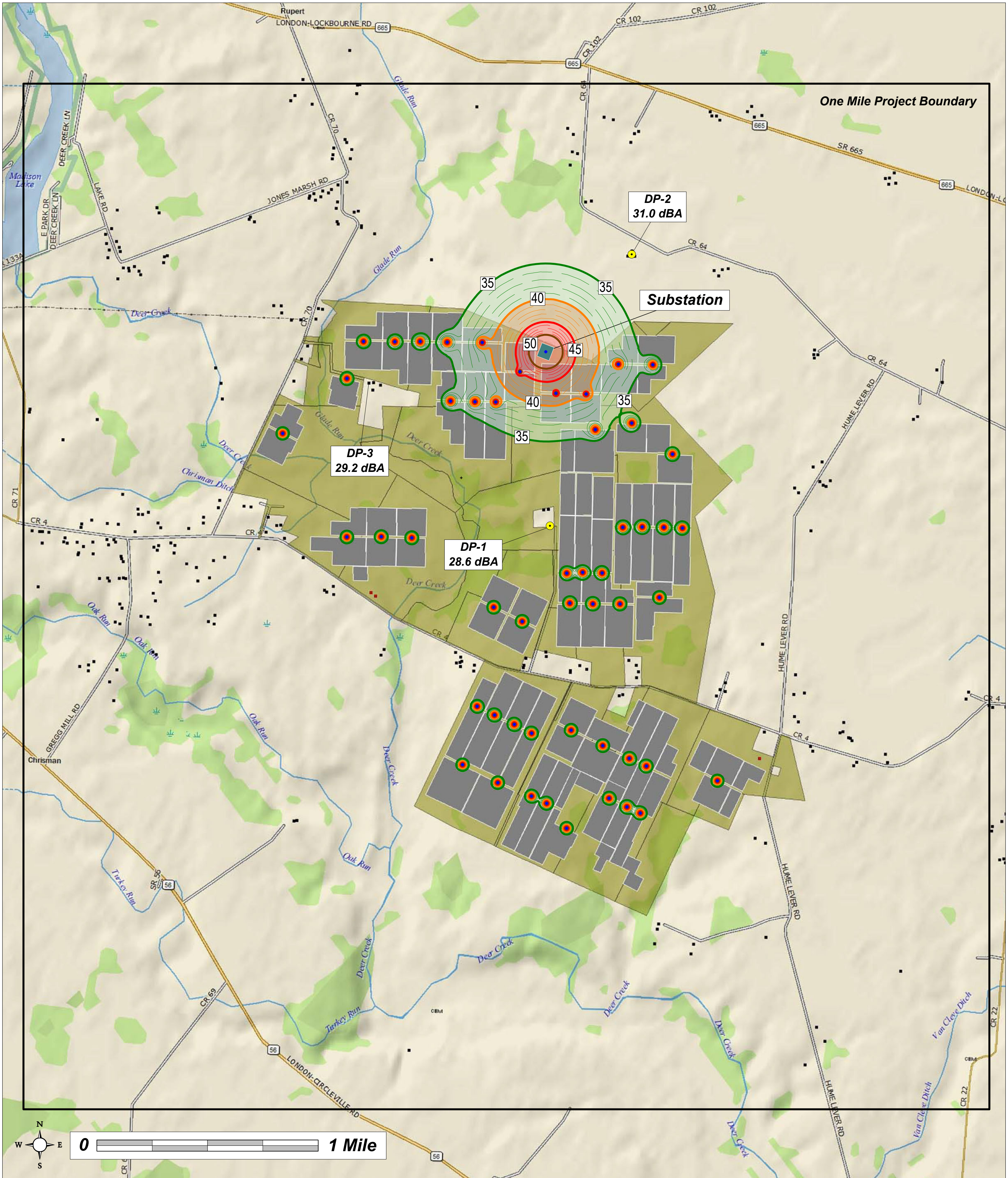
Descriptor			31.5	63	125	250	500	1000	2000	4000	8000	dBA	dBC
			Octave Band Center Frequency, Hz										
1. Main Step Up Transformer in Collector Substation													
Sound Power Level Estimate Based on Max MVA Rating													
Maximum Expected MVA Rating	**210**	MVA Max at OFAF (Oil Forced Air Forced)										103	
Standard NEMA Rating		NEMA = 55 +12 log (MVA), per EEI Guide*										83	
Size Factor (10 log s) Based on MVA												20	
Frequency Adjustment Factors			-3	3	5	0	0	-6	-11	-16	-23		
Est. Near Field Lp Based on NEMA Rating			80	86	88	83	83	77	72	67	60	**83**	
Nom. Lw = NEMA Rating + 10 log s			**100**	**106**	**108**	**103**	**103**	**97**	**92**	**87**	**80**	**103**	Use

* Edison Electric Institute, "Electric Power Plant Environmental Noise Guide", 2nd Ed., BBN, 1984.

Descriptor			31.5	63	125	250	500	1000	2000	4000	8000	dBA	dBC
2. TMEIC Model PVH-L2700GR-EG Inverter													
Calculated Sound Power Level at 22% Load from Progressive Distance Measurements													
A. 5 m Data													
Measured Lp(5 m)	15		55.6	52.5	44.3	38.6	49.3	44.9	34.2	44.5	43.1	51	
Distance from Unit	5	m											
Nom. Lw			77.5	74.4	66.2	60.6	71.3	66.9	56.1	66.4	65.1	73	
Correction for Est. Background Interference			-10	-9	-3	0	0	0	0	0	0		
Est. Lw			**68**	**65**	**63**	**61**	**71**	**67**	**56**	**66**	**65**	**73**	
B. 10 m Data													
Measured Lp(10 m)	16		55.5	52.5	44.2	36.6	43.6	37.2	28.4	38.2	37.7	45	
Distance from Unit	10	m											
Nom. Lw			83.5	80.5	72.2	64.5	71.6	65.2	56.4	66.2	65.6	73	
Correction for Est. Background Interference			-16	-15	-9	-4	0	0	0	0	0		
Est. Lw			**68**	**65**	**63**	**61**	**72**	**65**	**56**	**66**	**66**	**73**	
C. 20 m Data													
Measured Lp(20 m)	18		58.1	55.6	44.8	35.4	37.3	29.5	23.1	31.4	29.1	38.8	
Distance from Unit	20	m											
Nom. Lw			92.1	89.6	78.8	69.5	71.3	63.5	57.1	65.4	63.1	73	
Correction for Est. Background Interference			-22	-21	-15	-8	0	0	0	0	0		
Est. Lw			**70**	**69**	**64**	**61**	**71**	**63**	**57**	**65**	**63**	**72**	
Average As-Measured Lw, All Three Positions			**68**	**66**	**63**	**61**	**71**	**65**	**57**	**66**	**65**	**73**	
Est. Scale-up from 22 to 100% Capacity*	22		7	7	7	7	7	7	7	7	7		
Preliminary Design Lw per Inverter			**75**	**73**	**70**	**67**	**78**	**72**	**63**	**73**	**71**	**79**	Use
Subject to Field Verification													

* 10 log (100/22)

Notes:
Lp = Sound Pressure Level, dB re 20 μPa
Lw = Sound Power Level, dB re 1 pW



Project:
Madison Solar

Prepared for:
Big Plain Solar, LLC

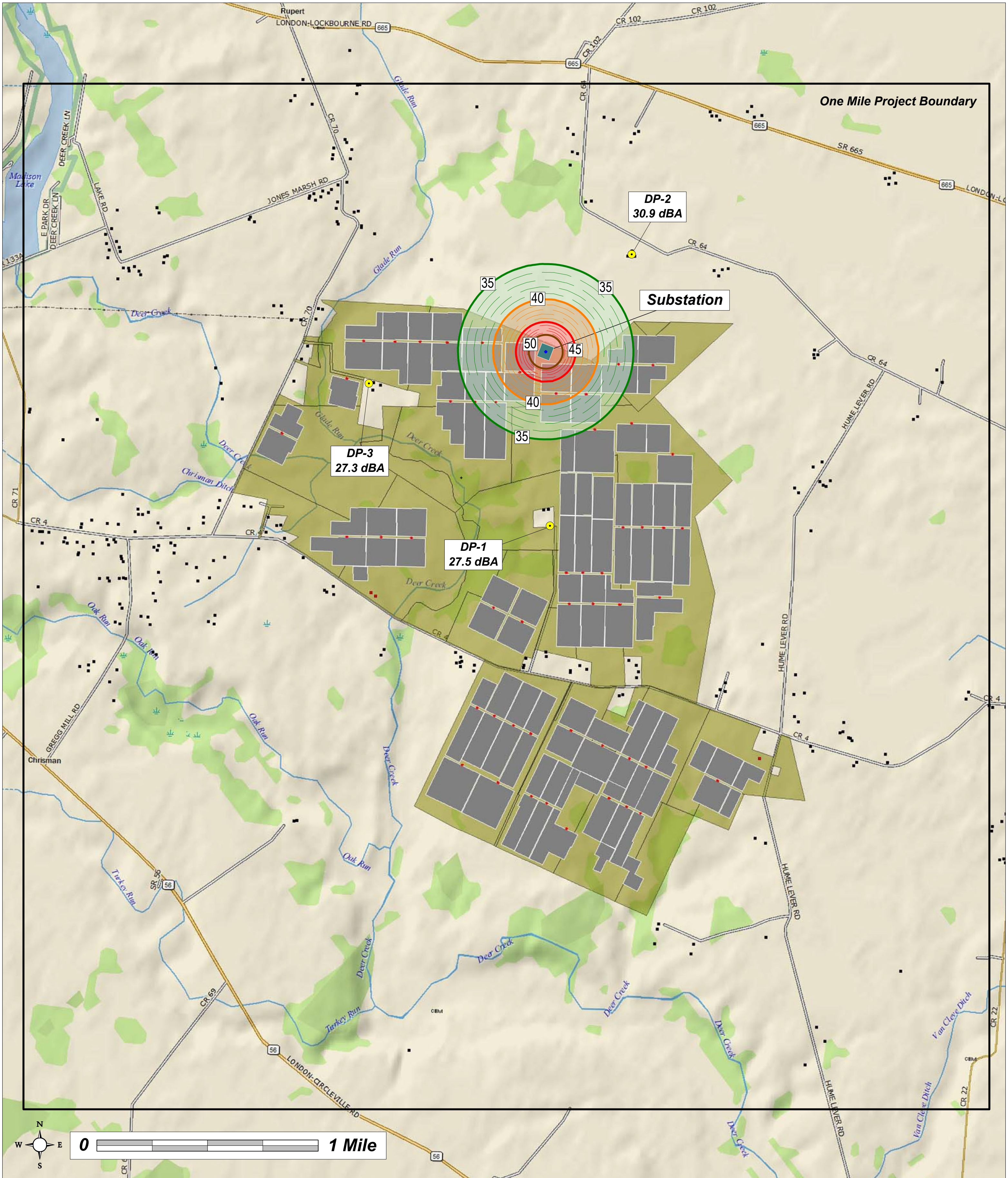
Date:
November 10, 2020

Drawing #:
FSM-Rev-K-1-1

Description:
Plot 1-1

Predicted Sound Contours (dBA) of Facility during Daytime Operation

Legend:
- Non-Participating Structure
- Participating Structure
- Design Point



Project:	Description:	Legend:
Madison Solar	**Plot 2-1**	Non-Participating Structure
Prepared for: **Big Plain Solar, LLC**	**Predicted Sound Contours (dBA) of Facility during Nighttime Operation**	Participating Structure
Date: November 10, 2020 — Drawing #: FSM-Rev-K-2-1		Design Point

EXHIBIT D TO NOTICE OF FOOTPRINT MODIFICATION

CASE NO. 19-1823-EL-BGN

To:	Big Plain Solar LLC,	**EDR Project No:**	18191
From:	Matthew Robinson		
Date:	October 9, 2020		
Reference:	Madison Solar Farm OPSB Case No. 19-1823-EL-BGN Supplemental Visual Analysis		

Comments:

The following technical memo presents the results of a revised visibility and visual impact analysis undertaken by Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C. (EDR) for the proposed Madison Solar Farm.

BACKGROUND

In April 2020, Big Plain Solar, LLC (the Applicant) submitted an Application to the Ohio Power Siting Board (OPSB) for a Certificate of Environmental Compatibility and Public Need (Certificate) in accordance with Section 4906.06 of the Ohio Revised Code (ORC) for the Madison Solar Farm (the Project) in Fairfield and Oak Run townships, Madison County, Ohio. As part of the Application, EDR prepared a Visual Resource Assessment (VRA) to satisfy those portions of the requirements of Ohio Administrative Code Chapter 4906-04-08(D) that relate to the identification of visually sensitive resources ("VSRs"), project visibility, and potential visual impacts resulting from the construction of a 196 megawatt ("MW") solar-powered electric generation facility and associated collection substation.

Since the submittal of the Certificate Application, the Applicant has relocated the proposed collection substation approximately 0.4 mile to the northwest of the previous collection substation location presented in the Certificate Application.

To address potential changes to substation visibility and visual impact that will occur as a result of the proposed modification, EDR prepared an updated viewshed analysis of the currently proposed substation location and evaluated the resulting changes. Methodology and results of this supplemental evaluation are presented below.

METHODOLOGY

<u>Viewshed Analysis</u>

To evaluate changes in potential substation visibility resulting from the new collection substation location, a revised digital surface model (DSM) viewshed analysis was conducted for the currently proposed substation location, using the same methodology employed in the 2020 VRA (EDR, 2020). The revised viewshed analysis is based on the tallest proposed component of the substation, which are narrow lightning masts, with a maximum height of 58 feet. The precise location of this component is not known at this time, so the analysis was run based on five representative points within the collection substation footprint, each with the assigned height of 58 feet. Because it accounts for the screening provided by vegetation and structures, as well as topography, the DSM viewshed analysis is a very accurate representation of anticipated substation visibility. However, it is worth noting that variable factors beyond the scope of a typical viewshed analysis may serve to restrict substation visibility (e.g., color of substation components, atmospheric/weather conditions, distance from viewer, and human visual acuity), being located within the DSM viewshed does not necessarily equate to actual substation visibility.

The resulting substation viewshed was compared to the viewshed of the previously proposed substation location, and differences in the location and degree of potential substation visibility were evaluated.

RESULTS

Viewshed Analysis

Revised viewshed results are presented in Table 1 and Figure 1, below. As these results indicate, the currently proposed substation location results in a decrease in potential substation visibility within the 2-mile radius VSA. The revised substation DSM viewshed analysis indicates that approximately 29.6% of the area within the 2-mile radius could have potential views of the substation. This compares to 35.8% for the previous layout, and thus represents a 6.2% decrease in the area of potential substation visibility within the VSA. Based on this reduction, it is anticipated that no additional impacts to VSRs are anticipated.

Table 1: Collection Substation Viewshed Results Comparison

Type of Viewshed Analysis	2-Mile Visual Study Area			
	April 2020 VRA Visibility[1]		Revised VRA Visibility	
	Mi^2	%	Mi^2	%
DSM Viewshed Visibility	4.7	35.8	3.9	29.6

[1]The 2-mile visual study areas for both layouts total 13.0 square miles (Mi^2).

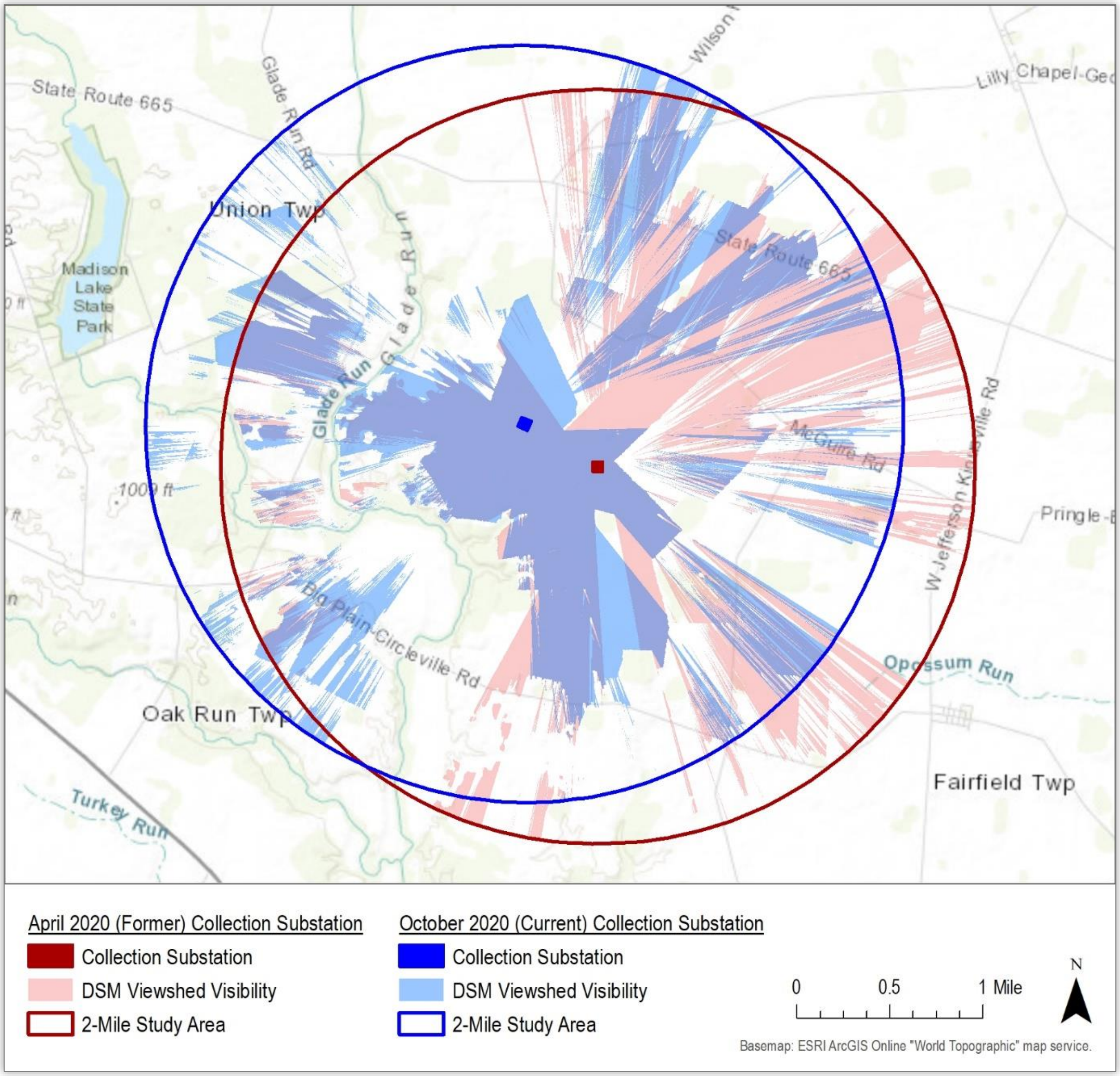


Figure 1: Collection Substation Viewshed Results Comparison

This analysis indicates that views of the substation will be most available from open areas to the northeast extending to State Route 665 (London-Lockbourne Rd), to the west-northwest across Glade Run Road, and to the south-southeast extending toward Big Plain Circleville Road. It is important to keep in mind that this is theoretical visibility, and that this analysis is conservatively based on five sample lightning mast locations within the substation footprint (as final substation design is not yet completed). It ignores the very narrow profile and gray color of the masts, which will make actual visibility difficult at greater distances.

CONCLUSIONS

The analyses conducted herein indicate that the revised substation location will result in no significant change in the overall visibility or visual impact of the proposed collection substation.

The substation viewshed analysis showed a decrease in substation visibility when considering five representative points within the substation footprint for the tallest proposed component of the substation, which are narrow lightning masts, with a maximum height of 58 feet. Overall, the decrease in area of potential substation visibility is minimal and does not change the conclusions of the previous evaluation.

<u>Literature Cited</u>

EDR. 2020. Visual Resource Assessment, *Madison Solar Farm, Oak Run and Fairfield Townships, Madison County, Ohio*. Prepared for Big Plain Solar, LLC. Prepared by Environmental Design & Research, Landscape Architecture, Planning, Environmental Services, Engineering and Surveying, P.C. Syracuse, NY.