

**Review and Evaluation of
Pine Grove Solar, LLC
Siting Assessment Report
Case Number: 2022-00262**

REPORT

Report

March 31, 2023

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Pine Grove Solar, LLC
Siting Assessment Report
Case Number: 2022-00262**

Prepared for

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SECTION A.

General Statement

SECTION A.

General Statement

This document provides a review of the Site Assessment Report (SAR) for the proposed Pine Grove Solar merchant electric generating facility submitted to the Kentucky State Board on Electrical Generation and Transmission Siting (the Siting Board). Pine Grove Solar, LLC submitted an administratively complete document titled “Application of Pine Grove Solar LLC for a Certificate of Construction for an Approximately 50 Megawatt Merchant Electric Solar Generating Facility in Madison County, Kentucky” (the “Application”) to the Siting Board on November 30, 2022. The Siting Board assigned the case number 2022-00262 to the Pine Grove Solar application. The proposed generating facility is subject to review by the Siting Board under KRS 278.700 *et seq.* (the Act), passed by the General Assembly of the Commonwealth of Kentucky in 2002. Board staff retained BBC Research & Consulting (BBC) to perform this review.

Provisions of the Act Establishing the SAR Review Process

The part of KRS 278 entitled “Electric Generation and Transmission Siting” defined a class of merchant power plants and required them to obtain construction certificates as a prerequisite to the commencement of actual construction activity. Those statutes also created the Siting Board and gave it the authority to grant or deny construction certificates requested by individual applicants. The Board is attached to the Kentucky Public Service Commission (PSC) for administrative purposes.

The Act created the application process and, within the process, a series of steps for preparing and submitting this report:

- The applicant files for a construction certificate and pays the fees. KRS 278.706.
- The applicant submits required items, including an SAR. KRS 278.706 & KRS 278.708.
- If it wishes, the Board may hire a consultant to review the SAR and provide recommendations about the adequacy of the information and proposed mitigation measures. KRS 278.708.
- The consultant must deliver the final report so the Board can meet its own statutory decision deadline — 120 days or 180 days from receipt of an administratively complete application, depending upon whether the Board will hold a hearing. KRS 278.710.

SAR Review Methodology

BBC undertook the following tasks to review Pine Grove Solar's SAR and complete this report:

- Reviewed prior SAR reviews prepared for the Siting Board by BBC and others since 2020 for proposed commercial solar generating facilities;
- Reviewed the contents of Pine Grove Solar's SAR and Application;
- Identified additional information we considered useful for a thorough review, and submitted questions to the applicant through the Siting Board Staff's requests for information;
- Conducted the required site visit, including obtaining oral information supplied by the applicant, in February 2023;
- Completed interviews and data collection with a number of outside sources as sourced in this document; and
- Compiled and incorporated all of the foregoing in the analysis.

Report Format

This report is structured to be responsive to KRS 278 and BBC's contract. It begins with this general statement that introduces the review. In Section B of the report, we present the executive summary and list all of the mitigation measures recommended by BBC. Section C offers detailed findings and conclusions of the study, and provides context for BBC's recommended mitigation measures.

Certain Limitations

There are inherent limitations to any review process of documents such as the SAR. These must be understood in utilizing this report for decision-making purposes.

Based on previous experience with the SAR review process, BBC has exercised judgment in deciding what information is most relevant and what level of detail is appropriate. This relates to project components, geographic extent of impacts, and assessment methodology. Board staff has previously provided review and guidance in this context.

While BBC has thoroughly reviewed the information provided in Pine Grove Solar's Application and Site Assessment Report and raised questions with the applicant regarding some apparent inconsistencies in that information, we have not conducted an audit of the information and data provided in those documents. Information regarding the layout and features of the proposed project and the surrounding area provided by the applicant are assumed to be accurate for purposes of this review. At this point in the planning process, Pine Grove Solar has not finalized the precise layouts of the solar arrays and some other project infrastructure. This review is based on the best available information at this time.

SECTION B.

Executive Summary

SECTION B.

Executive Summary

This report documents the evaluation of a Site Assessment Report (SAR) in compliance with KRS 278.704 and KRS 278.708. The Kentucky State Board on Electrical Generation and Transmission Siting (the Siting Board) received an application from Pine Grove Solar, LLC (Pine Grove Solar) on November 30, 2022, for approval to construct a commercial, photovoltaic solar merchant electric generating facility in Madison County, Kentucky. Siting Board staff retained BBC Research & Consulting (BBC), a Denver-based firm, to review the SAR. BBC was directed by the staff to review the SAR for adequacy, visit the site, conduct supplemental research where necessary, and provide recommendations about proposed mitigation measures.

This is the summary of BBC's final report, which encompasses the SAR review, establishes standards for evaluation, summarizes information from the applicant, notes deficiencies, offers supplemental information, and draws conclusions and recommendations related to mitigation. Issues outside the scope of KRS 278.708, including electricity market or transmission system effects and broader environmental issues, were not addressed in this engagement. This report does evaluate and consider the regional economic impacts of the proposed project and plans for future decommissioning.

Description of the Proposed Facility/Site Development Plan

The SAR provides a description of the proposed Pine Grove Solar facility in terms of surrounding land uses, legal boundaries, access control, utility service, setback requirements, visual impacts, impacts on surrounding property owners, noise levels, and traffic impacts. Additional detail on each topic was provided in the applicant's responses to the First and Second Requests for Information (RFI) from the Siting Board Staff during the SAR review process.

The proposed Pine Grove Solar facility would be a 50-megawatt alternating current (MWac) photovoltaic electricity generation facility situated east of Richmond in Madison County, approximately 40 miles southeast of the City of Lexington. The proposed Pine Grove facility would interconnect to the Louisville Gas & Electric/Kentucky Utilities transmission system.

The proposed site would be situated on parcels totaling about 485 acres, while the proposed facility components would utilize about 248 acres. The facility would be situated in a rural area of primarily agricultural and mixed agricultural/residential use and a smaller amount of solely residential land.

The site can only be accessed via Pine Grove Road, which is a little used, dead-end road that transitions from publicly owned and maintained to privately owned and maintained over its approximately two-mile length. Pine Grove Road, in turn, is only accessible via Brassfield Road, which intersects KY 52 about two miles north of Pine Grove Road in the unincorporated community of Bybee.

The largest number of homes in the proximity of the project lie north of the proposed facility along KY 52 in and near the unincorporated communities of Bybee and Waco. Homes in this area and travelers along KY 52 do not have a view into the site due to intervening topographic relief and existing vegetation.

Conclusions with respect to other descriptive elements of the facility follow:

- **Surrounding land use** — Overall, agricultural land comprises 32 percent of adjoining acres, while 53 percent is zoned agricultural/residential, and approximately 15 percent is solely residential. Measured in terms of the number of properties rather than their acreage, residential uses comprise 55 percent of adjoining parcels, while 15 percent of parcels are used in agriculture, and 30 percent are mixed use agricultural/residential parcels. The composition of surrounding land uses — where residential parcels comprise the largest share of adjacent parcels but a much smaller proportion of the total adjacent land area — is typical among the proposed solar facilities that BBC has reviewed for the Siting Board.
- **Proposed access control and security** — The SAR briefly describes proposed access control measures, noting requirements of the National Electric Safety Code that call for a six-foot fence with three strands of barbed wire at the top and a separate fence enclosing the project substation. Pine Grove Solar anticipates a total of five gated entrances to the project, all from Pine Grove Road. In addition, Pine Grove Solar plans to construct a gate across Pine Grove Road at the eastern end of the project to prohibit access by Pine Grove construction workers and operating and maintenance staff to the non-participating land at the end of Pine Grove Road on the eastern edge of the site.
- **Utilities** — The SAR states that auxiliary electrical service, if required, will be secured from Kentucky Utilities and delivered to the project substation.
- **Setback requirements** — Pine Grove Solar has secured a Conditional Use Permit from the Madison County Planning and Development Office, included as Attachment D of the Application (Certificate of Compliance and Conditional Use Permit). The required setbacks for the proposed Pine Grove Solar project are 100 feet from the centerline of any road to the Project's infrastructure, 100 feet between the Project's infrastructure and any adjacent nonparticipating property, and 200 feet between the Project's infrastructure and any adjacent property that contains a residence.
- **Other facility site development plan descriptions provided in the SAR** — Legal boundaries; right-of-way agreements; location of facility buildings, transmission lines, structures; and location of access roads, internal roads, and railways are addressed in the SAR. When considered alongside additional information supplied by Pine Grove Solar in their RFI responses during the review process, these materials appear to meet the informational requirements identified in KRS 278.708.

Compatibility with Scenic Surroundings

The applicant did not include a formal visual assessment in the SAR. However, Section 2 of the SAR summarizes the assessment of compatibility with scenic surroundings. The SAR describes the landscape context of the proposed project as “an agricultural and rural residential area of eastern Madison County.”¹ BBC also visited the proposed Pine Grove Solar project site in February 2023 to review the site and its surroundings.

Much of the proposed site is screened from view from surrounding homes and roadways by topography and/or existing vegetation. For example, the largest grouping of nearby homes, north of the site along KY 52 in or near the unincorporated communities of Bybee and Waco, cannot be seen from the site because of topographic relief between the site and KY 52.

There is a small group of homes near the western edge of the site that currently have relatively unobstructed views of the proposed locations for future solar panels and other equipment if the site is developed. This part of the project would be the primary entrance area to the facility and the most well-traveled section of public road with a view of the project components. The applicant supplied visual representations of the project’s proposed vegetative screening in this area in Appendix E of the SAR (Visual Impact Assessment).

Pine Grove Solar also commissioned a ForgeSolar glare analysis for the proposed project, which was included with the Application in Attachment B (Impact Studies). The results of the study were that neither green nor yellow glare is expected to occur at any observation points near the proposed project site, including points along Brassfield Road, Pine Grove Road, Bybee Loop Road, and KY 52.

Mitigation of visual impacts is addressed in the terms of the Conditional Use Permit for Pine Grove Solar issued by Madison County which specifies the proposed project must meet a range of conditions relating to lighting, glare, and landscaping and that the facility buildings and access points must blend in with the surrounding properties.

In general, BBC concurs with Pine Grove Solar’s conclusion that the proposed facility would not be incompatible with its surroundings from a scenic standpoint, though our assessment is contingent on successful completion of the proposed vegetative screening plans to reduce visual impact – particularly from areas where views into the site are currently relatively unobstructed by topography or existing vegetation. This assessment reflects the topography of the site, which limits its visibility from many of the nearby homes, the proposed screening plan, and recognizes that solar facilities have a relatively low profile, similar to or lower than most single-family homes.

¹ SAR, page 4.

Potential Changes in Property Values for Adjacent Property Owners

The central issue related to property values is whether or not, and to what extent, property values of other landowners will change as a result of development and operation of the proposed Pine Grove Solar facility. Pine Grove Solar engaged Kirkland Appraisals, LLC—which has conducted property value impact studies for several previous solar applications to the Siting Board—to examine the proposed project’s potential impact on property values.

In a summary statement, Kirkland Appraisals concludes that there will be no property value impacts from the proposed Pine Grove Solar facility on adjoining properties and that the proposed facility will be in harmony with the area.

The matched pair analysis shows no impact on home values due to abutting or adjoining a solar farm as well as no impact to abutting or adjacent vacant residential or agricultural land where the solar farm is properly screened and buffered. The criteria that typically correlates with downward adjustments on property values such as noise, odor, and traffic all indicate that a solar farm is a compatible use for rural/residential transition areas and that it would function in a harmonious manner with this area.²

To date, only a small handful of relevant property value impact studies of solar facilities have been conducted by academic researchers or other third-party analysts. Using different methods, and different data sources, recent studies by professors at the LBJ School of Public Affairs (University of Texas) and the University of Rhode Island have found that there could be small, negative impacts on property values from proximity to commercial solar facilities. Those negative effects appear to be more likely in suburban settings, rather than more rural settings. Another recent econometric study (at the University of Georgia) focused on solar facilities in North Carolina found no impacts on the value of nearby agricultural land, but did find statistically significant negative effects to the value of smaller residential properties close to solar facilities.³

Given the predominantly rural setting for the proposed Pine Grove Solar project—and acknowledging that the topography of the area and the project’s proposed vegetative buffers will help obscure the site’s physical elements from nearby residences and neighborhoods—we conclude that the proposed solar facility is unlikely to have measurable adverse impacts on most adjacent properties, but might affect the values of some smaller lot, adjacent residential properties located in closest proximity to nearby solar panels. New or existing vegetative screening near these properties may reduce this risk.

² SAR Appendix A, page 1.

³ Abashidze, Nino. *Essays on Economic and Health Effects of Land Use Externalities*. (Under the direction of Dr. Harrison Fell). Page 71. University of Georgia, 2019.

Expected Noise from Construction and Operation

Noise levels generated by facility construction and operation are addressed in Section 4 of the SAR (Anticipated Noise Levels) and in the Acoustic Assessment Report, conducted by Tetra Tech, which is included as Appendix D of the SAR. During project construction—including site preparation, excavation, and solar equipment installation—impacts on nearby noise-sensitive receptors (NSRs) will be generated by construction equipment and vehicles, particularly during pile driving for the solar panel racking. Operational sound levels are expected to be modest and non-disruptive for the operating lifetime of the project.

Information in the updated Acoustic Assessment Report provided in Pine Grove Solar’s response to the First RFI indicates that there are approximately 23 noise receptors that are within 2,000 feet of project equipment, excluding a barn and a cemetery located within the project boundary. This is a relatively small number of nearby homes relative to some of the other solar project site assessment reviews that BBC has conducted for the Siting Board. Four homes are shown as being within 200 feet of potential project construction activity. In response to BBC’s question about how this proximity is compliant with the terms of the Conditional Use Permit from Madison County in the Siting Board’s Second RFI, Pine Grove Solar clarified that the distances shown in the updated Acoustic Assessment Report reflect the distance from the homes to the edge of the Pine Grove Solar property. The distances from the nearest residences to actual solar equipment (including perimeter fencing) would be at least 200 feet.

During the construction phase, vehicles and machinery such as trucks, bulldozers, excavators, and pile drivers will generate noise onsite while preparing the site and installing the facility’s panels, racking, inverters, substation, and associated structures. Maximum noise levels will occur during pile driving of the solar arrays, which is consistent with previous solar project noise impact studies reviewed by the Siting Board.

Based on Table 2 in Appendix D of the SAR (which is included in the next section of this report as Figure C-14), the composite noise level at 200 feet away from “Above Grade Equipment Construction” including pile driving is projected to be about 88 dBA. At that noise level, the NIOSH recommended exposure limit is four hours per day.

During normal operation of the proposed Pine Grove Solar facility, noise levels from panel tracking motors, inverters, and the substation transformer are unlikely to be disruptive to local residents.

Impacts on Transportation

Section 5 of the SAR (Effect on Road and Railways) and Appendix F of the SAR (Transportation Assessment Report by Tetra Tech) provide information regarding anticipated impacts on transportation at and around the proposed project site during construction and operation.

Roadways near to the proposed Pine Grove Solar site are Brassfield Road west of the project and KY-52 and Bybee Loop Road northeast of the project. The proposed project is accessible only by Pine Grove Road, which runs east-west through the middle of the proposed project area. Pine Grove Road, in turn, can only be accessed from Brassfield Road. There is no railway in the vicinity of the proposed project.

The applicant reviewed available traffic volume data from the Kentucky Transportation Cabinet (KYTC) for the primary roadway, KY 52. Data were not available for Brassfield Road or Pine Grove Road. Modeling in the Transportation Assessment Report projects that KY 52 would operate at LOS C during peak construction commuter traffic, which is an acceptable level of service.

Most workers and delivery vehicles are likely to access the site by exiting KY 52 onto Brassfield Road at the unincorporated community of Bybee, then travelling about 2 miles south to the intersection with Pine Grove Road. The projected volume of construction traffic will undoubtedly be a very noticeable increase from the small number of vehicles currently using these secondary roads.

The intersection of Brassfield Road and Pine Grove Road is relatively tight and may pose challenges for some of the heavier truck deliveries to the site (see Figure C-7 in the next section for a photograph of this location). In response to BBC's question submitted as part of the Siting Board's Second RFI, Pine Grove Solar stated that shoulder stabilization and/or road widening may be necessary along the westerly edge of Brassfield Road to accommodate these delivery vehicles.

Other Considerations

Applicant economic impact study. Attachment H to the Pine Grove Solar Application (Economic Report) contains a study of the projected economic impacts from the proposed facility. The analysis was conducted by Dr. Paul Coomes, Emeritus Professor of the University of Louisville, using IMPLAN modeling.

Key findings from the analysis include:

- There will be a one-time spike in construction-related employment over about a 12-month period. The spike will include about 165 new jobs in Madison County in the first year, with a new payroll of \$11.6 million and a one-time yield of \$116,000 in occupational tax receipts for the county.
- A total of approximately \$6.0 million in property taxes is estimated to be paid during the 35-year operational life of the project, or about \$172,000 per year.

The level of investment in Madison County projected in the economic impact analysis appears to be roughly consistent with industry standards for a solar project of the size of the proposed Pine Grove Solar facility. The overall conclusions that the operating phase will have very modest economic impacts, but that the proposed solar facility will enhance local government revenue while requiring very few services, are consistent with the findings of other commercial solar economic impact studies. The largest impact on employment will be felt during the 12-month construction period.

Some information that would provide a more complete picture but which is not provided in the applicant's economic study includes the direct, indirect, and induced economic benefits from the current use of the site in agriculture; and the potential induced economic benefits from the

additional income received by the participating landowner if at least a portion of that income is spent locally. The former would at least slightly reduce the projected net economic benefits from ongoing operations of the facility, while the latter would likely increase those projected net benefits. Neither of these aspects would likely result in a material change to the results of the economic impact analysis.

Facility Decommissioning. In prior solar projects reviewed by the Siting Board, plans and assurances for decommissioning the sites at the end of their functional lives have been an important issue of concern to both the Siting Board and local governments.

Appendix G of the SAR (Decommissioning Plan) contains a plan for the decommissioning of the proposed facility. The plan was authored by Tetra Tech on behalf of the applicant. Decommissioning is also addressed in detail in article 14 in the Conditional Use Permit approved by Madison County which requires that a decommissioning plan be submitted to Madison County Planning and Development prior to the start of construction. Article 14 also specifies the required components of the decommissioning plan, which are generally similar to the elements of a decommissioning plan specified in prior reviews of proposed solar facilities for the Siting Board.

Summary Findings

Pine Grove Solar has generally provided the required information for the site assessment, including responses to BBC's questions (included in the requests for information from Siting Board Staff) following our review of their SAR. The Pine Grove Solar site appears to generally be well selected in terms of compatibility with the surrounding area and access to transmission infrastructure. The proposed setbacks and vegetative screening plan required by the Conditional Use Permit from Madison County should also help the facility be compatible with the surrounding area.

Mitigation Recommendations

Including mitigation identified by Pine Grove Solar in their Application and SAR, BBC recommends the following mitigation measures:

Regarding KRS 278.708 (3) (a)– description of the proposed facility –

1. Pine Grove Solar should provide a final site layout plan to the Siting Board when site design is finalized. Any change in project boundaries or site layout from the information reviewed during this evaluation—including changes to the locations of solar panels, inverters, transformers, the substation, project fencing or other project facilities—should be clearly documented and submitted to the Siting Board for review.
2. Pine Grove Solar or its contractor should control access to the site during construction and operation. All construction entrances should be gated and locked when not in use. The applicant's access control strategy should include adequate signage at all site entrances and boundaries—particularly in locations visible to the public, local residents, and business owners—to warn potential trespassers.

3. According to National Electric Code regulations, the security fence must be installed prior to any electrical installation work. Further, the substation must have its own separate security fence, with locked access.
4. Pine Grove Solar should promptly and fully meet the setback provisions and conditions imposed by the Madison County Conditional Use Permit.

Regarding KRS 278.708 (3) (b)– compatibility with scenic surroundings –

5. Existing vegetation between the solar arrays and nearby roadways and homes should be left in place to the extent feasible to help minimize visual impacts and screen the project from nearby homeowners and travelers.
6. Pine Grove Solar should execute their proposed screening plan as presented in Attachment B of the Application and ensure the new vegetative buffers are successfully established and develop as expected over time. Plantings should reach eight feet high within four years. Should the vegetation intended to provide a visual buffer fail to thrive after planting, Pine Grove Solar should replace the trees to maintain the visual buffer.
7. Pine Grove Solar should cultivate at least two acres of native pollinator-friendly species onsite.
8. Pine Grove Solar should use panels with anti-reflective coating to reduce glare and corresponding visual impacts.
9. Pine Grove Solar should be open to communication with adjacent landowners regarding viewshed impacts and the implementation of strategic additional vegetative screening, if needed.
10. Communication regarding viewshed impacts and concerns should be incorporated into the Complaint Resolution Program described further in mitigation recommendation #17 later in this section.

Regarding KRS 278.708 (3) (c)– potential changes in property values and land use –

11. Pine Grove Solar’s viewshed screening plan should incorporate particular efforts to reduce impacts on the views from the six smaller lot residential properties (smaller than five acres) adjacent to the proposed project.

Regarding KRS 278.708 (3) (d)– noise impacts –

12. Pine Grove Solar should strictly observe its written commitment to conduct construction activity only between 6 AM and 6 PM, Monday through Sunday, and to conduct pile driving only between 7 AM and 5 PM, Monday through Friday.

13. Pine Grove Solar should prioritize vegetative screen planting before commencing construction activity. This will not only mitigate noise but also allow for the growth of the tree screens during the construction phase, providing an established visual screen to protect the viewshed before the facility begins operation. It may also help mitigate against impacts to the property values of the smaller residential properties adjacent to the proposed facility.
14. Pine Grove Solar should notify residents and businesses within 2,400 feet of the project boundary about the construction plan, the noise potential, and mitigation plans one month prior to the start of construction.
15. If pile driving activity occurs within 1,500 feet of a noise sensitive receptor (e.g., residence), Pine Grove Solar should implement a construction method that will suppress the noise generated during the pile driving process. The Acoustic Assessment Report prepared for Pine Grove Solar by TetraTech identified that such mitigation could include "A noise/dust fence should be constructed along all boundaries facing residential houses." In prior reviews of proposed solar facilities for the Siting Board, similar mitigation methods have been identified as the semi-tractor and canvas method, sound blankets on fencing surrounding the solar site, or other comparable methods.
16. During construction, Pine Grove Solar should locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as practicable from neighboring residences.
17. Pine Grove Solar should implement a Customer Resolution Program to address any complaints from surrounding landowners. Pine Grove Solar should submit an annual status report on the Customer Resolution Program to the Siting Board, identifying any complaints, the steps taken to resolve those complaints, and whether the complaint was resolved to the satisfaction of the affected landowner.

Regarding KRS 278.708 (3) (e)– transportation impacts and fugitive dust –

18. Pine Grove Solar should submit a final construction schedule, including revised estimates of on-site workers and commuter vehicle traffic, to the Siting Board prior to commencement of construction.
19. Pine Grove Solar should develop and implement a traffic management plan for the construction phase of the project to minimize impacts on traffic flow and keep traffic safe. As part of this plan, Pine Grove Solar should implement ridesharing between construction workers; use appropriate traffic controls; or allow flexible working hours outside of peak hours to minimize any potential delays during AM and PM peak hours.
20. Pine Grove Solar and its construction contractors should comply with all laws and regulations regarding the use of roadways.

21. Pine Grove Solar should obtain permits from the KYTC and local road authorities as needed for overweight and overdimensional vehicle transport to the site and comply with all permit requirements, coordinating with the KYTC Permits Engineer and the Madison County Road Department as needed.
22. Pine Grove Solar should conduct a swept path analysis and study of the existing roadway geometry at the intersection of Brassfield Road and Pine Grove Road to determine whether shoulder stabilization and/or road widening is necessary to accommodate deliveries to the site. Pine Grove Solar should coordinate with the Madison County Road Department and Planning Department for approval of the design of these improvements if they are found to be necessary.
23. Pine Grove Solar should commit to rectify any damage to public roads by fixing or fully compensating the appropriate transportation authorities for any damage or degradation to the existing road network that it causes or to which it materially contributes.
24. Pine Grove Solar should properly maintain construction equipment and follow best management practices related to fugitive dust throughout the construction process. Dust impacts should be kept to a minimal level.

Regarding economic impacts, project decommissioning, and other issues –

25. Pine Grove Solar should commit to prioritizing local hiring and seeking to hire Madison County residents to fill the projected direct construction jobs.
26. Pine Grove Solar should submit its decommissioning plan to Madison County Planning and Development prior to the start of construction; and
27. Pine Grove Solar should work with the County to address any concerns regarding its proposed decommissioning plan.

Subject to the foregoing mitigation measures, BBC recommends that the Board approve the application for a certificate to construct based upon the siting considerations addressed in this review. This recommendation presumes that the project is developed as described in the applicant's SAR and supplemental information, and that the mitigation measures above are implemented appropriately. If these presumptions are correct, and based upon the information available to BBC at the time of this report, there are unlikely to be significant unmitigated impacts from construction and operation of the Pine Grove Solar generation project regarding scenic compatibility, property values, noise, or traffic.

SECTION C.

Detailed Findings and Conclusions

SECTION C.

Detailed Findings and Conclusions

This section provides detailed review and evaluation of each element of the Pine Grove Solar Site Assessment Report (SAR) as prescribed in Section 5 of KRS 278.708. It is organized into six subsections:

1. Description of Proposed Facility/Site Development Plan;
2. Compatibility with Scenic Surroundings;
3. Potential Changes in Property Values for Adjacent Property Owners;
4. Expected Noise from Construction and Operation;
5. Impacts on Transportation; and
6. Other Issues – Economic Impacts, Project Decommissioning, and Site-Specific Considerations

Although the Board will likely consider other issues in making its decision, these are beyond the present scope of our inquiry and so are not addressed here.

In evaluating these components of the SAR, BBC has followed a consistent pattern:

- First, BBC describes the generally accepted assessment criteria or methodology necessary to evaluate impacts of a project of this nature (**Potential Issues and Standard Assessment Approaches**).
- Secondly, we summarize relevant information included in the initial SAR (**Information Provided in the Applicant's SAR**).
- Thirdly, we describe supplemental information about the proposed Pine Grove Solar project facility, along with other information BBC was able to gather about the project and its impacts (**Supplemental Investigations, Research, and Analysis**).
- Finally, BBC draws its own conclusions about the project's potential impacts and recommended mitigation (**Conclusions and Recommendations**).

We believe that this format transparently presents the basis for our conclusions and recommendations.

Description of Proposed Facility/Site Development Plan

Potential Issues and Standard Assessment Approaches

As required by KRS 278.708(3)(a), the SAR must contain the following information:

- Subsection 1—surrounding land uses for residential, commercial, agricultural, and recreational purposes;
- Subsection 2—the legal boundaries of the proposed site;
- Subsection 3—proposed access control to the site;
- Subsection 4—the location of facility buildings, transmission lines, and other structures;
- Subsection 5—location and use of access ways, internal roads, and railways;
- Subsection 6—existing or proposed utilities to service the facility;
- Subsection 7—compliance with applicable setback requirements as provided under KRS 278.704(2), (3), or (4); and
- Subsection 8—evaluation of the noise levels expected to be produced by the facility.

BBC found each of these required information items in the SAR and examined them. To some extent, the required elements of the description of the facility and site development plan specified in the legislation overlap with topic-specific evaluations also required in the statute. In particular, the statute calls for specific evaluations of impacts on nearby property values, traffic, and noise levels. Both the applicant's SAR and the BBC team's evaluation provide further detail on these topics in subsequent sections.

Information Provided in the Applicant's SAR

The required description of the proposed Pine Grove Solar facility and site development plan is mainly set forth in Section 2 of the Application (Description of Proposed Site), Appendix A of the SAR (Property Value Impact Report), and Appendix B of the SAR (Preliminary Site Layout). Other related or supplementary information comes from various other sections of the SAR and other attachments included with the Application.

Overview of proposed facility. The proposed Pine Grove Solar facility would be a 50-megawatt alternating current (MWac) photovoltaic electricity generation facility situated near the eastern boundary of Madison County, which lies within the central Kentucky Bluegrass region. The proposed project is approximately 12 miles east of the Madison County seat, Richmond, and 40 miles southeast of the central Kentucky city of Lexington. Two small unincorporated communities, Waco and Bybee, sit a few miles north of the proposed project area. Section 2 of the Application (Description of Proposed Site) supplies an overview of the project.

Based on the information provided in the SAR and Application, the proposed facility would be constructed on an assemblage of private land totaling between 475 acres¹ and 486 acres,² for which Pine Grove Solar, LLC has procured leases with option to purchase.³ The SAR Visual Impact Assessment indicates that the fenced area of the proposed project facility would occupy 220 acres of the land leased to the project.⁴

Given the varied acreage numbers provided in the SAR, BBC requested clarification from Pine Grove regarding the total area of land leased to the project and the area of the proposed project footprint in the Siting Board's First Request for Information (RFI),

Figure 1, excerpted from Attachment A to the Application (Context Map), shows the parcels leased to the project as well as the residences (blue dots) within a two-mile radius.

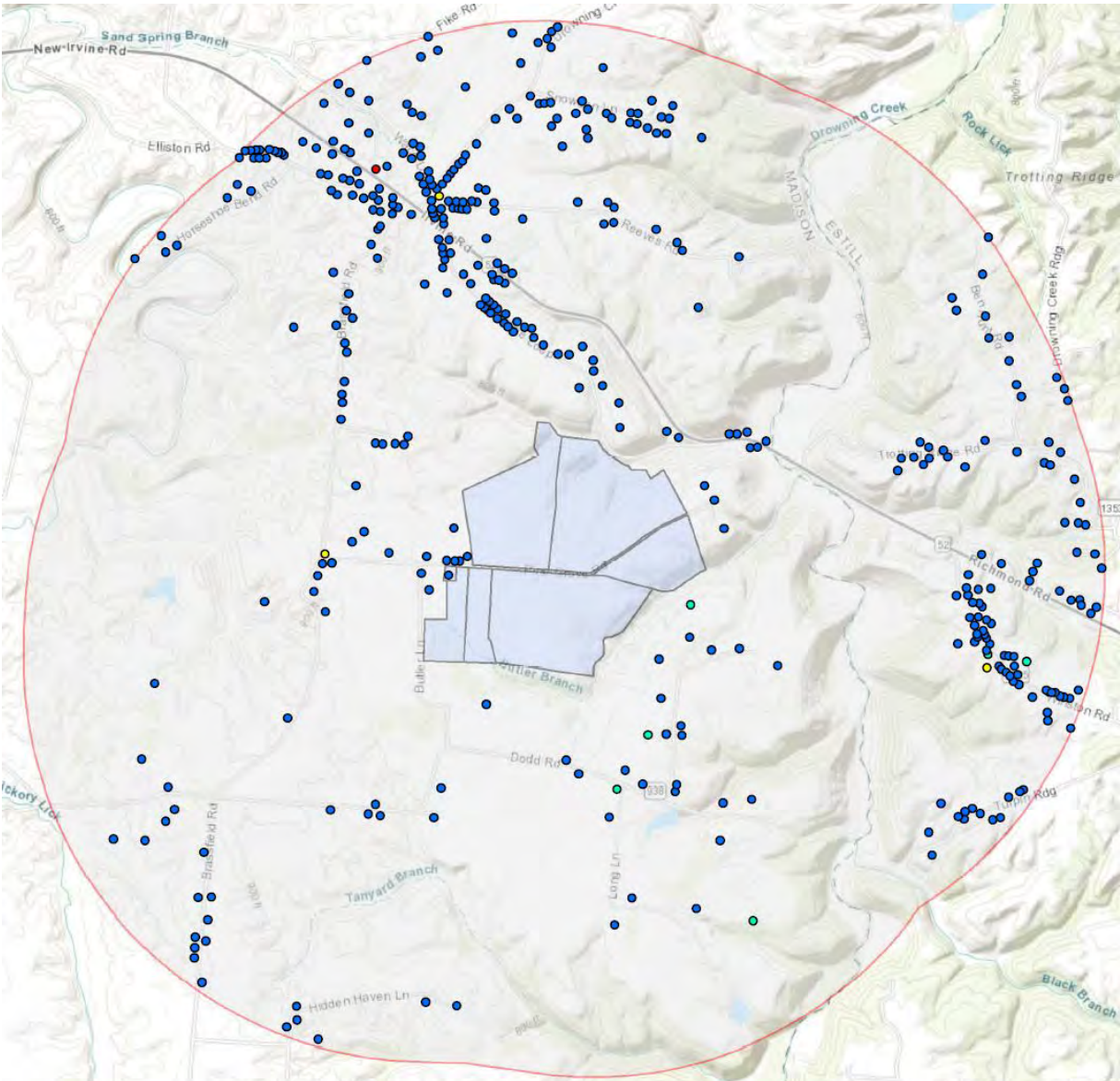
¹ SAR Appendix A – Property Value Impact Report, page 1.

² SAR Appendix G – Decommissioning Plan, page 3.

³ Pine Grove Solar Siting Board Application, page 4.

⁴ SAR Appendix E – Visual Impact Assessment, page 1.

Figure C-1.
Context Map for Pine Grove Solar



In addition to houses, three churches, one post office, and six cemeteries are within two miles of the proposed project's boundary. The applicant states there are no schools, parks, or healthcare facilities within two miles of the project's boundary and no residential neighborhoods (as defined by KRS 278.700(6)), hospitals, or nursing homes within 2,000 feet.⁵

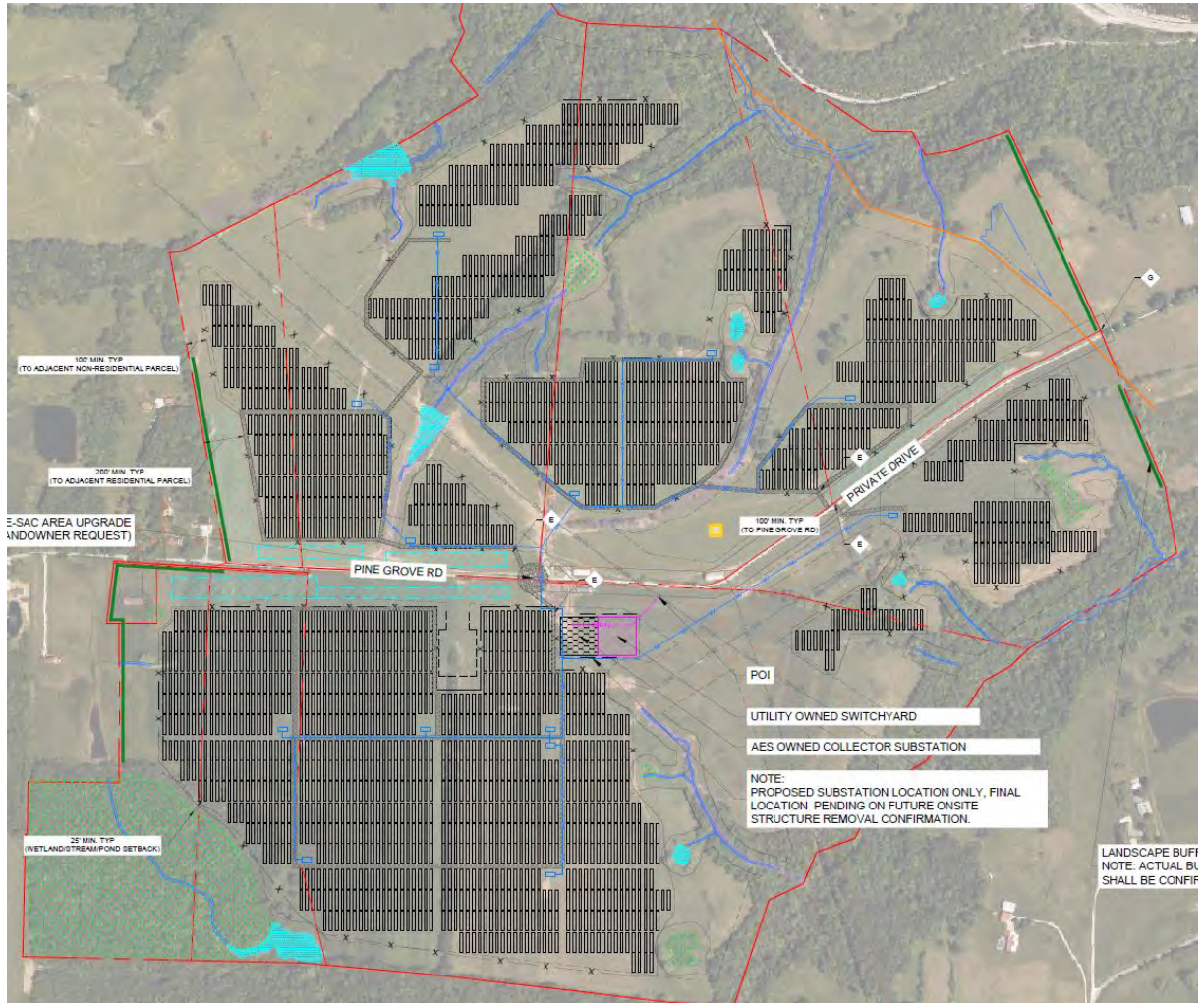
The applicant states that no railways are present within the proposed site,⁶ and BBC determined that there are no railway lines in the vicinity of the project. Nearby roadways include Brassfield Road

⁵ Pine Grove Solar Siting Board Application, page 4.

⁶ SAR, page 2.

west of the project and KY-52 and Bybee Loop Road northeast of the project. The proposed project is accessible only by Pine Grove Road, which runs east-west through the middle of the proposed project area. Figure C-2 is excerpted from Appendix B of the SAR (Preliminary Site Layout) and shows a high-level view of the proposed Pine Grove Solar project.

Figure C-2.
Pine Grove Solar Preliminary Site Layout



The applicant states that the equipment onsite at the Pine Grove Solar facility will consist of solar panels, racking, inverters, transformers, one substation transformer, and associated wiring and balance of system.⁷

The proposed Project would consist of 107,892 solar modules, associated solar module racking system and foundations, 36 solar inverters, 14 three-phase pad-mounted transformers, and associated electrical equipment and materials necessary to collect the energy produced. The project does not

⁷ Pine Grove Solar Siting Board Application, page 4.

include any overhead transmission lines. The facility is assumed to be secured by a seven-foot-tall chain link and barbed wire fence.⁸

Surrounding land uses. Appendix A of the SAR (Property Value Impact Report) provides some detail on the composition of the surrounding land. Figure C-3, excerpted from Appendix A, summarizes the use of land adjoining the proposed project.

Figure C-3.
Adjoining Parcel Land Use for Proposed Pine Grove Solar Project

Adjoining Use Breakdown		
	Acreage	Parcels
Residential	15.01%	55.56%
Agricultural	31.79%	14.81%
Agri/Res	53.20%	29.63%
Total	100.00%	100.00%

Overall, agricultural land comprises 32 percent of adjoining acres, while 53 percent is zoned agricultural/residential, and 15 percent is solely residential. Measured by the number of properties rather than their acreage, agricultural uses constitute 15 percent of adjoining parcels, while 30 percent of adjoining parcels are agricultural/residential and 56 percent are residential.

Appendix A also provides 2021 population estimates for the surrounding area.⁹ In 2021, an estimated 226 people lived within a one-mile radius of the project area; 2,457 within a three-mile radius; and 7,331 within a five-mile radius.

Legal boundaries. Page 2 of the SAR notes that the legal descriptions of participating properties listed in Appendix C of the SAR (Property/Legal) comprise the description of the proposed site’s legal boundaries. BBC’s review of Appendix C found that deed information was supplied for approximately 12 parcels, which is more than the number of parcels mapped in Attachment A (Context Map) – see Figure C-1. In the Siting Board’s First Request for Information (RFI), Pine Grove Solar was asked to provide copies of the lease agreements for all participating properties.

Access control. The Pine Grove Solar Application briefly describes proposed security measures:

A fence meeting the National Electric Safety Code (NESC) requirements, typically a six-foot fence with three strings of barbed wire at the top, will enclose the solar panels and associated infrastructure. The substation will also be enclosed by a separate fence. The Project will comply with the NESC and American National Standards Institute (ANSI) Z535 Safety Sign Standards for Electric Utility Power Plants and Substations to guide the placement of safety signage around the facility.¹⁰

Page 7 of the SAR refers to four driveways constructed as part of the project, and Appendix B to the SAR (Preliminary Site Layout) depicts four site entrances; these can be seen marked with an “E” in Figure C-2. However, pages 3 and 8 of Appendix F of the SAR (Transportation Assessment Report) refer to five project driveways, and Figure 1 of Appendix F shows five driveway entrances to the site.

⁸ SAR Appendix G, page 3.

⁹ SAR Appendix A, ESRI Housing Profiles, pages 7-9.

¹⁰ Pine Grove Solar Siting Board Application, page 4.

In the Siting Board's First RFI, Pine Grove Solar was asked to clarify the number and location of the proposed site entrances and provide a relevant corrected map.

In the Siting Board's Second RFI, BBC asked Pine Grove Solar to describe the safe access and egress requirements for the proposed project during both the construction and operation phases, including the design of any perimeter safety fencing for the substation; access for workers on site during construction and operation phases; and access for emergency services if required.

Location of buildings, transmission lines, and other structures. Page 2 of the SAR states that the location of buildings and project structures are depicted in Appendix B of the SAR (Preliminary Site Layout).

BBC examined Appendix B. These plans depict the proposed substation, switchyard, and locations of project components such as security fencing, entrance gates, and solar panels. In the First RFI, BBC requested more information from the applicant regarding the locations of all project inverters as well as the project's 14 pad-mounted transformers.

Location and use of access ways, internal roads, and railways. Page 6 of the SAR states that the location of access control points and internal roads are depicted in Appendix B of the SAR (Preliminary Site Layout). There are no railways present at the proposed site.

BBC examined Appendix B. The preliminary site layout depicts four site entrances, as described above and shown in Figure C-2; these are all accessed via Pine Grove Road. However, other attachments to the Application and SAR refer to five project driveways. In the Siting Board's First RFI, Pine Grove Solar was asked to clarify the number and location of the proposed site entrances.

Existing or proposed utilities. Page 4 of the SAR states that auxiliary electrical service, if required, will be secured from Kentucky Utilities and delivered to the project substation.

Compliance with applicable setback requirements. Kentucky statute 278.704(2) states that "...beginning with applications for site compatibility certificates filed on or after January 1, 2015, the proposed structure or facility to be actually used for solar or wind generation shall be required to be at least one thousand (1,000) feet from the property boundary of any adjoining property owner and two thousand (2,000) feet from any residential neighborhood, school, hospital, or nursing home facility."

Pine Grove Solar has secured a Conditional Use Permit from the Madison County Planning and Development Office, included as Attachment D of the Application (Certificate of Compliance and Conditional Use Permit). The required setback for the proposed Pine Grove Solar project is:

[A] setback of 100 feet from the centerline of any road to the Project's infrastructure, 100 feet between the Project's infrastructure and any adjacent nonparticipating property, and 200 feet between the Project's infrastructure and any adjacent property that contains a residence.¹¹

¹¹ Pine Grove Solar Siting Board Application, pages 4-5.

Evaluation of noise levels. Appendix D of the SAR (Noise Analysis Report) provides the assessment of the noise levels that will be generated during the construction and operation of the Pine Grove Solar facility. During the construction phase of the project, activities on site will generate intermittent noise at the nearest receptors (nearby residences). The construction phase is expected to last approximately 1 year and the operation phase 35 years.

During the operational life of the project, Pine Grove Solar anticipates a maximum daytime noise level of less than 50 dBA when measured at the nearest residence. However, the Noise Analysis Report did not provide complete information on the estimated noise levels during construction at the nearest noise-sensitive receptors. In the Siting Board's First RFI, BBC requested details from the applicant to augment the Noise Analysis Report, including an updated map of the locations of project inverters and pad-mounted transformers as well as the distance measurements and estimated noise levels at all noise-sensitive receptors close to the project boundary.

Noise levels and the details of Appendix D are discussed in greater depth and detail later in this section of BBC's report (Expected Noise from Construction and Operation).

Supplemental Investigations, Research, and Analysis

After reviewing the applicant's SAR, the BBC team sought to supplement the information provided in the SAR where necessary to describe the proposed facility and site development plan more fully.

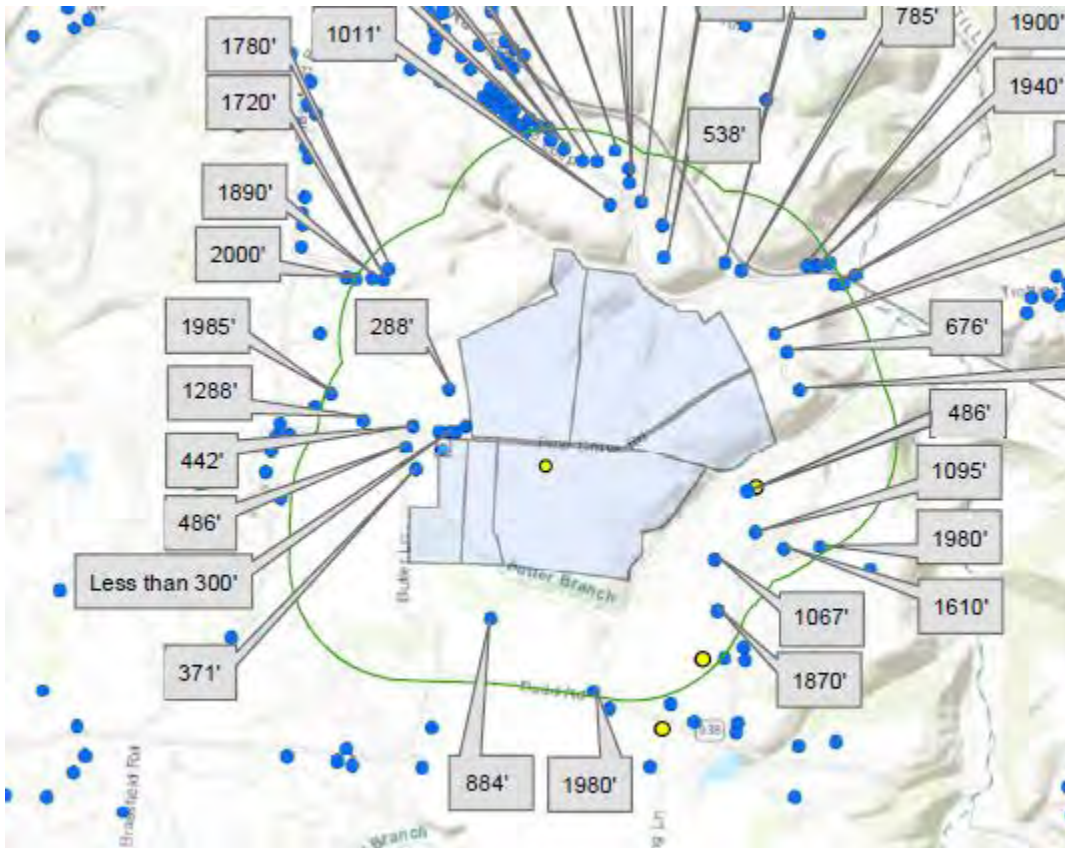
Overview of proposed facility. BBC posed several questions to Pine Grove Solar in the First RFI regarding the proposed facility, including a request for clarification regarding the project's total size (MW) and acreage. In their response, the applicant stated:

Pine Grove Solar has acquired a total acreage of 485.44 acres for the project. If built, the total fenced area for the project would be about 230.6 acres and the total acreage of the project that will contain project components would be about 248.0 acres. The total acreage of the project that will contain project components includes the total fenced-in area plus the areas that contain medium voltage collection lines and access roads.¹²

In addition, the applicant provided an updated context map showing a 2,000-foot radius around the proposed project site; this is excerpted in part in Figure C-4. It depicts the 2,000-foot radius in green and shows the distances to many of the nearest residences, which are marked as blue dots.

¹² Pine Grove Solar Responses to the First RFI, DR 1-1.

Figure C-4.
Pine Grove Solar 2,000-ft Project Radius and Distances to Nearby Residences



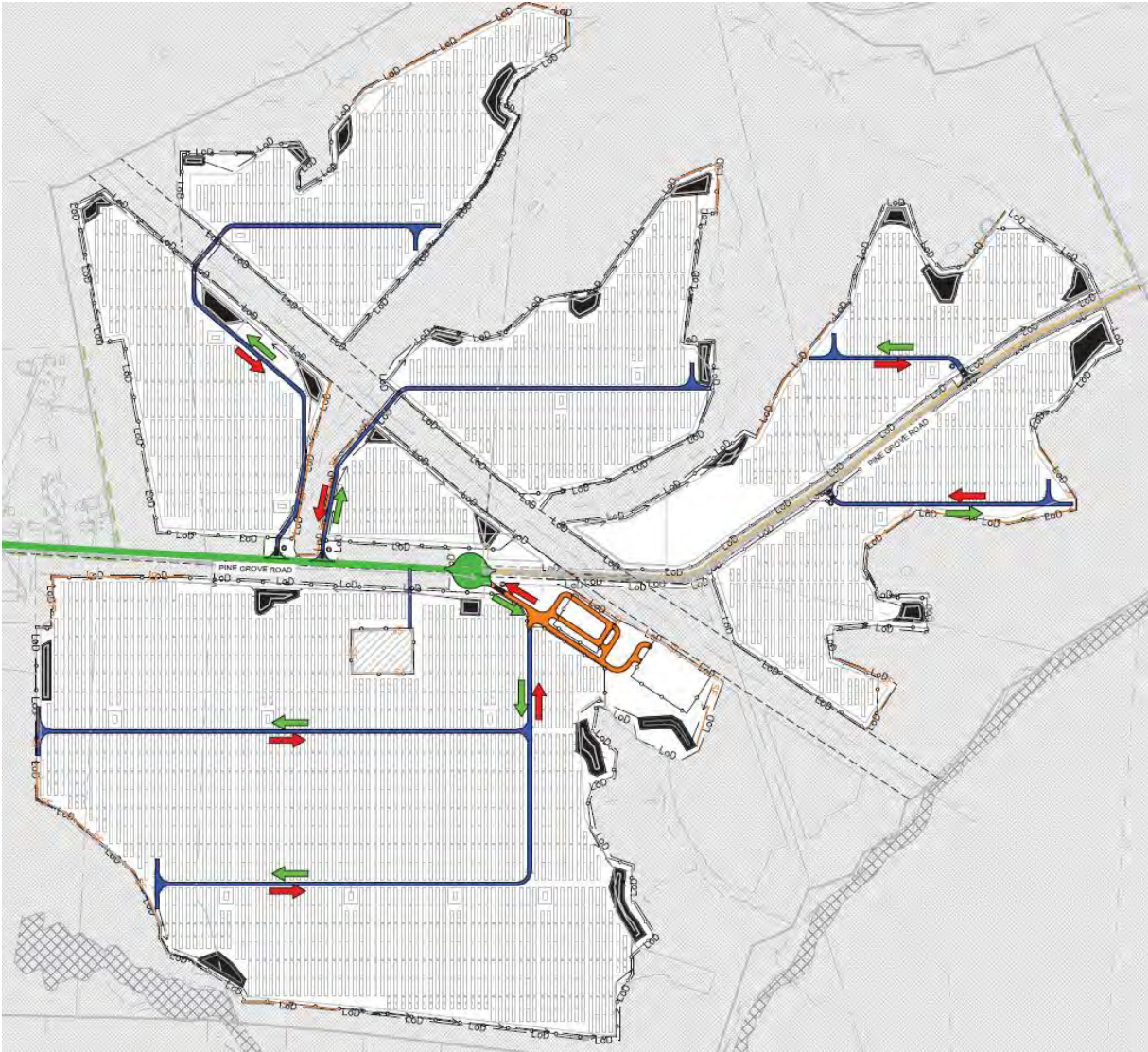
Surrounding land uses. The composition of surrounding land uses — where residential parcels comprise the majority of adjacent parcels but a small proportion of the total adjacent land area — is typical among the proposed solar facilities that BBC has reviewed for the Siting Board. Among the nine facilities BBC has reviewed for the Siting Board since early 2020¹³, residential land uses have averaged 58 percent of the surrounding parcels, and 8 percent of the surrounding acreage (compared to 56 percent and 16 percent, respectively, for the proposed Pine Grove site).

Legal boundaries. In response to questions posed by the Siting Board and BBC in the First RFI, Pine Grove Solar submitted to the Siting Board redacted copies of the confidential lease agreements for parcels in the proposed project.

Access control. The First RFI requested additional information on the number of entrances to the proposed Pine Grove Solar facility. In response, the applicant provided an updated road use plan map which is included in part as Figure C-5. Pine Grove Solar is proposing five site entrances, all from Pine Grove Road, as depicted on the updated map.

¹³ Prior BBC reviews include Turkey Creek Solar, Unbridled Solar, Ashwood Solar, Flat Run Solar, Martin County Solar, Green River Solar, Rhudes Creek Solar, Russellville Solar and the Telesto Energy Project.

Figure C-5.
Pine Grove Solar Road Use Plan



Location of buildings, transmission lines, and other structures. In response to BBC's request in the First RFI, Pine Grove Solar provided a detailed map of the locations of project inverters. The map image is too detailed to meaningfully excerpt for this report, but it does clearly show the locations of project inverters and the proposed substation.

Evaluation of noise levels. BBC's investigation of the proposed project's expected noise levels is addressed in full in a subsequent section of this report (Expected Noise from Construction and Operation).

Conclusions and Recommendations Regarding the Description of the Proposed Facility and Site Development Plan

Based upon review of the applicant's SAR, subsequent information gathered from the applicant, and additional data collected by the BBC team, we reach the following conclusion concerning the description of the facility and the proposed site development plan:

- The applicant has generally complied with the legislative requirements for describing the facility and site development plan.

Recommended mitigation. Based on our review of the SAR and Application, the applicant's responses to the RFIs from the Siting Board and BBC, and our visit to site—as well as recent Siting Board orders in other solar cases—BBC recommends the following mitigation measures regarding this portion of the Kentucky statutory requirements (KRS 278.708(3)(a):

- Pine Grove Solar should provide a final site layout plan to the Siting Board when site design is finalized. Any change in project boundaries or site layout from the information reviewed during this evaluation—including changes to the locations of solar panels, inverters, transformers, the substation, project fencing or other project facilities—should be clearly documented and submitted to the Siting Board for review.
- Pine Grove Solar or its contractor should control access to the site during construction and operation. All construction entrances should be gated and locked when not in use. The applicant's access control strategy should include adequate signage at all site entrances and boundaries—particularly in locations visible to the public, local residents, and business owners—to warn potential trespassers.
- According to National Electric Code regulations, the security fence must be installed prior to any electrical installation work. Further, the substation must have its own separate security fence, with locked access.
- Pine Grove Solar should promptly and fully meet the setback provisions and conditions imposed by the Madison County Conditional Use Permit.

Compatibility with Scenic Surroundings

This section of the SAR review addresses the compatibility of the proposed Pine Grove facility with the scenic surroundings. This component of the SAR is identified in KRS 278.708(3)(b).

Potential Issues and Standard Assessment Approaches

Various government agencies throughout the country employ visual assessment methodologies based on professionally accepted techniques. These techniques are fundamentally consistent in their approach to evaluating the elements of a project and its compatibility with existing landscapes and other surroundings.

An example of a visual assessment methodology in use by a state power plant siting agency is the methodology employed by the staff of the California Energy Commission. In California siting assessments, the assessment of potential incompatibility between a project and its scenic surroundings focuses on project structures, such as smokestacks. Typically, the assessment also addresses project lighting and the potential for visible cooling tower plumes.

A standard visual analysis generally proceeds in this sequence:

- Analysis of the project's visual setting;
- Identification of key observation points (KOP);
- Descriptions of visual characteristics of the project; and
- Evaluation of impacts to KOPs.

A KOP is a location where people may periodically or regularly visit, reside, or work within the viewshed of the project's structures or emissions.¹⁴

In general practice, visual impact evaluations are conducted within one of three general frameworks, depending upon the relevant jurisdiction and its level of involvement at the project site. These are listed in order of structural formality:

- A formal visual resource or scenery management system, typically in effect only on federal lands, such as the U.S. Forest Service Scenery Management System or the U.S. Bureau of Land Management Visual Resource Management System;
- Locally applicable laws, ordinances, regulations, or standards, where imposed by state or local governments; and
- The cultural context, including the influence of previous uses on the landscape and public attitudes toward the compatibility of various types of land use.

¹⁴ The viewshed is defined as an area of land, water, or other part of the environment visible to the eye from a vantage point. Conversely, the vantage point is presumed to be visible from locations within the viewshed.

Each framework, in its own way, embodies explicit or implicit consideration of some or all of the standard measures of visual impact: viewer exposure and sensitivity; relative project size, quality, visibility, exposure, contrast and dominance; and prevailing environmental characteristics, such as season and light conditions. Local regulations especially focus on screening of facilities from public view and the effects of glare from outdoor lighting upon adjacent property.

In this instance, the visual impact evaluation followed the second of the three approaches listed above. The selected approach is appropriate as requirements of the Madison County ordinance—as cited in the Conditional Use Permit issued by Madison County Planning & Development to Pine Grove Solar LLC, included as Attachment D of the Application—specifies the proposed project must meet a range of conditions relating to lighting, glare, and landscaping and that the facility buildings and access points must blend in with the surrounding properties.

Information Provided in the Applicant’s SAR

In compliance with KRS 278.708, Section 2 of the SAR summarizes the assessment of compatibility with scenic surroundings. The SAR describes the landscape context of the proposed project as “an agricultural and rural residential area of eastern Madison County.”¹⁵

Section 2 cites the findings from the Property Value Impact Report, which concludes that a solar farm is a compatible and harmonious use for rural agricultural/residential areas such as the proposed Pine Grove Solar project site.

The proposed Pine Grove Solar project would be a large, commercial solar facility similar in size to several previous solar projects reviewed by BBC and other consultants for the Siting Board. As with those similar projects, much of the project’s compatibility with the scenic surroundings will depend on a strategic and well-executed vegetative screening plan.

The applicant supplied visual representations of the project’s proposed vegetative screening in Appendix E of the SAR (Visual Impact Assessment), which is excerpted in part here as Figure C-6. This visual simulation is from a viewpoint along Pine Grove Road on the western edge of the project area. This part of the project would be the primary entrance area to the facility and the most well-traveled section of public road with a view of the project components.

¹⁵ SAR, page 4.

Figure C-6.
Visual Simulation for Example View Near Pine Grove Solar Project: Existing Landscape; Solar Panels with 5-ft Vegetation; Solar Panels with 10-ft Vegetation; and Solar Panels with 25-ft Vegetation



A summary discussion of the visual impacts of the proposed facility is presented in Appendix E of the SAR:

Viewers in close proximity to the Project may have unobstructed or partially screened views and include residents and travelers who would be adjacent to the local roads and highway. Existing vegetation between the solar arrays and the roads and residences would be left in place to the extent practicable to help screen the Project and reduce visual impacts from the adjacent homes. Landscape screening is proposed around the perimeter of the Project Area in strategic locations where adjacent viewers would have unobstructed or partially unobstructed views towards the Project Area. Landscaping would consist of a variety of evergreen trees that would help to screen portions of the Project and break up the uniformity of the blocks of PV panels, especially once the trees become more mature. Efforts will be made to select site appropriate, fast growing trees and shrubs. Landscape screening would help to reduce contrast, significantly in some areas, and overall visibility for adjacent viewers. It is anticipated that views of the Project from surrounding communities (e.g., Bybee, Winston, Richmond, Irvine) and Highway 52 would generally be screened by topography, vegetation, and existing structures associated with development.¹⁶

Pine Grove Solar also commissioned a ForgeSolar glare analysis for the proposed project, which was included with the Application in Attachment B (Impact Studies). The results of the study were that neither green nor yellow glare is expected to occur at any observation points near the proposed project site, including points along Brassfield Road, Pine Grove Road, Bybee Loop Road, and KY 52.

Supplemental Investigations, Research, and Analysis

Visual assessment. BBC visited the proposed Pine Grove Solar project site in February 2023 to review the site and its surroundings. Much of the proposed site is screened from view from surrounding homes and roadways by topography and/or existing vegetation. For example, the largest grouping of nearby homes, north of the site along KY 52 in or near the unincorporated communities of Bybee and Waco, cannot be seen from the site because of topographic relief between the site and KY 52. There is a small group of homes near the western edge of the site that currently have relatively unobstructed views of the proposed locations for future solar panels and other equipment if the site is developed.

Figure C-7 shows the intersection and entrance onto Pine Grove Road from Brassfield Road. All workers and deliveries to the site during construction and operations would pass through this intersection. The existing intersection appears tight for large delivery trucks, such as the vehicle that would deliver the substation transformer, to make the 90-degree turn onto Pine Grove Road.

¹⁶ Appendix E, page 10.

Figure C-7.
Entrance to Pine Grove Road from Brassfield Road (looking south, site is to left)



The photograph shown in Figure C-8 is taken from Pine Grove Road looking west towards the intersection with Brassfield Road shown in the preceding photograph (Figure C-7). Figure C-8 depicts some of the closest residences to the project. The structures on the right are on the north side of Pine Grove Road and are located within 100 feet of the edge of the property to be purchased by Pine Grove Solar,¹⁷ though they are 200 feet or more from the fence that would surround the facility and from the nearest solar panels, inverters, or other solar equipment.¹⁸

¹⁷ Pine Grove Solar Response to Siting Board's First Request for Information, page 104. Acoustic Assessment Report.

¹⁸ Pine Grove Solar Response to Siting Board's Second Request for Information, page 31.

Figure C-8.
Closest Homes on West End of Site, North Side of Pine Grove Road (looking west)



Figure C-9 is taken from the same location along Pine Grove Road, again looking west towards the intersection with Brassfield Road, but depicts nearby residences on the south side of Pine Grove Road. Some of these structures would also be located within 100 feet of the Pine Grove Solar property though they would also be 200 feet or more from the fence that would surround the facility and from the nearest panels or inverters.

Figure C-9.
Nearby Homes at West End of Site on South Side of Pine Grove Road (looking west)



Figure C-10 is also taken from the same location along Pine Grove Road, but faces east to look towards the center of the proposed site. The public portion of Pine Grove Road ends at the agricultural buildings seen in the distance, and Pine Grove Solar would construct a cul-de-sac at that location to allow vehicles to turn around. The existing agricultural structures would be removed.

Figure C-10.
View towards Middle of Site from Pine Grove Road (looking east)



Figure C-11 provides a closer view of the agricultural structures to be removed from the center of the site and the location of the proposed cul-de-sac, again facing to the east.

Figure C-11.
Closer View of Middle of Site and Future Cul-de-Sac Location



Figure C-12, also taken from the central portion of the site, shows the proposed location for the project substation that would be owned by Pine Grove Solar and the switchyard that would be owned by Kentucky Utilities. The existing high voltage transmission line (HVTL) can be seen in Figure C-12, heading to the south and east of the proposed substation location.

Figure C-12.
Future Substation Location and Existing HVTL (looking southeast)



Figure C-13 photographed from further northeast along the private portion of Pine Grove Road (northeast of the proposed cul-de-sac) shows the eastern boundary of the site where Pine Grove Solar would construct a gate to restrict access to the neighboring property to the east.

Figure C-13.
Eastern End of Site, Future Gate and Neighboring Property (looking northeast)



Conclusions and Recommendations Regarding Compatibility with Scenic Surroundings

The proposed Pine Grove Solar facility would be located in an area of predominantly agricultural and some low-density residential land. The proposed facility is compatible with the scenic surroundings, provided the applicant follows through with their screening mitigation plan to reduce the visual impact on some of the nearby homes.

Recommended mitigation. BBC recommends the following mitigation measures regarding this portion of the Kentucky statutory requirements (KRS 278.708(3)(b)):

- Existing vegetation between the solar arrays and nearby roadways and homes should be left in place to the extent feasible to help minimize visual impacts and screen the project from nearby homeowners and travelers.
- Pine Grove Solar should execute their proposed screening plan as presented in Attachment B of the Application and ensure the new vegetative buffers are successfully established and develop as expected over time. Plantings should reach eight feet high within four years. Should the vegetation intended to provide a visual buffer fail to thrive after planting, Pine Grove Solar should replace the trees to maintain the visual buffer.

- Pine Grove Solar should cultivate at least two acres of native pollinator-friendly species onsite.
- Pine Grove Solar should use panels with anti-reflective coating to reduce glare and corresponding visual impacts.
- Pine Grove Solar should be open to communication with adjacent landowners regarding viewshed impacts and the implementation of strategic additional vegetative screening, if needed.

Potential Changes in Property Values for Adjacent Property Owners

Potential Issues and Standard Assessment Approaches

Development of new power plants can raise issues related to potential changes in property values for nearby property owners. These issues may arise from the widespread perception that a power plant and its ancillary facilities—such as ash disposal landfills, overhead electric transmission lines and electric transformer sites—may be “undesirable land uses” whose impacts are expected to be translated economically into negative effects on property values. Studies also show that impacts may extend for some distance from the site, and possibly beyond the immediately adjacent properties. These findings, however, primarily apply to conventional, fossil fuel-fired plants.

Criteria for evaluating property values effects that reflect the concerns of a broad range of interested parties typically include these aspects of the issue:

- Land use compatibility;
- Findings from other empirical studies; and
- Potential for effects to other than adjacent property owners.

Land use compatibility. State and local governments around the country use standards of land use compatibility to minimize the effect of industrial land uses, like power plants, upon nearby properties. KRS Chapter 278 incorporates setback requirements as its primary standard for buffering the siting of power plants. Land use compatibility, in the strict sense of legal use, and in the general sense of reasonably probable use for a given location and “neighborhood,” are also factors in a general appraiser’s judgment and analysis concerning the “highest and best use” of a property.

Other general issues are also considered to encourage facility siting in compatible settings where negative effects would be minimal to the uses and values of nearby properties. In Wisconsin, for example, the Public Service Commission publishes this general definition of the range of potentially compatible sites for power plants:

“Typically, active or vacant industrial lands may be more compatible and urban residential lands may be less compatible with power plants. Generally, sites that are more compatible with present and planned land uses are more desirable, as are those where the plant would comply with existing land use regulations.”

General land use planning practice offers the option to adopt or negotiate for performance standards for outdoor lighting, noise, vibration, odor, smoke, or particulate matter, and so forth to minimize off-site impacts to adjacent uses.

Findings from empirical studies. Standard real estate appraisals are the most common type of empirical study used to evaluate potential changes to property values. The appraiser generally relies upon an examination of as many actual sales as possible of comparable properties in similar locations and with similar expectations for highest and best use.

Academic studies published in the land and environmental economics literature have used a variety of property value-based analyses to estimate the actual effect of power plants and other “undesirable

land uses” whose impacts may have translated economically into negative effects on adjacent property values. So called “undesirable” uses that have been studied in this fashion over time include nuclear and non-nuclear power generation; hazardous, toxic, and nuclear waste disposal; conventional solid waste disposal; waste incineration; and hazardous industrial facilities.

For example, one study investigated the effect newly opened power plants had on property values in neighborhoods located within five miles of the plant. The study included 60 power plants, several of which were located in Kentucky and the surrounding states. The study found that housing values decreased by 3 to 5 percent between 1990 and 2000 in these neighborhoods compared to neighborhoods located further away from the plant. Another study of 262 undesirable or “noxious” facilities located across the country, including 92 coal, natural gas, or oil-fired power plants (of which two were in the East South Central region that includes Kentucky), illustrates this effect. Power plants were found to significantly decrease property values in the communities where they are located. The literature also includes numerous studies of the effect of electric transmission lines upon property values.

The standard statistical technique for evaluating the potential effects of an environmental amenity (such as beach frontage) or a disamenity (such as proximity to a hazardous waste site) is called hedonic pricing analysis. This technique recognizes that before one can evaluate the impact of an external characteristic on property values, the influences of other important value factors must be isolated and held constant using statistical techniques (e.g., multiple regression analysis). A hedonic pricing model treats the good in question (in this case local property values) as a bundle of amenities (size, aesthetic quality of property, access to local town, etc.) and disamenities (pollution, noise, etc.). Such a model is designed to isolate and quantify the implied effect on overall property value from each amenity or disamenity. Hedonic pricing models have been used to evaluate the impacts of many different factors contributing to the value of a piece of property. Examples include examining the effect of the proximity to hog farms (Palmquist, Roka and Vukina, 1997), beaches (Pompe and Rinehart, 1995), airports, and electric power plants (Blomquist, 1973).

Hedonic models are statistically estimated using multiple regression analysis. However, hedonic studies are complex and require extensive statistical training and large amounts of data. Moreover, not all factors that influence a home’s selling price can be measured, and housing markets vary greatly from one region to another.

Potential for more distant off-site effects. Most analyses of property value impacts are local in scope. However, the effect of power plants and other facilities on property values has been shown to extend well beyond the site. This has been shown in at least one study, where negative effects of a small power plant located within the city of Winnetka, Illinois, were significant out to a distance of 11,500 feet, or more than two miles. As noted earlier, these findings also primarily apply to conventional, fossil-fuel fired plants.

Information Provided in the Applicant's SAR

Pine Grove Solar engaged Kirkland Appraisals, LLC—which has conducted property value impact studies for several previous solar applications to the Siting Board—to examine the proposed project’s potential impact on property values.

Appendix A of the SAR (Property Value Impact Report) provides a comparative study of property values in proximity to solar facilities in Kentucky and in other states across the US, using a matched pairs design. The study draws its conclusions regarding the impacts of the proposed facility on adjacent property values based on market analysis of value impacts from numerous other solar facilities.

Appendix A states that the closest home to the proposed project will be 320 feet from the nearest solar panel and that the average distance will be 1,207 feet.¹⁹ Additionally, surrounding residential density is low and most of the surrounding acreage is agricultural or agricultural/residential. In a summary statement, Kirkland Appraisals concludes that there will be no property value impacts from the proposed Pine Grove Solar facility on adjoining properties and that the proposed facility will be in harmony with the area.

The matched pair analysis shows no impact on home values due to abutting or adjoining a solar farm as well as no impact to abutting or adjacent vacant residential or agricultural land where the solar farm is properly screened and buffered. The criteria that typically correlates with downward adjustments on property values such as noise, odor, and traffic all indicate that a solar farm is a compatible use for rural/residential transition areas and that it would function in a harmonious manner with this area.²⁰

Supplemental Investigations, Research, and Analysis

BBC's investigation of additional research. To obtain further perspective on this issue, BBC reviewed recent studies regarding solar facility effects on nearby property values. As commercial scale solar facilities become more prevalent in the central and eastern portions of the United States, the research and information concerning potential impacts on property values is also continuing to evolve.

In 2018, a study of the potential effects of commercial solar farms on nearby property values was conducted by the LBJ School of Public Affairs at the University of Texas. That study contacted public sector property assessors in 430 counties across the United States that had at least one utility-scale PV solar facility in place. Thirty-seven residential property assessors agreed to fill out the on-line survey asking their opinion on the likelihood that a solar farm would impact nearby residential property values. Among the findings of that study were that:

- “The majority of responses suggested either no impact (66 percent of all estimates) on home prices, or a positive impact (11 percent of all estimates), as a result of proximity to solar installations.”
- “However, some respondents did estimate a negative impact on home prices associated with solar installations.” In the 23 percent of cases where negative impacts on value were estimated, the negative effect was estimated to increase with closer proximity and larger scale solar installations. Respondents who had actual experience in assessing homes near solar

¹⁹ Note that this information is inconsistent with other information from the noise assessment conducted for Pine Grove Solar and Pine Grove Solar's response to the Siting Board's Second Request for Information which indicates that four homes could be located as close as 200 feet to the nearest solar equipment (see pages C-36 and C-37 for discussion).

²⁰ SAR Appendix A, page 1.

installations estimated a 3 percent decline in value for homes within 100 feet of a 20 MW solar installations and a 5 percent decline in value within 100 feet of a 102 MW solar facility.

- “The results also suggest that experience assessing near a solar installation is associated with a much less negative estimate of impact.”²¹

Most recently, a 2020 study published by economists from the University of Rhode Island using the hedonic pricing analysis approach described earlier identified statistically significant negative impacts on home prices due to proximity to commercial solar sites in Rhode Island and Massachusetts —under certain conditions. Of the studies BBC has reviewed, this study appears to be the most robust in the sense that it covers a wide and diverse geographic area, observes hundreds of thousands of home sales transactions over a long period of time pre- and post-solar farm development, and has results that are robust to many different model specifications.

The study, based on “over 400,000 transactions within three miles of a solar site”, found that residential property values in suburban areas within one mile of a solar facility declined by 1.7 percent (on average) compared to surrounding properties, with larger effects on home values within 0.1 miles (500 feet) of a solar site (-7.0 percent). However, solar sites in industrial or rural areas²² had no statistically significant impact on home prices.²³

Another recent contribution to the research on this topic is the 2019 PhD Dissertation of Dr. Nino Abashidze, an economist at the University of Georgia. Dr. Abashidze used the hedonic pricing model approach and econometric regression analysis to evaluate the effects from proximity to solar farms on both agricultural land values and residential property values in North Carolina. Dr. Abashidze found that proximity to solar farms had no discernable effect on *agricultural* land values (properties 30 acres or larger in size). However, Dr. Abashidze did find statistically significant, negative impacts on *residential* property values. Dr. Abashidze’s econometric analysis found that (on average) homes within one mile of solar facilities experienced an estimated nine percent decrease in value, while homes closer to the facilities (within one-half mile) experienced an estimated 12 percent decrease in value. It is also important to note, however, that most of the residential properties in Dr. Abashidze’s analysis were located on relatively small lots (average lot size of 0.9 acres, sample standard deviation in lot size of 1.6 acres) and that the study was based on a relatively small number of home sales transactions compared to the University of Rhode Island study.²⁴

²¹ *An Exploration of Property-Value Impacts Near Utility-Scale Solar Installations*. Project Director: Dr. Varun Rai. Policy Research Project (PRP), LBJ School of Public Affairs, The University of Texas at Austin, May 2018.

²² In the study by Gaur and Lang cited below, “rural” is defined as areas with municipal population density of less than 850 people per square mile. The proposed Pine Grove facility would sit in unincorporated Madison County, and the surrounding area has a low population density.

²³ *Property Value Impacts of Commercial-Scale Solar Energy in Massachusetts and Rhode Island*. Vasunda Gaur and Cory Lang, University of Rhode Island. September 29, 2020. Available at https://works.bepress.com/cory_lang/33/

²⁴ Abashidze, Nino. *Essays on Economic and Health Effects of Land Use Externalities*. (Under the direction of Dr. Harrison Fell). Page 71. University of Georgia, 2019.

Conclusions and Recommendations

With the proliferation of commercial solar facilities across the U.S., there is an increasing focus on the potential effects on residential property values from proximity to such facilities.

Most studies sponsored by solar developers have analyzed this question using sales price comparisons of homes near solar facilities to comparable homes that are not proximate to a solar facility, using techniques similar to the approach used in appraising homes. These studies identify similar homes (except for their proximity to solar facilities) and use appraisal techniques, which may be more subjective than the statistical techniques used in econometric studies, to adjust for differences in age, square footage, and other home characteristics. BBC has reviewed several of these studies and can confirm that they have consistently found no impact on property values from proximity to solar installations.

To date, relatively few studies have been conducted by academic researchers or other “third-party” analysts, but the body of research is slowly growing. Using different methods, and different data sources, recent studies by professors at the LBJ School of Public Affairs (University of Texas) and the University of Rhode Island have found that there could be small, negative impacts on property values from proximity to commercial solar facilities. However, those negative effects appear to be more likely in suburban settings, rather than rural settings. Another recent study by a University of Georgia economist of impacts to property values from solar farms in North Carolina – using a hedonic pricing model and econometric approach similar to the University of Rhode Island study – found that solar facilities did not impact nearby *agricultural land* values but did reduce nearby *residential* values (within one mile) by nine to 12 percent, on average. Overall, the two econometric property value studies indicate that the likelihood of adverse impacts on property values from nearby solar facilities increases with proximity to the solar site and with residential density, and decreases in more rural, agricultural settings. The duration of adverse effects on nearby residential property values has yet to be established by the econometric research studies.

As shown earlier in Figure C-3, about 85 percent of the land use adjacent to the proposed Pine Grove Solar facility is considered to be either agricultural or large lot “agri/residential.” These properties appear unlikely to experience a measurable adverse impact on their values from the proposed solar facility. About 15 percent of the adjacent land is considered residential, and six of the 27 adjacent properties are residential homes on smaller than five acre lots.²⁵ These properties may be at risk of a reduction in value, though the findings from the economists at University of Rhode Island and at the University of Georgia are not entirely consistent in this regard.

Given the predominantly rural setting for the proposed Pine Grove Solar project—and acknowledging that the project’s proposed vegetative buffers will help obscure the site’s physical elements from nearby residences and roads—we conclude that the proposed solar facility is unlikely to have measurable adverse impacts on most adjacent properties, but might affect the values of some smaller lot, adjacent residential properties – particularly those with homes located in closest proximity to nearby solar panels.

²⁵ SAR Appendix A, page 5.

Recommended mitigation. It is important to note that while some of the academic studies discussed above have documented negative impacts to home values, the cause of the impacts has not been well researched. The studies hypothesize that solar farms may act as a visual disamenity, which suggests there is potential to mitigate negative impacts through actions designed to buffer the view of solar facilities from nearby homes. Consequently, BBC believes that Pine Grove Solar’s vegetative screening plans may help to minimize any adverse impact on nearby residential property values and recommends the following mitigation.

- Pine Grove Solar’s viewshed screening plan should incorporate particular efforts to reduce impacts on the views from the six smaller lot residential properties (smaller than five acres) adjacent to the proposed project.

Expected Noise from Construction and Operation

This section evaluates the studies and conclusions discussed in the SAR concerning peak and average noise levels associated with construction and operation of the proposed Pine Grove Solar facility. This component of the SAR is identified in KRS 278.708(3)(d).

Potential Issues and Standard Assessment Approaches

Various governmental agencies throughout the country employ noise assessment methodologies based on professionally accepted techniques. In evaluating the construction and operational stages of a project, these techniques are fundamentally consistent in that they seek to estimate the potential contribution to ambient noise levels at the site in terms of sensitive receptors. Generally, the assessment methodologies are meant to measure the increase in noise levels over the ambient conditions at residential and non-residential sensitive receptors.

A standard noise impact assessment focuses on several key factors:

- Identification of sensitive receptor sites;
- Existing local ambient noise levels;
- Estimated construction or operational noise intensities;
- Distances between noise sources and sensitive receptors;
- Time of day during which peak noises are anticipated;
- Noise created by transportation features such as conveyors, trucks, and rail lines; and
- Calculation of the cumulative effect of the new noise sources when combined with the existing ambient noise level, recognizing that new noise sources contribute to the ambient noise level, but not in an additive way.

Information Provided in the Applicant's SAR

Noise levels generated by facility construction and operation are addressed in Section 4 of the SAR (Anticipated Noise Levels) and in the Acoustic Assessment Report, conducted by Tetra Tech, which is included as Appendix D of the SAR. During project construction—including site preparation, excavation, and solar equipment installation—impacts on nearby noise-sensitive receptors (NSRs) will be generated by construction equipment and vehicles, particularly during pile driving for the solar panel racking. Operational sound levels are expected to be modest and non-disruptive for the operating lifetime of the project.

Noise generated during construction. Section 4 of the SAR cites the mandated construction operating times in effect for the proposed Pine Grove Solar project:

[The] Madison County Board of Adjustments has mandated that all construction operating times shall be limited to 6:00 a.m. to 6:00 p.m. and the site will be cleared by 7:00 pm. Workdays will be

seven days a week until completion of the project. Pile driving will only be permitted from 7:00 am to 5:00 pm Monday through Friday.²⁶

The Acoustic Assessment Report (Appendix D of the SAR) notes that construction schedule, equipment, and activities of the Pine Grove project are typical of other commercial solar generation facilities.²⁷ Typical equipment used in the construction of a solar generation facility, including the proposed Pine Grove Solar project, includes vehicles and machinery such as backhoes, excavators, dump trucks, graders, forklifts, cement mixers, and pile drivers.

Appendix D provides a table summary of projected noise levels generated by equipment during each of the project's construction work stages; this information is excerpted as Figure C-14 below.

Figure C-14.
Projected Construction Noise Levels

Phase No.	Construction Phase	Construction Equipment	Usage Factor %	Maximum (L _{max}) Equipment Noise Level at 50 ft	Composite L _{eq} Noise Level				
					100 ft	200 ft	500 ft	1,000 ft	2,000 ft
1	Site Preparation	(4) Backhoes (2) Plate Compactors (2) Crawler Tractors (5) Dump Trucks (2) Forklifts (4) Generator Sets (2) Graders (2) Scrapers (4) Skid Steer Loaders	40 20 40 40 20 50 40 40 40	97	87	81	73	67	61
2	Excavation	(4) Backhoes (2) Plate Compactors (2) Crawler Tractors (5) Dump Trucks (2) Forklifts (4) Generator Sets (2) Graders (2) Scrapers (2) Skid Steer Loaders	40 20 40 40 20 50 40 40 40	97	87	81	73	67	61
3	Utilities/Sub-grade	(4) Backhoes (2) Plate Compactors (2) Crawler Tractors (5) Dump Trucks (2) Forklifts (4) Generator Sets (2) Graders (2) Scrapers (2) Skid Steer Loaders	40 20 40 40 20 50 40 40 40	97	87	81	73	67	61
4	Above-grade Equipment Construction	(7) Backhoes (10) Bore/Drill Rigs (10) Cement Mixers (5) Forklifts (3) Concrete Saws (1) Plate Compactors (1) Cranes (5) Dump Truck (2) Excavators (4) Generator Sets (1) Pavers (1) Paving Equipment (2) Skid Steer Loaders (10) Trenchers (1) Rollers (2) Pile Drivers	40 20 40 20 20 20 18 40 40 50 50 40 40 50 20 20	106	94	88	80	74	68
5	Paving	(1) Rollers	20	85	72	68	58	52	46

²⁶ SAR, page 6.

²⁷ Appendix D, page 5.

The projected maximum construction noise level of 106 dBA for phase 4 of the project (above-grade equipment construction) is based on a pile driver noise level estimate of 101 dBA as measured at 50 feet. This is an appropriate estimate according to resources from the US Federal Highway Administration (FHWA) and the Environmental Protection Agency (EPA) and is comparable to other solar project applications BBC has reviewed for the Siting Board. However, unlike previous applications BBC has reviewed, the Pine Grove Acoustic Assessment Report does not include estimates of noise impacts at the identified NSRs that are in proximity to the proposed project. In the First RFI, BBC requested that the applicant provide an update to Appendix D to include the distance of each NSR from the nearest construction activity as well as the projected maximum noise level experienced at each NSR during the project's construction phase.

The Acoustic Assessment Report in Appendix D outlines three best management practices for mitigating general construction noise at the proposed Pine Grove Solar project site:

- *Construction equipment should be well-maintained and vehicles using internal combustion engines equipped with mufflers will be routinely checked to ensure they are in good working order;*
- *A noise/dust fence should be constructed along all boundaries facing residential houses; and*
- *A noise complaint hotline and local representative will be made available to address any noise-related issues.²⁸*

These mitigation measures are not referenced in Section 4 (Anticipated Noise Levels) or Section 6 (Mitigation Measures) of the applicant's SAR. In the First RFI, BBC asked Pine Grove Solar to describe fully their plans for construction noise mitigation and explain any departure from the recommended best management practices identified in Appendix D.

Noise generated during operation. During normal facility operation, select solar equipment will emit noise – specifically, the project substation transformer and the project inverters. The Acoustic Assessment Report describes the project equipment profile used in the operational sound modeling, which was conducted with the Cadna-A® sound model from DataKustik GmbH (2021):

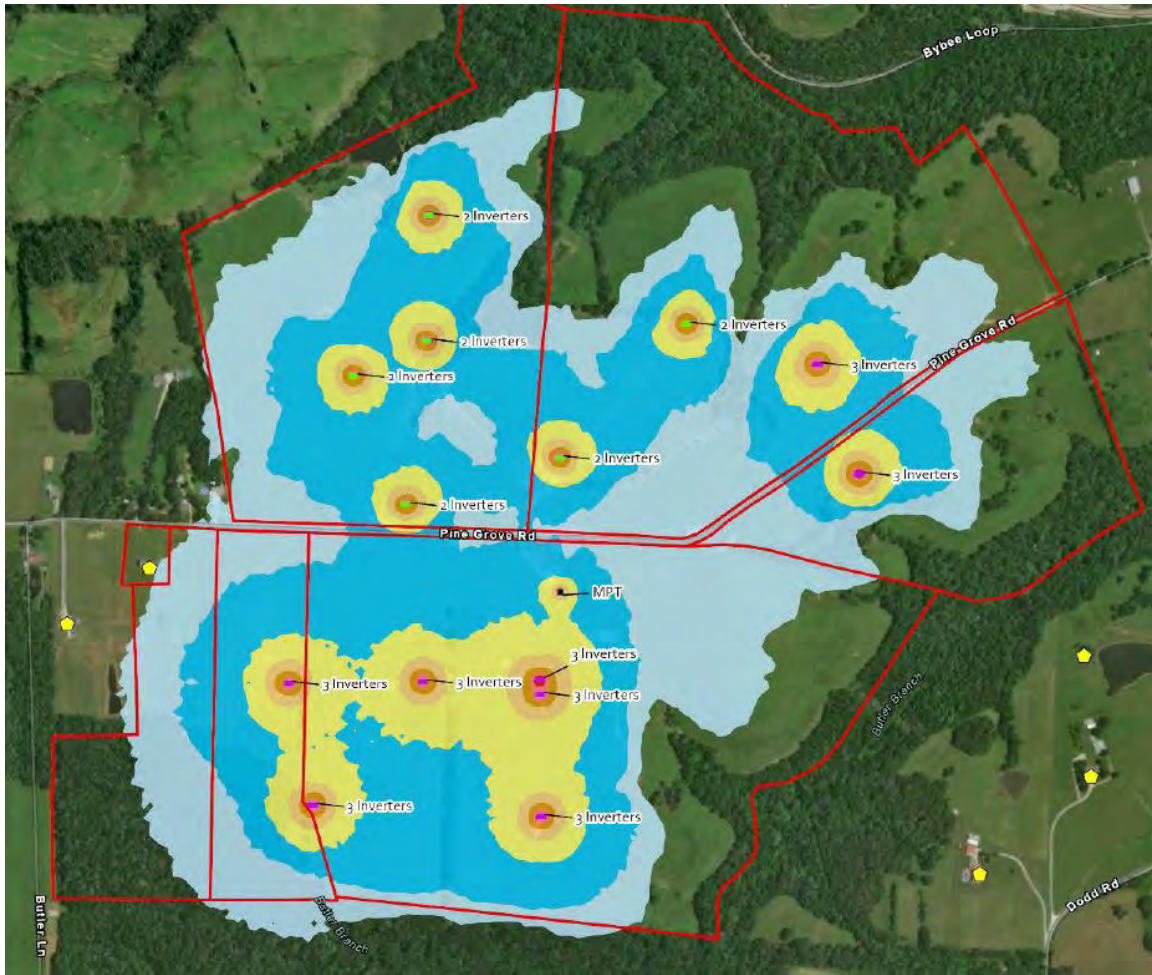
The Project site layout was directly imported into the acoustic model and includes 14 PCS [Power Conversion Stations] and one 53 MVA substation transformer; eight PCS include three power inverters and one 4.2-MVA distribution transformer, and six PCS include two power inverters and one 2.8-MVA distribution transformer. The principal sources of noise are the cooling fans on the inverters and transformers, the electrical components of the inverters, the distribution transformer associated with each PCS, and the main power transformer at the substation.²⁹

Figure C-15, excerpted from the Acoustic Assessment Report, shows the proposed project area (red outline); locations of the project inverters and substation transformer (also referred to as PCS in Appendix D); and the nearest residential noise receptors (yellow icons).

²⁸ Appendix D, page 7.

²⁹ Appendix D, page 9.

**Figure C-15.
Operational Sound Levels**



The color-coded sound contours depicted in Figure C-15 show noise levels reached at specific distances from the inverters and transformer. The light blue contour corresponds to a noise level of 50 dBA, the darker blue corresponds to 55 dBA, and the yellow corresponds to 60 dBA. A residence on the western boundary of the proposed project is the nearest depicted NSR to the project and sits on the edge of the modeled 50 dBA contour.

A complete table of operational acoustic modeling results is provided in the appendix of the Acoustic Assessment Report. In this table, the highest modeled operational sound level at an NSR near to the proposed project is 49 dBA; for reference, a noise level of 50 dBA is equated to the noise of moderate rainfall or the background noise of a quiet suburb.

The Acoustic Assessment Report summarizes the impacts of operational noise emissions as follows:

[In 1974] the U.S. EPA evaluated the effects of environmental noise with respect to health and safety and determined [a noise level] of 55 dBA to be the maximum sound level that will not adversely affect public health and welfare by interfering with speech or other activities in outdoor areas. [...]

Operational sound levels were modeled and evaluated at NSRs in the Project area. Anticipated Project sound sources consist of the collector substation main power transformer and inverters and distribution transformers located at the power conversion stations.

Modeling results show that Project operations will successfully comply with the U.S. EPA threshold of 55 dBA. [...] Overall, sound emissions associated with the Project are expected to remain at a low level, consistent with other solar energy facilities of similar size and design sited in the State of Kentucky.³⁰

In the First RFI, the applicant was asked to improve the acoustic assessment for both construction and operational noise emissions by mapping maximum noise levels to the respective NSR identification numbers used elsewhere in Appendix D.

Supplemental Investigations, Research, and Analysis

Pile driving noise estimates for KY solar projects. BBC compared the projected construction and operational noise levels from the Pine Grove Solar project to previous estimates for other Kentucky solar projects we have reviewed for the Siting Board over the past two years.³¹ We found that the noise level estimates in the Pine Grove Solar SAR for pile driving activity (101 dBA at 50 feet) are consistent with noise level projections from these other proposed solar facilities. Figure C-16 summarizes the pile driving noise levels estimated in several proposed solar facility applications.

³⁰ Appendix D, pages 4 and 12.

³¹ In addition to the proposed Pine Grove Solar project, BBC has also reviewed the proposed Turkey Creek, Unbridled, Ashwood, Flat Run, Martin County, Green River, Rhudes Creek, Russellville, and Telesto solar facilities.

Figure C-16.
Estimated Noise Levels from Pile Driving, KY Solar
Project Proposals (dBA)

	Maximum estimated noise level at 50 ft (dBA)
<i>Pine Grove Solar</i>	
Pile driver	101.0
<i>Telesto Energy</i>	
Pile driver (impact)	90.0
<i>Russellville Solar</i>	
Pile driver (impact)	102.0
<i>Rhudes Creek Solar</i>	
Pile driver & other equip.	90.0
<i>Green River Solar</i>	
Pile driver	94.9
<i>Martin County Solar</i>	
Pile driver (impact)	101.0
Pile driver (sonic)	95.0
<i>Flat Run Solar</i>	
Pile driver	100.6
<i>Ashwood Solar</i>	
Pile driver (impact)	101.0
Pile driver (sonic)	95.0
<i>Unbridled Solar</i>	
Pile driver (impact)	101.0
<i>Turkey Creek Solar</i>	
Pile driver (impact)	101.0
Pile driver (sonic)	96.0

Pine Grove Solar updated Acoustic Assessment Report. In response to a range of questions on the project’s noise analysis, posed by BBC and the Siting Board in the First RFI, Pine Grove Solar supplied an updated Acoustic Assessment Report.

An essential update to the construction noise analysis was the inclusion of the distances between nearby NSRs and that NSRs nearest point of project construction activity. Additionally, the applicant was requested to calculate maximum anticipated construction noise levels for each individual NSR. Both types of information were supplied in Table 3 of the Updated Acoustic Assessment Report, excerpted here as Figure C-17.

Figure C-17.
Projected Construction Noise Levels for Pile Install

NSR ID	UTM Coordinates (meters)		Distance to Construction (feet)	Received L_{max} (dBA)
	Easting	Northing		
1	754513.5	4178961	1483	79
2	754564.8	4178875	1218	81
3	754412.3	4178848	1012	82
4	754672	4178600	538	88
5	753589.3	4177576	(Barn within Project Boundary)	90
6	753448.9	4177481	371	91
7	755005.7	4177055	1068	82
8	755196	4177222	1096	82
9	755183.9	4177427	486	89
10	753853.3	4176741	885	83
11	755397.9	4177951	664	86
12	755330.9	4178139	676	86
13	754109.8	4177515	(Cemetery within Project Boundary)	90
14	755270.4	4178223	649	86
15	753425.7	4177899	442	90
16	753804.1	4177897	289	93
17	753563.9	4177678	95	103
18	753619.8	4177677	102	102
19	753646.6	4177679	113	101
20	753702.5	4177707	72	105
21	753397.1	4177593	487	89
22	753164.1	4177717	1288	80
23	754683.5	4178756	951	83
24	754999	4178583	843	84
25	755083.6	4178542	786	85

According to Figure C-17, four residences are within 200 feet of project construction: these are NSR IDs 17, 18, 19, and 20. In the Second RFI, BBC requested Pine Grove Solar to clarify how proximity to these residences would be handled in accordance with the proposed project’s setback requirements, which require “100 feet between the Project’s infrastructure and any adjacent nonparticipating

property, and 200 feet between the Project’s infrastructure and any adjacent property that contains a residence.”³²

Based on the information provided in Pine Grove Solar’s noise assessment as part of the SAR, the maximum projected noise level during pile driving activities at these four NSRs ranges from 101 to 105 dBA. For the 20 other nearby NSRs, the reported maximum noise level during pile driving ranges from 79 to 93 dBA.

Commonly accepted noise level exposure limits. BBC researched noise level exposure limits advocated by public health agencies such as the CDC and the National Institute for Occupational Safety and Health (NIOSH). NIOSH has a recommended exposure limit of 85 dBA (note that decibels are measured on a logarithmic scale).³³ Figure C-18 identifies the time that it takes for a person to reach their full daily noise dose based on differing levels of noise exposure.

Figure C-18.
Time to Reach 100 Percent of Daily Noise Dose

Source: Centers for Disease Control and Prevention, The National Institute for Occupational Safety and Health, Guidance and Regulations

Time to reach 100% noise dose	Exposure level (dBA)
8 hours	85
4 hours	88
2 hours	91
1 hour	94
30 minutes	97
15 minutes	100

At 105 dBA—the reported maximum noise level experienced during pile driving at the nearest NSR in Pine Grove Solar’s noise assessment as shown in Figure C-17—the 100% daily noise dose would be reached in fewer than 15 minutes. A noise level of 105 dBA is dangerous and unacceptable without mitigation. For the remaining NSRs, a maximum noise level of 93 dBA during pile driving would correspond to the full daily noise dose reached in approximately 1 hour. This would be a level of noise that warrants mitigation to protect nearby residents from excessive annoyance or exposure to noise hazards.

In Pine Grove Solar’s response to the question BBC posed in the Siting Board’s Second Request for Information, they clarified that the distances from “construction” shown in the noise assessment (and copied in this report as Figure C-17) were actually distances from the NSRs to the Pine Grove Solar property boundary. However, Pine Grove Solar will construct the facility in compliance with the requirement in the Conditional Use Permit from Madison County to keep a distance of at least 200 feet from the nearest solar equipment (in this case also including the perimeter fencing) and the nearest SAR.³⁴ Given this information, the maximum noise level at the four closest residences is likely to be approximately 96 dBA or lower, rather than the 105 dBA shown in Figure C-17. Nonetheless, if this noise level was continuous, it would still reach 100 percent of the recommended maximum daily

³² Pine Grove Solar Madison County Planning Department Conditional Use Permit.

³³ Noise and Hearing Loss Prevention. The National Institute for Occupational Safety and Health. <https://www.cdc.gov/niosh/topics/noise/default.html>

³⁴ Pine Grove Solar Responses to the Second RFI, DR 2-2.

noise dose within 30 to 60 minutes. Since pile driving would be intermittent, it would take longer to reach the maximum recommended daily noise dose at these nearby homes.

Construction noise mitigation methods. In the Siting Board’s First RFI, the applicant was asked to describe why the SAR and Application materials do not propose to utilize the recommended noise mitigation best practices (as identified in the Acoustic Assessment Report) during project construction and why the applicant believes mitigation is not necessary – or, to describe methods that will be used if the applicant does anticipate the need for noise mitigation.

Pine Grove Solar responded that significant adverse noise impacts are not anticipated during either the construction or operation of the proposed project:

Pine Grove Solar proposes mitigating noise impact through construction timing. Pine Grove Solar will conduct the most noise-intensive operations (driving piles) during the hours of 7:00 a.m. through 5:00 p.m. on Monday through Friday to mitigate noise disturbance. In addition, pile driving operation will only occur for a few months of the project’s construction, while the rest of the project will be constructed with common equipment such as forklifts, skidsteers, etc. In addition, as construction noise generating activities will progressively move across the development site during the duration of the construction phase, the highest noise levels would not be expected to be experienced at a single receptor for more than a day or two, as construction equipment and activities would only be in a single area for a short period of time. A phone number for a member of the construction team will be made available to the neighboring community who may be able to address noise complaints and other construction related concerns with heightened mitigation measures identified above.³⁵

This response from the applicant regarding noise mitigation measures is similar to responses from other solar facility applicants whose applications BBC has reviewed. While the mobile nature of pile driving activity subjects nearby noise sensitive receptors to noise levels that are temporary and intermittent, the maximum noise levels from pile driving are nonetheless very loud from the nearest sensitive receptors (residences) and could be hazardous with prolonged exposure.

Conclusions and Recommendations

During construction, noise from the pile drivers will have the most substantial impact on the nearest noise receptors. Maximum noise levels at the nearest NSRs could be up to 96 dBA, which would be a hazardous level of noise if it were continuous for more than 45 minutes per day. While pile driving is expected to be intermittent, which reduces the hazard, noise mitigation is warranted during that phase of construction.

During normal operation of the proposed Pine Grove Solar facility, noise levels from inverters and the substation transformer are unlikely to be disruptive to local residents.

The area in which the proposed project site sits is a working agricultural and rural residential landscape bordered by several roadways. It is unlikely that the noise levels at the site during facility operation will be incongruous with the existing noise profile of the area.

³⁵ Pine Grove Solar Responses to the First RFI, DR 1-33.

Recommended mitigation. Pine Grove Solar should clarify precisely where pile driving will occur and mitigate hazardous or annoying noise as necessary, depending on the proximity to nearby residences. Further:

- Pine Grove Solar should strictly observe its written commitment to conduct construction activity only between 6 AM and 6 PM, Monday through Sunday, and to conduct pile driving only between 7 AM and 5 PM, Monday through Friday.
- Pine Grove Solar should prioritize vegetative screen planting before commencing construction activity. This will not only mitigate noise but also allow for the growth of the tree screens during the construction phase, providing an established visual screen to protect the viewshed before the facility begins operation. It may also help mitigate against impacts to the property values of the smaller residential properties adjacent to the proposed facility.
- Pine Grove Solar should notify residents and businesses within 2,400 feet of the project boundary about the construction plan, the noise potential, and mitigation plans one month prior to the start of construction.
- If pile driving activity occurs within 1,500 feet of a noise sensitive receptor (e.g., residence), Pine Grove Solar should implement a construction method that will suppress the noise generated during the pile driving process. The Acoustic Assessment Report prepared for Pine Grove Solar by TetraTech identified that such mitigation could include “A noise/dust fence should be constructed along all boundaries facing residential houses.³⁶” In prior reviews of proposed solar facilities for the Siting Board, similar mitigation methods have been identified as the semi-tractor and canvas method, sound blankets on fencing surrounding the solar site, or other comparable methods.
- During construction, Pine Grove Solar should locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as practicable from neighboring residences.
- Pine Grove Solar should implement a Customer Resolution Program to address any complaints from surrounding landowners. Pine Grove Solar should submit an annual status report on the Customer Resolution Program to the Siting Board, identifying any complaints, the steps taken to resolve those complaints, and whether the complaint was resolved to the satisfaction of the affected landowner.

³⁶ Acoustic Assessment Report for the Pine Grove Solar Project. TetraTech, Inc. September 2022. Page 7. (Appendix D to the Pine Grove Solar Site Assessment Report.)

Impacts on Transportation

This portion of the SAR review examines the impacts of the proposed Pine Grove Solar facility on road transportation. This also includes traffic effects, such as congestion, safety, fugitive dust, and degradation of the transportation infrastructure. This component of the SAR corresponds to KRS 278.708(3)(e).

Potential Issues and Standard Assessment Approaches

Development of a new power plant can raise a variety of potential traffic related issues. These issues may arise from the movement of construction workers and heavy and oversized loads during the construction process and added congestion during both construction and subsequent operations.

Standard components of the evaluation of traffic-related impacts include:

1. Identification of access methods, and a description and visual portrayal of primary access routes to the site during construction and during operation.
2. Description of baseline traffic conditions: existing traffic counts, road capacity and level of service and any major existing constraints (e.g., bridge weight limitations, etc.).
3. Identification of any special transportation requirements during construction (e.g., the need to reinforce or "ramp over" existing bridges, detours, temporary closures, etc.).
4. Projection of traffic volumes related to construction and operation.
5. Determination of whether the additional traffic, during construction and operation, would lead to congestion, changes in the level of service of the existing road network or additional road maintenance costs.

Information Provided in the Applicant's SAR

Section 5 of the SAR (Effect on Road and Railways) and Appendix F of the SAR (Transportation Assessment Report by Tetra Tech) provide information regarding anticipated impacts on transportation at and around the proposed project site during construction and operation.

As discussed in earlier sections of this report, roadways near to the proposed Pine Grove Solar site are Brassfield Road west of the project and KY-52 and Bybee Loop Road northeast of the project. The proposed project is accessible only by Pine Grove Road, which runs east-west through the middle of the proposed project area. Pine Grove Road, in turn, can only be accessed from Brassfield Road. There is no railway in the vicinity of the proposed project.

As part of this assessment, Tetra Tech developed vehicle trip generation estimates associated with the project's anticipated peak construction workforce levels and reviewed them against existing traffic volumes and public transportation in the vicinity of the Project area. An evaluation of roadway capacity was conducted for KY 52, which is the primary roadway serving the site. The available sight distances at the five proposed site driveways were evaluated to ensure that minimum sight distance

criteria as defined by American Association of State Highway and Transportation Officials (AASHTO) is met.³⁷

The applicant reviewed available traffic volume data from the Kentucky Transportation Cabinet (KYTC) for the primary roadway, KY 52. Data were not available for Brassfield Road or Pine Grove Road. Tetra Tech's review of the traffic volume data revealed that traffic volume along the section of KY 52 in proximity to the proposed solar facility have seen negligible growth in the past decade, and that the roadway operates with a high level of service (LOS). Modeling in the Transportation Assessment Report projects that KY 52 would operate at LOS C during peak construction commuter traffic, which is an acceptable level of service.

[Peak] construction activity for the proposed solar facility is expected to generate 380 new vehicle trips (190 entering and 190 exiting) on a typical weekday, with approximately 114 new vehicle trips (111 entering and 3 exiting) during the weekday morning peak hour and 114 new vehicle trips (3 entering and 111 exiting) during the weekday evening peak hour. [...] The adjacent roadways are anticipated to have ample capacity to accommodate the temporary increase in daily and peak hour traffic with the project estimated to generate approximately two additional trips per minute during peak hours. Additionally, there are multiple routes connecting the site to the regional roadway system thereby reducing impacts to any single roadway segment or intersection.³⁸

Most workers and delivery vehicles are likely to access the site by exiting KY 52 onto Brassfield Road at the unincorporated community of Bybee, then travelling about 2 miles south to the intersection with Pine Grove Road (see Figure C-7 for a photograph of this intersection). The projected volume of construction traffic described above will undoubtedly be a very noticeable increase from the small number of vehicles currently using these secondary roads.

Pine Grove Solar anticipates minor fugitive dust impacts from construction and associated land disturbance, but these should be modest as the applicant will use best management practices to mitigate dust, such as revegetation, watering for dust control, covering spoil piles, and covering trucks to transport dirt. Once the construction phase is concluded and the project moves into its operational life, routine activities on site should not disturb the land or generate dust.

In the First RFI, BBC requested more information about the estimated number and class of delivery trucks anticipated on site and the load weight of the substation transformer delivery, as well as documentation of any correspondence between Pine Grove Solar and the KYTC District Engineer or the Madison County road department. BBC also requested that the applicant clarify the number of project driveways anticipated on site.

Supplemental Investigations, Research, and Analysis

Vehicle load weights and compatibility with local roadways. BBC conducted further research on the weight limits and vehicle classes permitted to travel on specific roadways in Kentucky. The primary route adjoining the proposed project site (KY 52) is rated for 80,000 pounds (KYTC Truck Weight Classification). Any vehicle loads exceeding this limit could subject the roadway and shoulder to

³⁷ Appendix F, page 1.

³⁸ Appendix F, page 5.

damage or degradation. Additionally, local roads transited by delivery trucks—such as Brassfield Road and Pine Grove Road—may be more susceptible to degradation from heavy loads. In the Second RFI, BBC asked Pine Grove Solar for information about any necessary widening of the intersection of Brassfield Road and Pine Grove Road in order to accommodate wide and heavy vehicles and equipment deliveries to site.

Regarding potential damage to local roadways, the most concerning delivery to site would be that of the proposed project's substation transformer. A 2012 publication on Large Power Transformers (LPTs) by the U.S. Department of Energy states:

Transporting an LPT is challenging – its large dimensions and heavy weight pose unique requirements to ensure safe and efficient transportation... When an LPT is transported on the road, it requires obtaining special permits and routes from the department of transportation of each state on the route of the LPT being transported. According to an industry source, obtaining these special permits can require an inspection of various infrastructure (e.g., bridges), which can add delay. In addition, transporting LPTs on the road can require temporary road closures due to traffic issues, as well as a number of crew and police officers to coordinate logistics and redirect traffic.

BBC contacted the Kentucky Transportation Cabinet's Department of Overweight/Over-dimensional Vehicles regarding their permitting process. BBC then utilized the KYTC Route Evaluation online tool to ascertain potential route restrictions for oversized deliveries. The BBC team input information for several sample configurations into the KYTC Route Evaluation tool and found that there could be problems with load clearances, particularly during delivery of the power transformer, dependent on the exact configuration of the delivery load.

Additionally, any local roads that are not state routes are not covered by KYTC permits and must instead go through the appropriate county entity. However, overall BBC finds that the limitations and challenges of the primary roadways adjacent to the proposed Pine Grove Solar project site are comparable with those of several other recent solar facility applications reviewed and approved by the Siting Board within the past 18 months.

BBC expects that advance planning between Pine Grove Solar and the KYTC (as well as the Madison County road department, as applicable) can mitigate problems resulting from overweight and over-dimensional load delivery.

In the First RFI, BBC requested further information from the applicant regarding planning or correspondence between Pine Grove Solar and the KYTC or the Madison County road department. The applicant responded that no communication had yet occurred with either entity, but that conditions of the Conditional Use Permit issued by Madison County require the county road supervisor to approve facility access points and require the applicant (Pine Grove Solar) to conduct and provide to the county a road survey prior to the start of construction.³⁹

³⁹ Pine Grove Solar Responses to the First RFI, DR 1-12 and 1-13.

In the Second RFI, BBC posed a more specific question regarding any anticipated improvements or modifications to the intersection of Brassfield Road and Pine Grove Road to accommodate heavy truck deliveries to the site. Pine Grove Solar responded:

Additional study, including a swept path analysis, of the existing roadway geometry will be required to determine if the intersection of Brassfield Road and Pine Grove Road is adequate to accommodate the turning movements of the anticipated construction and delivery vehicles. Pine Grove Solar expects that shoulder stabilization and/or road widening may be necessary along the westerly edge of Brassfield Road to accommodate these delivery vehicles. Pine Grove Solar will include this additional study and analysis in the next phase of project development and will coordinate with the Madison County Road Department and Planning Department for approval of the design of these potential mitigation measures.⁴⁰

Delivery vehicles. The Transportation Assessment Report projects that approximately 20 heavy duty trucks and 5 light duty trucks will arrive on the proposed site daily during the construction phase. Responding to the First RFI, Pine Grove solar supplied additional detail regarding delivery of the substation transformer:

The substation transformer for Pine Grove Solar has not been ordered or procured yet. AES estimates the shipping weight will be around 100,000 to 120,000 pounds, which would likely require a class 8 truck with an overweight permit.⁴¹

Conclusions and Recommendations

During construction, daily deliveries on semi-truck trailers and workforce commuter traffic will substantially increase the amount of traffic on primary roadways near the project site, particularly on KY 52, Brassfield Road, and Pine Grove Road. While there are no available traffic counts on Brassfield Road or Pine Grove Road, KY 52 is projected to maintain an acceptable level of service (LOS).

Delivery of the project's substation transformer will likely present some challenges given the load ratings of surrounding roadways, but, in general, challenges can be overcome with careful advance planning with the KYTC and Madison County Road Department and by utilizing an appropriate traffic management plan.

Recommended mitigation. BBC recommends the following measures to mitigate potential impacts on traffic and the local road network:

- Pine Grove Solar should submit a final construction schedule, including revised estimates of on-site workers and commuter vehicle traffic, to the Siting Board prior to commencement of construction.
- Pine Grove Solar should develop and implement a traffic management plan for the construction phase of the project to minimize impacts on traffic flow and keep traffic safe. As part of this plan, Pine Grove Solar should implement ridesharing between construction workers; use appropriate

⁴⁰ Pine Grove Solar Responses to the Second RFI, DR 2-5.

⁴¹ Pine Grove Solar Responses to the First RFI, DR 1-11.

traffic controls; or allow flexible working hours outside of peak hours to minimize any potential delays during AM and PM peak hours.

- Pine Grove Solar and its construction contractors should comply with all laws and regulations regarding the use of roadways.
- Pine Grove Solar should obtain permits from the KYTC and local road authorities as needed for overweight and overdimensional vehicle transport to the site and comply with all permit requirements, coordinating with the KYTC Permits Engineer and the Madison County Road Department as needed.
- Pine Grove Solar should conduct the swept path analysis and study of the existing roadway geometry at the intersection of Brassfield Road and Pine Grove Road to determine whether shoulder stabilization and/or road widening is necessary to accommodate deliveries to the site. Pine Grove Solar should coordinate with the Madison County Road Department and Planning Department for approval of the design of these improvements if they are necessary.
- Pine Grove Solar should commit to rectify any damage to public roads by fixing or fully compensating the appropriate transportation authorities for any damage or degradation to the existing road network that it causes or to which it materially contributes.
- Pine Grove Solar should properly maintain construction equipment and follow best management practices related to fugitive dust throughout the construction process. Dust impacts should be kept to a minimal level.

Other Issues

While not specifically required under the statutes authorizing SAR reviews by consultants for the Siting Board (KRS 278.708), it has become customary to consider additional issues in these reviews, including economic impacts and project decommissioning. This final portion of this section of BBC's report includes these aspects.

Economic Impacts

Current economic conditions and trends. As discussed previously, the proposed Pine Grove Solar facility would be located in Madison County, east of the county seat of Richmond. Ranked by population, Madison County is the eighth largest county in Kentucky with about 93,000 residents as of 2020. The county's population has grown at a notable pace over the past decade, adding about 10,000 new residents since 2010 and more than 20,000 since 2000.

Per capita personal income in Madison County was just under \$43,000 in 2021. There are about 47,000 jobs located in Madison County as of 2021. The largest employment sector is government (7,957 jobs), predominantly state and local government. Retail trade (5,756), manufacturing (4,932), and health care and social assistance (4,400) are the next largest employment sectors. Madison County's construction sector included over 3,000 jobs in 2021, while its farms employed over 1,200 people.⁴²

There were about 76,000 acres of cropland in Madison County as of the last Census of Agriculture in 2017, about one percent of the more than 6.6 million acres of cropland across all of Kentucky. Cropland in Madison County decreased substantially by about 30,000 acres over the ten-year period between the 2007 and 2017 Censuses of Agriculture. Across Kentucky as a whole, cropland decreased by about 650,000 acres over the same period.⁴³

Applicant economic impact study. Attachment H to the Pine Grove Solar Application (Economic Report) contains a study of the projected economic impacts from the proposed facility. The analysis was conducted by Dr. Paul Coomes, Emeritus Professor of the University of Louisville, using IMPLAN modeling.

Key findings from the analysis include:

- There will be a one-time spike in construction-related employment over about a 12-month period. The spike will include about 165 new jobs in Madison County in the first year, with a new payroll of \$11.6 million and a one-time yield of \$116,000 in occupational tax receipts for the county.
- A total of approximately \$6.0 million in property taxes is estimated to be paid during the 35-year operational life of the project, or about \$172,000 per year.

Review and assessment of applicant economic information. The level of investment in Madison County projected in the economic impact analysis appears to be roughly consistent with industry

⁴² U.S. Bureau of Economic Analysis, Table CAEMP25N Total Full-Time and Part-Time Employment by NAICS Industry.

⁴³ 2017 Census of Agriculture and 2007 Census of Agriculture. County Data. U.S.D.A. National Agricultural Statistics Service.

standards for a solar project of the size of the proposed Pine Grove Solar facility. The overall conclusions that the operating phase will have very modest economic impacts, but that the proposed solar facility will enhance local government revenue while requiring very few services, are consistent with the findings of other commercial solar economic impact studies. The largest impact on employment will be felt during the 12-month construction period.

Some information that would provide a more complete picture but which is not provided in the applicant's economic study includes the direct, indirect, and induced economic benefits from the current use of the site in agriculture; and the potential induced economic benefits from the additional income received by the participating landowner if at least a portion of that income is spent locally. The former would at least slightly reduce the projected net economic benefits from ongoing operations of the facility, while the latter would likely increase those projected net benefits. Neither of these aspects would likely result in a material change to the results of the economic impact analysis.

Recommended mitigation. BBC recommends the following measures in regard to potential economic impacts:

- Pine Grove Solar should commit to prioritizing local hiring and seeking to hire Madison County residents to fill the projected direct construction jobs.

Project Decommissioning

In prior solar projects reviewed by the Siting Board, plans and assurances for decommissioning the sites at the end of their functional lives have been an important issue of concern to both the Siting Board and local governments.

Applicant project decommissioning plan. Appendix G of the SAR (Decommissioning Plan) contains a plan for the decommissioning of the proposed facility. The plan was authored by Tetra Tech on behalf of the applicant.

Decommissioning activities will include removal of project components including solar modules, tracking system, steel piles, inverters and transformers, gen tie line cables, substation, equipment foundations, below-ground cables, access roads, and perimeter fences. Components may be sold for salvage or removed by a licensed contractor and transported to an approved landfill.⁴⁴

The sequence of decommissioning begins with removal of physical project components and progresses to the restoration and revegetation of disturbed land to allow a return to pre-construction land use to the extent possible. The decommissioning plan provided appears adequate and details the installation placement and subsequent removal of each type of project equipment at the facility.

Figure C-19 shows the estimated \$2.5 million decommissioning cost (excluding an estimated \$423,000 salvage value) of the facility, as excerpted from Appendix G.

⁴⁴ Appendix G, pages 7 and 14.

Figure C-19.
Estimated Decommissioning Costs

Item	Extended Cost
Equipment & Facilities Mobilization / Demobilization	
Equipment Mobilization	\$ 61,200
Site Facilities	\$ 2,200
Crew Mobilization & Site Setup	\$ 36,200
Project Site Support	\$ 254,900
Crew Demobilization & Site Cleanup	\$ 24,100
<i>Subtotal</i>	\$ 378,600
Substation & Transmission Line Retirement	
Substation Disassembly	\$ 175,700
Transmission Line Disassembly	\$ 8,000
<i>Subtotal</i>	\$ 183,700
Solar Array Retirement	
Fence Removal	\$ 44,000
Inverter / Transformer Removal	\$ 71,300
Remove Foundations to Subgrade	\$ 36,300
Solar Panel Removal & Disposal	\$ 689,700
Solar Rack (Trackers) & Post Removal	\$ 545,400
Above Grade Cable Removal - Rack Mounted	\$ 76,900
<i>Subtotal</i>	\$ 1,463,600
Site Restoration - Partial Site Seeding	
Strip & Decompact Roads	\$ 43,900
Spot Grade Disturbed Areas	\$ 18,000
Re-Seed With Native Vegetation - Roads & Areas Disturbed By Construction	\$ 33,500
<i>Subtotal</i>	\$ 95,400
Contractor Markups	
Home Office, Project Management (5% Of Cost)	\$ 106,100
Contractor OH & Fee (13% Of Cost)	\$ 289,600
<i>Subtotal</i>	\$ 395,700
Total Decommissioning Cost	\$ 2,517,000

¹ Costs reflect values as of the fourth quarter 2022 and do not include assumptions with respect to escalation or discount rates.

Recommended mitigation. Decommissioning is also addressed in detail in article 14 in the Conditional Use Permit approved by Madison County which requires that a decommissioning plan be submitted to Madison County Planning and Development prior to the start of construction. Article 14 also specifies the required components of the decommissioning plan, which are generally similar to the elements of a decommissioning plan specified in prior reviews of proposed solar facilities for the Siting Board. To mitigate concerns regarding decommissioning:

- Pine Grove Solar should submit its decommissioning plan to Madison County Planning and Development prior to the start of construction; and
- Pine Grove Solar should work with the County to address any concerns regarding its proposed decommissioning plan.