BEFORE THE OHIO POWER SITING BOARD

In the Matter of the Application of Dodson Creek Solar, LLC for a Certificate of Environmental Compatibility and Public Need.	**))))**	**Case No. 20-1814-EL-BGN**

DIRECT TESTIMONY OF EDDIE DUNCAN

Q.1. Please state your name, title, and business address.

A.1. My name is Eddie Duncan. I am employed by Resource Systems Group, Inc. ("RSG") as a Senior Director and lead RSG's acoustics work. My business address is 55 Railroad Row, White River Junction, VT 05001.

Q.2. What are your duties as a Senior Director?

A.2. As Senior Director, I direct and manage projects related to acoustics and noise. This includes noise assessments for projects from a wide variety of sectors, including solar power development. I manage and mentor the acoustics staff, and am responsible for strategy and client relationships.

Q.3. What is your educational and professional background?

A.3. I am Board Certified by the Institute of Noise Control Engineering and am a member of the Acoustical Society of America where I served as a member of the Technical Committee on Architectural Acoustics for over 10 years. I received my Bachelor of Science in Engineering Science (B.S.) at Rensselaer Polytechnic Institute, Troy, New York in 2003 and a Master of Science in Environmental Studies (M.S.) at Green Mountain College, Poultney, Vermont in 2013.

I have 18 years of experience in the field of acoustics with much of that experience measuring, modeling, and analyzing noise from renewable energy sources and power

transmission projects. I have worked across many different public and private sectors including power transmission, renewable energy, transportation, public lands, recreation, mining, manufacturing, healthcare, education, and commercial and residential development. I have conducted noise analyses for over 40 solar projects since 2012. I regularly author papers on the topic of noise from renewable energy projects. For example, I am coauthor of "An overview of sound from commercial photovoltaic facilities" published in the proceedings of Noise-Con 2020. Additionally, I have provided testimony to the Ohio Power Siting Board ("OPSB") in the following solar proceedings: Yellowbud Solar (Case No. 20-972-EL-BGN) and Ross County Solar (Case No. 20-1380-EL-BGN).

Q.4. On whose behalf are you offering testimony?

A.4. I am testifying on behalf of the Applicant, Dodson Creek Solar, LLC ("Applicant"), regarding its Application filed in Case No. 20-1814-EL-BGN.

Q.5. What is the purpose of your testimony?

A.5. The purpose of my testimony is to describe the noise assessment study conducted by RSG and included in the Application as Exhibit P and to summarize the results of that study. Additionally, I will be addressing recommended Conditions 28 and 29 of the Staff Report of Investigation ("Staff Report) filed by Staff on October 22, 2021, which I have reviewed.

Q.6. Please describe the noise assessment study included in the Application.

A.6. RSG carried out a noise impact assessment for the Dodson Creek Solar Project ("Project") to determine existing baseline acoustical conditions in the Project area and model sound emissions of the primary sound-producing Project components, namely

inverters and transformers, so that projected sound levels could be compared to the existing acoustical conditions.

The Project includes transformers and inverters operating during the day, and only transformers operating at night. However, the inverters may operate sometimes at night to provide reactive power management. As such, the study assumed that inverters could potentially operate at night.

The Project area is primarily agricultural with scattered residences and farmsteads throughout. A total of 184 sensitive receptors were included in the study, of which 180 were non-participating sensitive receptors.

Q.7. Did you conduct background sound monitoring?

A.7. Yes, background sound level monitoring was conducted at four monitor locations around the Project Area. The four monitors were (A) Spickard Road, about 1,350 feet from U.S. 50 which is the primary sound source in the area; (B) a more remote location in the northern Project area that is setback further from U.S. 50 and local roadways; (C) near an agglomeration of residences along Abernathy Road; and (D) a more remote location in the southern portion of the Project Area. Sound levels were continuously measured from December 10 to December 18, 2020 at Monitors A and B. Subsequent monitoring was conducted from March 26 to April 4, 2021 at Monitors C and D. During analysis, sound level data were removed from the dataset to maintain integrity of the background sound levels during the periods that would cause false sound level readings or artificially high levels, such as wind speeds above 11 mph; precipitation and thunderstorm events; anomalous events; or equipment interactions by RSG staff, other people, or animals.

Q.8. How did you select the four monitoring locations?

A.8. We selected the areas of representative soundscapes in which we should do monitoring throughout the Project area, and then worked with the Applicant to identify specific locations where we could gain site access. Each location was selected as representative of a given landscape or soundscape experienced by sensitive receptors in and around the Project area. We typically consider factors such as land use, road traffic, distance to roadways, population density, and distance to geographic features (rivers, relative elevation, ground cover, etc.). Consideration is also given to security of the monitoring equipment. In this case, the factors that affect the soundscape in the Project area are not too complex and the monitor location decisions were primarily driven by the location of the sensitive receptors and roadways. The distance a monitor is placed from a roadway is determined by the setback distance of sensitive receptors along the roadway. The characteristics that are represented at each monitor location that played a role in monitor location selection are listed in the Table below:

Monitor	**Factors for Selection**	**Distance to Nearest Road**
A	Representative of receptors in the project area that are setback from, but adjacent to U.S. 50. Setback approximately 1,350 feet from U.S. 50. Closest monitor to proposed substation.	140 feet from Spickard Road
B	Northern portion of the project area. Relatively large setback from nearest road.	1,065 feet from Spickard Road
C	Representative of the agglomeration of receptors along Abernathy Road.	280 feet from Tedrick Road

Monitor	Factors for Selection	Distance to Nearest Road
D	Southern end of the project area. Representative of receptors that are most remote from U.S. 50.	350 feet from Sherry Road.

Q.9. Do you believe the four monitoring locations are representative of a significant amount of the Project area?

A.9. Yes, the four monitor locations are representative of residences throughout the Project Area.

Q.10. What did the survey results indicate with respect to the sound levels that currently exist in the area?

A.10. Based on the background sound monitoring conducted at the four monitoring locations in the Project area, the average existing daytime and nighttime equivalent continuous sound levels (L_{eq}) in the area are 41 dBA and 37 dBA, respectively.

Q.11. Based on these results, did you establish a Project noise design goal?

A.11. Although there is a specific sound level limit for wind power projects within the Ohio Administrative Code, there is not one for solar power projects. For this project, we used a similar procedure established for wind projects. That is, the design threshold for non-participating sensitive receptors used in the assessment of the Project is the measured ambient sound level plus 5 dBA for daytime and nighttime periods. This sets the daytime design threshold at 46 dBA and the nighttime design threshold at 42 dBA.

Q.12. What did your modeling results indicate with respect to the projected sound levels when the Project is in operation?

A.12. Sound propagation modeling was conducted at the 184 sensitive receptors (180 non-participating and 4 participating) throughout the Project Area, using the inverter with the highest sound emissions under consideration, a representative substation transformer, and solar trackers which are all representative of the equipment that may be used for the Project. The modeling shows that all sensitive receptors are projected to be below the Project design goals. Notably, none of the non-participating sensitive receptors were modeled to receive a sound pressure level of over 36 dBA, which is below the daytime and nighttime project design thresholds of 46 and 42 dBA respectively. For comparison, a level of 36 dBA is comparable to existing background sound levels in the area and is perceived as approximately four times quieter than conversational speech.

Q.13. Can mitigation be utilized in the event an operational noise issue developed?

A.13. Yes. In the event an operational noise issue developed, noise barriers could be strategically placed next to inverters to mitigate sound from propagating in specific directions. Alternatively, some inverter manufacturers have additional noise mitigation elements that could be installed to reduce the sound from specific inverters that need it. While these mitigation options may be available, our assessment does not include these elements as they were not necessary to meet the design goal of ambient sound levels plus 5 dBA at non-participating receptors.

Q.14. Are there any other potential noise sources associated with the Project?

A.14. In addition to operational sound, a certain amount of unavoidable noise will be generated during construction. Construction activities include road construction,

substation construction, trenching, inverter installation, piling, and racking. In any given area, construction will be relatively short in duration, particularly for road construction, trenching, piling, and racking. Construction equipment will be fitted with exhaust systems and mufflers to reduce exhaust noise. In addition, the material staging areas will be located away from sensitive receptors when feasible. To the extent possible, circular vehicular movements will be established to minimize the use of back alarms.

In an effort to further mitigate construction noise, the Applicant has committed in the Application that construction will take place between 7 a.m. and 7 p.m., or until dusk when sunset occurs after 7 p.m., though limited construction that does not contribute to excess noise at sensitive receptors may occur outside of these hours. The Applicant also has committed to limiting pile driving operations to the hours of 9 a.m. to 7 p.m. or dusk, whichever is later. Extended pile driving hours will increase efficiency and reduce the total number of days necessary for pile driving activities. Facility setbacks assist in the mitigation of sound during construction as installation will mostly be at least 300 feet from non-participating sensitive receptors. The Applicant has also committed to keep equipment in good working conditions to minimize excess noise emissions.

Q.15. Have you reviewed the Staff Report issued on October 22, 2021, including the condition on pile driving?

A.15. Yes. I have reviewed the Staff Report and Condition 28 which addresses the impact of pile driving. Condition 28, as recommended by Staff, requires the Applicant to install a sound monitor in a representative location if pile driving is required between 7:00 a.m. and 9:00 a.m. and after 6:00 p.m. or until dusk (when sunset occurs after 6:00 p.m.) to catalog

that the noise impact at non-participating receptors is not greater than the daytime ambient Leq plus 10 dBA.

Q.16. Do you agree with Staff's recommendation?

A.16. While I understand the intent of Staff's condition, the condition should be revised, as also included in Ms. Hesch's testimony. The Applicant has already collected and presented sound data to Staff via Exhibit P and that can be utilized to create a map of areas where pile driving cannot occur between 7:00 a.m. and 9:00 a.m. Specifically, I recommend that the condition be revised as follows:

> General construction activities shall be limited to the hours of 7:00 a.m. to 7:00 p.m., or until dusk when sunset occurs after 7:00 p.m. Impact pile driving shall be limited to the hours between 9:00 a.m. and 6:00 p.m. Impact pile driving may occur between 7:00 a.m. and 9:00 a.m., and after 6:00 p.m. or until dusk when sunset occurs after 6:00 p.m., if the noise impact at non-participating receptors is not greater than daytime ambient Leq plus 10 dBA. ~~If impact pile driving is required between 7:00 a.m. and 9:00 a.m., and after 6:00 p.m. or until dusk when sunset occurs after 6:00 p.m., the Applicant shall install a noise monitor in a representative location to catalog that this threshold is not being exceeded.~~ Prior to pile driving activities, the Applicant will provide a map to Staff indicating areas where pile driving cannot occur between 7:00 a.m. and 9:00 a.m., based on the daytime ambient Leq plus 10 dBA from the sound data previously collected to support Exhibit P to the application. Hoe ram operations, if required, shall be limited to the hours between 10:00 a.m. and 4:00 p.m., Monday through Friday. Construction activities that do not involve noise increases above ambient levels at sensitive receptors are permitted outside of daylight hours when necessary. The Applicant shall notify property owners or affected tenants within the meaning of Ohio Adm.Code 4906-3-03(B)(2) of upcoming construction activities including potential for nighttime construction.

This condition language has been recently approved by the OPSB for the Sycamore Creek Solar Project (Case No. 20-1762-EL-BGN).

Q.17. Have you reviewed the Staff Report issued on October 22, 2021, including the condition on sound modeling?

A.17. Yes, I have reviewed the Staff Report and Recommendation and Condition 29 which addresses pre-construction sound modeling. Condition 29 as recommended by Staff requires the Applicant to conduct additional sound modeling if the sound power output for the transformer and inverters selected for the project are higher than the sound power output data used in my sound modeling (the results of which are included in the Application). If sound power output data is not available, Staff recommends that an operational noise test be done at one location to determine if operational sound levels are greater than the project area ambient Leq plus five dBA.

Q.18. Do you agree with Staff's recommendation?

A.18. While I understand the intent of Staff's condition, the condition should be revised as included in Ms. Hesch's testimony to provide more clarity and allow for modeling across the entire Project Area rather than a specific test at one site. If data is not available for the transformer that the Project selects, we can rely on the NEMA TR1 standard. However, if data is not available from the manufacturer for the inverters, the next best approach is to use sound power data from a similar model. Once the final inverter is installed, sound level measurements can be made in close proximity to the installed inverter to determine whether modeling is necessary using the actual sound level measurements. Specifically, I recommend as follows;

- If transformer manufacturer data is not available, the model will be updated with sound emission data following the NEMA TR1 standard.

- If inverter manufacturer data is not available, a similar inverter model will be used to update the sound propagation model prior to construction.
- Once constructed, sound level measurements will be made in close proximity to an inverter to determine the sound power level of the installed inverter. If the sound power level of the installed inverter is 2 dBA or more above the sound power level used in the updated pre-construction model, then the sound propagation model will be updated to ensure project-wide compliance with the applicable sound level limit. If the sound power level is determined to be less than 2 dBA above the sound power level used in the updated pre-construction model, then the project will be deemed in-compliance.

For those reasons, I agree with Mr. Hesch that Condition 29 should be revised as follows:

> If the inverters or substation transformer chosen for the project have a higher sound power output than the models used in the noise model, the Applicant shall submit, 30 days prior to construction, the results from an updated noise model for the project using the expected sound power output from the models chosen for the project, to show that sound levels will not exceed the project area average daytime ambient level of 41 dBA plus five dBA at any nonparticipating sensitive receptor. If transformer manufacturer data is not available, the model will be updated with sound emission data following the NEMA TR1 standard. If inverter manufacturer data is not available, a similar inverter model will be used to update the sound propagation model prior to construction. Once constructed, sound level measurements will be made in close proximity to the inverter to determine the sound power level of the installed inverter. If the sound power level of the installed inverter is 2 dBA or more above the sound power level used in the updated preconstruction model, then the sound propagation model will be updated to ensure project-wide compliance with the applicable sound level limit. If the sound power level is determined to be less than 2 dBA above the sound power level used in the updated preconstruction model, then the project will be deemed in-compliance. If the equipment chosen for the project are at the same (or lower) sound power outlet as the models used in the noise model, no further action is needed for compliance of this condition. ~~show that sound levels will not exceed the daytime ambient level plus five dBA at any non-participating sensitive receptor and will be submitted at least 30 days prior to construction. If noise data is not available from the inverter or transformer~~

~~manufacturer, an operational noise test may be performed to comply with this condition. The test must be performed on a sunny day between 10 a.m. and 2 p.m. in the months of May-August, at a distance equal to the minimum distance from an inverter to a non-participating residence. If the test shows the operational noise level is greater than project area ambient Leq level plus five dBA additional noise mitigation will be required. This condition is complied with if the test shows the operational noise level is equal or less than project area ambient Leq level plus five dBA. The Applicant shall file a report on the public docket that shows either 1) for the chosen inverter and substation transformer that sound levels will not exceed the daytime ambient level plus five dBA at any non-participating sensitive receptor or 2) results of the operational noise test showing that sound levels will not exceed the daytime ambient level plus five dBA at any non-participating sensitive receptor.~~

Again, this condition language has been recently approved by the OPSB for the Sycamore Creek Solar Project (Case No. 20-1762-EL-BGN).

Q.19. What are your overall conclusions regarding the potential noise impacts of the Project?

A.19. Based on the survey of the existing environmental sound levels in the vicinity of the proposed Project area and conservative projections of the Project's future sound emissions, operational sound from the Project, whether created during the day or night, should not result in an excess of the design threshold of existing ambient sound levels plus 5 dBA. Projected sound levels from the Project are no more than 36 dBA, which is comparable to existing background sound levels in the area. And, as I noted above, mitigation to inverters can be implemented in the event an operational noise issue develops.

Q.20. Does this conclude your direct testimony?

A.20. Yes, it does.

CERTIFICATE OF SERVICE

The Public Utilities Commission of Ohio's e-filing system will electronically serve notice of the filing of this document on the parties referenced on the service list of the docket card who have electronically subscribed to the case. In addition, the undersigned certifies that a courtesy copy of the foregoing document is also being served on the persons below via electronic mail on November 19, 2021 to:

/s/ Anna Sanyal
Anna Sanyal

Jodi Bair
jodi.bair@ohioattorneygeneral.gov

Thomas Shepherd
thomas.shepherd@ohioattorneygeneral.gov

Counsel for Staff of the Ohio Power Siting Board

Jack A. Van Kley
jvankley@vankleywalker.com

Counsel for Robert and Laurie Banks

Anneka P. Collins
acollins@hcprosecutor.org

Counsel for Dodson and Hamer Townships, Highland County, Ohio

Chad A. Endsley
cendsley@ofbf.org

Leah F. Curtis
lcurtis@ofbf.org

Amy M. Milam
amilam@ofbf.org

Attorneys for Ohio Farm Bureau Federation