

# Operational Noise Analysis of the Blue Creek Wind Farm Project

TO: Blue Creek Wind Farm Project Team  
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## Summary

This memorandum updates the noise analysis conducted for Blue Creek Wind Farm, LLC's proposed Blue Creek Wind Farm (the Facility) in Paulding and Van Wert counties, Ohio. This assessment is updated to reflect the revised layout consisting of 160 Gamesa G90 wind turbines (G-90) on 100 meter (328-foot) tall towers and the associated electrical substations. The expected operational noise levels predicted at residences within the Project area range from less than 30 decibels (A-weighted scale) (dBA) to 50.

## Methods

Sound level contours and individual predictions for every residences identified in the project area were developed. Standard acoustical engineering methods were used in this analysis. The noise propagation factors used were adopted from ISO 9613-2, *Acoustics – Sound Attenuation During Propagation Outdoors, Part 2: General Method of Calculation* (International Organization for Standardization [ISO], 1993) and VDI 2714, *Outdoor Sound Propagation* (Verein Deutscher Ingenieure [VDI], 1988). Atmospheric absorption for conditions of 10°Celsius (50°Fahrenheit) and 70 percent relative humidity (conditions that favor propagation) was computed in accordance with ISO 9613-1, *Acoustics – Sound Attenuation During Propagation Outdoors, Part 1: Calculation of the Absorption of Sound by the Atmosphere* (ISO, 1993).

Each Gamesa wind turbine was specified to have an overall noise power level of 106.4 dBA and was modeled on an octave band basis for the nine standard octave bands from 31.5 to 8,000 Hz. This overall noise power level represents the maximum turbine noise level determined in accordance with IEC 61400-11, *Wind Turbine Generator Systems – Part 11: Acoustic Noise Measurement Techniques* (International Electrotechnical Commission [IEC], 2006). This maximum sound power level used in this analysis is realized at wind speeds of 6 meters per second (m/s) (13.4 mph) or greater. The 6 m/s wind speed is referenced to a 10 meter (32.8-foot) height, which is equivalent to a hub height wind speed of 8.7 m/s (19.5 mph) in accordance with the IEC 61400-11 standard. Consistent with previous data requests, a hard and fully reflective ground factor of  $G=0.0$  in ISO 9613-2 was used.

Atmospheric propagation is not strongly dependent on temperature, and the 70 percent relative humidity is a representative of favorable propagation (that is, higher predicted project sound levels). All results are expressed in terms of the average sound pressure level,  $L_{eq}$ .

It should be noted that when winds are slower than those that correspond to maximum noise emissions, the sound levels will be less.

Three Facility substations, each with a maximum sound power level of 100 dBA, were also included in the analysis.

## Operational Noise Levels

The cumulative level from all turbines and the substation operating at their maximum sound power levels is presented in the following attachments:

- Model results (Table A-1 and Table A-2)
- Noise sensitive receptor coordinates (identified residential structures, schools, hospitals, nursing homes, assisted living and healthcare facilities, religious institutions, and public libraries) (Table A-1)
- Source coordinates (Table A-3)
- Predicted sound level contour maps (Figure A-1)

The range in expected operational noise levels presented in Attachment A varies from less than 30 dBA to 50 dBA. Table A-4 summarizes the number of receptors within specific sound pressure level ranges.

TABLE A-4  
Summary of Predicted Project Sound Levels

Sound Level	Number of Receptors
50 dBA	22
47 to 49 dBA	225
44 to 46 dBA	231
41 to 44 dBA	144

## References

International Electrotechnical Commission (IEC). 2006. *Wind Turbine Generator Systems – Part 11: Acoustic Noise Measurement Techniques – Amendment 1*. International Standard 61400-11. Geneva, Switzerland.

International Organization for Standardization (ISO). 1993. *Acoustics – Sound Attenuation During Propagation Outdoors*. Part 1: Calculation of the Absorption of Sound by the Atmosphere. Part 2: General Method of Calculation. ISO 9613. Switzerland.

Verein Deutscher Ingenieure (VDI). 1988. *Outdoor Sound Propagation*. VDI 2714, Verlag GmbH, Dusseldorf, Beuth Verlag, Berlin, Koln, Germany.

**Attachment A**

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