

## Evaluation of Existing Ambient Sound Levels within the Blue Creek Wind Farm Project Area

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This memorandum presents an expanded evaluation of the measured ambient sound levels within the Blue Creek Wind Farm Project area. As indicated in the April 30, 2010 memorandum "Ambient Sound Survey of the Blue Creek Wind Farm Project Area" (included as Attachment A to this memorandum), existing ambient sound levels were found to generally increase with increasing wind speed. This is also true of wind turbine sound emissions. Recent decisions from the Ohio Power Siting Board (OPSB) indicate that the average existing ambient sound level ( $L_{eq}$ ) at various wind speeds should be evaluated in conjunction with the corresponding turbine sound level to determine the period when the potential for the greatest differential may occur. This was the "critical wind speed," which may occur at wind speeds other than those corresponding to maximum turbine sound emissions. Table 1 indicates the rate at which the Gamesa G90 wind turbine sound levels vary with wind speed.

TABLE 1  
 Gamesa G90 Sound Power Levels Versus Wind Speed

Wind Speed at 100 meter Height (m/s)	Sound Power Level (dBA)
4.3	92.8
5.8	98.1
7.2	103.0
8.7	106.4
10.1	106.4
11.6	106.4
13	106.4

m/s = meters per second

The turbine sound power level does not continue to increase with increasing wind speed above hub height (100 meter) winds of 8.7 m/s. It is for this reason that this analysis focuses on the wind speeds of interest: 4.3, 5.8, 7.2 and 8.7 m/s. While the measured ambient sound levels were found to vary over a wide range, an average level may be established through a regression analysis of the sound level versus wind speed data or by evaluating the sound levels for each wind speed. This analysis used linear regressions to determine the

representative sound level for each wind speed of interest. The plots are included in Attachment B.

Table 2 presents the results for both day and nighttime periods for each of the monitoring locations, as well as the site wide average of all sites. The site-wide average (Blue Creek Project) was determined by evaluating the regression when the individual data datasets from all of the measurement locations were combined.

TABLE 2  
Measured Sound Levels at Reference Speeds (in dBA)

Monitor Location	Monitoring Period	Sound Level Metric	Wind Speed at Hub Height (m/s)			
			4.3	5.8	7.2	8.7
H91	Day	L <sub>eq</sub>	42.4	43.7	44.9	46.3
	Night	L <sub>eq</sub>	44.5	44.4	44.3	44.2
H139	Day	L <sub>eq</sub>	40.4	41.3	42.2	43.1
	Night	L <sub>eq</sub>	36.8	37.7	38.5	39.4
H141	Day	L <sub>eq</sub>	41.8	42.3	42.7	43.2
	Night	L <sub>eq</sub>	34.8	35.8	36.8	37.8
H171	Day	L <sub>eq</sub>	50.9	51.4	51.9	52.3
	Night	L <sub>eq</sub>	46.5	47.3	48.1	48.7
H240	Day	L <sub>eq</sub>	39.3	40.9	42.4	44.1
	Night	L <sub>eq</sub>	32.8	35.4	37.8	40.3
H248	Day	L <sub>eq</sub>	37.8	39.2	40.5	42.0
	Night	L <sub>eq</sub>	30.9	33.3	35.6	38.1
H393	Day	L <sub>eq</sub>	42.6	43.7	44.7	45.4
	Night	L <sub>eq</sub>	39.6	40.6	41.5	42.2
H455	Day	L <sub>eq</sub>	40.3	41.5	42.6	43.7
	Night	L <sub>eq</sub>	37.8	39.3	40.7	42.1
H534	Day	L <sub>eq</sub>	47.2	47.9	48.4	49.1
	Night	L <sub>eq</sub>	44.2	45.0	45.7	46.5
<b>Blue Creek Project</b>	<b>Day</b>	<b>L<sub>eq</sub></b>	<b>42.5</b>	<b>43.6</b>	<b>44.6</b>	<b>45.6</b>
	<b>Night</b>	<b>L<sub>eq</sub></b>	<b>38.6</b>	<b>39.9</b>	<b>41.0</b>	<b>42.3</b>

Table 3 summarizes the evaluation of critical wind speed focused on quieter nighttime periods. As indicated in Table 3, the overall critical wind speed was determined to coincide with the wind speed at which the maximum turbine sound emissions are achieved. As indicated in Table 3, the critical wind speed was determined to be 8.7 m/s, which coincides with the maximum turbine sound power level. The baseline average ambient  $L_{eq}$  at this wind speed was determined to be 42 dBA.

**TABLE 3**  
Critical Wind Speed Evaluation (in dBA)

	Wind Speed at Hub Height (m/s)			
	4.3	5.8	7.2	8.7
G90 Sound Power Level	92.8	98.1	103	106.4
Blue Creek Project Nighttime $L_{eq}$	38.6	39.9	41.0	42.3
Differential	54.2	58.2	62.0	64.1

**Attachment A**

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**Attachment B**

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