APPENDIX A NOISE IMPACT ASSESSMENT ISSUE E

GL Garrad Hassan

RENEWABLE ENERGY APPROVAL APPLICATION - NOISE IMPACT ASSESSMENT

ERNESTOWN WIND POWER PROJECT, ONTARIO

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Author

A. Brunskill

Checked by

S. Dokouzian, D. Boudreau, M. Roberge, A. Nercessian

Approved by

D. Eaton

GL Garrad Hassan Canada, Inc.

151 Slater Street, Suite 806, Ottawa, Ontario CANADA
Phone: (613) 230-3787 | Fax: (613) 230-1742
www.gl-garradhassan.com

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REVISION HISTORY

Issue	Issue Date	Summary
A	13 July 2012	Original release
B	28 September 2012	Revision of turbine labels and addition of one receptor
C	3 October 2012	Added statement and reference for the tonality of the E-92
D	18 December 2012	Added guarantee letter from Enercon. Removed transformer from the noise model. Added neighbouring solar farms to the noise model. Added concordance table.
E	5 June 2013	Revised to consider Enercon E82 2.0 MW turbine.

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1 INTRODUCTION

GL Garrad Hassan Canada, Inc. ("GL GH") was retained by Ernestown Windpark LP ("Client" or "EWLP") to prepare a Noise Impact Assessment ("NIA") of the Ernestown Wind Power Project (the "Project") in accordance with the Ontario Regulation 359/09 (Renewable Energy Approvals (REA) under Part V.0.1 of the Ontario Environmental Protection Act (EPA)) [1]. This NIA also follows the Ontario Ministry of the Environment (MOE) 2008 NPC Noise Interpretation Guidelines [2].

The proposed Ernestown Wind Power Project is located in southern Ontario, in the Township of Loyalist, Lennox Addington, Ontario.

The layout being evaluated is comprised of five (5) E82 2.0 MW turbines manufactured by Enercon. A substation transformer will not be used for the Ernestown Wind Farm.

The objective of this assessment is twofold:

- Confirm the sound level limit requirements for the Project by providing an assessment of the existing baseline environmental noise conditions in the vicinity of the wind farm; and
- Predict the noise levels generated by the Project at all Points of Reception, Participants and Vacant Lot Receptors within 1,500 m of the turbines.

2 GENERAL DESCRIPTION OF PROJECT SITE

2.1 General Characteristics

The proposed Ernestown Wind Power Project is located in southern Ontario, in the Township of Loyalist, Lennox Addington, Ontario. More specifically, the Project is located south of Caton and Millhaven Road, east of County Road 4, north of Taylor Kidd Boulevard and approximately 2.5 km west of County Road 6. The participating lots that comprise the Project Location occupy a total of approximately 270 ha. Project components will be installed on privately-owned agricultural lots within this area.

The Project has been configured using five (5) E82 2.0 MW turbines manufactured by Enercon. The wind turbines have been sited on lands that the Client holds with access rights through leases. It is anticipated that the Projects collection system may be partially located on public rights-of-ways.

Energy generated by the Project will be collected via overhead or underground lines and directed to a switching station located at the southern end of the site. The project's collection system will connect to a Hydro One owned 44kV distribution line located on Taylor Kidd Boulevard.

The landscape in the study area is predominantly characterized as a typical southeastern Ontario landscape with rural single family residences, agricultural fields and associated farms punctuated with numerous hedgerows, isolated woodlands, and the occasional watercourse feature. Photographs included in Figure 2-1 show typical views of the land and features of the study area.

Figure 2-1: Land Features of the Ernestown Wind Power Project

2.2 Land Use Description

The Project is located within the Township of Loyalist in the County of Lennox Addington, Ontario. The Township of Loyalist is a community of 15,000 + situated on the north shores of Lake Ontario between the Town of Greater Napanee and the City of Kingston. The township is a blend of rural and urban areas with a number of smaller hamlets throughout. The County of Lennox Addington covers approximately 2,777 square kilometres, stretching from Lake Ontario northward to over 130 km to Renfrew County.

Agriculture is a predominant economic activity and land use throughout the Township of Loyalist and the County of Lennox Addington. Properties surrounding the Project are characterized as low-medium density residential while also including a number of agricultural operations. Other land use within the study area, specifically adjacent to Taylor Kidd Boulevard includes recreational, commercial, and industrial uses. Primary access to the Project will predominantly be from frequently travelled municipal roads. A municipal zoning map of the project area is shown in Appendix A.

2.3 Points of Reception

Receptor locations (i.e. Points of Reception) for the Project were identified by GL GH using base data from recent aerial photos obtained from the Client, and field reconnaissance to verify locations and building types. Field reconnaissance was completed by GL GH in February 2012. The height of each Point of Reception – taken to be 1.5 m and 4.5 m for one-storey and two-storey houses respectively – was also noted. All Points of Reception, as per the definition of the MOE, were considered in this NIA.

The MOE Noise Guidelines [2] generally define a Point of Reception (POR) as a house, campground, church, school or other sensitive building that is not located on the same premises as the wind farm, including its turbines and ancillary structures. Points of Reception can also include locations on vacant lots that have residences as a permitted use; in this case GL GH has placed a Vacant Lot Receptor (VLR) on such lots in a location that is consistent with the building pattern in the area, as per the O. Reg. 359/09 and the Ontario MOE Noise Guidelines. The default height of a VLR is 4.5 m.

A residence or VLR located on the same premises as the wind turbine(s) or other Project infrastructure is not a Point of Reception as defined by the MOE noise guidelines, and considered a "Participating Receptor" and thus MOE noise limits do not apply. The Client provided GL GH with the location of infrastructure planned for the project, and specified the lots which can be considered as participating.

The coordinates of each of the Points of Reception, Participants and Vacant Lot Receptors are listed in Appendix C and Appendix D, respectively.

3 DESCRIPTION OF POINTS OF RECEPTION

There are a total of 98 Points of Reception (PoR) located within a radius 1,500 m of a wind turbine, among which 20 are Vacant Lot Receptors (VLRs) and 78 are dwellings or other sensitive receptors such as churches and cemeteries. There are two (2) dwellings considered as Participants.

3.1 Receptor Classes

The MOE categorizes Points of Reception into three classes: 1, 2, and 3. Class 1 refers to an acoustic environment typical of a major population centre where the background noise is dominated by the urban hum. These areas are highly urbanized and have moderate to high noise levels throughout the day and night. Class 2 areas have an acoustic environment characterized by low ambient sound levels between 19:00 and 07:00, whereby the evening and night time levels are defined by natural sounds, infrequent human activity and no clearly audible sounds from stationary sources (e.g. industrial and commercial facilities). Class 3 areas are typical of rural and/or small communities (i.e. with populations of less than 1000) and an acoustic environment that is dominated by natural sounds with little or no road traffic.

Within the study area the main sources of ambient sound that currently exist include:

- Vehicular traffic on the local concession and side roads, some of which are gravel roads;
- Occasional sounds due to agricultural activities;
- Occasional sounds due to anthropogenic domestic activities; and
- Natural sounds.

Based on these conditions, **all Points of Reception are considered as having a Class 3 acoustic environment.**

3.2 Determination of Applicable Noise Limits

As stated in the MOE guidelines, the noise limits for a wind farm are set according to the existing MOE noise guidelines in NPC-205/NPC-232 while taking into account the wind-generated background noise.

For a Class 3 area, the sound level limits as defined by the MOE Interpretation are described in the sections below.

3.2.1 Wind Turbine Installations in Class 3 Areas (Rural), Wind Speeds Below 6 m/s

The lowest sound level limit expressed in terms of L_{eq} is: i) 40 dB(A); or ii) the minimum hourly background sound level established in accordance with Publications NPC-232/NPC-233, whichever is higher.

3.2.2 Class 3 Areas, Wind Speeds Above 6 m/s

The lowest sound level limit expressed in terms of L_{eq} is: i) the wind-induced background sound level, expressed in terms of ninetieth percentile sound level (L_{A90}) plus 7 dB; or ii) the minimum hourly background sound level established in accordance with Publications NPC-205/NPC-232/NPC-233, whichever is higher.

The applicable noise limits should be those defined by the MOE as summarized below in Table 3-1. A sample calculation of how noise modeling was determined for each Point of Reception appears in Appendix B where intermediate and cumulative A-weighted sound pressure levels from each noise source are provided.

Table 3-1: Summary of noise limits for Points of Reception (Class 3)

Wind Turbine Noise Criterion NPC-232 [dB(A)]	**Wind Speed [m/s]**				
	6	**7**	**8**	**9**	**10**
	40	43	45	49	51

4 DESCRIPTION OF SOURCES

4.1 Turbine Description

The proposed Enercon E82 2.0 MW turbine is a 3-bladed, upwind, horizontal-axis turbine. The total rotor diameter of the turbine is 82 m, resulting in a swept area of 5,281 m^2, and is designed to operate at between 6 and 18 revolutions per minute (rpm). The turbine rotor and nacelle are mounted on top of a 98 m tubular tower which is manufactured in sections from steel plate.

Table 4-1 presents the general specifications of the wind turbine.

Table 4-1: Turbine description – Enercon E82 2.0 MW

Model	**E82 2.0 MW**
Rated power	2.0 MW
Hub height	98 m
Rotor diameter	82 m
Rotor swept area	5,281 m^2
Operational interval	6 – 18 rpm
Number of blades	3
Cut-in wind speed	3 m/s
Cut-out wind speed	25 m/s
Nominal wind speed	11 m/s

Full noise specifications as provided by the manufacturer can be found in Appendix E. Coordinates of all turbines are listed in Appendix F.

The layout being evaluated consists of 5 Enercon E82 2.0 MW turbines. According to the Client, the collector system will connect to a switching station rather than a substation. According to the MOE, switching stations are not considered to be significant noise sources [2], and therefore have not been modeled in this analysis.

4.2 Other Wind Farms

It should be noted that no adjacent wind farms in operation or under development within 5 km of the project are to be considered for this NIA. The proposed Amherst Island Wind Farm, currently under development, is greater than 5 km from the nearest Ernestown turbine.

4.3 Neighbouring Solar Farms

There are four proposed solar farms in the area.

Axio Power Canada Inc./SunEdison Canada have submitted to the Ministry of the Environment a Noise Impact Assessment Report for the Napanee TS Taylor Kidd Solar Energy Project [3], which is a proposed 10 MW solar farm. This solar farm is planned for an area immediately adjacent to the proposed Ernestown Wind Farm. The significant noise sources associated with this solar farm consist of ten inverter units and one substation. For each source, octave band sound power levels and coordinates and heights of these components were taken from the Napanee TS Taylor Kidd Solar Energy Project Noise Impact Assessment [3]. As specified in [3], the mitigating effects of an enclosure equipped with acoustical louvers have been considered when modeling the noise from each inverter unit.

SunEdison Canada has submitted to the Ministry of the Environment a Noise Impact Assessment Report for the Kingston Gardiner Hwy 2 South Solar Energy Project [4], which is a 10 MW solar farm. This proposed solar farm is planned for a location approximately 4.6 km from the proposed Ernestown Wind Farm. The significant noise sources associated with this solar farm consist of ten inverter units and one substation. For each source, octave band sound power levels and coordinates and heights of these components were taken from the Kingston Gardiner Hwy 2 South Solar Energy Project Noise Impact Assessment [4]. As specified in [4], the mitigating effects of an enclosure equipped with acoustical louvers have been considered when modeling the noise from each inverter. Additionally, as specified, a noise barrier has been modeled near the substation. Details regarding the noise barrier, including dimensions and coordinates, can be found in [4].

SunEdison Canada has submitted to the Ministry of the Environment a Noise Impact Assessment Report for the Kingston Gardiner TS Odessa Solar Energy Project [5], which is a 10 MW solar farm. This proposed solar farm is planned for a location approximately 4.8 km from the proposed Ernestown Wind Farm. The significant noise sources associated with this solar farm consist of ten inverters and one substation. For each source, octave band sound power levels and coordinates and heights of these components were taken from the Kingston Gardiner TS Odessa Solar Energy Project Noise Impact Assessment [5]. As specified, the mitigating effects of an enclosure equipped with acoustical louvers have been considered when modeling the noise from each inverter. Additionally, as specified, a noise barrier has been modeled near the substation. Details regarding the noise barrier, including dimensions and coordinates, can be found in [5].

Kingston Solar LP has submitted to the Ministry of the Environment a Noise Impact Assessment Report for the Sol-Luce Kingston Solar PV Energy Project, which is a 100 MW solar farm [6]. This proposed solar farm is located approximately 5.3 km from the proposed Ernestown Wind Farm. Due to the large distance between Ernestown Wind Farm and this solar project, the noise contribution from this solar farm has not been considered as part of this assessment.

5 NOISE EMISSION RATINGS

5.1 Noise Emission Rating of the Turbines

Broadband [7] and octave band [8] sound power levels of the E82 2.0 MW wind turbine were provided by the manufacturer and are shown in Appendix E. Measurements were made in accordance with the IEC 61400 – 11 Ed. 2.1 method [9] using standardized wind speeds at 10 m height [8]. The worst case octave band and broadband sound power levels of the turbine were retained for the purpose of the noise impact assessment to account for summer night-time shear.

Enercon has provided broadband and octave band sound power levels corresponding to 10 m height wind speeds of 6, 7, 8, 9, and 10 m/s. For each wind speed, the octave band values in the measurement report [8] have been scaled up such that the broadband value calculated from the octave band values is equal to the broadband value specified by Enercon in [7].

GL GH has determined that the octave band sound power levels corresponding to a 10 m wind speed of 7 m/s result in the greatest sound pressure level at all receptors. Therefore, the E82 2.0 MW octave band sound power levels used for the simulation in this NIA are those stated for each octave band centre frequency, for a 10 m height wind speed of 7 m/s. The acoustic emissions of the turbine under consideration are shown in Table 5-1.

A tonal audibility of $\Delta L_{a,k} < 2$ dB can be expected over the whole operational range (valid in the near vicinity of the turbine according to IEC 61400-11 ed.2) [7].

Table 5-1: E82 2.0 Wind Turbine Acoustic Emission Summary

Make and Model : Enercon E82 2.0 MW										
Electrical Rating : 2.0 MW										
Hub Height (m) : 98 m										
Wind Shear Coefficient : 0.35, typical summer night time shear of the region										
	Octave Band Sound Power Level [dB]									
	Manufacturer's Emission Levels					Adjusted Emission Levels				
Wind Speed [m/s]	6	7	8	9	10	6	7	8	9	10
Frequency [Hz]										
63	113.5	113.8	112.6	112.7	112.9	113.8	113.8	113.8	113.8	113.8
125	108.6	109.7	109.8	110.6	110.8	109.7	109.7	109.7	109.7	109.7
250	102.2	103.6	104.0	103.6	102.9	103.6	103.6	103.6	103.6	103.6
500	99.2	101.4	101.5	101.3	100.6	101.4	101.4	101.4	101.4	101.4
1000	96.7	98.8	98.5	98.6	98.8	98.8	98.8	98.8	98.8	98.8
2000	89.2	91.8	92.1	92.2	93.6	91.8	91.8	91.8	91.8	91.8
4000	76.4	78.7	79.6	80.4	82.4	78.7	78.7	78.7	78.7	78.7
8000	78.5	80.0	76.0	75.8	76.6	80.0	80.0	80.0	80.0	80.0

A-weighted	101.6	103.5	103.5	103.5	103.5	103.5	103.5	103.5	103.5	103.5

5.2 Noise Emission Rating of the Neighbouring Solar Farm Components

Noise emitted by three neighbouring solar farms has been modeled in this report, as described in Section 4.3. Specifically, these include the Napanee TS Taylor Kidd Solar Energy Project, the Kingston Gardiner Hwy 2 South Solar Energy Project, and the Kingston Gardiner TS Odessa Solar Energy Project. Each solar farm has a single substation and ten inverter units. All three farms will have identically rated components; that is, the noise emission ratings from all three substations are identical, and the noise emission ratings from all thirty inverter units are identical.

Broadband sound power levels and octave band sound power levels of each substation and inverter were obtained from the Noise Impact Assessment of each solar farm [3] [4] [5] and are shown in Table 5-2 and Table 5-3, respectively. A tonality penalty of 5 dBA has been applied to the sound power levels of both the transformer and the inverter. The reported octave band sound power levels from the inverter have been adjusted to consider the louver, as described in [3].

Table 5-2: Neighbouring solar farm substation transformer sound power level

	Octave Band Sound Power Level* (dBA)									
Frequency (Hz)	32	63	125	250	500	1000	2000	4000	8000	Broadband
PWL (dBA)	48.0	67.2	79.3	81.8	87.2	84.4	80.6	75.4	66.3	90.8

* Includes 5 dBA penalty to account for tonality

Table 5-3: Neighbouring solar farm inverter sound power level, including the mitigating effects of the louvers

	Octave Band Sound Power Level* (dBA)									
Frequency (Hz)	32	63	125	250	500	1000	2000	4000	8000	Broadband
PWL (dBA)	N/A	59.8	73.9	86	80.6	72.1	74.6	84.9	70.4	89.6

* Includes 5 dBA penalty to account for tonality

6 NOISE IMPACT ASSESSMENT

The sound pressure levels at each Point of Reception, Participant and VLR for the aggregate of all wind turbines and substation associated with the Project were calculated based on the ISO 9613-2 method.

The ISO 9613 standard [10] [11] provides a prediction of the equivalent continuous A-weighted sound pressure level at a distance from one or more point sources under meteorological conditions favourable to propagation from sources of sound emission. These conditions are for downwind propagation or, equivalently, propagation under a well-developed moderate ground-based temperature inversion, commonly occurring at night.

The method consists of octave-band algorithms (i.e., with nominal mid-band frequencies from 63 Hz to 8 kHz) for calculating the attenuation of the emitted sound. The algorithm takes into account the following physical effects:

- Geometrical divergence – attenuation due to spherical spreading from the sound source;
- Atmospheric absorption – attenuation due to absorption by the atmosphere; and
- Ground effect – attenuation due to the acoustical properties of the ground.

ISO-9613-2 parameters were set as follows:

- Ambient air temperature: 10ºC;
- Ambient barometric pressure: 101.32 kPa;
- Humidity: 70%;
- Source ground factor: 0.7;
- Middle ground factor: 0.7;
- Receptor ground factor: 0.7; and
- The effect of topography was considered.

Additional calculations concerning propagation through foliage were not performed in this NIA, implying that the values calculated for sound attenuation are likely to be conservative in areas where there is foliage present in the line of sight between any turbine and a Point of Reception. The estimated accuracy of the ISO 9613 method, as stated in ISO 9613-2, is ± 3 dB.

The wind turbine, inverter and substation noise emission ratings used for each octave band were those specified in Table 5-1, Table 5-2, and Table 5-3. The noise impact was calculated for each Point of Reception and Participant located within 1,500 m of one or more turbines or substation, and the calculated noise level was then compared with the applicable noise limit for each Point of Reception as stated in Table 3-1.

Noise levels were calculated at 4.5 m agl for 2-storey Points of Reception/Participants respectively, and at 1.5 m agl at 16 points along a 30 m radius circle for each 1-storey Point of Reception/Participant. For the latter, the highest of these 16 values was chosen and presented in the table of noise levels.

7 NOISE IMPACT ASSESSMENT SUMMARY TABLE

7.1 Results

The noise level at each critical Point of Reception within 1,500 m of any turbine of the Project, for wind speeds between 6 m/s and 10 m/s, is tabulated in Table 7-1. For each Point of Reception, the following information is provided:

- The distance to the closest wind turbine;
- For Points of Reception at 1.5 m agl, the sound pressure level presented for wind speeds from 6 m/s to 10 m/s is the maximum noise level on the circumference of a 30-m radius circle centered on the Point of Reception;
- For Points of Reception at 4.5 m, the sound pressure level presented for wind speeds from 6 m/s to 10 m/s is the noise level at the Point of Reception location at its height;
- The sound level limit for that Point of Reception according to the MOE noise guidelines at each wind speed from 6 m/s to 10 m/s;
- The applicable background sound level; and
- Whether or not the noise levels at the Point of Reception comply with the MOE guidelines (for continued reference, compliance is confirmed for all Points of Reception).

The closest distance between a wind turbine and a Point of Reception for this project is 611 m between Turbine T4 and receptor 205, and 625 m between turbine T3 and VLR 258.

The highest calculated noise levels were found at dwelling R205 at 39.9 dB(A) and at VLR258 at 38.5 dB(A).

The results show that the Ernestown Wind Power Project complies with the applicable MOE environmental noise guidelines at all wind speeds modelled (i.e., 6, 7, 8, 9 and 10 m/s). Noise iso-contour maps illustrating the maximum noise contribution of the Ernestown Wind Power Project are shown in Appendix A.

Similarly, the maximum noise level at each Participant within 1,500 m of any turbine is tabulated in Table 7-2.

Table 7-3 is a concordance table showing the noise level contributions from the Ernestown Wind Farm and the Napanee TS Taylor Kidd Solar Farm.

Table 7-1: Noise Impact Assessment Summary

Point of Reception ID	Receptor Height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Receptor [dB(A)] at selected Wind Speed in m/s					Sound Level Limit [dB(A)] at Selected Wind Speed in m/s					Applicable Background Sound Level	Compliance With Limit (Yes/No)
				6 or <	7	8	9	10	6 or <	7	8	9	10	NPC 232 (C 3)	
R8	4.5	1417	1	29.2	29.2	29.2	29.2	29.2	40	43	45	49	51	40	Yes
R9	1.5	1392	1	27.6	27.6	27.6	27.6	27.6	40	43	45	49	51	40	Yes
R10	1.5	1328	1	28.0	28.0	28.0	28.0	28.0	40	43	45	49	51	40	Yes
R11	4.5	1223	1	30.5	30.5	30.5	30.5	30.5	40	43	45	49	51	40	Yes
R12	1.5	1177	1	29.1	29.1	29.1	29.1	29.1	40	43	45	49	51	40	Yes
R13	1.5	1142	1	29.4	29.4	29.4	29.4	29.4	40	43	45	49	51	40	Yes
R14	4.5	1099	1	31.5	31.5	31.5	31.5	31.5	40	43	45	49	51	40	Yes
R15	1.5	1059	1	30.2	30.2	30.2	30.2	30.2	40	43	45	49	51	40	Yes
R16	1.5	1096	1	29.8	29.8	29.8	29.8	29.8	40	43	45	49	51	40	Yes
R17	4.5	1057	1	31.9	31.9	31.9	31.9	31.9	40	43	45	49	51	40	Yes
R18	4.5	996	1	32.4	32.4	32.4	32.4	32.4	40	43	45	49	51	40	Yes
R19	4.5	971	1	32.6	32.6	32.6	32.6	32.6	40	43	45	49	51	40	Yes
R20	4.5	1012	1	32.3	32.3	32.3	32.3	32.3	40	43	45	49	51	40	Yes
R21	1.5	1001	1	30.8	30.8	30.8	30.8	30.8	40	43	45	49	51	40	Yes
R22	4.5	944	1	32.9	32.9	32.9	32.9	32.9	40	43	45	49	51	40	Yes
R23	4.5	912	1	33.2	33.2	33.2	33.2	33.2	40	43	45	49	51	40	Yes
R24	1.5	900	1	31.8	31.8	31.8	31.8	31.8	40	43	45	49	51	40	Yes
R25	4.5	1062	1	31.9	31.9	31.9	31.9	31.9	40	43	45	49	51	40	Yes
R26	4.5	1119	1	31.4	31.4	31.4	31.4	31.4	40	43	45	49	51	40	Yes
R27	1.5	1164	1	29.4	29.4	29.4	29.4	29.4	40	43	45	49	51	40	Yes
R28	1.5	1222	1	28.9	28.9	28.9	28.9	28.9	40	43	45	49	51	40	Yes
R29	4.5	1294	1	30.1	30.1	30.1	30.1	30.1	40	43	45	49	51	40	Yes
R30	1.5	1338	1	28.1	28.1	28.1	28.1	28.1	40	43	45	49	51	40	Yes
R31	4.5	1371	1	29.6	29.6	29.6	29.6	29.6	40	43	45	49	51	40	Yes
R32	1.5	1409	1	27.6	27.6	27.6	27.6	27.6	40	43	45	49	51	40	Yes
R33	1.5	1444	1	27.3	27.3	27.3	27.3	27.3	40	43	45	49	51	40	Yes
R34	1.5	1481	1	27.1	27.1	27.1	27.1	27.1	40	43	45	49	51	40	Yes

Point of Reception ID	Receptor Height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Receptor [dB(A)] at selected Wind Speed in m/s					Sound Level Limit [dB(A)] at Selected Wind Speed in m/s					Applicable Background Sound Level	Compliance With Limit (Yes/No)
				6 or <	7	8	9	10	6 or <	7	8	9	10	NPC 232 (C 3)	
R47	1.5	854	1	32.4	32.4	32.4	32.4	32.4	40	43	45	49	51	40	Yes
R48	4.5	829	1	34.2	34.2	34.2	34.2	34.2	40	43	45	49	51	40	Yes
R49	4.5	791	1	34.7	34.7	34.7	34.7	34.7	40	43	45	49	51	40	Yes
R50	1.5	792	1	33.3	33.3	33.3	33.3	33.3	40	43	45	49	51	40	Yes
R51	1.5	788	1	33.4	33.4	33.4	33.4	33.4	40	43	45	49	51	40	Yes
R52	4.5	791	1	35.0	35.0	35.0	35.0	35.0	40	43	45	49	51	40	Yes
R53	1.5	796	1	33.8	33.8	33.8	33.8	33.8	40	43	45	49	51	40	Yes
R54	1.5	922	1	32.6	32.6	32.6	32.6	32.6	40	43	45	49	51	40	Yes
R56	1.5	1021	1	31.6	31.6	31.6	31.6	31.6	40	43	45	49	51	40	Yes
R57	1.5	1070	1	31.3	31.3	31.3	31.3	31.3	40	43	45	49	51	40	Yes
R58	4.5	1028	1	33.6	33.6	33.6	33.6	33.6	40	43	45	49	51	40	Yes
R59	1.5	906	1	33.5	33.5	33.5	33.5	33.5	40	43	45	49	51	40	Yes
R60	4.5	916	2	34.7	34.7	34.7	34.7	34.7	40	43	45	49	51	40	Yes
R61	4.5	975	2	34.1	34.1	34.1	34.1	34.1	40	43	45	49	51	40	Yes
R62	1.5	971	2	32.4	32.4	32.4	32.4	32.4	40	43	45	49	51	40	Yes
R63	1.5	948	2	32.4	32.4	32.4	32.4	32.4	40	43	45	49	51	40	Yes
R65	4.5	783	2	35.4	35.4	35.4	35.4	35.4	40	43	45	49	51	40	Yes
R66	4.5	867	2	34.4	34.4	34.4	34.4	34.4	40	43	45	49	51	40	Yes
R67	1.5	972	2	31.4	31.4	31.4	31.4	31.4	40	43	45	49	51	40	Yes
R68	4.5	885	2	33.9	33.9	33.9	33.9	33.9	40	43	45	49	51	40	Yes
R69	4.5	901	2	33.8	33.8	33.8	33.8	33.8	40	43	45	49	51	40	Yes
R70	4.5	842	2	34.5	34.5	34.5	34.5	34.5	40	43	45	49	51	40	Yes
R71	4.5	815	2	34.6	34.6	34.6	34.6	34.6	40	43	45	49	51	40	Yes
R72	1.5	992	2	31.3	31.3	31.3	31.3	31.3	40	43	45	49	51	40	Yes
R73	4.5	1002	2	32.7	32.7	32.7	32.7	32.7	40	43	45	49	51	40	Yes
R74	1.5	925	2	31.8	31.8	31.8	31.8	31.8	40	43	45	49	51	40	Yes
R75	4.5	949	2	33.1	33.1	33.1	33.1	33.1	40	43	45	49	51	40	Yes
R76	4.5	938	2	33.2	33.2	33.2	33.2	33.2	40	43	45	49	51	40	Yes
R77	1.5	955	2	31.4	31.4	31.4	31.4	31.4	40	43	45	49	51	40	Yes

Point of Reception ID	Receptor Height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Receptor [dB(A)] at selected Wind Speed in m/s					Sound Level Limit [dB(A)] at Selected Wind Speed in m/s					Applicable Background Sound Level	Compliance With Limit (Yes/No)
				6 or <	7	8	9	10	6 or <	7	8	9	10	NPC 232 (C 3)	
R78	1.5	1081	2	30.3	30.3	30.3	30.3	30.3	40	43	45	49	51	40	Yes
R79	1.5	1205	2	29.3	29.3	29.3	29.3	29.3	40	43	45	49	51	40	Yes
R80	1.5	1134	2	29.9	29.9	29.9	29.9	29.9	40	43	45	49	51	40	Yes
R81	4.5	1145	2	31.6	31.6	31.6	31.6	31.6	40	43	45	49	51	40	Yes
R82	4.5	1305	2	30.4	30.4	30.4	30.4	30.4	40	43	45	49	51	40	Yes
R83	1.5	1356	2	28.3	28.3	28.3	28.3	28.3	40	43	45	49	51	40	Yes
R85	4.5	1477	2	29.4	29.4	29.4	29.4	29.4	40	43	45	49	51	40	Yes
R86	4.5	1488	2	29.4	29.4	29.4	29.4	29.4	40	43	45	49	51	40	Yes
R92	4.5	657	1	36.1	36.1	36.1	36.1	36.1	40	43	45	49	51	40	Yes
R118	1.5	1095	2	30.4	30.4	30.4	30.4	30.4	40	43	45	49	51	40	Yes
R119	1.5	1064	2	30.7	30.7	30.7	30.7	30.7	40	43	45	49	51	40	Yes
R127	4.5	1448	4	30.9	30.9	30.9	30.9	30.9	40	43	45	49	51	40	Yes
R128	4.5	1437	4	31.0	31.0	31.0	31.0	31.0	40	43	45	49	51	40	Yes
R203	4.5	1438	4	31.6	31.6	31.6	31.6	31.6	40	43	45	49	51	40	Yes
R204	4.5	1209	4	33.2	33.2	33.2	33.2	33.2	40	43	45	49	51	40	Yes
R205	4.5	611	4	39.9	39.9	39.9	39.9	39.9	40	43	45	49	51	40	Yes
R218	4.5	1104	1	32.6	32.6	32.6	32.6	32.6	40	43	45	49	51	40	Yes
R219	4.5	1156	1	31.9	31.9	31.9	31.9	31.9	40	43	45	49	51	40	Yes
R225	4.5	919	2	33.6	33.6	33.6	33.6	33.6	40	43	45	49	51	40	Yes
R226	1.5	943	2	32.3	32.3	32.3	32.3	32.3	40	43	45	49	51	40	Yes
R227	1.5	986	1	30.9	30.9	30.9	30.9	30.9	40	43	45	49	51	40	Yes
R303	4.5	681	1	35.7	35.7	35.7	35.7	35.7	40	43	45	49	51	40	Yes
VLR244	4.5	1448	4	30.9	30.9	30.9	30.9	30.9	40	43	45	49	51	40	Yes
VLR246	4.5	1048	1	31.9	31.9	31.9	31.9	31.9	40	43	45	49	51	40	Yes
VLR247	4.5	966	1	33.7	33.7	33.7	33.7	33.7	40	43	45	49	51	40	Yes
VLR250	4.5	1165	1	30.9	30.9	30.9	30.9	30.9	40	43	45	49	51	40	Yes
VLR251	4.5	907	2	33.6	33.6	33.6	33.6	33.6	40	43	45	49	51	40	Yes
VLR257	4.5	1106	2	31.9	31.9	31.9	31.9	31.9	40	43	45	49	51	40	Yes
VLR258	4.5	625	3	38.5	38.5	38.5	38.5	38.5	40	43	45	49	51	40	Yes

Point of Reception ID	Receptor Height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Receptor [dB(A)] at selected Wind Speed in m/s					Sound Level Limit [dB(A)] at Selected Wind Speed in m/s					Applicable Background Sound Level	Compliance With Limit (Yes/No)
				6 or <	7	8	9	10	6 or <	7	8	9	10	NPC 232 (C 3)	
VLR259	4.5	701	3	37.8	37.8	37.8	37.8	37.8	40	43	45	49	51	40	Yes
VLR263	4.5	1452	3	32.2	32.2	32.2	32.2	32.2	40	43	45	49	51	40	Yes
VLR266	4.5	1218	2	31.2	31.2	31.2	31.2	31.2	40	43	45	49	51	40	Yes
VLR272	4.5	1152	3	34.2	34.2	34.2	34.2	34.2	40	43	45	49	51	40	Yes
VLR280	4.5	753	2	35.3	35.3	35.3	35.3	35.3	40	43	45	49	51	40	Yes
VLR281	4.5	1146	4	34.5	34.5	34.5	34.5	34.5	40	43	45	49	51	40	Yes
VLR282	4.5	1034	4	36.2	36.2	36.2	36.2	36.2	40	43	45	49	51	40	Yes
VLR290	4.5	870	1	34.3	34.3	34.3	34.3	34.3	40	43	45	49	51	40	Yes
VLR293	4.5	894	1	33.6	33.6	33.6	33.6	33.6	40	43	45	49	51	40	Yes
VLR294	4.5	1084	4	35.0	35.0	35.0	35.0	35.0	40	43	45	49	51	40	Yes
VLR295	4.5	1059	3	34.7	34.7	34.7	34.7	34.7	40	43	45	49	51	40	Yes
VLR301	4.5	867	3	36.3	36.3	36.3	36.3	36.3	40	43	45	49	51	40	Yes
VLR302	4.5	671	3	38.1	38.1	38.1	38.1	38.1	40	43	45	49	51	40	Yes

Table 7-2: Noise Impact Assessment Summary – Participants

Participant ID	Height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Dwelling [dB(A)]
R55	4.5	881	1	34.9
R64	1.5	794	2	34.1

Table 7-3: Noise level contributions from the Ernestown Wind Farm and the Taylor Kidd Solar Farm from shared receptors

UTM coordinates		Noise receptor ID		Distance to nearest source [m]		Nearest source ID		Level of farm [dB(A)]		Level [dB(A)]
Easting [m]	Northing [m]	Ernestown	Taylor Kidd Solar	Ernestown	Taylor Kidd Solar	Ernestown	Taylor Kidd Solar	Ernestown	Taylor Kidd Solar	Total
363821	4896651	R127	7	1448	840	T4	Sub	30.1	23.4	30.9
363855	4896687	R128	6	1437	812	T4	Sub	30.2	23.6	31.0
364453	4898145	R203	3	1438	864	T4	Inv8	30.4	25.5	31.6
364245	4897985	R204	2	1210	610	T4	Inv8	31.8	27.6	33.2
363390	4897369	R205	1	612	238	T4	Inv5	38.2	34.3	39.9
363844	4896666	VLR244	n/a	1448	830	T4	Sub	30.1	23.5	30.9
362036	4898775	VLR258	n/a	626	1526	T3	Inv1	38.5	18.3	38.5
361943	4898736	VLR259	n/a	701	1579	T3	Inv1	37.7	18.0	37.8
364018	4899045	VLR263	n/a	1452	1174	T3	Inv6	31.8	22.0	32.2
363743	4898918	VLR272	n/a	1152	980	T3	Inv6	33.8	23.6	34.2
364170	4897674	VLR281	n/a	1146	433	T4	Inv10	32.2	30.6	34.5
364024	4897551	VLR282	n/a	1034	288	T4	Inv10	33.1	33.3	36.2
364122	4897795	VLR294	n/a	1084	424	T4	Inv10	32.7	31.2	35.0
363623	4898986	VLR295	n/a	1059	1038	T3	Inv6	34.3	23.1	34.7
363480	4898797	VLR301	n/a	867	856	T3	Inv6	36.0	24.9	36.3

8 CONCLUSION

Based on the approach presented in this NIA, the Ernestown Wind Power Project is compliant with the MOE noise limits at all Points of Reception and Vacant Lot Receptors within 1,500 m of the Project's noise sources, for wind speeds of 6, 7, 8, 9, and 10 m/s.

9 REFERENCES

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[7] Enercon Canada Inc., 2010. Sound Power Level of the ENERCON E-82 E2 Operational Mode 2000 kW. Received via email from Nhung Nguyen, Ernestown Windpark LP, to Andrew Brunskill, GL GH, May 2013.

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[9] International Electrotechnical Commission (IEC), 2006. IEC 61400 – 11 Ed. 2.1 Wind turbine generator systems – Part 11: Acoustic noise measurement techniques. 46 p.

[10] International Organization for Standardization (ISO), 1993. Acoustics - Attenuation of Sound During Propagation Outdoors - Calculation of the Absorption of Sound by the Atmosphere. ISO 9613-1. 33 p.

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APPENDIX A LAND USE, AERIAL PHOTO, AND NOISE ISO-CONTOUR MAPS

360000 362000 364000 366000

4904000 4902000 4900000 4898000 4896000 4894000

ROSE ROAD
REES ROAD
OLD WILTON ROAD
SHANE STREET
Odessa
ODESSA MAIN STREET
Kingston Gardiner TS
Odessa Solar Project
COUNTY ROAD 2
Kingston Gardiner
Hwy 2 South
Solar Project
FAIRBANKS STREET
COUNTY ROAD 6
LUCAS ROAD
CATON ROAD
CLARKE ROAD
IRISH ROAD
WING ROAD
MILLHAVEN ROAD
Asselstine
T1
T2
COUNTY ROAD 4
COUNTY ROAD 16
MCINTYRE ROAD
Links Mills
T3
T4
T5
HAM ROAD
Napanee TS Taylor
Kidd Solar Energy Project
PARROTTS BAY LANE
AMHERST DR.
Ernestown
DOYLE ROAD
TAYLOR KIDD BOULEVARD
JIM SNOW DRIVE
Bayview
Nicholsons Point
ERNESTOWN BATH
BATH ROAD
Millhaven
Lake Ontario

Ontario
Gananoque
Napanee
Kingston
Belleville
Area Shown
Lake Ontario

360000 362000 364000 366000

Legend

Project Components

- Ernestown Wind Farm
- Investigation Area (1500 m)

Other Components

- Solar Project
- Existing Substation
- Pipeline
- Transmission Line
- Railway
- Permanent Watercourse
- Intermittent Watercourse
- Expressway / Highway
- Arterial / Collector
- Local Road / Street
- Permanent Waterbody
- Permanent Wetland
- Pit / Quarry
- Other Building
- Wooded Area
- Park / Sports Field
- Municipal Boundary

0 250 500 1,000 1,500 2,000 Meters

Ernestown Wind Park Inc.

NEIGHBOURING SOLAR FARMS NEAR THE ERNESTOWN WIND FARM

GL Garrad Hassan

923-001-121211-AB

December 11, 2012

Projection: UTM Zone 18, NAD83
Sources: ESRI, OBM, CanVec, Geobase and Loyalist Township.

360000 361000 362000 363000 364000 365000

4902000 4901000 4900000 4899000 4898000 4897000 4896000

MILLHAVEN ROAD
CATON ROAD
COUNTY ROAD 6
ERNESTOWN
T1
T2
T3
T4
T5
DOYLE ROAD
TAYLOR KIDD BOULEVARD
JIM SNOW DRIVE
COUNTY ROAD 4
BATH ROAD
Lake Ontario

Legend

Project Components
- Investigation Area (1 500 m)
- Wind Turbine (5)
- Participating Receptor

Other Components
- 1-Storey Receptor
- 2-Storeys Receptor
- Vacant Lot Receptor
- Existing Substation
- Transmission Line
- Expressway / Highway
- Arterial / Collector
- Local Road / Street
- Railway
- Permanent Watercourse
- Intermittent Watercourse
- Pipeline
- Other Building
- Permanent Waterbody
- Permanent Wetland
- Park / Sports Field
- Municipal Boundary

Land Use Designations
- Aggregate
- Agricultural
- Environmental Protection
- Environmentally Sensitive
- Industrial
- Open Space
- Rural
- Shoreline Residential

ERNESTOWN Wind Park

LAND USE DESIGNATIONS

GL Garrad Hassan

923-004-121211-01-AB

December 11, 2012

Projection: UTM Zone 18, NAD83
Sources: OBM, CanVec, Geobase and Loyalist Township.

361000 362000 363000 364000 365000

4901000 4900000 4899000 4898000 4897000 4896000

T1 T2 T3 T4 T5

205

N

Lake Ontario

361000 362000 363000 364000 365000

Legend

Project Components

- Wind Turbine (5)
- Investigation Area (1500 m)

Taylor Kidd Solar Farm

- Transformer
- Substation

Other Components

- 2-Storey Receptor
- Municipal Boundary

0 125 250 500 750 1,000 Meters

ERNESTOWN Wind Park

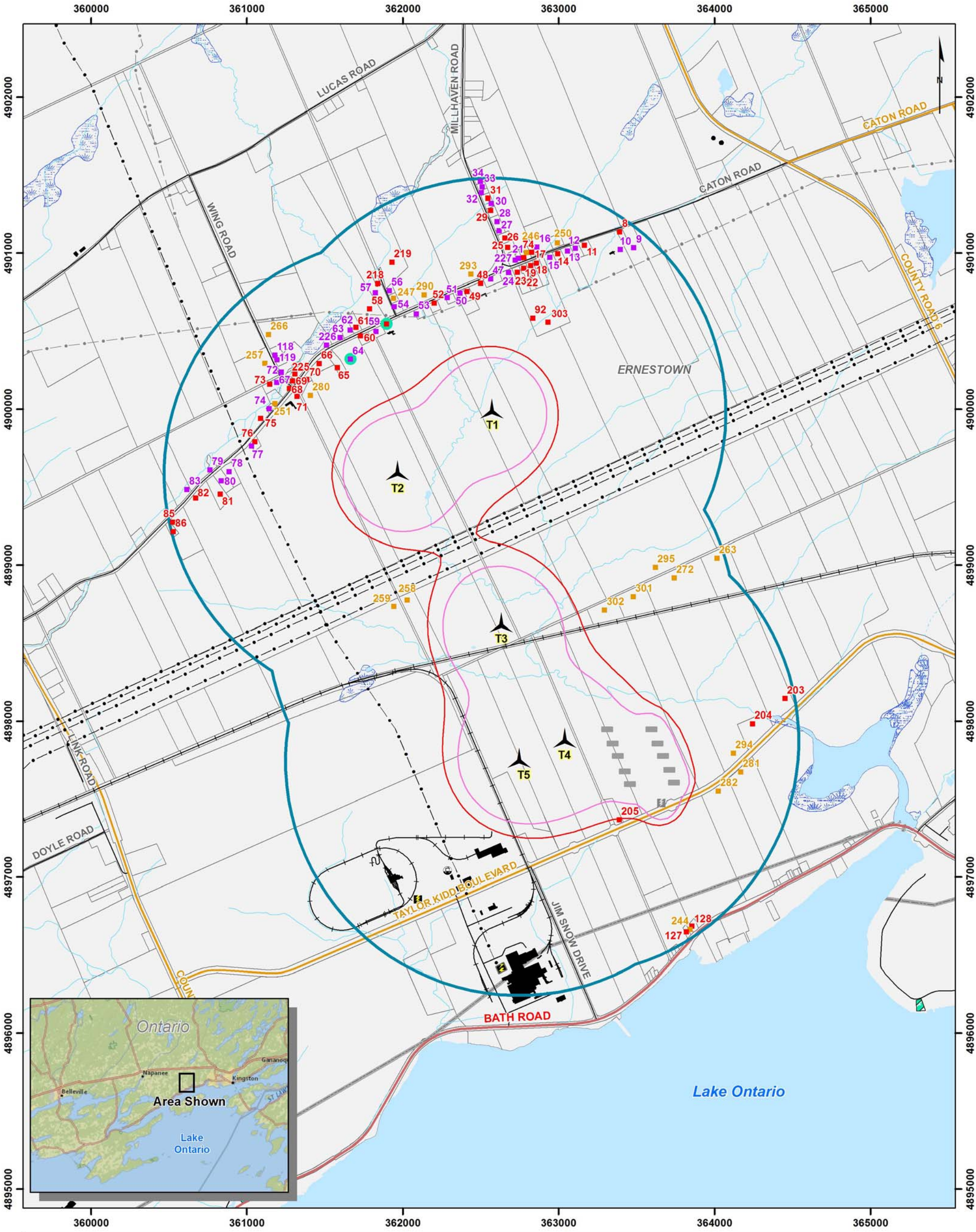
PROPOSED WIND TURBINE LAYOUT AND AERIAL PHOTOS

923-001-121211-01-AB

December 11, 2012

GL Garrad Hassan

Projection: UTM Zone 18, NAD83
Sources, ESRI, OBM, CanVec, Geobase, Horizon Legacy Energy Corp., and Loyalist Township.



Legend

Project Components

- Wind Turbine (5)
- Investigation Area (1 500 m)
- Participating Receptor

Predicted Sound Level at Wind Speed of 6 m/s

- 40 dB(A) at 1.5m agl*
- 40 dB(A) at 4.5m agl*

*agl: above ground level

Other Components

- 1-Storey Receptor
- 2-Storeys Receptor
- Vacant Lot Receptor
- Existing Substation
- Transmission Line
- Expressway / Highway
- Arterial / Collector
- Local Road / Street
- Railway
- Permanent Watercourse
- Intermittent Watercourse
- Pipeline
- Other Building
- Permanent Waterbody
- Permanent Wetland
- Park / Sports Field
- Municipal Boundary

Taylor Kidd Solar Farm

- Transformer / Inverter Cluster
- Substation

0 125 250 500 750 1,000 Meters

ERNESTOWN Wind Park

PREDICTED SOUND LEVELS FOR WIND TURBINES (WIND SPEED OF 6 M/S) LAYOUT 29 - ENERCON E82 2.0

GL Garrad Hassan

923-001-130524-01-AB

May 24, 2013

Projection: UTM Zone 18, NAD83

Sources: OBM, CanVec, Geobase and Loyalist Township.

Legend

Project Components

- Investigation Area (1 500 m)
- Wind Turbine (5)
- Participating Receptor

Predicted Sound Level at Wind Speed of 8 m/s

- 45 dB(A) at 1.5m agl*
- 45 dB(A) at 4.5m agl*

*agl: above ground level

Other Components

- 1-Storey Receptor
- 2-Storeys Receptor
- Vacant Lot Receptor
- Existing Substation
- Transmission Line
- Expressway / Highway
- Arterial / Collector
- Local Road / Street
- Railway
- Permanent Watercourse
- Intermittent Watercourse
- Pipeline
- Other Building
- Permanent Waterbody
- Permanent Wetland
- Park / Sports Field
- Municipal Boundary

Taylor Kidd Solar Farm

- Transformer / Inverter Cluster
- Substation

0 125 250 500 750 1,000 Meters

ERNESTOWN Wind Park

PREDICTED SOUND LEVELS FOR WIND TURBINES (WIND SPEED OF 8 M/S) LAYOUT 29 - ENERCON E82 2.0

GL Garrad Hassan

923-001-130524-02-AB

May 24, 2013

Projection: UTM Zone 18, NAD83

Sources: OBM, CanVec, Geobase and Loyalist Township.

APPENDIX B SAMPLE CALCULATION FOR NOISE MODELING

Resulting A-weighted sound pressure level at Receptors R205 and VLR258

The calculation of cumulative receptor noise levels from wind turbines uses the methodology of ISO 9613-2, "*Acoustics — Attenuation of sound during propagation outdoors: Part 2: General method of calculation*". These calculations are conducted with CadnaA *(which is an implementation of ISO 9613-1 and ISO 9613-2)*.

As an example, in this appendix, the results are presented at Point of Reception R205 and VLR258. The following conditions were used:

- Turbine locations (Appendix F);
- Receptor locations (Appendix C).

Turbine characteristics and modelling parameters:

- Hub-heights: 98 m (E82 2.0 MW);
- Ambient air temperature: 10ºC;
- Ambient barometric pressure: 101.32 kPa;
- Relative humidity: 70%;
- Wind speed (10 m agl): 6 m/s;
- Source ground factor: 0.7,
- Middle ground factor: 0.7,
- Receptor ground factor: 0.7, and
- See Table 5-1 for broadband and octave band sound power levels.

The following table presents an example result and intermediate values of the calculations as the A-weighted sound pressure levels at two chosen example receptors, due to each turbine, substation or inverter and each octave band. The net results, the A-weighted sound pressure level at the example receptors R205 and VLR258 for all bands and all noise sources within 5000 m of the example receptor, are 39.9 and 38.5 dB(A), respectively.

Sample Calculations

Sound Pressure Levels at R205

Source ID	Distance* [m]	Octave Band Sound Pressure Levels [dB(A)]									Broadband SPL by Source [dB(A)]
		32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
Ernestown T1	2739	N/A	10.5	10.9	12.3	14.1	9.9	-12.3	+	+	18.8
Ernestown T2	2636	N/A	10.9	11.3	12.8	14.6	10.6	-11.0	-85.2	+	19.3
Ernestown T3	1457	N/A	16.2	17.0	19.1	22.0	20.1	5.6	-41.4	+	26.4
Ernestown T4	620	N/A	23.7	24.9	27.4	31.1	30.6	21.1	-6.5	-59.5	35.6
Ernestown T5	750	N/A	22.0	23.1	25.6	29.2	28.5	18.1	-12.5	-76.4	33.7
Taylor Kidd Substation	290	-8.6	10.6	16.2	18.7	27.3	24.2	18.7	6.7	-26.7	30.0
Taylor Kidd Inverter1	585	N/A	-1.9	3.9	17.5	14.5	5.0	4.0	0.8	-63.0	19.8
Taylor Kidd Inverter2	491	N/A	-0.5	5.6	19.1	16.2	6.8	6.4	5.3	-50.5	21.4
Taylor Kidd Inverter3	409	N/A	0.7	7.4	20.6	17.8	8.6	8.7	9.5	-39.4	23.1
Taylor Kidd Inverter4	311	N/A	2.6	9.9	23.0	20.2	11.2	11.8	14.9	-25.7	25.7
Taylor Kidd Inverter5	238	N/A	4.2	12.3	25.2	22.5	13.6	14.6	19.4	-15.1	28.2
Taylor Kidd Inverter6	616	N/A	-2.2	3.4	17.0	14.0	4.5	3.3	-0.6	-66.9	19.3
Taylor Kidd Inverter7	548	N/A	-1.4	4.6	18.1	15.1	5.7	4.9	2.6	-58.0	20.4
Taylor Kidd Inverter8	496	N/A	-0.6	5.5	19.0	16.1	6.7	6.3	5.1	-51.2	21.3
Taylor Kidd Inverter9	453	N/A	0.0	6.4	19.8	16.9	7.7	7.4	7.3	-45.3	22.2
Taylor Kidd Inverter10	425	N/A	0.5	7.0	20.3	17.5	8.3	8.2	8.7	-41.5	22.8
Total A-Weighted Broadband Sound Pressure Level											**39.9**

* Includes the heights of noise sources and receptors.
\+ Indicates values below -88.0 dBA
N/A: Value of 32 Hz frequency not available for the inverter.

Sound Pressure Levels at VLR258

Source ID	Distance* [m]	Octave Band Sound Pressure Levels [dB(A)]									Broadband SPL by Source [dB(A)]
		32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
Ernestown T1	1327	N/A	17.0	17.8	20.1	23.1	21.4	7.6	-36.3	+	27.5
Ernestown T2	819	N/A	21.2	22.3	24.8	28.3	27.4	16.7	-15.5	-85.2	32.7
Ernestown T3	633	N/A	23.5	24.7	27.2	30.9	30.4	20.8	-7.2	-61.2	35.4
Ernestown T4	1360	N/A	16.8	17.6	19.8	22.8	21.1	7.1	-37.6	+	27.2
Ernestown T5	1262	N/A	17.4	18.3	20.6	23.6	22.1	8.7	-33.8	+	28.0
Taylor Kidd Substation	2086	-28.5	-9.5	-3.7	-2.5	2.6	-3.7	-20.0	-73.4	+	5.2
Taylor Kidd Inverter1	1526	N/A	-9.5	-5.3	8.4	4.6	-6.5	-13.2	-38.1	+	10.2
Taylor Kidd Inverter2	1606	N/A	-10.0	-5.8	7.9	4.0	-7.2	-14.4	-41.2	+	9.7
Taylor Kidd Inverter3	1680	N/A	-10.3	-6.2	7.4	3.5	-7.9	-15.5	-44.0	+	9.2
Taylor Kidd Inverter4	1776	N/A	-15.6	-7.6	3.4	-1.9	-13.5	-21.6	-52.4	+	4.9
Taylor Kidd Inverter5	1853	N/A	-15.9	-8.0	2.9	-2.5	-14.1	-22.7	-55.3	+	4.4
Taylor Kidd Inverter6	1771	N/A	-10.8	-6.7	6.9	2.9	-8.7	-16.8	-47.4	+	8.6
Taylor Kidd Inverter7	1850	N/A	-11.2	-7.1	6.4	2.3	-9.3	-17.9	-50.4	+	8.1
Taylor Kidd Inverter8	1921	N/A	-11.5	-7.5	6.0	1.9	-9.9	-18.9	-53.0	+	7.7
Taylor Kidd Inverter9	2003	N/A	-11.8	-7.9	5.6	1.4	-10.6	-20.1	-56.1	+	7.3
Taylor Kidd Inverter10	2073	N/A	-12.1	-8.2	5.2	0.9	-11.1	-21.1	-58.7	+	6.9
Total A-Weighted Broadband Sound Pressure Level											**38.5**

* Includes the heights of noise sources and receptors.
\+ Indicates values below -88.0 dBA
N/A: Value of 32 Hz frequency not available for the inverter.

APPENDIX C COORDINATES OF POINTS OF RECEPTION

Coordinates of all modeled Points of Reception and Vacant Lot Receptors for the Ernestown Wind Power Project (UTM18-NAD83 projection) are given in the tables below:

Point of Reception ID	Easting [m]	Northing [m]
R8	363392	4901137
R9	363482	4901035
R10	363397	4901023
R11	363167	4901050
R12	363107	4901030
R13	363058	4901015
R14	362995	4900996
R15	362945	4900972
R16	362861	4901039
R17	362828	4901007
R18	362860	4900935
R19	362821	4900920
R20	362776	4900972
R21	362743	4900967
R22	362777	4900903
R23	362737	4900878
R24	362680	4900875
R25	362674	4901038
R26	362657	4901097
R27	362619	4901144
R28	362607	4901203
R29	362564	4901275
R30	362568	4901319
R31	362547	4901352
R32	362504	4901388
R33	362510	4901424
R34	362498	4901460
R47	362565	4900835
R48	362500	4900807
R49	362413	4900756
R50	362369	4900746
R51	362286	4900715
R52	362203	4900680
R53	362087	4900612
R54	361946	4900657
R56	361914	4900761
R57	361826	4900747
R58	361787	4900644
R59	361828	4900497
R60	361729	4900470
R61	361701	4900524
R62	361662	4900507
R63	361599	4900459
R65	361581	4900267
R66	361465	4900292
R67	361193	4900173
R68	361273	4900134
R69	361293	4900183
R70	361385	4900193
R71	361322	4900083
R72	361221	4900238
R73	361147	4900161
R74	361143	4900004
R75	361088	4899941
R76	361052	4899790
R77	361030	4899763
R78	360887	4899600
R79	360763	4899612
R80	360835	4899541
R81	360831	4899455
R82	360672	4899432
R83	360616	4899486
R85	360524	4899276
R86	360527	4899215
R92	362835	4900584
R118	361180	4900346
R119	361194	4900316
R127	363821	4896651
R128	363855	4896687
R203	364453	4898145
R204	364245	4897985
R205	363390	4897369
R218	361840	4900806
R219	361931	4900942
R225	361309	4900227

Point of Reception ID	Easting [m]	Northing [m]
R226	361511	4900411
R227	362723	4900956
VLR244	363844	4896666
VLR246	362795	4901005
VLR247	361941	4900712
VLR250	362994	4901067
VLR251	361181	4900037
VLR257	361116	4900292
VLR258	362029	4898775
VLR259	361943	4898736
VLR263	364018	4899045
VLR266	361140	4900479
VLR272	363743	4898918
VLR280	361407	4900088
VLR281	364170	4897674
VLR282	364024	4897551
VLR290	362138	4900734
VLR293	362437	4900865
VLR294	364122	4897795
VLR295	363623	4898986
VLR301	363480	4898797
VLR302	363296	4898713
R303	362933	4900559

APPENDIX D COORDINATES OF PARTICIPANTS

Coordinates of all modeled participants for the Ernestown Wind Power Project (UTM18-NAD83 projection) are given in the table below.

Participant ID	Easting [m]	Northing [m]
55	361898	4900547
64	361665	4900320

APPENDIX E TURBINE TECHNICAL SPECIFICATIONS

Sound Power Level

of the

ENERCON E-82 E2

Operational Mode 2000 kW

(Data Sheet)

Imprint

Editor: ENERCON GmbH • Dreekamp 5 • 26605 Aurich • Germany

Telephone: 04941-927-0
Fax: 04941-927-109

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Department: ENERCON GmbH / Site Assessment

Glossary

WEC means an ENERCON wind energy converter.

WECs means more than one ENERCON wind energy converter.

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Revision /date:	1.0/ April 2010		

ENERCON ENERGY FOR THE WORLD	Sound Power Level E-82 E2	Page 2 of 3

Sound Power Level for the E-82 E2 with 2000 kW rated power

in relation to wind speed at 10 m height					
hub height / V_s in 10 m height	78 m	85 m	98 m	108 m	138 m
5 m/s	96,3 dB(A)	96.6 dB(A)	97.2 dB(A)	97.5 dB(A)	98.2 dB(A)
6 m/s	100.7 dB(A)	101.0 dB(A)	101.6 dB(A)	101.9 dB(A)	102.6 dB(A)
7 m/s	103.3 dB(A)	103.5 dB(A)	103,5 dB(A)	103,5 dB(A)	103,5 dB(A)
8 m/s	103,5 dB(A)	103,5 dB(A)	103,5 dB(A)	103,5 dB(A)	103,5 dB(A)
9 m/s	103,5 dB(A)	103,5 dB(A)	103,5 dB(A)	103,5 dB(A)	103,5 dB(A)
10 m/s	103,5 dB(A)	103,5 dB(A)	103,5 dB(A)	103,5 dB(A)	103,5 dB(A)
95% rated power	103,5 dB(A)	103,5 dB(A)	103,5 dB(A)	103,5 dB(A)	103,5 dB(A)

Measured value at 95% rated power				*102,5 dB(A)* *KCE 209244-03.04*	

in relation to wind speed in hub height									
wind speed at hub height [m/s]	7	8	9	10	11	12	13	14	15
Sound Power Level [dB(A)]	96.6	99.9	102.6	103.5	103.5	103.5	103.5	103.5	103.5

1. The relation between the sound power level and the standardized wind speed in 10 m height as shown above is valid on the premise of a logarithmic wind profile with a roughness length of 0.05 m. The relation between the sound power level and the wind speed at hub height applies for all hub heights. During the sound measurements the wind speeds are derived from the power output and the power curve of the WEC.
2. A tonal audibility of $\Delta L_{a,k} \leq 2$ dB can be expected over the whole operational range (valid in the near vicinity of the turbine according to IEC 61 400 -11 ed. 2).
3. The sound power level values given in the table are valid for the **Operational Mode 2000 kW** (defined via the rotational speed range of 6 – 17,5 rpm). The respective power curve is the calculated power curve E-82 E2 2MW dated November 2009 (Rev. 3.x).
4. The values displayed in the tables above are based on official and internal measurements of the sound power level. If available the official measured values are given in this document as a

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Revision /date:	1.0/ April 2010		

reference (in italic print). The extracts of the official measurements can be made available upon request. The values given in the measurement extracts do not replace the values given in this document. All measurements have been carried out according to the recommended German and international standards and guidelines as defined in the measurement reports, respectively.

5. Due to the typical measurement uncertainties, if the sound power level is measured according to one of the accepted methods the measured values can differ from the values shown in this document in the range of +/- 1 dB.

   Accepted measurement methods are:

   a) IEC 61400-11 ed. 2 („Wind turbine generator systems – Part 11: Acoustic noise measurement techniques; Second edition, 2002-12"), and

   b) the FGW-Guidelines („Technische Richtlinie für Windenergieanlagen – Teil 1: Bestimmung der Schallemissionswerte", published by the association "Fördergesellschaft für Windenergie e.V.", 18th revision).

   If the difference between total noise and background noise during a measurement is less than 6 dB a higher uncertainty must be considered.

6. For noise-sensitive sites it is possible to operate the E-82 E2 with reduced rotational speed and reduced rated power during night time. The sound power levels resulting from such operational mode can be provided in a separate document upon request.

7. The sound power level of a wind turbine depends on several factors such as but not limited to regular maintenance and day-to-day operation in compliance with the manufacturer's operating instructions. Therefore, this data sheet can not, and is not intended to, constitute an express or implied warranty towards the customer that the E-82 E2 WEC will meet the exact sound power level values as shown in this document at any project specific site.

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Summary of Test Report
(Conversion of hub height of 108 m to 98 m) /1/

Basic sheet "Geräusche" (*Noise*), according to the "Technische Richtlinien für Windenergieanlagen, Teil 1: Bestimmung der Schallemissionswerte"
(Technical Guidelines for Wind Energy Converters, Part 1: Determination of sound emission values)

Rev. 18 of February 1, 2008 (Editor: Fördergesellschaft Windenergie e.V. Stresemannplatz 4, D-24103 Kiel)

Extract of Test Report 209244-04.02 IEC
on noise emission of wind energy converter of type E-82 E2

General Data		Technical Data (manufacturer's specifications)	
Manufacturer of WEC:	Enercon GmbH	Rated power (generator):	2.000 kW (reduced)
Serial number:	82679	Diameter of rotor:	82 m
Location of WEC (ca.):	26629 Großefehn	Hub height above ground:	98 m ***
Geographic co-ordinates:	GK longitude: 34.15.287 GK latitude: 59.14.701	Type of tower:	conical tube tower
		Power control:	Pitch

Complementary rotor data (manufacturer's specifications)		Complementary data of gear unit and generator (manufacturer's specifications)	
Manufacturer of rotor blade:	Enercon	Manufacturer of gear unit:	not applicable
Type of rotor blade:	E-82 E2	Type of gear unit:	not applicable
Blade setting angle:	variable	Manufacturer of generator:	Enercon
Number of rotor blades:	3	Type of generator:	E-82 E2
Rotor speed range:	6 to 18 r.p.m. (mode OM I)	Generator speed range:	6 to 18 r.p.m. (mode OM I)

Calculated Performance Chart ENERCON E-82 E2; 2,000 kW; calculated by ENERCON (Rev. 3.0)

	Reference Point: standardized wind speed in 10 m height	Reference Point: true electrical power	Noise emission parameters	Observations
sound power level $L_{WA,P}$	5 ms^{-1}	563 kW	--	(1)
	6 ms^{-1}	1,038 kW	100.0 dB(A)	
	7 ms^{-1}	1,561 kW	101.8 dB(A)	
	8 ms^{-1}	1,904 kW	102.5 dB(A)	
	9 ms^{-1}	2,000 kW	102.5 dB(A)	
	10 ms^{-1}	2,000 kW	102.0 dB(A)	
tonal audibility $\Delta L_{a,k}$	5 ms^{-1}	563 kW	--	(1)
	6 ms^{-1}	1,038 kW	< - 3.0 dB	
	7 ms^{-1}	1,561 kW	- 2.8 dB	
	8 ms^{-1}	1,904 kW	- 2.8 dB	
	9 ms^{-1}	2,000 kW	0.0 dB	
	10 ms^{-1}	2,000 kW	- 0.2 dB	
impulse adjustment for small distances K_{IR}	5 ms^{-1}	563 kW	--	(1)
	6 ms^{-1}	1,038 kW	0 dB	
	7 ms^{-1}	1,561 kW	0 dB	
	8 ms^{-1}	1,904 kW	0 dB	
	9 ms^{-1}	2,000 kW	0 dB	
	10 ms^{-1}	2,000 kW	0 dB	

Third-octave band sound power level for $v_s = 5$ ms^{-1} in dB(A)

Frequency	50	63	80	100	125	160	200	250	315	400	500	630
$L_{WA,P}$	--	--	--	--	--	--	--	--	--	--	--	--
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	--	--	--	--	--	--	--	--	--	--	--	--

Octave band sound power level for $v_s = 5$ ms^{-1} in dB(A)

Frequency	63	125	250	500	1,000	2,000	4,000	8,000
$L_{WA,P}$	--	--	--	--	--	--	--	--

Third-octave band sound power level for $v_s = 6$ ms^{-1} in dB(A)

Frequency	50	63	80	100	125	160	200	250	315	400	500	630
$L_{WA,P}$	78.6**	80.1	82.9	85.3	87.7	84.6	85.3	87.4	88.5	87.9*	88.6*	91.4
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	90.9	90.5	89.3	86.8	82.9	79.1	74.2	69.4	64.4	63.5	66.6	74.9

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Octave band sound power level	for v_s = 6 ms^{-1} in dB(A)							
Frequency	63	125	250	500	1,000	2,000	4,000	8,000
$L_{WA,P}$	85.7*	90.9	92.0	94.4	95.1	88.8	75.8	75.8

Third-octave band sound power level	for v_s = 7 ms^{-1} in dB(A)											
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
$L_{WA,P}$	79.8**	80.3	82.8	84.9	89.6	85.1*	85.5*	89.1	89.9*	90.5*	90.8*	93.3
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	92.8	92.5	91.6	89.2	85.8	81.4	76.4	71.6	66.0	66.2	69.6	75.9

Octave band sound power level	for v_s = 7 ms^{-1} in dB(A)							
Frequency	63	125	250	500	1,000	2,000	4,000	8,000
$L_{WA,P}$	85.9*	91.9	93.3	96.5	97.1	91.3	78.0	77.2

Third-octave band sound power level	for v_s = 8 ms^{-1} in dB(A)											
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
$L_{WA,P}$	78.0	79.9	82.7	84.7	90.4	86.7	86.4	90.2	91.1	92.2	91.5*	93.7
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	93.2	93.0	92.0	90.0	87.0	82.7	77.9	73.7	67.9	65.6	67.1	72.0

Octave band sound power level	for v_s = 8 ms^{-1} in dB(A)							
Frequency	63	125	250	500	1,000	2,000	4,000	8,000
$L_{WA,P}$	85.4	92.7	94.4	97.3	97.5	92.3	79.6	73.9

Third-octave band sound power level	for v_s = 9 ms^{-1} in dB(A)											
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
$L_{WA,P}$	78.3	79.9	82.7	84.8	91.6	86.6	86.1	89.8	90.5	91.9	91.5*	93.2
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	93.1	93.1	92.1	89.9	87.1	83.2	78.5	74.5	68.8	66.0	66.7	71.5

Octave band sound power level	for v_s = 9 ms^{-1} in dB(A)							
Frequency	63	125	250	500	1,000	2,000	4,000	8,000
$L_{WA,P}$	85.4	93.4	93.9	97.0	97.5	92.3	80.3	73.6

Third-octave band sound power level	for v_s = 10 ms^{-1} in dB(A)											
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
$L_{WA,P}$	77.8	79.6	82.5	84.4	91.4	86.4	85.1*	88.9	89.0*	90.3*	90.5*	92.4*
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	92.3	92.8	92.5	90.7	88.3	84.6	80.1	76.0	70.5	67.7	67.2	71.5

Octave band sound power level	for v_s = 10 ms^{-1} in dB(A)							
Frequency	63	125	250	500	1,000	2,000	4,000	8,000
$L_{WA,P}$	85.2	93.2	92.8*	95.9*	97.3	93.3	81.9	74.0

This summary of the test report is valid only in combination with the certification of the manufacturer of 03/05/2010.
These specifications do not replace the test report mentioned above (particularly for noise immission predictions).

Observations:
(1) No values available due to meteorological conditions
* Difference between working and background noise < 6 dB, correction by 1.3 dB
** Difference between working and background noise < 3 dB, values shall not be presented
*** Conversion of hub height of 108 m to 98 m

/1/ Wind turbine generator systems – Part 11: Acoustic noise; measurement techniques (IEC 61400-11:2002 and A1:2006); German version DIN EN 61400-11:2007

Measured by: KÖTTER Consulting Engineers - Rheine -

Date: 8/06/2010

i. V. Dipl.-Ing. O. Bunk i. A. Dipl.-Ing. J. Weinheimer

KÖTTER CONSULTING ENGINEERS
Bonifatiusstraße 400 · 48432 Rheine
Tel. 0 59 71 - 97 10 0 · Fax 0 59 71 - 97 10 43

GL Garrad Hassan

APPENDIX F COORDINATES OF TURBINES

Coordinates of turbines considered in the Ernestown Wind Power Project are listed below in UTM18-NAD83 projection.

Turbine ID	Easting [m]	Northing [m]
T1	362573	4899981
T2	361968	4899586
T3	362633	4898610
T4	363041	4897871
T5	362747	4897742

Coordinates of noise sources considered in the adjacent solar projects are listed below in UTM18-NAD83 projection.

Napanee TS Taylor Kidd Solar Energy Project

Source ID	Easting [m]	Northing [m]
TKSub	363660	4897475
TKInv1	363312	4897949
TKInv2	363347	4897858
TKInv3	363381	4897778
TKInv4	363426	4897678
TKInv5	363459	4897597
TKInv6	363596	4897949
TKInv7	363636	4897858
TKInv8	363671	4897778
TKInv9	363711	4897688
TKInv10	363742	4897607

Kingston Gardiner Hwy 2 South Solar Energy Project

Source ID	Easting [m]	Northing [m]
H2Sub	366586	4903350
H2Inv1	366526	4903226
H2Inv2	366677	4903239
H2Inv3	366584	4903091
H2Inv4	366733	4903105
H2Inv5	366639	4902958
H2Inv6	366789	4902972
H2Inv7	366695	4902825
H2Inv8	366845	4902839
H2Inv9	366751	4902692
H2Inv10	366901	4902705

Kingston Gardiner TS Odessa Solar Energy Project

Source ID	Easting [m]	Northing [m]
OdSub	358838	4902880
OdInv1	358436	4903562
OdInv2	358488	4903442
OdInv3	358546	4903308
OdInv4	358646	4903091
OdInv5	358659	4902987
OdInv6	358801	4903280
OdInv7	358653	4903575
OdInv8	358668	4903442
OdInv9	358867	4903104
OdInv10	358912	4903001