November 2012

NEXTERA ENERGY CANADA, ULC SUMMERHAVEN WIND ENERGY CENTRE APPLICATION FOR AN AMENDED RENEWABLE ENERGY APPROVAL

Revised Noise Study Report

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REPORT

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Version Control

Rev.	Date	Revision Description	Reviewer Initials
1.0	August 2011	Original NSR for REA Application	JT
2.0	November 2012	Revised NSR prepared for Amended REA Application - Selection of smaller turbines to replace a number of approved turbines - Repositioning of 1 turbine from approved layout - Incorporation of available information from other wind projects in the vicinity	JT

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1.0 INTRODUCTION

This Revised Noise Study Report (the Report) has been prepared to provide information to the public, Aboriginal communities, municipalities and local authorities regarding the proposed Summerhaven Wind Energy Centre (the Project). This Report revises a Noise Study Report dated August 2011 (2011 Report), and subsequent addendum documents, which were prepared to support the original application for a Renewable Energy Approval (REA) under Ontario Regulation (O. Reg.) 359/09 made under the *Environmental Protection Act (EPA)*. An REA approval was issued on March 16, 2012 (REA # 2484-8RQUS4).

This Report has been prepared in accordance with O. Reg. 359/09, Technical Bulletin Six: Required Setbacks for Wind Turbines (MOE, 2010), and MOE publication PIBS 4709e "Noise Guidelines for Wind Farms: Interpretation for Applying MOE NPC Publications to Wind Power Generation Facilities (October 2008)" (MOE, 2008).

1.1 Project Summary

The Project consists of the site preparation, construction, operation, and decommissioning of 58 wind turbine generators with a total installed nameplate capacity of 128.8 MW. The Project will be owned and operated by a wholly owned subsidiary of NextEra Energy Canada, ULC, Summerhaven Wind, LP (NextEra Energy Canada) and will be located in the vicinity of Nanticoke, Haldimand County, Ontario (Figure 1, end of Report). The Project lifespan from obtaining the REA Approval to the end of Decommissioning is estimated to be 27 years.

Turbine towers will be constructed on a concrete foundation. Underground and overhead cables will interconnect individual turbines and eventually connect to the substation (see Site Plan Report). The operation of the wind turbines will be monitored remotely from a Project operations building located near the substation. Once tested and commissioned, the turbines will require scheduled visits for maintenance during the Operations Phase. Maintenance will include complete inspection of the turbine's components and the tower, functionality testing, replacement of worn parts, bolt tightening and lubrication of moving parts. Routine preventative maintenance activities will be completed as per manufacturer requirements.

The Project Area is illustrated in Figure 1. Land use is predominantly cash-crop agriculture (i.e., farming for corn, soybeans, wheat), although some areas are pasture (predominantly for cattle) and several wooded areas are present. Selkirk Provincial Park and Haldimand Conservation Area are located along the shore of Lake Erie south of the Project Area. The Grand River runs northeast of the Project Area and Imperial Oil is directly southwest.

The location of the Project was predicated by interest expressed by local landowners. Haldimand County is also attractive for wind development due to its proximity to Lake Erie, which results in favourable wind conditions for wind power production.

The Project will consist of fifty-eight (58) Siemens wind turbine generators (WTGs), thirty two (32) will be SWT-2.221-101 WTGs and twenty six (26) will be SWT-2.221-93 WTGs. The WTGs will be in full operation year-round, 24-hours per day when winds are sufficient. These noise sources will be situated within the property boundary as shown in Figures 2a through 2g (end of the Report). Table 1 summarizes the wind turbine locations. The WTGs will each have a nameplate capacity of 2.221 MW. The manufacturer's specifications are outlined below in Table 2a and Table 2b.

The substation will be fenced and secured based on standard utility practices and will include an oil containment system to prevent soil contamination in the event of a leak. The transformer location is provided in Table 3.

Table 1: Wind Turbine Locations

Project Name: NextEra Energy Canada., Summerhaven Wind Energy Centre

Type of Coordinates: UTM 17 NAD 83

Equipment Make & Model: Siemens 2.221, 80m hub height

Identifier[1]	Rotor Diameter (m)	Location Coordinates		Identifier	Rotor Diameter (m)	Location Coordinates	
		X (Easting)	Y (Northing)			X (Easting)	Y (Northing)
WTG-001	93	576124	4749873	WTG-032	101	590737	4746531
WTG-003	93	574742	4748226	WTG-033	101	594906	4747489
WTG-004	93	575685	4748309	WTG-034	101	588348	4744337
WTG-005	93	576990	4748661	WTG-035	101	588779	4744087
WTG-006	93	578518	4748834	WTG-036	101	589271	4744225
WTG-007	93	579869	4749156	WTG-037	101	589975	4744279
WTG-008	93	580947	4749341	WTG-038	101	591475	4744600
WTG-009	93	586015	4749711	WTG-039	101	591880	4745113
WTG-010	93	586837	4749912	WTG-040	101	592721	4744952
WTG-011	93	587326	4751141	WTG-041	101	593224	4745318
WTG-012	93	572316	4746292	WTG-042	101	593522	4745702
WTG-013	93	572920	4746475	WTG-043	101	594899	4745794
WTG-014	93	574224	4746586	WTG-044	101	596210	4746279
WTG-015	93	576150	4746799	WTG-045	101	596181	4745775
WTG-016	93	577821	4747047	WTG-046	101	597119	4745943
WTG-017	93	582468	4747896	WTG-047	101	597178	4746411
WTG-018	101	588422	4748589	WTG-048	101	590280	4742517
WTG-019	101	590644	4749342	WTG-049	101	590293	4742174
WTG-020	93	573903	4745199	WTG-050	101	590314	4741857
WTG-021	93	577726	4746477	WTG-051	101	592008	4742791
WTG-022	93	579685	4746426	WTG-052	101	593087	4743349
WTG-023	93	580952	4746798	WTG-053	101	593930	4743637
WTG-024	93	582973	4747085	WTG-054	101	595213	4744131
WTG-025	93	583914	4747307	WTG-055	101	596817	4743995
WTG-026	101	584940	4747269	WTG-056	101	597076	4743766
WTG-027	101	586761	4746915	WTG-057	93	579024	4749020
WTG-028	101	591259	4748123	WTG-058	93	584373	4748649
WTG-030	101	587383	4745469	WTG-059	93	577118	4747104
WTG-031	101	589357	4746128	WTG-061	93	577924	4745876

[1] Turbines number 2, 29 and 60 do not exist.

Table 2a: Siemens SWT-2.221-101 Turbine Technical Specifications

Component	Specification
Rated capacity	2.221 MW
Cut-in wind speed	4m/s
Cut-out wind speed	25 m/s
Rated wind speed	12-13 m/s
Number of blades	3-bladed, horizontal axis
Rotor Diameter	101 m
Swept area	8,000 m^2
Tower (hub) height	80m

Source: Modified from Siemens, 2010a

Table 2b: Siemens SWT-2.221-93 Turbine Technical Specifications

Component	Specification
Rated capacity	2.221 MW
Rated wind speed	13-14 m/s
Number of blades	3-bladed, horizontal axis
Rotor Diameter	93 m
Swept area	6,800 m^2
Tower (hub) height	80m

Source: Modified from Siemens, 2010b

Table 3: Substation Transformer Location

Identifier	Location Coordinates	
	X (Easting)	Y (Northing)
Substation	582616	4747537

2.0 DESCRIPTION OF TECHNICAL TERMS

To help understand the analysis and recommendations made in this report, the following is a brief discussion of technical noise terms.

Sound pressure level is expressed on a logarithmic scale in units of decibels (dB). Since the scale is logarithmic, a sound that is twice the sound pressure level as another will be three decibels (3 dB) higher.

The noise data and analysis in this report have been given in terms of frequency distribution. The levels are grouped into octave bands. Typically, the centre frequencies for each octave band are 31.5, 63, 125, 250, 500, 1000, 2000, 4000 and 8000 Hertz (Hz.). The human ear responds to the pressure variations in the atmosphere that reach the ear drum. These pressure variations are composed of different frequencies that give each sound we hear its unique character.

It is common practice to sum sound levels over the entire audible spectrum (i.e., 20 Hz to 20 kHz) to give an overall sound level. However, to approximate the hearing response of humans, each octave band measured has a weighting applied to it. The resulting “A-weighted” sound level is often used as a criterion to indicate a maximum allowable sound level. In general, low frequencies are weighted higher, as human hearing is less sensitive to low frequency sound.

Environmental noise levels vary over time, and are described using an overall sound level known as the L_{eq}, or energy averaged sound level. The L_{eq} is the equivalent continuous sound level, which in a stated time, and at a stated location, has the same energy as the time varying noise level. It is common practice to measure L_{eq} sound levels in order to obtain a representative average sound level. The L_{90} is defined as the sound level exceeded for 90% of the time and is used as an indicator of the “ambient” noise level.

3.0 CRITERIA AND GUIDELINES

The Project site location can be best defined as Class 3 (Rural), as per MOE Publications NPC-232 (MOE, 1995). The performance limits for Class 3 areas are listed in MOE publication NPC-232 (MOE, 1995). The noise level limits are also provided in reference to wind induced background sound level in MOE publications PIBS 4709e "Noise Guidelines for Wind Farms: Interpretation for Applying MOE NPC Publications to Wind Power Generation Facilities" (MOE, 2008).

The sound level limit for the residential receptors in a Class 3 area can be described as follows:

- For wind speeds at or below 6 m/s.

  The sound level limit at a Point of Reception, expressed in terms of the hourly equivalent energy sound level (L_{eq}) is 40.0 dBA or the minimum hourly background sound level established in accordance with requirements in Publication NPC-232, whichever is higher.

- For wind speeds above 6m/s.

  The sound level limit at a Point of Reception in a Class 3 Area (Rural), under conditions of average wind speed above 6 m/s respectively, expressed in terms of the hourly equivalent energy sound level (Leq), is the wind induced background sound level, expressed in terms of ninetieth percentile sound level (L90) plus 7 dB, or the minimum hourly background sound level established in accordance with requirements in Publications NPC-232, whichever is higher.

These limits are summarized in Table 4.

Table 4: Noise Level Limits Based on Average Wind Speed at 10 m Height

Wind Speed (m/s)	**≤ 6**	**7**	**8**	**9**	**10**
Class 3 Criteria (dBA)	40.0	43.0	45.0	49.0	51.0

The Project is a Class 4 wind facility, as per O. Reg. 359/09 under the Environmental Protection Act. As per REA requirements, the turbines have been located at a minimum of 550m from any point of reception (POR).

4.0 RECEPTORS

4.1 Points of Reception

Two Thousand three hundred and thirty seven (2337) receptors have been identified as being the most sensitive Point(s) of Reception (POR(s)) in accordance with MOE guidelines. These receptors were originally identified in the 2011 Report. Figure 2a through 2g illustrate PORs within 2 km of the proposed turbines or transformers, and in accordance with MOE guidance, modelling was completed for all PORs within 1.5 km of any infrastructure associated with the Project. Accordingly, these PORs were assigned a specific ID. These receptors have been modelled at a height of 4.5 m or higher, if the actual top storey is higher as established through field programs, and located at the centre of the dwelling. One hundred twenty nine (129) vacant lots have also been modelled with vacant lot PORs (VPORs) located within a 1 hectare building envelope typical to the area. More specifically, in keeping with a conservative approach, the VPORs have been placed in each corner of the building envelope for modelling purposes. This study provides results for the corner that would result in the maximum noise level. These receptors have also been modelled at a height of 4.5 m above grade. Table 5 summarizes these locations.

Table 5: Points of Reception Location Summary

Receptor ID	Description	Location Coordinates	
		X (Easting)	Y (Northing)
POR0001	Refer to attached CD for Table 5.		
POR0002			
POR0003			

4.2 Participating Receptor Locations

In accordance with MOE guidelines, a receptor is a Participating Receptor (PR) and is not considered as a POR if the property of the receptor is associated with the Project. Therefore, the sound level limits stated in Section 3 of this report do not apply.

Eighty two (82) receptors have been identified as PRs in accordance with MOE guidelines. These receptors were originally identified in the 2011 Report and modelled at a height of 4.5 m and located at the centre of the dwelling. In addition, fifty two (52) signed vacant lots have also been modelled as vacant lot PRs (VPRs) located within a building envelope typical to the area. These PRs have been placed at the corner of the building envelope resulting in the highest noise levels. These receptors have also been modelled at a height of 4.5m above grade. PR locations are summarized in Table 6. A zoning map is included in Appendix A.

Table 6: Participating Receptor Locations Summary

Receptor ID	Description	Location Coordinates	
		X (Easting)	Y (Northing)
PR0001	Refer to attached CD for Table 6.		
PR0002			
PR0003			

5.0 METHODOLOGY

5.1 Predicted Noise Impact Assessment

A predictive analysis was performed using the commercially available software package Cadna/A. Geometrical spreading, attenuation from barriers, ground effect and atmospheric absorption were included in the analysis as determined from ISO 9613 (part 2), which is the current standard used for outdoor sound propagation predictions. It should be noted that this standard makes provisions to include a correction to address for downwind or ground based temperature inversion conditions. Noise predictions have been made assuming a downwind or moderate temperature inversion conditions for all PORs, a design condition consistent with the accepted practice of the MOE.

5.2 Atmospheric Absorption

As required by the MOE, the attenuation due to atmospheric absorption is based on the atmospheric attenuation coefficients for a temperature of 10ºC and a relative humidity of 70%. Table 7 summarizes the atmospheric attenuation coefficients used in this assessment.

Table 7: Summary of Atmospheric Absorption Coefficients

Octave Band Centre Frequency (Hz)	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Atmospheric Absorption Coefficients (dB/km)	0.1	0.4	1.0	1.9	3.7	9.7	32.8	117.0

5.3 Ground Effect

In accordance with MOE procedures, ground effect at the source(s), receiver(s) and all areas between can be set to one of the following two options:

- Variable ground effect (G(source) = 1, G(receiver) = 0.5, G(middle) = 0.8).
- Uniform ground effect (G=0.7 everywhere).

For the purpose of this assessment, uniform ground effect was applied.

5.4 Turbine Noise Emission Rating

Wind Shear

Sound power levels emitted by wind turbine generators are dependent on wind speeds at the hub. In contrast, the background noise levels specified by the MOE are based on wind speeds at receptor locations. Therefore, the site-specific wind shear has been used to account for the difference in wind speed between winds at 10 m versus wind speed at hub height (i.e., 80m). Table 8 summarizes the difference in wind speed for the Project based on a site-specific summer night time average wind shear value of 0.4184.

Table 8: Predicted Hub-height Wind Speed

Wind Speed (m/s) at 10m height	**≤ 6**	**7**	**8**	**9**	**10**
Wind Speed (m/s) at Hub height	≤ 14.32	16.71	18.77	21.48	23.87

Turbine Noise Emission Rating

As required by the MOE, the sound power data for the Siemens WTGs was acquired in accordance with IEC 61400-11 (IEC, 2002) procedures as identified in the manufacturer's noise data provided in Appendix B. The manufacturer's noise data demonstrates that the wind turbines are not tonal. This information is presented in Table 9 and Table 10 for the Siemens-SWT-101 and Siemens-SWT-93 WTGs respectively.

Table 9: Noise Source Sound Power Level Summary Table for Siemens-SWT-101 turbines

	Octave Band Sound Power Level (dB)									
	Manufacturer's Emission Levels [1,2,3]					Adjusted Emission Levels				
Wind Speed (m/s) at 10m height	**≤ 6**	**7**	**8**	**9**	**10**	**≤ 6**	**7**	**8**	**9**	**10**
Frequency (Hz)										
63	108.8	N/A	108.6	N/A	N/A	108.8	108.7	108.6	108.6	108.6
125	109.9	N/A	109.1	N/A	N/A	109.9	109.5	109.1	109.1	109.1
250	105.6	N/A	104.6	N/A	N/A	105.5	105.0	104.6	104.6	104.6
500	102.7	N/A	103.0	N/A	N/A	102.7	102.9	103.0	103.0	103.0
1000	99.6	N/A	100.1	N/A	N/A	99.6	99.9	100.1	100.1	100.1
2000	95.9	N/A	95.3	N/A	N/A	95.9	95.6	95.3	95.3	95.3
4000	88.3	N/A	88.6	N/A	N/A	88.3	88.5	88.6	88.6	88.6
8000	86.0	N/A	86.8	N/A	N/A	86.0	86.4	86.8	86.8	86.8
A-Weighted	**105**	**105**	**105**	**105**	**105**	**105**	**105**	**105**	**105**	**105**

[1] Tested based on Measurement standard IEC 61400-11 ed. 2 2002.
[2] Octave band data for 7m/s was not provided and was interpolated between 6m/s and 8m/s
[3] Octave band data for 9m/s and 10m/s was not provided. It is understood that the 8m/s data represents maximum noise levels

Table 10: Noise Source Sound Power Level Summary Table for Siemens-SWT-93 turbines

	Octave Band Sound Power Level (dB)									
	Manufacturer's Emission Levels [1,2,3]					Adjusted Emission Levels				
Wind Speed (m/s) at 10m height	**≤ 6**	**7**	**8**	**9**	**10**	**≤ 6**	**7**	**8**	**9**	**10**
Frequency (Hz)										
63	110.9	N/A	111.7	N/A	N/A	110.9	111.3	111.7	111.7	111.7
125	111.1	N/A	110.0	N/A	N/A	111.0	110.5	110.0	110.0	110.0
250	109.2	N/A	107.7	N/A	N/A	109.1	108.4	107.7	107.7	107.7
500	101.7	N/A	102.4	N/A	N/A	101.7	102.1	102.4	102.4	102.4
1000	94.6	N/A	96.9	N/A	N/A	94.7	95.9	96.9	96.9	96.9
2000	91.6	N/A	92.3	N/A	N/A	91.6	92.0	92.3	92.3	92.3
4000	87.2	N/A	88.0	N/A	N/A	87.2	87.6	88.0	88.0	88.0
8000	82.1	N/A	86.5	N/A	N/A	82.3	84.6	86.5	86.5	86.5
A-Weighted	**104.4**	**104.4**	**104.4**	**104.4**	**104.4**	**104.4**	**104.4**	**104.4**	**104.4**	**104.4**

[1] Tested based on Measurement standard IEC 61400-11 ed. 2 2002.
[2] Octave band data for 7m/s was not provided and was interpolated between 6m/s and 8m/s
[3] Octave band data for 9m/s and 10m/s was not provided. It is understood that the 8m/s data represents maximum noise levels

5.5 Transformer Noise Emission Rating

The Project substation will include a step up power transformer. Table 11 provides the transformer noise specification that will be used to procure the substation transformer. The specification is based a sound pressure level of 63 dBA at a distance of 2 m from any surface on the transformer. A detailed description of the transformer can be found in the attached CD. This results in an overall sound power level of 88 dBA for the transformer. The transformer was modelled at a height of 7 m.

Table 11: Substation Transformer Sound Power Noise Specification

	Octave Band Centre Frequency (Hz)							
Source	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Transformer[1,2]	91.1	94.7	92.7	85.5	78.7	75.4	67.1	58.3

[1] Transformers will be designed in accordance with all applicable standards including CSA-C88-M90 and the above octave band sound power levels.
[2] A 5 dB penalty has been added to the transformers overall sound pressure levels at each POR in accordance with MOE requirements.

5.6 Cumulative Effects Assessment

In order to assess potential cumulative effects associated with the Project, all other planned projects within a 10 km buffer around the site were considered (Figure 3, end of the Report).

As per published MOE guidelines (MOE, 2008) NextEra Energy Canada completed research to identify any approved adjacent projects. Two (2) planned Project within a 10 km radius of the Summerhaven Wind Energy Centre was identified, which was the Capital Power Corporation (CPC) Port Dover and Nanticoke (PDN) wind farm and the Samsung Renewable Energy Inc. (Samsung) Grand Renewable Energy Park (GREP). For all other projects, information was limited to the various project Notices of Commencement. In order to address foreseeable and predicted cumulative noise impacts with the adjacent PDN and Samsung wind farms and the Summerhaven Wind Energy Centre, CPC and NextEra Energy Canada worked together to develop layouts that would allow both projects to co-exist. In May 2010 a layout (crystallized) was presented to the MOE for both the PDN wind farm and the Summerhaven Wind Energy Centre. The MOE agreed to allow the two projects to proceed without consideration for other proposed projects in the area. As the Samsung GREP project received an REA approval since the 2011 Report, the GREP project was included in the cumulative effects assessment.

- **Capital Power Corporation Wind Project**– In late November 2009, CPC acquired the Port Dover and Nanticoke (PDN) wind farm from Tribute Resources Inc (TSX-V: TRB). The Project, proposed for Haldimand County and Norfolk County, would have the potential to generate approximately 105 megawatts (MW) of renewable energy and would be developed through the Ontario Power Authority's (OPA) recently launched Feed-in-Tariff (FIT) program. The CPC Wind Project consists of up to sixty (60) Vestas V90 wind turbines for a nameplate capacity of up to 108 MW. (Zephyr North, 2012a).
- **Samsung Renewable Energy Inc. Renewable Energy Project –** Is proposed within the Haldimand County. It consists of a 148.6 MW (nameplate capacity) wind project, a 100 MW (nameplate capacity) solar project and a transmission line to convey electricity to the existing power grid. The Samsung GREP consists of up to sixty-seven (67) Siemens SWT-2.3-101 WTGs (sixty-five (65) turbines with a nameplate capacity of 2.221 MW and two (2) turbines with a nameplate capacity of 2.126 MW), (Zephyr North, 2012b).

6.0 RESULTS

6.1 Noise Impact Assessment

Using noise data provided by the WTG manufacturer and the noise specification for the substation transformer, Golder has carried out noise predictions for the operation of the Project. The manufacturer's test data was based on a surface roughness of 2.133m, the data was adjusted based on the site specific wind shear of 0.4184. The results of the predictions are summarized in Table 18 and Table 19. Figures 4a, 4b, and 4c (end of the Report) show the resulting noise level contours for 6, 7, and 8 m/s respectively. Noise contours for 9m/s and 10m/s are equivalent to 8m/s (maximum sound power is reached at 8m/s). Please refer to the attached CD for sample calculations. As required by the MOE, sample calculations include noise predictions for a single WTG at one receptor location and all WTGs at a single receptor location.

6.2 Cumulative Effects Assessment

6.2.1 CPC PDN wind farm and Samsung GREP projects

As discussed in Section 5.6, the cumulative effects assessment was completed by generating noise predictions due to the Summerhaven Wind Energy Centre, the PDN wind and the GREP projects.

Turbine coordinates for both the PDN wind farm and GREP project is provided in Tables 12 and 13 respectively. Transformer and Inverter locations associated with the solar component of the GREP are provided in Tables 14 and 15 respectively, while the substation locations for the projects is provided in Tables 16 and 17 for the PDN and GREP projects respectively. A noise model was created based on these layouts and manufacturer's noise data as presented in the noise studies prepared for the respective projects. Based on a conservative site specific wind shear assumed, the highest sound power was applied at all wind speeds for both PDN wind and GREP projects.

When modelling the PDN wind farm alone, one (1) receptor within the Summerhaven Wind Energy Centre Project area has a noise level above 40.0 dBA. The level at VPR0050 is 45.2 dBA. VPR0050 is located at the base of PDN turbine T340 and VPR0015 is located on the same lot as PDN turbine T349. It is Golder's understanding that the PDN wind farm has been developed to meet the MOE's noise guideline requirements of 40.0 dBA at 6m/s. Therefore, this receptor is considered to be a participating receptor for the PDN wind farm.

When modelling the GREP project alone, two (2) receptors within the Summerhaven Wind Energy Centre Project area have noise levels above 40.0 dBA. The levels at VPR0122 and POR2174 are 40.9 and 40.4 dBA respectively. It is Golder's understanding that the GREP project has been developed to meet the MOE's noise guideline requirements of 40.0 dBA at 6m/s. Therefore, these receptors are considered to be a participating receptor for the GREP project.

Modelling all projects together results in an additional thirty one (31) receptors increasing to over 40.0 dBA. The receptors are all participating receptors with the exception of POR1914. For the participating receptors, the 40.0 dBA limit does not apply. The receptor POR1914 is 429 m from the nearest GREP wind turbine and would therefore be a participating receptor with respect to the GREP project and exempt from the nose level limits.

The noise levels due to the NextEra Energy Canada Summerhaven Wind Energy Centre on receptors farther than 1.5 km from the Project are at 25 dBA or lower. This is significantly lower than the 40.0 dBA noise level limit and should not be a concern for receptors within the PDN or GREP project areas.

Table 12: Capital Power Corporation Port Dover and Nanticoke Wind Project Wind Turbine Locations

Project Name: Capital Power Corporation Port Dover and Nanticoke Wind Project

Type of Coordinates: UTM 17 NAD 83

Equipment Make & Model: Vestas V90, 90m hub height

Identifier	Location Coordinates		Identifier	Location Coordinates	
	X (Easting)	Y (Northing)		X (Easting)	Y (Northing)
T401	568697	4738990	T524	580850	4740726
T402	568926	4738733	T525	580425	4742237
T403	569076	4738504	T527	580845	4740070
T404	568895	4738193	T528	580924	4742063
T406	569647	4738615	T529	580960	4745244
T407	569430	4739242	T530	581146	4740457
T408	569563	4738160	T531	581225	4740767
T409	569814	4739619	T532	581259	4739957
T410	569995	4739250	T533	581277	4745145
T411	570172	4738893	T534	581699	4743973
T412	570109	4738532	T535	581714	4740972
T413	570344	4738290	T536	581857	4743740
T414	570347	4739860	T537	582020	4740794
T501	571882	4744905	T538	582260	4744187
T502	572054	4744163	T539	582759	4742476
T503	572511	4744710	T540	583577	4744367
T505	573708	4743768	T541	583795	4745820
T506	574387	4743875	T543	584273	4742681
T507	574930	4742640	T546	584917	4742909
T510	574802	4743808	T547	584896	4744176
T511	575322	4742751	T548	584767	4743168
T513	577329	4744017	T549	585207	4743227
T514	577261	4744282	T550	585310	4744492
T516	578653	4744610	T551	585331	4743737
T517	579441	4742072	T552	585480	4744274
T518	579533	4741665	T553	585719	4743350
T519	579897	4743587	T554	585946	4741934
T521	580139	4743140	T556	586076	4741064
T522	579948	4742195	T557	586174	4740775
T523	580395	4745151	T558	582339	4740661

Table 13: Samsung Renewable Energy Inc. Grand Renewable Energy Park Wind Turbine Locations

Project Name: Samsung Renewable Energy Inc. Grand Renewable Energy Park

Type of Coordinates: UTM 17 NAD 83

Equipment Make & Model: Siemens SWT-2.3-101 WTGs, 99.5 m hub height

Identifier	Location Coordinates		Identifier	Location Coordinates	
	X (Easting)	Y (Northing)		X (Easting)	Y (Northing)
Samsung10	593994	4748442	Samsung36	590002	4755767
Samsung58	589733	4750362	Samsung37	602481	4749039
Samsung1	607287	4746785	Samsung38	602608	4749469
Samsung2	605035	4746639	Samsung39	603875	4749401
Samsung3	606942	4746830	Samsung40	604239	4749614
Samsung4	604861	4746993	Samsung41	590395	4753879
Samsung5	602757	4745791	Samsung42	600381	4750377
Samsung6	606513	4747319	Samsung43	588466	4752970
Samsung7	608495	4747949	Samsung44	599489	4748483
Samsung8	607477	4747512	Samsung45	590085	4753880
Samsung9	600290	4745005	Samsung46	590582	4751836
Samsung11	603472	4748075	Samsung47	604740	4750499
Samsung12	601479	4747111	Samsung48	594126	4750504
Samsung13	594663	4751618	Samsung49	608750	4749784
Samsung14	603952	4750047	Samsung50	609091	4749844
Samsung15	608232	4749798	Samsung51	601762	4745085
Samsung16	594352	4749960	Samsung52	599708	4748016
Samsung17	598648	4747922	Samsung53	600301	4748359
Samsung18	587941	4753452	Samsung54	607370	4746400
Samsung19	606366	4749368	Samsung55	600136	4746677
Samsung20	592573	4749463	Samsung56	598675	4750335
Samsung21	602692	4746290	Samsung57	606650	4751283
Samsung22	601756	4751401	Samsung59	614355	4748118
Samsung23	591178	4751634	Samsung60	614974	4747470
Samsung24	592280	4749799	Samsung61	614326	4747732
Samsung25	599133	4750265	Samsung62	614680	4748176
Samsung26	607589	4749481	Samsung63	614750	4747811
Samsung27	598999	4748313	Samsung64	614705	4747338
Samsung28	591339	4752273	Samsung65	611480	4747403
Samsung29	599967	4750467	Samsung66	611758	4747387
Samsung30	606959	4749603	Samsung67	612236	4747633
Samsung33	589588	4755581	Samsung68	602131	4748909
Samsung34	589790	4753921	Samsung69	606923	4747368
Samsung35	602880	4749652			

Table 14: Samsung Renewable Energy Inc. Grand Renewable Energy Park - Solar Farm Transformer Locations

Project Name: Samsung Renewable Energy Inc. Grand Renewable Energy Park

Type of Coordinates: UTM 17 NAD 83

Equipment Make & Model: 1MVA 34.5 kV free-standing transformer

Identifier	Location Coordinates		Identifier	Location Coordinates	
	X (Easting)	Y (Northing)		X (Easting)	Y (Northing)
Tr601	596363	4750350	Tr651	597187	4748987
Tr602	596176	4750180	Tr652	596410	4748810
Tr603	596369	4750177	Tr653	596547	4748810
Tr604	596506	4750177	Tr654	596684	4748810
Tr605	596672	4750178	Tr655	596821	4748810
Tr606	596781	4750176	Tr656	596915	4748981
Tr607	596097	4750009	Tr657	597189	4748981
Tr608	596234	4750171	Tr658	596516	4748473
Tr609	596371	4750171	Tr659	596653	4748473
Tr610	596508	4750171	Tr661	597130	4748216
Tr611	596645	4750170	Tr662	597197	4748226
Tr612	596782	4750169	Tr663	597268	4748226
Tr613	596017	4749838	Tr664	597338	4748226
Tr614	596210	4749834	Tr665	597414	4748225
Tr615	596348	4749834	Tr666	597126	4750395
Tr616	596485	4749834	Tr667	597262	4750395
Tr617	596622	4749834	Tr668	597398	4750395
Tr618	596759	4749833	Tr669	597530	4750396
Tr619	596896	4749833	Tr670	597711	4750377
Tr620	595938	4749827	Tr671	597849	4750377
Tr621	596075	4749828	Tr672	597986	4750377
Tr622	596212	4749828	Tr673	597049	4750389
Tr623	596349	4749828	Tr674	597186	4750389
Tr624	596487	4749828	Tr675	597322	4750389
Tr625	596624	4749828	Tr676	597458	4750389
Tr626	596761	4749827	Tr677	597567	4750388
Tr627	596898	4749827	Tr678	597713	4750371
Tr628	595996	4749657	Tr679	597982	4750371
Tr629	596133	4749656	Tr680	596998	4750215
Tr630	596270	4749656	Tr681	597107	4750052
Tr631	596122	4749410	Tr682	597243	4750052

Identifier	Location Coordinates		Identifier	Location Coordinates	
	X (Easting)	Y (Northing)		X (Easting)	Y (Northing)
Tr632	596121	4749399	Tr683	597380	4750052
Tr633	596192	4749399	Tr684	597516	4750052
Tr634	596799	4749656	Tr685	597625	4750055
Tr635	596936	4749656	Tr686	597404	4750046
Tr636	596907	4749159	Tr687	597216	4750046
Tr637	597044	4749159	Tr688	597041	4750043
Tr638	596635	4749153	Tr689	597269	4749212
Tr639	596772	4749153	Tr690	597443	4749211
Tr640	596909	4749153	Tr691	597730	4749211
Tr641	597046	4749153	Tr692	597929	4749212
Tr642	597206	4748987	Tr693	597323	4749202
Tr643	596294	4748988	Tr694	597435	4749205
Tr644	596338	4748812	Tr695	597571	4749205
Tr645	596409	4748816	Tr696	597707	4749205
Tr646	596546	4748816	Tr697	597843	4749205
Tr647	596683	4748816	Tr698	597952	4749204
Tr648	596820	4748816	Tr699	597476	4748953
Tr649	596613	4748897	Tr700	597745	4748953
Tr650	597050	4748987	Tr701	597542	4748947

Table 15: Samsung Renewable Energy Inc. Grand Renewable Energy Park - Solar Farm Inverter Locations

Project Name: Samsung Renewable Energy Inc. Grand Renewable Energy Park

Type of Coordinates: UTM 17 NAD 83

Equipment Make & Model: two 500 kW SMA SC500HE-US housed in an SMA MV-PP enclosure

Identifier	Location Coordinates		Identifier	Location Coordinates	
	X (Easting)	Y (Northing)		X (Easting)	Y (Northing)
Tr702	596362	4750352	Tr802	597230	4748818
Tr704	596175	4750179	Tr806	596409	4748809
Tr706	596368	4750179	Tr808	596546	4748809
Tr708	596505	4750179	Tr810	596683	4748808
Tr710	596671	4750176	Tr812	596821	4748808
Tr712	596780	4750177	Tr814	596958	4748808
Tr714	596096	4750007	Tr816	597232	4748808
Tr716	596233	4750169	Tr818	596515	4748475
Tr718	596370	4750169	Tr820	596652	4748475
Tr720	596507	4750169	Tr822	597129	4748557

Identifier	Location Coordinates		Identifier	Location Coordinates	
	X (Easting)	Y (Northing)		X (Easting)	Y (Northing)
Tr722	596644	4750168	Tr824	597196	4748567
Tr724	596782	4750168	Tr826	597267	4748567
Tr726	596017	4749836	Tr828	597337	4748567
Tr728	596210	4749836	Tr830	597413	4748223
Tr730	596347	4749836	Tr832	597125	4750397
Tr732	596484	4749836	Tr834	597261	4750397
Tr734	596621	4749835	Tr836	597397	4750397
Tr736	596758	4749835	Tr838	597530	4750398
Tr738	596895	4749835	Tr840	597711	4750379
Tr740	595937	4749825	Tr842	597848	4750379
Tr742	596074	4749826	Tr844	597985	4750379
Tr744	596212	4749826	Tr846	597049	4750388
Tr746	596349	4749826	Tr848	597185	4750388
Tr748	596486	4749826	Tr850	597321	4750387
Tr750	596623	4749826	Tr852	597458	4750387
Tr752	596760	4749826	Tr854	597566	4750386
Tr754	596897	4749826	Tr856	597712	4750370
Tr756	595995	4749655	Tr858	597982	4750370
Tr758	596132	4749655	Tr860	596998	4750216
Tr760	596270	4749655	Tr862	597106	4750054
Tr762	596798	4749654	Tr864	597243	4750054
Tr764	596936	4749654	Tr866	597379	4750054
Tr766	596121	4749408	Tr868	597515	4750054
Tr768	596191	4749397	Tr870	597624	4750053
Tr770	596906	4749161	Tr872	597040	4750045
Tr772	597044	4749161	Tr874	597215	4750045
Tr774	596121	4749397	Tr876	597403	4750044
Tr776	596293	4748986	Tr878	597268	4749214
Tr778	596634	4749152	Tr880	597443	4749213
Tr780	596771	4749151	Tr882	597730	4749213
Tr782	596908	4749151	Tr884	597928	4749214
Tr784	597046	4749151	Tr886	597323	4749204
Tr786	597206	4748989	Tr888	597434	4749204
Tr788	596337	4748810	Tr890	597570	4749203
Tr790	596408	4748818	Tr892	597706	4749203
Tr792	596545	4748818	Tr894	597843	4749203
Tr794	596682	4748818	Tr896	597951	4749203
Tr796	596819	4748818	Tr898	597476	4748955

Identifier	Location Coordinates		Identifier	Location Coordinates	
	X (Easting)	Y (Northing)		X (Easting)	Y (Northing)
Tr798	596956	4748818	Tr900	597744	4748955
Tr800	597093	4748818	Tr902	597541	4748946

Table 16: Capital Power Corporation Port Dover and Nanticoke Wind Project Substation Transformer Location

Identifier	Location Coordinates	
	X (Easting)	Y (Northing)
Transformer	576096	4746561

Table 17: Samsung Renewable Energy Inc. Grand Renewable Energy Project Substation Transformer Location

Identifier	Location Coordinates	
	X (Easting)	Y (Northing)
Wind Farm Transformer	596520	4749103
Solar Farm Transformer	596520	4749113

Table 18: Combined Noise Impact Assessment Summary - Points of Reception

Point of Reception ID	Distance to Nearest Wind Turbine (m)	Nearest Turbine ID	Calculated Overall SPL (dBA) at Receptor Locations at Selected Wind Speeds (m/s)					Sound Level Limit at Selected Wind Speeds (dBA)					Compliance with MOE Limits?
			≤ 6	7	8	9	10	≤ 6	7	8	9	10	
POR001	Refer to attached CD for Table 13.												
POR002													
POR003													

Table 19: Combined Noise Impact Assessment Summary - Participating Receptors

Participating Receptor ID	Distance to Nearest Wind Turbine (m)	Nearest Turbine ID	Calculated Sound Level at Selected Wind Speeds (dBA)				
			≤ 6	7	8	9	10
PR001	Refer to attached CD for Table 14.						
PR002							
PR003							

Table 20A: Cumulative Effects – 6 m/s

Receptor ID	Closest Summerhaven Source		Contribution of Summerhaven Project	Closest Capital Power Source		Contribution of Capital Power Project (dBA)	Closest GREP Project Source		Contribution of Samsung Project (dBA)	Total Predicted Level (dBA) CADNA
	Distance	ID		Distance	ID		Distance	ID		
POR001	Refer to attached CD for Table 20A									
POR002										
POR003										

Table 20B: Cumulative Effects – 7 m/s

Receptor ID	Closest Summerhaven Source		Contribution of Summerhaven Project	Closest Capital Power Source		Contribution of Capital Power Project (dBA)	Closest GREP Project Source		Contribution of Samsung Project (dBA)	Total Predicted Level (dBA) CADNA
	Distance	ID		Distance	ID		Distance	ID		
POR001	Refer to attached CD for Table 20B									
POR002										
POR003										

Table 20C: Cumulative Effects – 8 m/s

Receptor ID	Closest Summerhaven Source		Contribution of Summerhaven Project	Closest Capital Power Source		Contribution of Capital Power Project (dBA)	Closest GREP Project Source		Contribution of Samsung Project (dBA)	Total Predicted Level (dBA) CADNA
	Distance	ID		Distance	ID		Distance	ID		
POR001	Refer to attached CD for Table 20C									
POR002										
POR003										

7.0 CONCLUSION

Golder was retained by NextEra Energy Canada ULC., to prepare a Revised Noise Study Report for an application for an amended Renewable Energy Approval for the proposed 128.82 MW Project, located in the vicinity of vicinity of Nanticoke, Haldimand County, Ontario. Using manufacturer's noise specifications, Golder has predicted noise levels that are at or below the MOE noise level limits at specified wind speeds. Based on these results, the Project will operate within compliance limits as set out by the MOE.

8.0 REFERENCES

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Report Signature Page

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FIGURES