Appendix 13 Noise and Shadow Flicker Modelling

November 4, 2014

Mr. Trent MacDonald
EON WIndElectric
4 MacDonald Avenue
Dartmouth, NS B3B 1C5

Dear Mr. MacDonald,

Re: Sound and Shadow Flicker Modeling Results
Porters Lake Wind Power Project, Halifax County, NS

INTRODUCTION

Watts Wind is proposing the development of the Porters Lake Wind Power Project (the Project). The Project consists of two General Electric (GE) 1.6 MW turbines located in the community of Porters Lake.

To support Project planning and the Nova Scotia Environmental Assessment (EA) process, Strum completed the following sound and shadow flicker modelling assessments.

BACKGROUND

Wind Turbines and Noise

Wind turbines generate sound both through the movement of mechanical equipment inside the nacelle and through the interaction of the blades with the air as they rotate around the nacelle. In modern turbine designs, much of the mechanical noise is mitigated through the use of noise insulating materials. Aerodynamic sound resulting from blade rotation is an unavoidable by-product of wind energy generation, although advances in blade engineering have greatly reduced the sound power level emitted from operating turbines. The sound pressure level at a given point in the landscape surrounding the wind turbine is influenced by propagation distance, local topography, atmospheric conditions, and vegetative cover (Hau 2006).

Nova Scotia has no specific sound guidelines for wind farms; however, through the EA process, Nova Scotia Environment (NSE) requires that predicted noise levels at identified residential receptors (as well as daycares, hospitals, and schools) not exceed 40 dBA. As this guideline is intended to be protective of human sleep disturbance, 40 dBA does not apply to commercial or vacant lot receptors. This guideline was used in the current sound assessment for the Project.

Wind Turbines and Shadow Flicker

The rotating blades of a wind turbine can cast a moving shadow on locations within a certain distance of the turbine. This intermittent shadow, perceived as a change in light intensity to an observer, is referred to as shadow flicker. The potential impact area depends on the time of year and day and the wind turbine's physical characteristics (height, rotor diameter, blade width, and orientation of the rotor blades).

For shadow flicker to occur, the following criteria must be met:

- The sun must be shining and not be obscured by clouds/fog.
- The source turbine must be operating.
- The wind turbine must be situated between the sun and the shadow receptor.
- The wind turbine must be facing directly towards, or away from, the sun such that the rotational plane of the blades (rotor plane) is perpendicular to the azimuth of incident sun rays. For this to occur, the wind direction would have to be parallel to the azimuth of the incident sun rays throughout the day.
- The line of sight between the turbine and the shadow receptor must be clear. Light-impermeable obstacles, such as vegetation, tall structures, etc., will prevent shadow flicker from occurring at the receptor.
- The shadow receptor has to be close enough to the turbine to be in the shadow.

There are no municipal, provincial, or federal guidelines related to shadow flicker, but many jurisdictions (including NSE) have adopted the industry standard of no more than 30 hours of shadow flicker per year, or no more than 30 minutes of shadow flicker on the worst day of the year. These guidelines were developed in Germany to prevent excessive annoyance to neighbours of wind energy developments and are now included under that country's *Federal Emission Control Act* (as cited in Haugen 2011). These guidelines were used in the current shadow flicker assessment for the Project.

ASSESSMENT METHODOLOGY AND RESULTS

Project Layout and Turbine Characteristics

All modeling was based on the Project layout and the GE 1.6-82.5 turbine model. The precise coordinates and locations of each turbine are:

- T1: 44° 43' 31.30" N, 63° 21' 24.28" W;
- T2: 44° 43' 34.89" N, 63° 21' 04.27" W.

The GE 1.6-82.5 turbine model has the following structural characteristics (GE 2012):

- Hub height – 80 m;
- Rotor diameter – 82.5 m.

Sound Assessment

Sound Methodology

An acoustic assessment was conducted for the Project to predict sound pressure levels at identified receptors within a 2 km radius of the proposed turbine locations. The assessment was completed using the "Decibel" module of the WindPro v. 2.8 software package. For the purposes of this model, receptors included all structures identified in the provincial topographic mapping, as well as any additional identifiable structures based on aerial imagery. No attempt to distinguish sheds and outbuildings from dwellings or cottages was made.

The sound assessment model followed ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method and calculations, and was based on the following input information:

- UTM coordinates for the wind turbines;
- UTM coordinates for existing receptors (134) within a 2 km radius of the Project site;
- A wind speed of 10 m/s, the speed at which the highest sound power level output is achieved (based on test data from the manufacturer);
- Overall sound emission data for the GE 1.6-82.5, provided by the manufacturer in the document "Technical Documentation Wind Turbine Generator Systems 1.6-82.5 - 50 Hz and 60 Hz 1.68-82.5 - 60 Hz" (GE 2012);
- Topographic data for the surrounding area; and
- 1/1 octave level data provided by the manufacturer.

The ISO 9613-2 calculation method assumes meteorological conditions that are ideal for noise propagation, including a ground temperature of 10^{o}C and 70% relative humidity. A conservative ground factor of 0.5 was applied to the model, although the forested nature of the landscape (e.g. predominantly porous ground which is capable of supporting vegetative growth) could support a higher value.

Sound Modeling Results

Modeling results are provided in Table 1 (attached) and indicate that predicted sound pressure levels will not exceed 40 dBA at any existing receptor (Drawing 1).

Shadow Flicker Assessment

Shadow Flicker Methodology

A shadow flicker assessment was completed for the Project to assess the potential impact of shadows at identified receptors within a 2 km radius of the proposed turbine locations. Receptors were identified using the same methodology as described in the previous section for the sound assessment. The assessment was completed using the "Shadow" module of the WindPro v. 2.8 software package using worst case scenario conditions, including:

- Constant sunshine during daylight hours;
- Turbines are always operational;
- Turbine blades are oriented perpendicular to the line between the sun and all receptors;
- No obstructions are present that may obscure shadows; and
- Receptor windows are oriented towards the turbine(s).

The extent of the shadow zone of each turbine was calculated in consideration of the structural characteristics of the turbine, according to guidelines used in Germany (WindPro 2012).

Shadow Flicker Results

Modeling results are provided in Table 2 (attached) and indicate that all existing receptors are predicted to comply with the industry standard of no more than 30 minutes of shadow on the worst day and no more than 30 hours of shadow flicker per year (Drawing 2).

CONCLUSIONS

An evaluation of potential sound and shadow flicker levels of the Porters Lake Wind Power Project was completed. Based on predictive modeling, sound and shadow flicker levels are not expected to exceed NSE guidelines or accepted industry standards at any existing receptor.

Once you have had an opportunity to review this correspondence, please contact us to address any questions you may have.

Thank you,

Melanie Smith, MES
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Shawn Duncan, BSc.
Vice President
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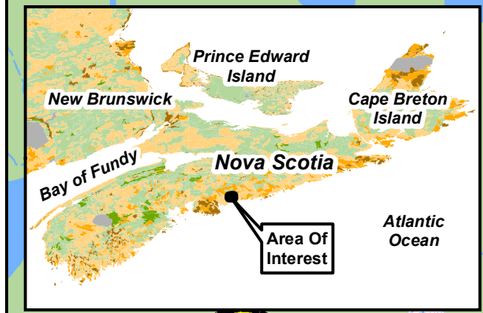
REFERENCES

General Electric. 2012. Technical Documentation Wind Turbine Generator Systems 1.6-82.5 - 50 Hz and 60 Hz 1.68-82.5 - 60 Hz. 7 pp.

Haugen K.M.B. 2011. International review of policies and recommendations for wind turbine setbacks from residences: setbacks, noise, shadow flicker, and other concerns. Minnesota Department of Commerce: Energy Facility Permitting. 43 pp.

WindPRO. 2012. Environment Manual Section 4.2.1 - Shadow Calculation Method. Pp 350-351.



N

Highway 7

Porters Lake

Lake Echo

Grand Lake

Highway 107

R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R17 R18 R19 R21 R22 R23 R24 R25 R27 R28 R29 R30 R31 R32 R33 R34 R37 R38 R41 R42 R43 R45 R46 R47 R48 R49 R51 R53 R54 R55 R56 R57 R58 R59 R60 R61 R62 R63 R64 R65 R66 R67 R68 R70 R71 R72 R73 R74 R75 R76 R78 R79 R80 R81 R82 R83 R84 R85 R86 R87 R88 R89 R90 R91 R92 R93 R94 R95 R96 R97 R98 R99 R101 R103 R104 R105 R106 R107 R108 R110 R112 R113 R115 R116 R117 R118 R119 R120 R121 R122 R123 R124 R127 R128 R131 R132 R133

0 200 400 600 800 1,000 1,200 1,400 Metres

Notes:

1. Reference: Digital Topographic Mapping by Nova Scotia Geomatics Centre.
2. Projection: WGS84, UTM Zone 20 North.
3. Sound Isolines Calculated in WindPro v. 2.9.

Legend:

- Noise Receptors
- Proposed Turbine

Sound Modeling Results

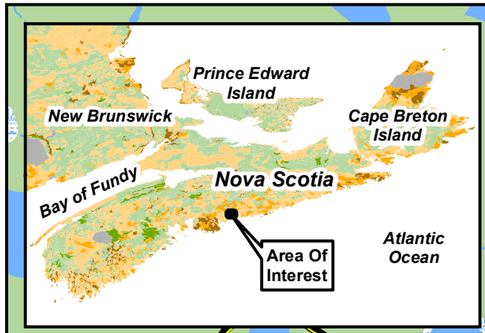
Predicted Sound Level (dBA)

- 35 - 39.9
- 40 - 44.9
- 45 - 49.9
- 50 - 54.9
- 55 +
- Major Roads and Highways
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Mapped Wet Area

Sound Modeling Results

Strum CONSULTING

Date: Nov. 2014	Project #: 14-5102
Scale: 1:17,500	Drawing #: 1
Drawn By: G. Gregory	
Checked By: M. Smith	



N

Highway 7

Porters Lake

Lake Echo

Grand Lake

Highway 107

R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R12 R13 R14 R15 R17 R18 R19 R21 R22 R23 R24 R25 R27 R28 R29 R30 R31 R32 R33 R34 R37 R38 R41 R42 R43 R45 R46 R47 R48 R49 R51 R53 R54 R55 R56 R57 R58 R59 R60 R61 R62 R63 R64 R65 R66 R67 R68 R70 R71 R72 R73 R74 R75 R76 R78 R79 R80 R81 R82 R83 R84 R85 R86 R87 R88 R89 R90 R91 R92 R93 R94 R95 R96 R97 R98 R99 R101 R103 R104 R105 R106 R107 R108 R110 R112 R113 R115 R116 R117 R118 R119 R120 R121 R122 R123 R124 R127 R128 R131 R132 R133 R109

0 200 400 600 800 1,000 1,200 1,400 1,600 Metres

Notes:

1. Reference: Digital Topographic Mapping by Nova Scotia Geomatics Centre.
2. Projection: WGS84, UTM Zone 20 North.
3. Shadow Extents Calculated in WindPro v. 2.9.

Legend:

- Proposed Turbine
- Shadow Receptors
- Major Roads and Highways
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Mapped Wet Area

Shadow Flicker Modeling Results

Predicted Shadow Hrs/Year

- 0 +
- 10 +
- 30 +
- 100 +

Shadow Flicker Modeling Results

Strum CONSULTING

Date: Nov. 2014	Project #: 14-5102
Scale: 1:17,500	Drawing #: 2
Drawn By: G. Gregory	
Checked By: M. Smith	

Table 1: Sound Modeling Results, Porters Lake Wind Power Project, Porters Lake, NS *Project #14-5102*

Receptor ID	Easting	Northing	Predicted Noise Level (dBA)
R1	469768	4952740	28.1
R2	469785	4952151	28.1
R3	469786	4952786	28.2
R4	469791	4952724	28.2
R5	469795	4952759	28.2
R6	469808	4952319	28.3
R7	469814	4952737	28.4
R8	469814	4952865	28.3
R9	469833	4952924	28.3
R10	469833	4952289	28.4
R11	469835	4952951	28.3
R12	469838	4952121	28.3
R13	469843	4953008	28.3
R14	469844	4952980	28.3
R15	469846	4952907	28.4
R16	469850	4952961	28.4
R17	469866	4952931	28.5
R18	469884	4952115	28.6
R19	469884	4952088	28.5
R20	469916	4952066	28.7
R21	469925	4951991	28.6
R22	469940	4952026	28.8
R23	469946	4953307	28.3
R24	469976	4951980	28.9
R25	469979	4953324	28.5
R26	469981	4952093	29.1
R27	469989	4951932	28.9
R28	469990	4953466	28.2
R29	469995	4952072	29.2
R30	470011	4953404	28.5
R31	470013	4953386	28.5
R32	470014	4952063	29.3
R33	470023	4952026	29.3
R34	470195	4953736	28.4
R35	470251	4953753	28.6
R36	470275	4953808	28.5
R37	470291	4953800	28.6
R38	470314	4953792	28.8
R39	470357	4953768	29.1
R40	470368	4953784	29.1
R41	470377	4953761	29.2
R42	470392	4953779	29.2
R43	470396	4953748	29.3
R44	470412	4953760	29.4
R45	470422	4953580	30.1
R46	470434	4953581	30.1
R47	470470	4953616	30.2
R48	470480	4953711	29.9
R49	470497	4953697	30
R50	470521	4953688	30.2
R51	470524	4953583	30.6
R52	470531	4953700	30.2

Receptor ID	Easting	Northing	Predicted Noise Level (dBA)
R53	470541	4953682	30.3
R54	470542	4953598	30.6
R55	470561	4953696	30.3
R56	470590	4953661	30.6
R57	470611	4953678	30.7
R58	470679	4953523	31.7
R59	470689	4953490	31.9
R60	470752	4953599	31.7
R61	470912	4953481	33.3
R62	470923	4953466	33.4
R63	471016	4953431	34.2
R64	471019	4953451	34.1
R65	471082	4953402	34.8
R66	471137	4953398	35.1
R67	471210	4953424	35.4
R68	471210	4953406	35.5
R69	472619	4954225	30.5
R70	472636	4954174	30.7
R71	472660	4954100	31.2
R72	472674	4954107	31.1
R73	472689	4954245	30.2
R74	472699	4954260	30.1
R75	472707	4954065	31.3
R76	472714	4954118	30.9
R77	472718	4954207	30.3
R78	472740	4954193	30.4
R79	472744	4954116	30.8
R80	472765	4954122	30.7
R81	472785	4954123	30.7
R82	472793	4954194	30.2
R83	472815	4954200	30.1
R84	472874	4954255	29.7
R85	472884	4954092	30.6
R86	472885	4954265	29.6
R87	472886	4954112	30.4
R88	472886	4954134	30.3
R89	472943	4954242	29.5
R90	472977	4954152	29.9
R91	472990	4953847	31.6
R92	473036	4954227	29.3
R93	473037	4953731	32
R94	473045	4954180	29.5
R95	473059	4953858	31.2
R96	473070	4954158	29.6
R97	473081	4954149	29.6
R98	473106	4954253	29
R99	473127	4953790	31.3
R100	473144	4954265	28.8
R101	473182	4953796	31
R102	473225	4953894	30.3
R103	473238	4954205	28.8
R104	473256	4953807	30.6

Receptor ID	Easting	Northing	Predicted Noise Level (dBA)
R105	473274	4953927	30
R106	473277	4953810	30.5
R107	473329	4954232	28.3
R108	473331	4953832	30.1
R109	473335	4951625	31.4
R110	473340	4953918	29.7
R111	473395	4953967	29.3
R112	473400	4953943	29.3
R113	473416	4953867	29.6
R114	473443	4953958	29.1
R115	473447	4953975	29
R116	473469	4953889	29.3
R117	473503	4953978	28.8
R118	473526	4953904	29
R119	473559	4954013	28.4
R120	473578	4953896	28.8
R121	473633	4953920	28.4
R122	473641	4953930	28.4
R123	473685	4953926	28.2
R124	474019	4952297	28.9
R125	469793	4952810	28.2
R126	469873	4953018	28.4
R127	469876	4952223	28.6
R128	469951	4952136	29
R129	470054	4951999	29.4
R130	469997	4952101	29.2
R131	473867	4953534	28.6
R132	473819	4953674	28.4
R133	473832	4953723	28.2
R134	473159	4954206	29

Table 2: Shadow Flicker Modeling Results, Porters Lake Wind Power Project, Porters Lake, NS Project #14-5102

Name	Easting	Northing	Predicted Shadow Hours/per year	Predicted Maximum Shadow Hours/Day
R1	469768	4952740	1:18	0:09
R2	469785	4952151	1:16	0:09
R3	469786	4952786	1:23	0:08
R4	469791	4952724	1:28	0:09
R5	469795	4952759	1:25	0:09
R6	469808	4952319	1:37	0:10
R7	469814	4952737	1:28	0:09
R8	469814	4952865	1:31	0:09
R9	469833	4952924	1:34	0:09
R10	469833	4952289	1:35	0:10
R11	469835	4952951	1:35	0:09
R12	469838	4952121	1:22	0:09
R13	469843	4953008	1:35	0:09
R14	469844	4952980	1:37	0:09
R15	469846	4952907	1:37	0:09
R16	469850	4952961	1:38	0:09
R17	469866	4952931	1:42	0:10
R18	469884	4952115	1:26	0:09
R19	469884	4952088	1:24	0:09
R20	469916	4952066	1:30	0:09
R21	469925	4951991	1:46	0:10
R22	469940	4952026	1:48	0:10
R23	469946	4953307	1:25	0:09
R24	469976	4951980	2:00	0:10
R25	469979	4953324	0:00	0:00
R26	469981	4952093	1:43	0:10
R27	469989	4951932	1:50	0:10
R28	469990	4953466	0:00	0:00
R29	469995	4952072	1:50	0:10
R30	470011	4953404	0:00	0:00
R31	470013	4953386	0:00	0:00
R32	470014	4952063	1:53	0:10
R33	470023	4952026	2:00	0:11
R34	470195	4953736	0:00	0:00
R35	470251	4953753	0:48	0:04
R36	470275	4953808	0:00	0:00
R37	470291	4953800	0:00	0:00
R38	470314	4953792	0:20	0:03
R39	470357	4953768	0:22	0:03
R40	470368	4953784	0:20	0:03
R41	470377	4953761	0:19	0:03
R42	470392	4953779	0:14	0:02
R43	470396	4953748	0:18	0:03
R44	470412	4953760	0:20	0:03
R45	470422	4953580	3:35	0:09
R46	470434	4953581	3:12	0:09
R47	470470	4953616	0:24	0:03
R48	470480	4953711	0:20	0:03
R49	470497	4953697	0:23	0:03
R50	470521	4953688	0:24	0:03
R51	470524	4953583	0:24	0:03

Table 2: Shadow Flicker Modeling Results, Porters Lake Wind Power Project, Porters Lake, NS Project #14-5102

Name	Easting	Northing	Predicted Shadow Hours/per year	Predicted Maximum Shadow Hours/Day
R52	470531	4953700	0:24	0:03
R53	470541	4953682	0:28	0:03
R54	470542	4953598	0:30	0:04
R55	470561	4953696	0:28	0:03
R56	470590	4953661	0:33	0:04
R57	470611	4953678	0:32	0:04
R58	470679	4953523	0:44	0:05
R59	470689	4953490	0:42	0:05
R60	470752	4953599	0:55	0:05
R61	470912	4953481	1:23	0:06
R62	470923	4953466	1:28	0:07
R63	471016	4953431	2:04	0:08
R64	471019	4953451	2:06	0:07
R65	471082	4953402	2:37	0:08
R66	471137	4953398	4:01	0:09
R67	471210	4953424	2:57	0:09
R68	471210	4953406	4:14	0:09
R69	472619	4954225	0:00	0:00
R70	472636	4954174	0:00	0:00
R71	472660	4954100	0:00	0:00
R72	472674	4954107	0:00	0:00
R73	472689	4954245	0:00	0:00
R74	472699	4954260	0:00	0:00
R75	472707	4954065	0:00	0:00
R76	472714	4954118	0:00	0:00
R77	472718	4954207	0:00	0:00
R78	472740	4954193	0:00	0:00
R79	472744	4954116	0:00	0:00
R80	472765	4954122	0:00	0:00
R81	472785	4954123	0:00	0:00
R82	472793	4954194	0:00	0:00
R83	472815	4954200	0:00	0:00
R84	472874	4954255	0:00	0:00
R85	472884	4954092	0:00	0:00
R86	472885	4954265	0:00	0:00
R87	472886	4954112	0:00	0:00
R88	472886	4954134	0:00	0:00
R89	472943	4954242	0:00	0:00
R90	472977	4954152	0:00	0:00
R91	472990	4953847	0:00	0:00
R92	473036	4954227	0:00	0:00
R93	473037	4953731	0:00	0:00
R94	473045	4954180	0:00	0:00
R95	473059	4953858	0:00	0:00
R96	473070	4954158	0:00	0:00
R97	473081	4954149	0:00	0:00
R98	473106	4954253	0:00	0:00
R99	473127	4953790	0:00	0:00
R100	473144	4954265	0:00	0:00
R101	473182	4953796	0:00	0:00
R102	473225	4953894	0:00	0:00

Table 2: Shadow Flicker Modeling Results, Porters Lake Wind Power Project, Porters Lake, NS Project #14-5102

Name	Easting	Northing	Predicted Shadow Hours/per year	Predicted Maximum Shadow Hours/Day
R103	473238	4954205	0:00	0:00
R104	473256	4953807	0:00	0:00
R105	473274	4953927	0:00	0:00
R106	473277	4953810	0:00	0:00
R107	473329	4954232	0:00	0:00
R108	473331	4953832	0:00	0:00
R109	473335	4951625	6:55	0:11
R110	473340	4953918	0:00	0:00
R111	473395	4953967	0:00	0:00
R112	473400	4953943	0:00	0:00
R113	473416	4953867	0:00	0:00
R114	473443	4953958	0:00	0:00
R115	473447	4953975	0:00	0:00
R116	473469	4953889	0:00	0:00
R117	473503	4953978	0:00	0:00
R118	473526	4953904	0:00	0:00
R119	473559	4954013	0:00	0:00
R120	473578	4953896	0:00	0:00
R121	473633	4953920	0:00	0:00
R122	473641	4953930	0:00	0:00
R123	473685	4953926	0:00	0:00
R124	474019	4952297	2:00	0:09
R125	469793	4952810	1:25	0:09
R126	469873	4953018	1:43	0:10
R127	469876	4952223	1:34	0:10
R128	469951	4952136	1:38	0:10
R129	470054	4951999	2:10	0:11
R130	469997	4952101	1:47	0:10
R131	473867	4953534	0:06	0:01
R132	473819	4953674	0:03	0:01
R133	473832	4953723	0:00	0:00
R134	473159	4954206	0:00	0:00

November 10, 2014

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4 MacDonald Avenue
Dartmouth, NS B3B 1C5

Dear Mr. MacDonald,

Re: Sound Modeling Results - Ground Factor of 0
Porters Lake Wind Power Project, Halifax County, NS

Watts Wind is proposing the development of the Porters Lake Wind Power Project (the Project). The Project consists of two General Electric 1.6 MW turbines located in the community of Porters Lake.

To support Project planning and the Nova Scotia Environmental Assessment process, Strum completed a sound modeling assessment, as detailed in the November 4, 2014 report titled, "Sound and Shadow Flicker Modeling Results, Porters Lake Wind Power Project, Halifax County."

Following the completion of this assessment, the sound modeling was re-run using the same methodology as documented in the November 4, 2014 report; however, a ground factor of 0 was used in place of a ground factor of 0.5.

Modeling results are provided in Table 1 and indicate that predicted sound pressure levels will not exceed 40 dBA at any existing receptor (Drawing 1).

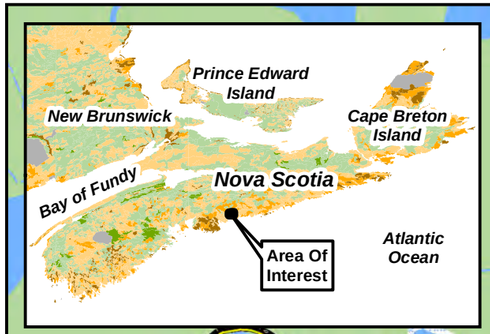
Once you have had an opportunity to review this correspondence, please contact us to address any questions you may have.

Thank you,

Melanie Smith, MES
Environmental Specialist
msmith@strum.com

Shawn Duncan, BSc.
Vice President
sduncan@strum.com

Strum Project # 14-5102



N

Highway 7

Porters Lake

Highway 107

Lake Echo

Grand Lake

R73 R74 R84 R86 R89 R92 R98 R107 R70 R78 R82 R83 R103 R76 R80 R81 R88 R90 R96 R97 R94 R71 R79 R87 R72 R75 R85

R119 R115 R117 R105 R112 R116 R120 R122 R123 R121 R91 R95 R108 R110 R113 R118 R99 R106 R93 R101 R104

R133 R132 R131

R38 R43 R42 R34 R37 R48 R55 R41 R56 R57 R49 R46 R53 R54 R60 R45 R47 R51 R58 R59 R61 R62 R64 R67 R68 R63 R65 R66

R28 R30 R31 R25 R23

R13 R14 R17 R9 R15 R8 R3 R5 R1 R7 R4

R6 R10 R127 R2 R128 R18 R19 R32 R33 R12 R22 R29 R24 R21

R124

R109

0 200 400 600 800 1,000 1,200 1,400 Metres

Notes:

1. Reference: Digital Topographic Mapping by Nova Scotia Geomatics Centre.
2. Projection: WGS84, UTM Zone 20 North.
3. Sound Isolines Calculated in WindPro v. 2.9.

Legend:

- Noise Receptors
- Proposed Turbine

Sound Modeling Results

Predicted Sound Level (dBA)

- 35 - 39.9
- 40 - 44.9
- 45 - 49.9
- 50 - 54.9
- 55 +
- Major Roads and Highways
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Mapped Wet Area

Sound Modeling Results

Strum CONSULTING

Date: Nov. 2014	Project #: 14-5102
Scale: 1:17,500	Drawing #: 1
Drawn By: G. Gregory	
Checked By: M. Smith	

Table 1: Sound Modeling Results, Porters Lake Wind Power Project, Porters Lake, NS Project #14-5102

Receptor ID	Easting	Northing	Predicted Noise Level (dBA)
R1	469768	4952740	29.6
R2	469785	4952151	29.5
R3	469786	4952786	29.6
R4	469791	4952724	29.7
R5	469795	4952759	29.7
R6	469808	4952319	29.8
R7	469814	4952737	29.8
R8	469814	4952865	29.7
R9	469833	4952924	29.8
R10	469833	4952289	29.9
R11	469835	4952951	29.8
R12	469838	4952121	29.8
R13	469843	4953008	29.7
R14	469844	4952980	29.8
R15	469846	4952907	29.9
R16	469850	4952961	29.8
R17	469866	4952931	30
R18	469884	4952115	30
R19	469884	4952088	30
R20	469916	4952066	30.1
R21	469925	4951991	30.1
R22	469940	4952026	30.2
R23	469946	4953307	29.8
R24	469976	4951980	30.4
R25	469979	4953324	29.9
R26	469981	4952093	30.6
R27	469989	4951932	30.3
R28	469990	4953466	29.7
R29	469995	4952072	30.6
R30	470011	4953404	29.9
R31	470013	4953386	30
R32	470014	4952063	30.7
R33	470023	4952026	30.7
R34	470195	4953736	29.9
R35	470251	4953753	30.1
R36	470275	4953808	30
R37	470291	4953800	30.1
R38	470314	4953792	30.2
R39	470357	4953768	30.5
R40	470368	4953784	30.5
R41	470377	4953761	30.6
R42	470392	4953779	30.6
R43	470396	4953748	30.8
R44	470412	4953760	30.8
R45	470422	4953580	31.5
R46	470434	4953581	31.6
R47	470470	4953616	31.7
R48	470480	4953711	31.3
R49	470497	4953697	31.5
R50	470521	4953688	31.6
R51	470524	4953583	32.1
R52	470531	4953700	31.6

Table 1: Sound Modeling Results, Porters Lake Wind Power Project, Porters Lake, NS Project #14-5102

Receptor ID	Easting	Northing	Predicted Noise Level (dBA)
R53	470541	4953682	31.8
R54	470542	4953598	32.1
R55	470561	4953696	31.8
R56	470590	4953661	32.1
R57	470611	4953678	32.1
R58	470679	4953523	33.2
R59	470689	4953490	33.4
R60	470752	4953599	33.2
R61	470912	4953481	34.7
R62	470923	4953466	34.9
R63	471016	4953431	35.6
R64	471019	4953451	35.5
R65	471082	4953402	36.2
R66	471137	4953398	36.6
R67	471210	4953424	36.8
R68	471210	4953406	37
R69	472619	4954225	31.9
R70	472636	4954174	32.2
R71	472660	4954100	32.6
R72	472674	4954107	32.5
R73	472689	4954245	31.6
R74	472699	4954260	31.5
R75	472707	4954065	32.7
R76	472714	4954118	32.4
R77	472718	4954207	31.8
R78	472740	4954193	31.8
R79	472744	4954116	32.3
R80	472765	4954122	32.2
R81	472785	4954123	32.1
R82	472793	4954194	31.7
R83	472815	4954200	31.6
R84	472874	4954255	31.1
R85	472884	4954092	32
R86	472885	4954265	31
R87	472886	4954112	31.9
R88	472886	4954134	31.8
R89	472943	4954242	31
R90	472977	4954152	31.4
R91	472990	4953847	33.1
R92	473036	4954227	30.8
R93	473037	4953731	33.5
R94	473045	4954180	31
R95	473059	4953858	32.7
R96	473070	4954158	31
R97	473081	4954149	31
R98	473106	4954253	30.4
R99	473127	4953790	32.8
R100	473144	4954265	30.3
R101	473182	4953796	32.5
R102	473225	4953894	31.8
R103	473238	4954205	30.2
R104	473256	4953807	32.1

Table 1: Sound Modeling Results, Porters Lake Wind Power Project, Porters Lake, NS Project #14-5102

Receptor ID	Easting	Northing	Predicted Noise Level (dBA)
R105	473274	4953927	31.4
R106	473277	4953810	32
R107	473329	4954232	29.8
R108	473331	4953832	31.6
R109	473335	4951625	32.9
R110	473340	4953918	31.2
R111	473395	4953967	30.7
R112	473400	4953943	30.8
R113	473416	4953867	31.1
R114	473443	4953958	30.6
R115	473447	4953975	30.5
R116	473469	4953889	30.7
R117	473503	4953978	30.2
R118	473526	4953904	30.4
R119	473559	4954013	29.8
R120	473578	4953896	30.2
R121	473633	4953920	29.9
R122	473641	4953930	29.8
R123	473685	4953926	29.6
R124	474019	4952297	30.4

Appendix 14 Visual Impact Assessment

November 4, 2014

Mr. Trent MacDonald
EON WindElectric
300 Prince Albert Rd., Suite 200
Dartmouth, NS B2Y 4J2

Dear Mr. MacDonald,

Re: Visual Assessment
Porter's Lake Community Wind Project

INTRODUCTION

Watts Wind is proposing the development of the Porters Lake Wind Power Project (the Project). The Project consists of two General Electric (GE) 1.6 MW turbines located in the community of Porters Lake.

To support Project planning and the Nova Scotia Environmental Assessment (EA) process, Strum completed the following visual assessment.

PREDICTED VIEW PLANE

The predicted view plane was established by collecting representative photos from vantage points within the community to represent the existing and future visual landscape.

Photographs were collected with magnetic bearings and a GPS waypoint recorded at each photo location. Geographical Information System (GIS) software was used to plot the photo locations and construct bearing lines to assist in the construction of a 3D view, generated using the GIS. A 3D surface was then constructed using the provincial Digital Elevation Model (DEM) points from the Nova Scotia Topographic Database, which supports 5 m contour intervals. The proposed turbine locations and specifics regarding the height of the turbines were used to develop the view plane. Each selected viewing site was created using the viewer location (photo GPS point, elevation, and bearing line) resulting in an accurate 3D view. The resulting computer generated view was then merged with the digital photographs using a scaled image of the proposed turbine.

Photos were taken from three locations as shown in Drawing 1. Simulated results are provided in Figures 1-3.

Actual View:

Predicted View:

Figure 1. Roadside from Highway 7: View to the southeast, towards the Project site.

Actual View:

Predicted View:

Figure 2. Roadside from Sandy Lane. View to the southwest, towards the Project site.

Actual View:

Predicted View:

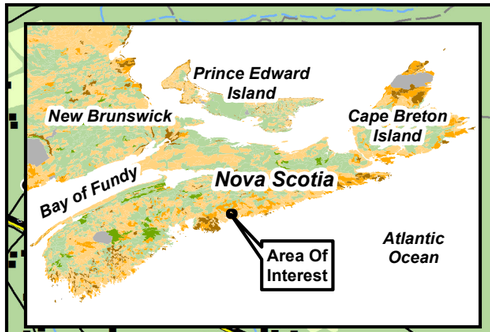
Figure 3. Roadside from Highway 107. View to the northeast, towards Project site.

Once you have had an opportunity to review this correspondence, please contact us to address any questions you may have.

Thank you,

Melanie Smith, MES
Environmental Specialist
msmith@strum.com

Shawn Duncan, BSc.
Vice President
sduncan@strum.com



N

Parker Lane

Highway 7

Porters Lake

Photo 2

Sandy Lane

Bluerock Rd

Photo 1

Roland Norwood Dr

Duck Pond

Forked Pond

Griswold Lake

Highway 107

Photo 3

Country Lake Dr

Grand Pond

0 200 400 600 800 1,000 Metres

Notes:

1. Reference: Digital Topographic Mapping by Nova Scotia Geomatics Centre.
2. Projection: WGS84, UTM Zone 20 North.

Legend:

- Proposed Turbine
- Visual Assessment Location
- Building
- Major Roads and Highways
- Public Roads
- Access Roads / Trails
- Existing Transmission Lines
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Mapped Wet Area
- Cleared Area

Visual Assessment Locations

Strum CONSULTING

Date: October 2014	Project #: 14-5102
Scale: 1:11,000	Drawing #: 1
Drawn By: H. Serhan	
Checked By: M. Smith	