HEKATRON

Optischer Rauchschalter ORS 142

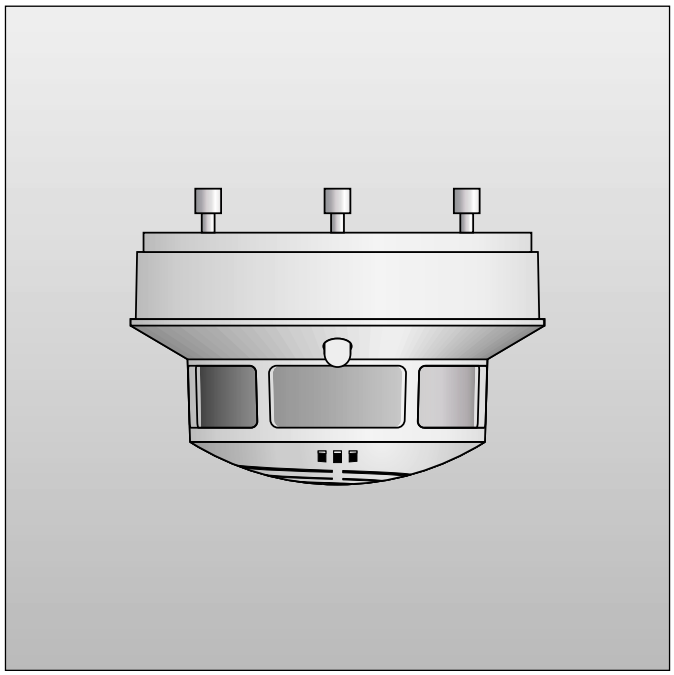
- optische Raucherkennung
- Verschmutzungsanzeige
- Alarmschwellennachführung
- kommunikationsfähig
- Meßkammerüberwachung
- potentialfreier Öffner

Détecteur de fumée optique ORS 142

- détection de fumée optique
- indicateur de colmatage
- correction du seuil d'alarme
- communication
- surveillance par chambre de mesure
- contact d'ouverture exempt de potentiel

ORS 142 optical smoke switch

- Optical smoke detection
- Contamination warning
- Auto contamination compensation
- Communications capability
- Sensing chamber monitoring
- NC volt-free contact



Der optische Rauchschalter ORS 142 erkennt frühzeitig sowohl Schwelbrände als auch offene Brände mit Rauchentwicklung.
Ein zusätzlicher Temperaturfühler spricht bei einer Umgebungstemperatur von 70 °C an.
Er wird vorzugsweise in Feststellanlagen und maschinellen Rauchabzugsanlagen eingesetzt.
Der ORS 142 löst den bisherigen Rauchschalter ORS 132 ab.

Le détecteur de fumée optique ORS 142 décèle rapidement aussi bien les feux couvants que les feux déclarés avec émission de fumée.
Un capteur thermique supplémentaire se déclenche automatiquement à partir d'une température ambiante de 70°C.
Ce dispositif s'utilise de préférence pour les contrôles automatiques des portes et systèmes de désenfumage mécaniques

The ORS 142 optical smoke switch reacts promptly to smouldering fires as well as to flaming fires that develop smoke.
An additional temperature sensor is triggered at an ambient temperature of 70 °C.
Its principal application is for door holder/closer systems and powered smoke ventilation systems.

Der ORS 142 arbeitet nach dem Streulichtprinzip. Lichtsender und -empfänger sind in der Meßkammer so angeordnet, daß das Licht des Senders den Empfänger nicht direkt trifft. Erst das an Schwebeteilen gestreute Licht gelangt zum Empfänger.
Die Auswerteelektronik des ORS 142 überwacht den Rauchmeßteil des Melders zusätzlich auf leichte Verschmutzung, starke Verschmutzung und Störung (Meßkammerausfall).
Die jeweiligen Betriebszustände zeigt der ORS 142 optisch an.
Eine Langzeit-Alarmschwellennachführung sorgt für einen gleichbleibenden Abstand zwischen Grundsignal und Alarmschwelle, bis der Grenzwert für starke Verschmutzung erreicht ist.
Ein Relaiskontakt öffnet bei Alarm sowie bei Spannungsausfall.

Kommunikation

Der ORS 142 meldet seinen Funktionszustand über Stift 3 an eine RZA 142 (Rauchschalter-Zustandsanzeige). Hier werden ebenfalls die Zustände mit farbigen LEDs optisch angezeigt.
Wird der ORS 142 an ein RSI (Rauchschalter-Interface) angeschlossen, können die Melderzustände mit einem PC abgefragt werden. Mit einem Modem können RSI und PC über eine Postleitung kommunizieren.

L'ORS 142 fonctionne sur le principe de la lumière diffuse. L'émetteur et le récepteur de lumière sont positionnés dans la chambre de mesure de manière que la lumière provenant de l'émetteur ne parvienne pas directement au récepteur, mais seulement sous forme de lumière diffusée sur les particules en suspension.
L'unité d'évaluation électronique de l'ORS 142 surveille le dispositif de mesure de fumée du détecteur afin de déceler l'encrassement, faible ou important, ainsi que les pannes (défaillances de la chambre de mesure).
Les états de fonctionnement de l'ORS 142 sont signalés de manière optique.
Le dispositif de correction du seuil d'alarme assure un écart constant entre le signal de base et le seuil d'alarme, et ceci jusqu'à ce que la valeur limite d'encrassement important soit atteinte.
Un contact de relais s'ouvre en cas d'alarme ou d'absence de courant.

Communication

L'ORS 142 signale son état de fonctionnement au niveau de l'ergot 3 de l'indicateur de fonctionnement RZA 142. Des DEL de couleur signalent également les états de fonctionnement de manière optique.
Lorsque l'ORS 142 est branché sur une interface de détecteur de fumée, il est possible de vérifier l'état de fonctionnement du détecteur à partir d'un PC. A l'aide d'un modem, l'interface et le PC peuvent communiquer par une ligne téléphonique.

The ORS 142 operates on the light scatter principle. Inside the sensing chamber a light source and a light sensor are arranged so that the light normally does not fall on the sensor. It is only when airborne particles enter the chamber that light is scattered onto the sensor.
The ORS 142 electronic circuitry also monitors the smoke detection system for slight contamination (dust and dirt build-up), heavy contamination and faults (sensing chamber failure).
LEDs provide an optical indication of the operating status of the ORS 142.
A long-term compensation function automatically maintains a constant difference between the quiescent signal and the alarm threshold, until a set limit indicating heavy contamination is reached.
A relay contact opens in the alarm condition or on power failure.

Communications

The ORS 142 signals its functional status via pin 3 to an RZA 142 smoke switch status indicator, whose coloured LEDs give an additional remote optical indication of the instrument's condition.
If the ORS 142 is linked to an RSI smoke switch interface, detector status can be scanned from a PC. The RSI and the PC can also communicate over a telecommunications line.

DIBt-Zulassungen für:

Feststellanlagen	Z-6.5-1571 Z-6.5-1725
maschinelle Rauchabzugsanlagen	Z-78.5-15

Homologations DIBt pour :

Équipements coupe-feu	Z-6.5-1571 Z-6.5-1725
Systèmes de désenfumage mécaniques	Z-78.5-15

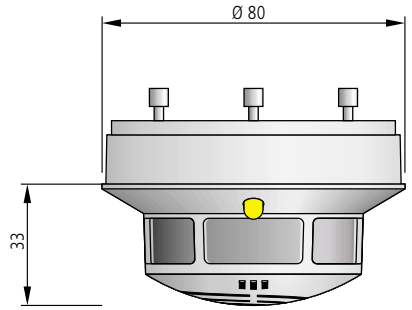
DIBt approvals for:

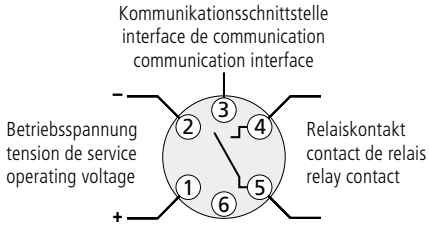
Hold-open systems	Z-6.5-1571 Z-6.5-1725
Powered smoke ventilation systems	Z-78.5-15

Technische Daten/Caractéristiques techniques/Technical data

nach/selon/to EN 54, Teil 7	Rauch	Fumée	Smoke
70 °C	Temperatur	Température	Temperature
18 bis/à/to 28 VDC	Betriebsspannung	Tension de service	Operating voltage
	Stromaufnahme bei 28 V_	Consommation pour 28 V_	Current draw at 28 V DC
max. 21 mA	in Ruhe	au repos	quiescent
max. 10 mA	bei Alarm	en cas d'alarme	in alarm
max. 25 mA	bei Störung	en cas de défaillance	in fault
Öffner/contact d'ouverture/NC	Relaiskontakte	Contacts de relais	Relay contact
max. 30 VDC	Schaltspannung	Tension d'enclenchement	switched voltage
max. 1 A	Schaltstrom	Courant d'enclenchement	switched current
max. 30 W	Schaltleistung	Puissance de rupture	switched power
IP 42	Schutzart	Indice de protection	Ingress protection
-20 bis/à/to +80 °C	Betriebsumgebungstemperatur	Température ambiante d'exploitation	Ambient operating temperature
120 g	Gewicht	Poids	Weight

Maßbild/Plan coté/Dimensioned drawing





Der ORS 142 darf nur an Hekatron-Netzgeräte angeschlossen werden und passt in die vorhandene Sockelserie 143.

L'ORS 142 doit être branché exclusivement sur des unités d'alimentation Hekatron et peut être monté dans les socles existants du type 143.

The ORS 142 may only be connected to Hekatron mains-power devices and matches the existing bases type 143.

Relais/Relais/Relay		**Einzelanzeige/Affichage individuel/LED**	
Betrieb en service in operation	4 5	grün/vert/green	———
leicht verschmutzt légèrement encrassé slight contamination	4 5	grün/vert/green gelb/jaune/yellow	⊓⊓⊓
stark verschmutzt encrassé heavy contamination	4 5	grün/vert/green gelb/jaune/yellow	⊓⊓⊓⊓
Störung défaillance fault	4 5	gelb/jaune/yellow	———
Alarm alarme alarm	4 5	rot/rouge/red	———
spannungslos hors tension power off	4 5	dunkel/sombre/dark	

Bestelldaten/Références/Ordering data

5 000 552	ORS 142	Rauchschalter, weiß nach RAL 9010	Détecteur de fumée, blanc RAL 9010	Smoke switch, white (DIN shade RAL 9010)
		andere Farben auf Anfrage	autres couleurs sur demande	other colours on request

Technische Änderungen sowie Liefermöglichkeiten vorbehalten.

Sous réserve de modifications techniques ainsi que de possibilités de livraison.

Specifications subject to change without notice. Delivery subject to availability.

HEKATRON Vertriebs GmbH
Brühlmatten 9
D-79295 Sulzburg
Telefon (07634) 500-264
Telefax (07634) 500-323

www.hekatron.de
info@hekatron.de

HEKATRON
Sicherheitssysteme

Ein Unternehmen der
Schweizer Securitas Gruppe

Une entreprise du
Groupe suisse Securitas

A member of the
Swiss Securitas Group

7050175.0402 TDB

WIND ENERGY CONVERTER CHARACTERISTICS E-101

Rotor	
Type	E-101
Rotor diameter	101 m
Swept area	8012 m^2
Power regulation	Pitch
RPM	4 –14,5 min^{-1}
Cut in wind	2,5 m/s
Cut out wind	28 – 34 m/s
Survival wind speed	59,5 m/s

Gear Box	
Not applicable	No gearbox

Blades	
Manufacturer	ENERCON
Blade length	48,5 m
Material	GRP (Epoxy)
Lightning protection	included

Generator	
Manufacturer	ENERCON
Nominal Power	3000 kW
Type (model)	Synchronous, direct-drive ringgenerator
Protection classification	IP 23
Insulation class	F

Yaw System	
Type	electrical motors
Yaw control	Active (based on wind vane signal)
Yaw rate	0,5°/sec

Controller	
Manufacturer	ENERCON
Type	microprocessor
Grid connection	Via ENERCON inverter
Remote communication	ENERCON Remote Monitoring System
UPS	included

Braking System	
Aerodynamic brake	- three independent blade pitch systems with emergency supply - rotor brake - rotor lock, locking at 30°

Tower			
Hub heights	99 m	135 m	
Tower	Prefab concrete	Prefab concrete	
Design Wind Class	**IIA**	**IIA**	

Sources: Design Assessment

FUNDAMENT-DATENBLATT
FOUNDATION DATA SHEET

E-101/BF/133/27/01

WZ III (DIBt- Richtlinie Fassung 2004, Anhang B)
WZ 4; GK I (DIN 1055-4: 2005-03)
WTC II A (IEC 61400-1, 3rd edition, 2005-08)
WEA-Klasse II A (DIN EN 61400-1, 2006-07)

Bauteil: **Fundament– Flachgründung ohne Auftriebswirkung**
Component: **Foundation – Flat Foundation without Buoyancy**

8107894074-7 E I
Reviewed
Essen, 20. April 2011
S. Möller Expert of
TÜV NORD SysTec GmbH & Co. KG

TÜV NORD
20. APR. 2011

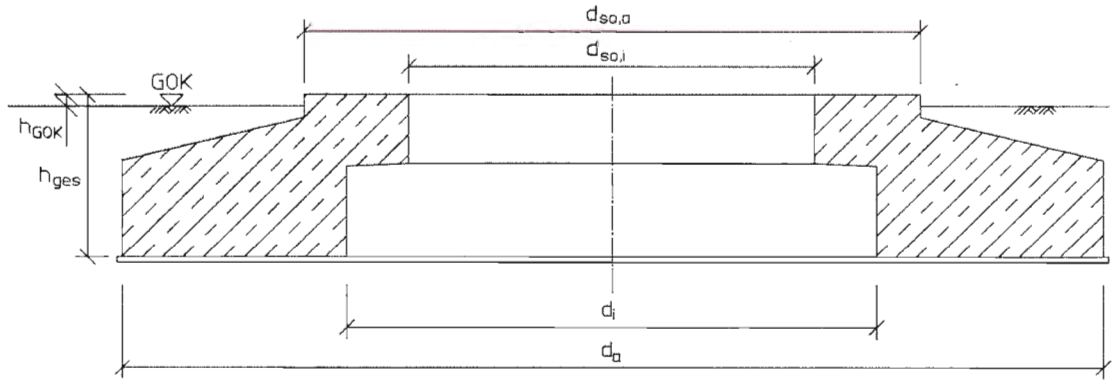
Document information:			
Author/ date:	MFE / 2011-02-09		
Department:	WRD-K	Translator / date:	-
Approved / date:	TE / 2011-02-09	Revisor / date:	-
Revision / date:	MFE 1 / 2011-03-14	Reference:	WRD-K-04-FDB-FEB-E-101_BF_133_27_01-Rev_1-EN

1.0 General information

Design-specific structural analysis:	Structural calculation by ENERCON GmbH, E-101/BF/133/27/01 Flat foundation without buoyancy – ∅ 20.90 m Revision 1 – 14.03.2011

2.0 Foundation dimensions

Outer diameter	d_a	20.90 m
Inner diameter	d_i	11.20 m
Base diameter – outside	$d_{so,a}$	13.50 m
Base diameter – inside	$d_{so,i}$	8.50 m
Foundation height	h_{ges}	3.10 m
Base height	h_{so}	0.40 m
Spur incline height	h_n	0.60 m
Spur height	h_{sp}	2.10 m
Difference between foundation top edge and ground level	h_{gok}	0.20 m
Concrete quality and volume	C 30/37	677 m³
Reinforcement steel and weight	B 500B	68.6 t



TÜV NORD
20. APR. 2011

3.0 Minimum rocking spring stiffness

Observe the following minimum values with regard to elastic clamping between foundation and subsoil:

Total system (tower and foundation)	**kφ,stat** **15000 [MNm/rad]**
	kφ,dyn **150000 [MNm/rad]**

The resulting required dynamic stiffness moduli ($E_{oed,dyn}$) depend on the foundation dimensions and Poisson's ratio.

Equivalent radius of a circle with the same stiffness:

r = 10.23 m

The following applies to circular foundations:

$$k_{\varphi} = \frac{8 \cdot G \cdot r^3}{3 \cdot (1 - \nu)}$$

This means that

$$E_{oed,dyn} = k_{\varphi} \cdot \frac{3}{4} \cdot \frac{1}{r^3} \cdot \frac{(1+\nu) \cdot (1-\nu)^2}{1 - \nu - 2 \cdot \nu^2}$$ where

G = shear modulus
r = radius
ν = Poisson's ratio

4.0 Allowed inclination

Maximum allowed inclination due to subsoil settlement within 20 years, related to the outer diameter.

$\Delta s \leq 40$ mm

5.0 Soil bearing pressure

The in-situ subsoil must be able to bear a minimum pressure of $\sigma_{k,vorh}$ **= 401 kN/m².**

TÜV NORD
20. APR. 2011

6.0 Loads at the bottom edge of the foundation

The F_Z loads indicated include the dead weight of the foundation γ = 25 kN/m³ and soil weight γ = 18 kN/m³ when dry.

6.1 Characteristic load cases

Load case	($\gamma_{aero}/\gamma_{mass}$)	F_{xy} [kN]	F_z [kN]	M_{xy} [kNm]	M_z [kNm]
DLC 1.0	(1.00/1.00)	1100	-36707	103954	-
DLC 3.2	(1.00/1.00)	1470	-36790	153801	-8420
DLC 6.2	(1.00/1.00)	1700	-36590	189565	-8590

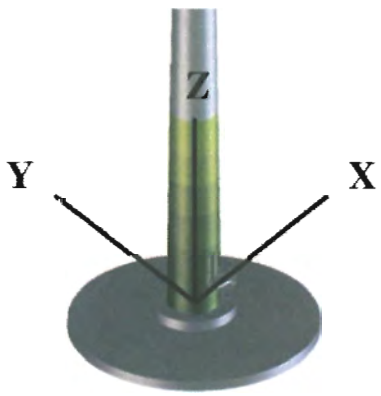
Loads do not include partial safety factor (γ_F = 1.0)

6.2 Load case design values

Load case	($\gamma_{aero}/\gamma_{mass}$)	F_{xy} [kN]	F_z [kN]	M_{xy} [kNm]	M_z [kNm]
DLC 3.2	(1.35/1.35)	2110	-49067	217115	-11600
DLC 3.2	(1.35/1.00)	2110	-36808	217115	-11600

All loads include partial safety factors

7.0 Coordinate system



TÜV NORD
20. APR. 2011

Gewichte / Weights E-101

In der folgenden Tabelle sind die Gewichte der Transport- und Aufbaueinheiten der E-101 angegeben. Es ist zu beachten, dass es sich dabei um ca.-Angaben handelt. Bei den Einzelgewichten sind jeweils die notwendigen Transport- und Aufbauvorrichtungen berücksichtigt, das angegebene Gondelgesamtgewicht entspricht der Turmkopfmasse nach Fertigstellung der Anlage.

In the following table the weights of the transport and installation component-assemblies of the E-101 are given. It is to be noted that the values are approximated. The weights include the necessary transport and installation devices, the given value for overall nacelle weight corresponds to the tower head mass after completion of the turbine.

Transport	**Transport**		
Rotorblatt mit HKS	Rotor blade with fin	ca. 21,0	t
3x HKS	3x Fin	ca. 2,4	t
Rotornabe	Rotor hub	ca. 50,0	t
Generator	Generator	ca. 83,0	t
Gondel (Maschinenträger etc.)	Nacelle (main carrier etc.)	ca. 59,0	t
Aufbau	**Installation**		
Rotornabe (incl. Rotorblätter)	Rotor hub (incl. rotor blades)	ca. 115,0	t
Generator	Generator	ca. 84,0	t
Generator-Stator	Generator stator	ca. 52,0	t
Generator-Rotor	Generator rotor	ca. 35,0	t
Gondel (Maschinenträger etc.)	Nacelle (main carrier etc.)	ca. 59,0	t
Gondelgesamtgewicht	**Overall nacelle weight**	**ca. 255,0**	**t**

Sound Power Level of the ENERCON E-101 3.0 MW

Publisher:

ENERCON Canada Inc.

1000, rue de La Gauchetière ouest Bureau 2310
Montréal, QC, H3B 4W5
+1 514 ENERCON (+1 514 363 7266)

The following represents the maximum sound power level of the E-101 3.0 MW for the entire operational range of wind speeds in accordance with the measurement technique IEC 61 400 – 11:2002 and A1:2006.

Sound Power Level for the E-101 with 3.0 MW rated power

Hub Height	124m	135m
95% rated power	104.8 dB(A)	104.8 dB(A)

1. A tonal audibility of $\Delta L_{a,k} \leq 2$ dB can be expected over the whole operational range and is valid in the near vicinity of the turbine according to IEC 61 400 -11 ed. 2.

2. Sound power level values provided in the table are valid for the **Operational Mode I**. The respective power curve is the calculated power curve E-101 dated October 2009 (Rev 2.0).

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

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

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

4. 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 cannot, and is not intended to, constitute an express or implied warranty towards the customer that the E-101 WEC will meet the exact sound power level as shown in this document at any project specific site.

KÖTTER CONSULTING ENGINEERS

Summary of Test Report
(Measured hub height of 99 m) /1/

Master Data Sheet "Geräusche" (*Noise*), in accordance with
"Technische Richtlinien für Windenergieanlagen, Teil 1: Bestimmung der Schallemissionswerte"
(Technical Guidelines for Wind Turbine Generators, 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 213122-02.01 IEC
on noise emission of wind turbine generator of type E-101

General Data		**Technical Data (manufacturer's specifications)**	
Manufacturer of WTG:	Enercon GmbH	Rated power (generator):	3,050 (3,250) kW
Serial number:	1010002	Diameter of rotor:	101 m
Location of WTG (approx.):	49733 Haren	Hub height above ground:	99 m
Geographic co-ordinates:	GK longitude: 25.76.214	Type of tower:	conical tubular concrete
	GK latitude: 58.59.856	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-101-1	Type of gear unit:	not applicable
Blade setting angle:	variable	Manufacturer of generator:	Enercon
Number of rotor blades:	3	Type of generator:	G-101/30-G2
Rotor speed range:	5 to 14.7 rpm. (mode OM I)	Rated speed of generator:	5 to 14.7 rpm. (mode OM I)

Calculated Performance Chart: Performance characteristic E101 3 MW OM I ; calculated by ENERCON (Rev. 1.0)

	Reference Point		**Noise emission parameters**	**Observations**
	standardized wind speed at a height of 10 m	true electrical power		
sound power level $L_{WA,P}$	6 ms^{-1}	1,414 kW	103.6 dB(A)	
	7 ms^{-1}	2,077 kW	104.3 dB(A)	
	8 ms^{-1}	2,751 kW	104.8 dB(A)	
	9 ms^{-1}	2,987 kW	104.6 dB(A)	(1)
	10 ms^{-1}	3,050 kW	--	(2)
tonal audibility ɜ $L_{a,k}$	6 ms^{-1}	1,414 kW	- 1.5 dB	
	7 ms^{-1}	2,077 kW	0 dB	
	8 ms^{-1}	2,751 kW	0 dB	
	9 ms^{-1}	2,987 kW	0 dB	(1)
	10 ms^{-1}	3,050 kW	--	(2)
impulse adjustment for immediate vicinity K_{IN}	6 ms^{-1}	1,414 kW	0 dB	
	7 ms^{-1}	2,077 kW	0 dB	
	8 ms^{-1}	2,751 kW	0 dB	
	9 ms^{-1}	2,987 kW	0 dB	(1)
	10 ms^{-1}	3,050 kW	--	(2)

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
$L_{WA,P}$	78.3	81.8*	83.0**	84.2	89.6	85.7*	89.2	92.7	94.1	94.6	95.1	94.9
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	93.5	91.6	90.0	89.0	85.4	84.1	82.3	79.3	74.8	67.8*	64.7**	65.3**

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
$L_{WA,P}$	85.6*	91.9	97.2	99.6	96.7	91.5	84.6	70.3*

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
$L_{WA,P}$	78.9	83.3	84.0	84.9	88.2	86.4*	89.6	94.7	94.9	95.4	95.8	95.5
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	94.0	92.0	90.4	89.3	86.1	84.7	82.9	79.9	74.4*	68.4*	64.6**	62.7**

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
$L_{WA,P}$	87.3	91.5	98.4	100.3	97.1	91.9	85.0	71.5**

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
$L_{WA,P}$	82.1	82.8	84.4	88.4	86.8	90.1	94.8	95.0	95.6	96.3	96.2	82.1
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	95.0	93.3	91.5	90.4	86.7	85.4	83.7	80.9	75.9	69.7*	67.1**	65.5**

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
$L_{WA,P}$	86.3	91.6	98.6	100.8	98.3	92.8	86.0	73.3**

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
$L_{WA,P}$	78.6	81.9	82.4*	83.9	87.8	85.9*	88.6	93.8	94.2	95.1	96.0	96.3
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	95.4	93.8	92.3	91.0	87.4	86.0	84.1	81.1	76.7	71.7	68.4	66.8*

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
$L_{WA,P}$	86.0	90.8	97.6	100.6	98.8	93.5	86.4	74.2

This summary of the test report is valid only in combination with the manufacturer's certificate dated 12/03/2013.

These specifications do not replace the test report mentioned above (particularly for noise immission predictions).

Observations:
(1) Maximum value of standardized wind speed during the WTG-operation measurement v_s = 8,9 m/s
(2) Due to weather conditions, no data available during WTG operation
* 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

/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: 23/04/2013

Dipl.-Ing. Oliver Bunk Matthias Humpohl, B.Sc.

KÖTTER CONSULTING ENGINEERS
Bonifatiusstraße 400 · 48432 Rheine
Tel. 0 59 71 - 97 10.0 · Fax 0 59 71 - 97 10.43

Appendix E Sample Calculations and CADNA/A Inputs/Outputs (In the Attached CD)

Receiver

Name: H1BIRD3890
ID: O_1153
X: 621067.4
Y: 4749725.2
Z: 180.6

Name	ID	X (m)	Y (m)	Z (m)	Dist (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	I/a dB	K0 (dB)	Dc (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahous (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
R11TO20	T20	620627.3	4749341.4	300.6	596.1	0	DEN	A	104.8	0	0	0	66.5	1.4	-0.5	0	0	0	0	0	37.4
R11TS13	T96	621422.7	4750668.3	299.5	1014.8	0	DEN	A	104.8	0	0	0	71.1	2.2	-0.5	0	0	0	0	0	31.9
R11TO63	T63	621609.3	4751032.3	300.4	1420.1	0	DEN	A	104.8	0	0	0	74.0	3.0	-0.4	0	0	0	0	0	28.2
R11TO62	T62	621876.7	4751310.9	301.0	1784.4	0	DEN	A	104.8	0	0	0	76.0	3.6	-0.4	0	0	0	0	0	25.6
R11TO99 (formally R11TS82)	T99	619207.8	4749223.6	299.0	1929.6	0	DEN	A	104.8	0	0	0	76.7	3.8	-0.4	0	0	0	0	0	24.7
R11TO05	T05	621171.0	4747754.0	303.8	1977.7	0	DEN	A	104.8	0	0	0	76.9	3.9	-0.4	0	0	0	0	0	24.4
R11TO46	T46	622737.0	4748967.6	302.0	1837.5	0	DEN	A	102.9	0	0	0	76.3	3.7	-0.3	0	0	0	0	0	23.3
R11TO47	T47	622482.9	4748446.9	303.3	1911.2	0	DEN	A	102.9	0	0	0	76.6	3.8	-0.3	0	0	0	0	0	22.8
R11TO45	T45	623160.0	4748650.4	302.1	2355.6	0	DEN	A	102.9	0	0	0	78.4	4.5	-0.3	0	0	0	0	0	20.2
R11TO16	T16	624153.0	4749242.9	300.3	3125.4	0	DEN	A	104.8	0	0	0	80.9	5.6	-0.3	0	0	0	0	0	18.6
R11TO14	T14	624137.0	4748807.0	301.1	3206.3	0	DEN	A	104.8	0	0	0	81.1	5.7	-0.3	0	0	0	0	0	18.2
R11TO44	T44	624350.0	4748471.0	301.8	3516.2	0	DEN	A	104.8	0	0	0	81.9	6.2	-0.3	0	0	0	0	0	17.0
R11TO48	T48	624687.0	4749282.7	300.4	3648.6	0	DEN	A	104.8	0	0	0	82.2	6.3	-0.3	0	0	0	0	0	16.5
R11TO43	T43	624815.3	4748952.0	301.1	3828.7	0	DEN	A	104.8	0	0	0	82.7	6.6	-0.2	0	0	0	0	0	15.8
R11TO84	T84	622487.1	4753392.7	304.0	3934.7	0	DEN	A	104.8	0	0	0	82.9	6.7	-0.3	0	0	0	0	0	15.4
R11TO22	T22	624829.2	4748510.0	302.0	3955.1	0	DEN	A	104.8	0	0	0	82.9	6.7	-0.3	0	0	0	0	0	15.4
R11TO89	T89	623216.4	4753159.8	304.0	4053.5	0	DEN	A	104.8	0	0	0	83.2	6.9	-0.3	0	0	0	0	0	15.1
R11TO42	T42	619935.0	4753628.0	304.0	4065.7	0	DEN	A	104.8	0	0	0	83.2	6.9	-0.3	0	0	0	0	0	15.0
R11TO21	T21	625004.0	4748242.0	302.6	4208.5	0	DEN	A	104.8	0	0	0	83.5	7.1	-0.3	0	0	0	0	0	14.6
R11TO61	T61	625177.0	4747970.0	302.9	4470.4	0	DEN	A	104.8	0	0	0	84.0	7.4	-0.3	0	0	0	0	0	13.7
R11TO98	T98	617981.7	4753042.5	302.4	4532.3	0	DEN	A	104.8	0	0	0	84.1	7.5	-0.3	0	0	0	0	0	13.6
Mohawk05(V82-1.65 MW-Vestas-103.2 dBA&Hu	MH05	623047.0	4746843.0	260.0	3497.4	0	DEN	A	102.1	0	0	0	81.9	14.5	-1.0	0	0	0	0	0	6.7
Mohawk02(V82-1.65 MW-Vestas-103.2 dBA&Hu	MH02	622632.0	4746480.0	260.4	3603.5	0	DEN	A	102.1	0	0	0	82.1	14.7	-1.0	0	0	0	0	0	6.2
Mohawk04(V82-1.65 MW-Vestas-103.2 dBA&Hu	MH04	623297.0	4746604.0	260.0	3836.6	0	DEN	A	102.1	0	0	0	82.7	15.3	-1.0	0	0	0	0	0	5.1
R11TO65	T65	622983.8	4754678.9	299.0	5312.9	0	DEN	A	104.8	0	0	0	85.5	8.4	-0.4	0	0	0	0	0	11.3
R11TO49	T49	626835.9	4748915.1	299.0	5826.4	0	DEN	A	104.8	0	0	0	86.3	9.0	-0.5	0	0	0	0	0	10.0
R11TO19	T19	620379.6	4755516.1	299.0	5832.8	0	DEN	A	104.8	0	0	0	86.3	9.0	-0.5	0	0	0	0	0	10.0
R11TO82	T82	618390.0	4754915.0	299.0	5841.0	0	DEN	A	104.8	0	0	0	86.3	9.0	-0.5	0	0	0	0	0	10.0
Mohawk06(V82-1.65 MW-Vestas-103.2 dBA&Hu	MH06	622661.0	4745529.0	263.9	4489.4	0	DEN	A	102.1	0	0	0	84.0	16.8	-1.1	0	0	0	0	0	2.3
Transformer2 (100/133/166 ONAN/ONAF/ONAF MVA)	ST2	622836.6	4754678.6	178.7	5259.9	0	DEN	A	103.2	0	0	0	85.4	9.8	-0.3	0	0	4.1	0	0	4.1
SWT-2.221-101 - Grand Renewable Energy Project	GREPT58	614974.0	4747470.0	283.2	6498.1	0	DEN	A	105.0	0	0	0	87.3	10.8	-0.4	0	0	0	0	0	7.4
R11TO13	T13	621410.0	4756122.0	299.0	6407.1	0	DEN	A	104.8	0	0	0	87.1	9.6	-0.5	0	0	0	0	0	8.6
SWT-2.221-101 - Grand Renewable Energy Project	GREPT60	614680.0	4748176.0	282.6	6573.3	0	DEN	A	105.0	0	0	0	87.4	10.9	-0.4	0	0	0	0	0	7.2
SWT-2.221-101 - Grand Renewable Energy Project	GREPT61	614750.0	4747811.0	284.5	6601.8	0	DEN	A	105.0	0	0	0	87.4	10.9	-0.4	0	0	0	0	0	7.2
R11TO23	T23	627539.7	4748974.3	299.0	6516.8	0	DEN	A	104.8	0	0	0	87.3	9.7	-0.5	0	0	0	0	0	8.4
SWT-2.221-101 - Grand Renewable Energy Project	GREPT62	614705.0	4747338.0	281.3	6796.2	0	DEN	A	105.0	0	0	0	87.6	11.1	-0.4	0	0	0	0	0	6.7
R11TO12	T12	621127.0	4756402.0	299.2	6678.2	0	DEN	A	104.8	0	0	0	87.5	9.9	-0.6	0	0	0	0	0	8.0
Mohawk01(V82-1.65 MW-Vestas-103.2 dBA&Hu	MH01	623355.0	4745400.0	268.2	4893.7	0	DEN	A	102.1	0	0	0	84.8	17.7	-1.1	0	0	0	0	0	0.6
R11TO24	T24	627752.2	4750238.9	299.0	6705.6	0	DEN	A	104.8	0	0	0	87.5	9.9	-0.6	0	0	0	0	0	7.9
SWT-2.221-101 - Grand Renewable Energy Project	GREPT57	614355.0	4748118.0	284.5	6902.9	0	DEN	A	105.0	0	0	0	87.8	11.2	-0.5	0	0	0	0	0	6.5
Mohawk03(V82-1.65 MW-Vestas-103.2 dBA&Hu	MH03	623974.0	4745737.0	265.5	4935.7	0	DEN	A	102.1	0	0	0	84.9	17.8	-1.1	0	0	0	0	0	0.4
R11TO91	T91	620503.9	4756520.8	299.1	6820.0	0	DEN	A	104.8	0	0	0	87.7	10.0	-0.6	0	0	0	0	0	7.7
SWT-2.221-101 - Grand Renewable Energy Project	GREPT59	614326.0	4747732.0	284.5	7030.6	0	DEN	A	105.0	0	0	0	87.9	11.3	-0.5	0	0	0	0	0	6.2
R11TO11	T11	620836.0	4756609.3	299.9	6889.1	0	DEN	A	104.8	0	0	0	87.8	10.1	-0.6	0	0	0	0	0	7.5

Receiver

Name:	H1BIRD3890
ID:	O_1153
X:	621067.4
Y:	4749725.2
Z:	180.6

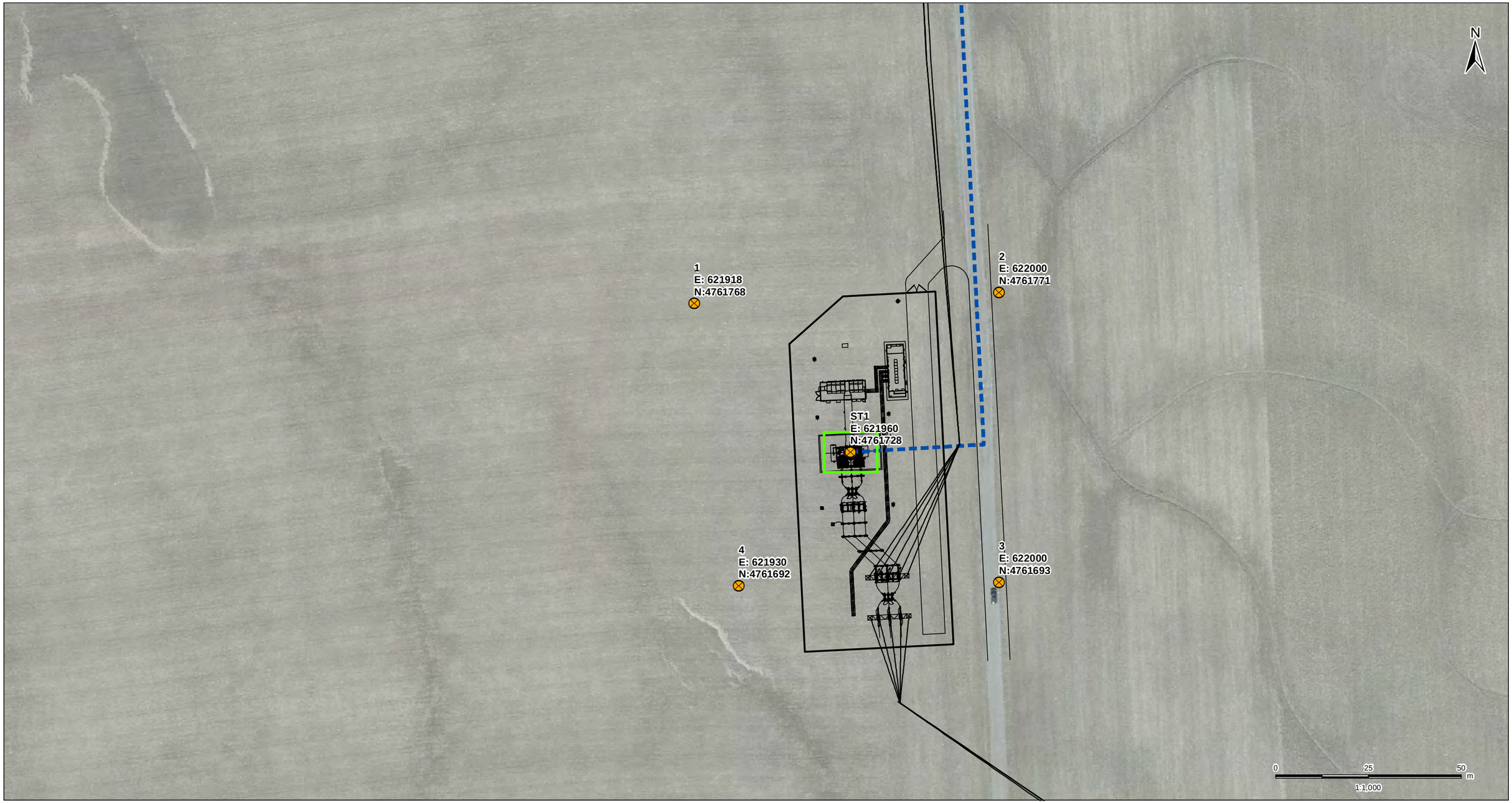
Name	ID	X (m)	Y (m)	Z (m)	Dist (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	I/a dB	K0 (dB)	Dc (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahous (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
R11TO41	T41	620998.0	4756851.0	300.4	7127.2	0	DEN	A	104.8	0	0	0	88.1	10.3	-0.6	0	0	0	0	0	7.0
R11TO72	T72	620828.0	4757122.0	301.3	7401.7	0	DEN	A	104.8	0	0	0	88.4	10.6	-0.6	0	0	0	0	0	6.4
R11TO37	T37	623038.4	4758881.0	299.0	9366.4	0	DEN	A	104.8	0	0	0	90.4	12.4	-0.8	0	0	0	0	0	2.8
R11TO10	T10	623259.5	4758989.9	299.0	9521.3	0	DEN	A	104.8	0	0	0	90.6	12.5	-0.8	0	0	0	0	0	2.6
WF01(Wainfleet Wind Energy Project Vesta	WF01	631359.0	4751252.0	270.1	10404.7	0	DEN	A	105.0	0	0	0	91.3	13.6	-1.7	0	0	0	0	0	1.8
Rosa Flora Turbine	RFT	615270.0	4756417.0	250.0	8854.1	0	DEN	A	103.5	0	0	0	89.9	9.9	-1.3	0	0	0	0	0	5.0
WF02(Wainfleet Wind Energy Project Vesta	WF02	631758.0	4750750.0	270.9	10740.0	0	DEN	A	105.0	0	0	0	91.6	13.8	-1.8	0	0	0	0	0	1.3
WF03(Wainfleet Wind Energy Project Vesta	WF03	631921.0	4750541.0	271.3	10884.7	0	DEN	A	105.0	0	0	0	91.7	13.9	-1.8	0	0	0	0	0	1.2
R11TS09	T95	622816.6	4760851.0	304.0	11263.2	0	DEN	A	104.8	0	0	0	92.0	13.8	-1.0	0	0	0	0	0	0.0
WF05(Wainfleet Wind Energy Project Vesta	WF05	632706.0	4748817.0	272.1	11674.4	0	DEN	A	105.0	0	0	0	92.3	14.4	-1.9	0	0	0	0	0	0.2
WF04(Wainfleet Wind Energy Project Vesta	WF04	632750.0	4748389.0	273.8	11759.2	0	DEN	A	105.0	0	0	0	92.4	14.4	-2.0	0	0	0	0	0	0.1
R11TO09	T09	616789.8	4762576.1	304.0	13544.8	0	DEN	A	104.8	0	0	0	93.6	15.3	-1.3	0	0	0	0	0	-2.9
R11TO51	T51	617020.3	4762751.8	304.0	13641.4	0	DEN	A	104.8	0	0	0	93.7	15.4	-1.3	0	0	0	0	0	-3.0
Transformer1 (100/133/166 ONAN/ONAF/ONAF MVA)	ST1	621959.7	4761728.0	182.3	12036.0	0	DEN	A	103.2	0	0	0	92.6	17.0	1.0	0	0	3.2	0	0	-10.6
R11TO07	T07	618635.6	4764052.9	304.0	14533.2	0	DEN	A	104.8	0	0	0	94.2	15.9	-1.5	0	0	0	0	0	-3.9
R11TO75	T75	621356.9	4764542.6	304.0	14820.8	0	DEN	A	104.8	0	0	0	94.4	16.1	-1.5	0	0	0	0	0	-4.2
R11TO39	T39	617348.6	4764279.3	304.0	15022.2	0	DEN	A	104.8	0	0	0	94.5	16.2	-1.5	0	0	0	0	0	-4.4
R11TO32	T32	624780.5	4764409.8	304.0	15147.4	0	DEN	A	104.8	0	0	0	94.6	16.3	-1.6	0	0	0	0	0	-4.5
R11TO29	T29	628498.0	4763100.5	303.1	15301.3	0	DEN	A	104.8	0	0	0	94.7	16.4	-1.6	0	0	0	0	0	-4.7
R11TO34	T34	626486.0	4764591.4	304.0	15823.5	0	DEN	A	104.8	0	0	0	95.0	16.6	-1.7	0	0	0	0	0	-5.2
R11TO54	T54	619944.0	4765594.0	304.0	15909.0	0	DEN	A	104.8	0	0	0	95.0	16.7	-1.7	0	0	0	0	0	-5.3
R11TO35	T35	627163.5	4764483.1	304.0	15968.0	0	DEN	A	104.8	0	0	0	95.1	16.7	-1.7	0	0	0	0	0	-5.3
R11TO38	T38	620669.2	4765751.8	304.0	16032.0	0	DEN	A	104.8	0	0	0	95.1	16.8	-1.7	0	0	0	0	0	-5.4
R11TO01	T01	622985.8	4765745.3	306.3	16135.1	0	DEN	A	104.8	0	0	0	95.2	16.8	-1.7	0	0	0	0	0	-5.5
R11TO76	T76	623639.9	4765719.5	304.0	16200.3	0	DEN	A	104.8	0	0	0	95.2	16.8	-1.7	0	0	0	0	0	-5.5
R11TO97	T97	617214.7	4765641.9	306.9	16376.9	0	DEN	A	104.8	0	0	0	95.3	16.9	-1.7	0	0	0	0	0	-5.7
R11TO03	T03	629895.5	4763587.6	304.0	16435.3	0	DEN	A	104.8	0	0	0	95.3	17.0	-1.7	0	0	0	0	0	-5.7
R11TO08	T08	614544.5	4764911.4	304.7	16528.3	0	DEN	A	104.8	0	0	0	95.4	17.0	-1.8	0	0	0	0	0	-5.8
R11TO31	T31	625150.0	4765821.0	309.0	16606.1	0	DEN	A	104.8	0	0	0	95.4	17.1	-1.8	0	0	0	0	0	-5.9
R11TO74	T74	621655.8	4763002.3	303.7	13290.7	0	DEN	A	102.9	0	0	0	93.5	13.8	-1.4	0	0	0	0	0	-3.1
R11TO36	T36	622378.6	4763063.1	299.0	13402.8	0	DEN	A	102.9	0	0	0	93.5	13.9	-1.4	0	0	0	0	0	-3.2
R11TO78	T78	628581.0	4764783.0	304.0	16828.8	0	DEN	A	104.8	0	0	0	95.5	17.2	-1.8	0	0	0	0	0	-6.1
R11TO33	T33	626968.7	4765950.4	309.0	17265.6	0	DEN	A	104.8	0	0	0	95.7	17.4	-1.9	0	0	0	0	0	-6.4
R11TO02	T02	627379.8	4765942.2	309.0	17402.7	0	DEN	A	104.8	0	0	0	95.8	17.4	-1.9	0	0	0	0	0	-6.6
R11TO93	T93	618324.0	4767127.0	309.0	17617.2	0	DEN	A	104.8	0	0	0	95.9	17.5	-1.9	0	0	0	0	0	-6.7
R11TO06	T06	623095.6	4767244.5	310.0	17636.8	0	DEN	A	104.8	0	0	0	95.9	17.6	-1.9	0	0	0	0	0	-6.8
R11TO81a	T81	616342.8	4766967.0	309.0	17877.9	0	DEN	A	104.8	0	0	0	96.0	17.7	-2.0	0	0	0	0	0	-7.0
R11TO52	T52	614214.8	4766530.6	309.7	18149.3	0	DEN	A	104.8	0	0	0	96.2	17.8	-2.0	0	0	0	0	0	-7.2
R11TO55	T55	623610.3	4764393.4	304.0	14887.6	0	DEN	A	102.9	0	0	0	94.5	14.6	-1.6	0	0	0	0	0	-4.6
R11TO66	T66	619127.0	4768529.0	314.0	18904.2	0	DEN	A	104.8	0	0	0	96.5	18.1	-2.1	0	0	0	0	0	-7.7
R11TO27	T27	622534.5	4768708.0	314.0	19039.9	0	DEN	A	104.8	0	0	0	96.6	18.2	-2.1	0	0	0	0	0	-7.9
R11TO04	T04	627524.4	4767739.7	309.0	19137.2	0	DEN	A	104.8	0	0	0	96.6	18.2	-2.2	0	0	0	0	0	-7.9
R11TO94	T94	618752.1	4768764.2	314.0	19179.8	0	DEN	A	104.8	0	0	0	96.7	18.3	-2.2	0	0	0	0	0	-8.0
R11TO57	T57	624435.2	4768696.0	309.0	19267.9	0	DEN	A	104.8	0	0	0	96.7	18.3	-2.2	0	0	0	0	0	-8.0

Receiver

Name: H1BIRD3890
ID: O_1153
X: 621067.4
Y: 4749725.2
Z: 180.6

Name	ID	X (m)	Y (m)	Z (m)	Dist (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	I/a dB	K0 (dB)	Dc (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahous (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
R11TO58	T58	628473.0	4767629.0	309.0	19375.5	0	DEN	A	104.8	0	0	0	96.7	18.3	-2.2	0	0	0	0	0	-8.1
R11TO28	T28	622516.5	4769095.7	309.0	19425.1	0	DEN	A	104.8	0	0	0	96.8	18.4	-2.2	0	0	0	0	0	-8.1
R11TO85	T85	619135.8	4769107.8	314.0	19479.1	0	DEN	A	104.8	0	0	0	96.8	18.4	-2.2	0	0	0	0	0	-8.2
R11TO56	T56	626599.0	4768825.0	309.0	19885.2	0	DEN	A	104.8	0	0	0	97.0	18.6	-2.3	0	0	0	0	0	-8.5
R11TO53	T53	614455.8	4766402.4	309.0	17940.5	0	DEN	A	102.9	0	0	0	96.1	16.0	-2.0	0	0	0	0	0	-7.2
R11TO18	T18	630122.5	4766228.8	309.0	18825.1	0	DEN	A	102.9	0	0	0	96.5	16.3	-2.2	0	0	0	0	0	-7.8

Appendix F Additional Information



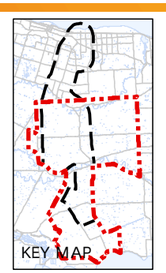
V:\01609\Active\160950269\planning\drawing\mxd_Modification_Reports\Acoustic_Assesment\160950269_Figure_F1_F2_Substations_Layout.mxd
Revised: 2015-09-21 By: bcowper

September 2015
133560006

Stantec

Legend
- Noise Emission Locations
- Barrier
- Potential Access Road
- Transformer Substation

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2013.
3. Orthoimagery © First Base Solutions, 20xx.



Client/Project
FWRN LP
Niagara Region Wind Farm
Acoustic Assessment Report

Figure No.
F.1

Title
North Transformer Station

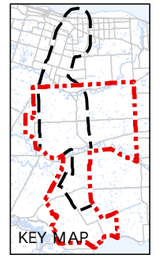
V:\01609\Active\160950269\planning\drawing\mxd_Modification_Reports\Acoustic_Assessment\160950269_Figure_F1_F2_Substations_Layout.mxd
Revised: 2015-09-21 By: bcowper

September 2015
133560006

Stantec

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2013.
3. Orthoimagery © First Base Solutions, 20xx.

Legend
- Noise Emission Locations
- Barrier
- Proposed Turbine Location - E101 3.0 MW
- Potential Access Road
- Temporary Laydown Area
- Watercourse
- Transformer Substation
- Turbine Blade Length



Client/Project
FWRN LP
Niagara Region Wind Farm
Acoustic Assessment Report

Figure No.
F.2

Title
South Transformer Station

MANUFACTURERS SOUND EMISSION AND ADJUSTED SOUND EMISSION

Table 3.1 Wind Turbine Sound Emission Summary

Make: ENERCON

Model: E101

Electrical Rating: 3MW

Hub Height: 124 m or 135 m

Data Source: Enercon (Appendix D) - for all wind shear above 0.2

Octave Band Sound Power Level (dB ref. 10^{-12} Watts)

		Manufacturer's Emission Level					Adjusted Emission Level				
10m Height Wind Speed (m/s)		6	7	8	9	10	6	7	8	9	10
Frequency (Hz)	63	111.3	112	112.4	112.3	--	112.5	112.5	112.5	112.5	112.5
	125	106.5	107.2	107.6	107.5	--	107.7	107.7	107.7	107.7	107.7
	250	106	106.7	107.1	107	--	107.2	107.2	107.2	107.2	107.2
	500	102.8	103.5	103.9	103.8	--	104	104	104	104	104
	1000	97.1	97.8	98.2	98.1	--	98.3	98.3	98.3	98.3	98.3
	2000	90.4	91.1	91.5	91.4	--	91.6	91.6	91.6	91.6	91.6
	4000	83.7	84.4	84.8	84.7	--	84.9	84.9	84.9	84.9	84.9
	8000	73.2	73.9	74.3	74.2	--	74.4	74.4	74.4	74.4	74.4
Overall (dBA ref. 10^{-12} Watts)		103.6	104.3	104.7	104.6	--	104.8	104.8	104.8	104.8	104.8

Make: ENERCON

Model: E82

Electrical Rating: 2.3MW

Hub Height: 135 m

Data Source: Enercon (Appendix D) - for all wind shear above 0.2

Octave Band Sound Power Level (dB ref. 10^{-12} Watts)

		Manufacturer's Emission Level					Adjusted Emission Level				
10m Height Wind Speed (m/s)		6	7	8	9	10	6	7	8	9	10
Frequency (Hz)	63	111.1	111.7	111.8	112.8	113.2	112.8	112.8	112.8	112.8	112.8
	125	106.7	108.9	109.3	110.7	110.7	110.7	110.7	110.7	110.7	110.7
	250	100.6	102.8	103.2	102.9	102.3	102.9	102.9	102.9	102.9	102.9
	500	98.9	100.8	101.4	100.5	99.7	100.5	100.5	100.5	100.5	100.5
	1000	95.9	97.7	98.5	98.7	98.3	98.7	98.7	98.7	98.7	98.7
	2000	87.8	90.2	91	92.6	92.8	92.6	92.6	92.6	92.6	92.6
	4000	74.8	77.5	78.4	80.5	81.5	80.5	80.5	80.5	80.5	80.5
	8000	76.5	75.5	74.5	74.5	76.3	74.5	74.5	74.5	74.5	74.5
Overall (dBA ref. 10^{-12} Watts)		100.6	102.6	103.2	103.3	102.9	103.3	103.3	103.3	103.3	103.3

[1] As per the data, overall sound power data is available from 6 m/s (corresponding to 1414 kW or approximately 38% of the rated power) to 9 m/s (corresponding to 2987 kW or approximately 99.6% of the rated power of 3MW). As per the test, the maximum sound power level occurs at 8.3 m/s wind speed and corresponding spectral data is given in the data sheet. The spectral data for other wind speed were obtained by scaling based on the overall data.

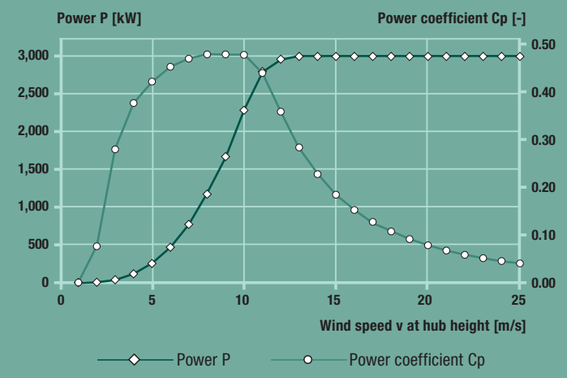
[2] No data was given for the 10 m/s wind speed since the turbine reaches 95% of rated power output at 8.3 m/s wind speed. For this model the attached test report indicates that the maximum sound power level occurs at 8.3 m/s wind speed. The maximum sound power level as provided from manufacturer was used. A wind shear adjusted sound data is provided in Appendix F.

MANUFACTURER'S CATALOG DATA

E-101

3,000 kW

Calculated power curve



Wind [m/s]	Power P [kW]	Power coefficient Cp [-]
1	0.0	0.000
2	3.0	0.076
3	37.0	0.279
4	118.0	0.376
5	258.0	0.421
6	479.0	0.452
7	790.0	0.469
8	1,200.0	0.478
9	1,710.0	0.478
10	2,340.0	0.477
11	2,867.0	0.439
12	3,034.0	0.358
13	3,050.0	0.283
14	3,050.0	0.227
15	3,050.0	0.184
16	3,050.0	0.152
17	3,050.0	0.127
18	3,050.0	0.107
19	3,050.0	0.091
20	3,050.0	0.078
21	3,050.0	0.067
22	3,050.0	0.058
23	3,050.0	0.051
24	3,050.0	0.045
25	3,050.0	0.040

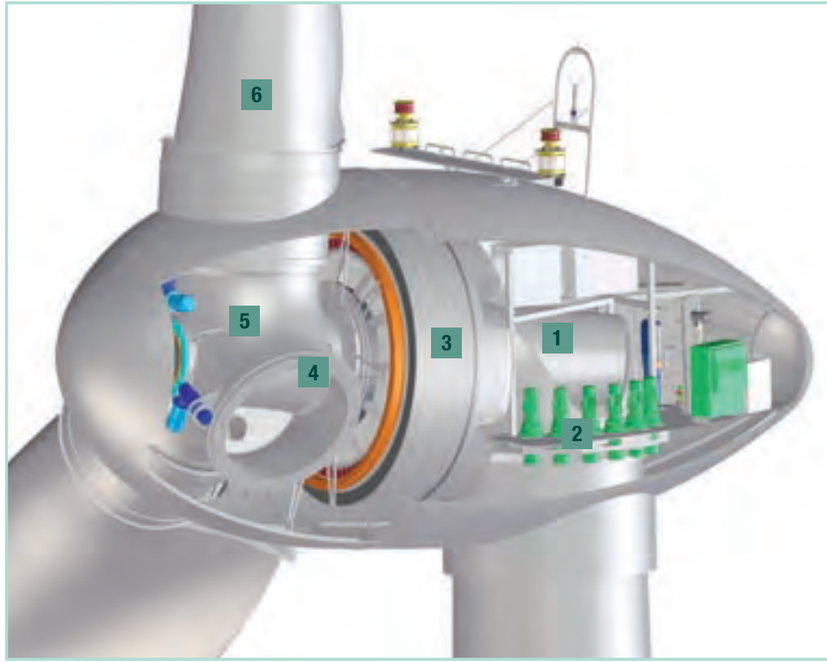
ρ = 1.225 kg/m³

For more information on the ENERCON power curve, please see the last page.

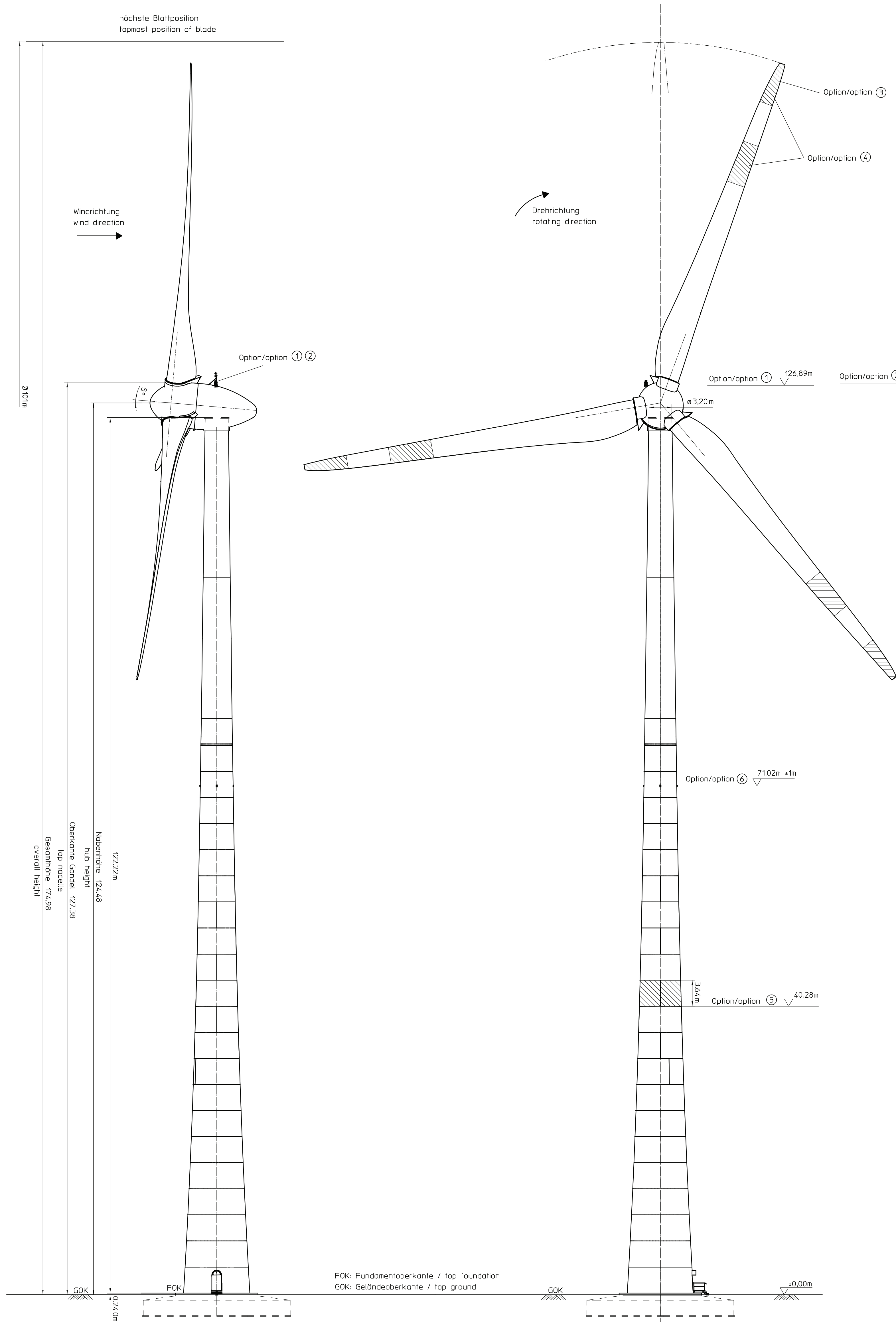
Technical specifications E-101

Rated power:	3,000 kW
Rotor diameter:	101 m
Hub height:	99 m / 135 m
Wind zone (DIBt):	WZ III
Wind class (IEC):	IEC/NVN IIA
WEC concept:	Gearless, variable speed Single blade adjustment
Rotor	
Type:	Upwind rotor with active pitch control
Rotational direction:	Clockwise
No. of blades:	3
Swept area:	8,012 m²
Blade material:	GRP (epoxy resin); Built-in lightning protection
Rotational speed:	Variable, 4–14.5 rpm
Pitch control:	ENERCON single blade pitch system; one independent pitch system per rotor blade with allocated emergency supply
Drive train with generator	
Hub:	Rigid
Main bearing:	Double-row tapered/cylindrical roller bearings
Generator:	ENERCON direct-drive annular generator
Grid feed:	ENERCON inverter
Brake systems:	– 3 independent pitch control systems with emergency power supply – Rotor brake – Rotor lock, latching (15°)
Yaw system:	Active via yaw gear, load-dependent damping
Cut-out wind speed:	28–34 m/s (with ENERCON storm control*)
Remote monitoring:	ENERCON SCADA

*For more information on the ENERCON storm control feature, please see the last page.

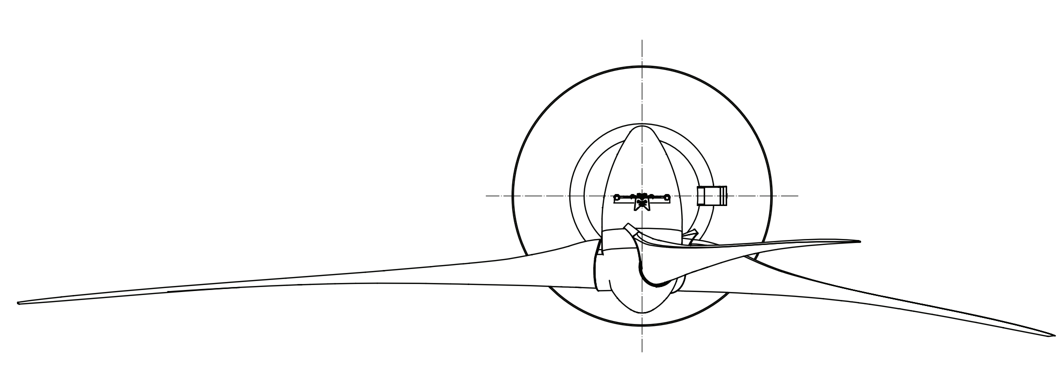


1 Main carrier
2 Yaw drive
3 Annular generator
4 Blade adapter
5 Rotor hub
6 Rotor blade



Entwurf /
Drafting

Statisch und Konstruktiv
nicht geprüft



Projektbezogene Angaben /
project specific data

Projekt / project:

Geländehöhe über NN /
ground height above sea level:

Gesamthöhe über NN /
total height above sea level:

Optionen / options:

① Nachtkennzeichnung / night marking:
W - Rot / W - Red

② Tageskennzeichnung / daylight marking:
weißes Blitzlicht mit Sichtweitenreduzierung
white flashlight with visibility reduction

③ Tageskennzeichnung / daylight marking:
6m rot (RAL 3020) / graues Rotorblatt
(RAL 7038) / 6m red (RAL 3020)
grey rotor blade (RAL 7038)

④ Tageskennzeichnung / daylight marking:
rot/grau/rot (RAL 3020 / RAL 7038 /
RAL 3020) je 6m lang / red/grey/red
(RAL 3020 / RAL 7038 / RAL 3020)
every 6m long

⑤ Tageskennzeichnung / daylight marking:
3,83m Farbfeld RAL 3020 /
3,83m colour field RAL 3020

⑥ Nachtkennzeichnung / night marking:
Hindernisfeuer auf jeder Turmachse 10CD /
obstruction fire on every tower axis 10CD

Dieses Dokument wurde auf Anfrage bzw. für einen bestimmten Auftrag verschickt. Der Empfänger wurde nicht registriert ! ⟹ Der Empfänger wird bei Änderung des Dokuments nicht automatisch informiert !

This document has been sent on request / for a certain order. The receiver has not been registered ! ⟹ The receiver will not automatically be informed in the case of alterations !

ENERCON GmbH
Dreekamp 5
26605 Aurich
Germany

Allgemeintoleranzen / General tolerances	Oberfläche DIN ISO 1302	Maßstab / Scale 1:200
		Gewicht / Weight KG
	Dat.	Name
Prep. by	08.07.2010	Stiemert
Approved		
Standard		
Release language		

WRD-Turm

Ansicht Betonfertigteilturm
View Precast Concrete Tower
E-101 E1/BF/125/*

No guarantee can be given in respect of this translation.

ID Nr.: KM649659

101.00.008 - 0

Sprache / Language: DE
Blatt / Sheet: 1
1 Bl.

Rev.	Änderung/Change	Fr. Dat.	Name

WIND ENERGY CONVERTER CHARACTERISTICS E-101

Rotor	
Type	E-101
Rotor diameter	101 m
Swept area	8012 m^2
Power regulation	Pitch
RPM	4 –14,5 min^{-1}
Cut in wind	2,5 m/s
Cut out wind	28 – 34 m/s
Survival wind speed	59,5 m/s

Gear Box	
Not applicable	No gearbox

Blades	
Manufacturer	ENERCON
Blade length	48,5 m
Material	GRP (Epoxy)
Lightning protection	included

Generator	
Manufacturer	ENERCON
Nominal Power	3000 kW
Type (model)	Synchronous, direct-drive ringgenerator
Protection classification	IP 23
Insulation class	F

Yaw System	
Type	electrical motors
Yaw control	Active (based on wind vane signal)
Yaw rate	0,5°/sec

Controller	
Manufacturer	ENERCON
Type	microprocessor
Grid connection	Via ENERCON inverter
Remote communication	ENERCON Remote Monitoring System
UPS	included

Braking System	
Aerodynamic brake	- three independent blade pitch systems with emergency supply - rotor brake - rotor lock, locking at 30°

Tower			
Hub heights	99 m	135 m	
Tower	Prefab concrete	Prefab concrete	
Design Wind Class	**IIA**	**IIA**	

Sources: Design Assessment

Prevention

All mechanical and electrical components of the wind energy converter in which overheating or short circuits could potentially ignite a fire are permanently monitored by sensors – primarily to ensure their proper functioning – while the WEC is running. If the WEC control system detects irregularities, the wind energy converter stops or continues with limited power. This function is the most effective component of the fire safety system.

Components

Special fire safety components of the E-70 E4 include:

- One Hekatron ORS 142 smoke detector (see appendix for data sheet) on the rotor head side of the stator support ring
- One Hekatron ORS 142 smoke detector on the machine house side of the stator support ring
- One Hekatron ORS 142 smoke detector on the bottom side of the main carrier (i.e., at the tower top)
- One hand-held CO_2 fire extinguisher in the nacelle
- If required by national regulations, one hand-held CO_2 fire extinguisher in the tower base (ENERCON personnel carry an additional fire extinguisher in their Service vehicles)
- Fire retardant or hardly inflammable or incombustible materials for specific components.

No smoke detectors are installed inside the tower and in the tower base. Since the WEC cooling system transports air from the tower base to the area above the tower top at high speed, the smoke detectors in the nacelle are able to detect a fire in the tower or the tower base.

Safe stopping of the wind energy converter in hazardous situations

The emergency pitch unit of each rotor blade consists of blade relay box, capacitor box, and pitch motor. If a safety-relevant sensor reports a fault or a safety switch is triggered, the wind energy converter stops immediately. The pitch control boxes disconnect the pitch motors from the control system and switch the contactors in the blade relay boxes to power supply by the capacitor boxes. The rotor blades automatically move into feathered position independently of each other until switched off by limit switches on the blade bearings. In case of an emergency stop of the rotor (in the event of a fire) an additional electromechanical brake is used. Decelerating the rotor from its rated speed to a standstill takes 10 to 15 seconds.

Fire during WEC operation

There are no persons present in the wind energy converter while it is running. If a fire is detected the rotor of the WEC stops as quickly as possible (emergency stop). The smoke detectors and/or temperature sensors generate signals that are immediately forwarded by the SCADA remote monitoring system to ENERCON Service, who in turn will immediately alert the local fire service and the utility operating the grid. They decide on site which measures are required. The ENERCON Service Center is staffed 24/7 and can thus be contacted at any time

Fire while persons are present

In this scenario, follow the instructions and rules of conduct below.

- Stop the wind energy converter and turn off the main switch, if still possible. Otherwise, push the EMERGENCY STOP button.
- Call the fire service.
- Rescue any injured persons from the danger zone and ensure first aid is provided.
- Use carbon dioxide fire extinguishers to fight the fire; follow the operating instructions of the fire extinguishers. Only try to fight the fire if you can do so without putting your own safety at risk and if the escape route is clear.
- If the fire cannot be extinguished immediately, do not continue fire fighting efforts. Evacuate the wind energy converter and any ancillary buildings, and leave the WEC. Cordon off a wide area around the WEC.
- If it is no longer possible to descend safely in the tower, climb up into the nacelle and use rescue equipment (abseiling device) to leave the nacelle through the winch hatch.
- Notify the technical manager of the relevant utility company.
- Clear access roads for emergency services.
- Notify ENERCON Service.

If the *Maintenance* status has been activated during service work on the wind energy converter, any signals generated by smoke detectors and other sensors are **not** transmitted to ENERCON Service.

Maintenance

In the event of a SCADA system fault a corresponding message is sent to the ENERCON Service Center that will then initiate troubleshooting measures at once. The smoke detectors and the SCADA system are inspected in the setting of the annual electrical maintenance. Inspection and maintenance of fire extinguishers is performed in accordance with national regulations.

HEKATRON

Optischer Rauchschalter ORS 142

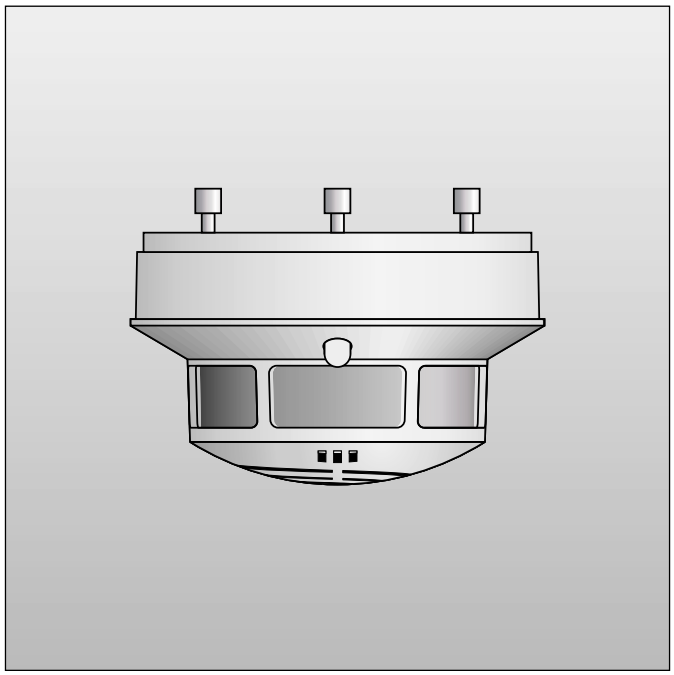
- optische Raucherkennung
- Verschmutzungsanzeige
- Alarmschwellennachführung
- kommunikationsfähig
- Meßkammerüberwachung
- potentialfreier Öffner

Détecteur de fumée optique ORS 142

- détection de fumée optique
- indicateur de colmatage
- correction du seuil d'alarme
- communication
- surveillance par chambre de mesure
- contact d'ouverture exempt de potentiel

ORS 142 optical smoke switch

- Optical smoke detection
- Contamination warning
- Auto contamination compensation
- Communications capability
- Sensing chamber monitoring
- NC volt-free contact



Der optische Rauchschalter ORS 142 erkennt frühzeitig sowohl Schwelbrände als auch offene Brände mit Rauchentwicklung.
Ein zusätzlicher Temperaturfühler spricht bei einer Umgebungstemperatur von 70 °C an.
Er wird vorzugsweise in Feststellanlagen und maschinellen Rauchabzugsanlagen eingesetzt.
Der ORS 142 löst den bisherigen Rauchschalter ORS 132 ab.

Le détecteur de fumée optique ORS 142 décèle rapidement aussi bien les feux couvants que les feux déclarés avec émission de fumée.
Un capteur thermique supplémentaire se déclenche automatiquement à partir d'une température ambiante de 70°C.
Ce dispositif s'utilise de préférence pour les contrôles automatiques des portes et systèmes de désenfumage mécaniques

The ORS 142 optical smoke switch reacts promptly to smouldering fires as well as to flaming fires that develop smoke.
An additional temperature sensor is triggered at an ambient temperature of 70 °C.
Its principal application is for door holder/closer systems and powered smoke ventilation systems.

Der ORS 142 arbeitet nach dem Streulichtprinzip. Lichtsender und -empfänger sind in der Meßkammer so angeordnet, daß das Licht des Senders den Empfänger nicht direkt trifft. Erst das an Schwebeteilen gestreute Licht gelangt zum Empfänger.
Die Auswerteelektronik des ORS 142 überwacht den Rauchmeßteil des Melders zusätzlich auf leichte Verschmutzung, starke Verschmutzung und Störung (Meßkammerausfall).
Die jeweiligen Betriebszustände zeigt der ORS 142 optisch an.
Eine Langzeit-Alarmschwellennachführung sorgt für einen gleichbleibenden Abstand zwischen Grundsignal und Alarmschwelle, bis der Grenzwert für starke Verschmutzung erreicht ist.
Ein Relaiskontakt öffnet bei Alarm sowie bei Spannungsausfall.

Kommunikation

Der ORS 142 meldet seinen Funktionszustand über Stift 3 an eine RZA 142 (Rauchschalter-Zustandsanzeige). Hier werden ebenfalls die Zustände mit farbigen LEDs optisch angezeigt.
Wird der ORS 142 an ein RSI (Rauchschalter-Interface) angeschlossen, können die Melderzustände mit einem PC abgefragt werden. Mit einem Modem können RSI und PC über eine Postleitung kommunizieren.

L'ORS 142 fonctionne sur le principe de la lumière diffuse. L'émetteur et le récepteur de lumière sont positionnés dans la chambre de mesure de manière que la lumière provenant de l'émetteur ne parvienne pas directement au récepteur, mais seulement sous forme de lumière diffusée sur les particules en suspension.
L'unité d'évaluation électronique de l'ORS 142 surveille le dispositif de mesure de fumée du détecteur afin de déceler l'encrassement, faible ou important, ainsi que les pannes (défaillances de la chambre de mesure).
Les états de fonctionnement de l'ORS 142 sont signalés de manière optique.
Le dispositif de correction du seuil d'alarme assure un écart constant entre le signal de base et le seuil d'alarme, et ceci jusqu'à ce que la valeur limite d'encrassement important soit atteinte.
Un contact de relais s'ouvre en cas d'alarme ou d'absence de courant.

Communication

L'ORS 142 signale son état de fonctionnement au niveau de l'ergot 3 de l'indicateur de fonctionnement RZA 142. Des DEL de couleur signalent également les états de fonctionnement de manière optique.
Lorsque l'ORS 142 est branché sur une interface de détecteur de fumée, il est possible de vérifier l'état de fonctionnement du détecteur à partir d'un PC. A l'aide d'un modem, l'interface et le PC peuvent communiquer par une ligne téléphonique.

The ORS 142 operates on the light scatter principle. Inside the sensing chamber a light source and a light sensor are arranged so that the light normally does not fall on the sensor. It is only when airborne particles enter the chamber that light is scattered onto the sensor.
The ORS 142 electronic circuitry also monitors the smoke detection system for slight contamination (dust and dirt build-up), heavy contamination and faults (sensing chamber failure).
LEDs provide an optical indication of the operating status of the ORS 142.
A long-term compensation function automatically maintains a constant difference between the quiescent signal and the alarm threshold, until a set limit indicating heavy contamination is reached.
A relay contact opens in the alarm condition or on power failure.

Communications

The ORS 142 signals its functional status via pin 3 to an RZA 142 smoke switch status indicator, whose coloured LEDs give an additional remote optical indication of the instrument's condition.
If the ORS 142 is linked to an RSI smoke switch interface, detector status can be scanned from a PC. The RSI and the PC can also communicate over a telecommunications line.

DIBt-Zulassungen für:

Feststellanlagen	Z-6.5-1571 Z-6.5-1725
maschinelle Rauchabzugsanlagen	Z-78.5-15

Homologations DIBt pour :

Équipements coupe-feu	Z-6.5-1571 Z-6.5-1725
Systèmes de désenfumage mécaniques	Z-78.5-15

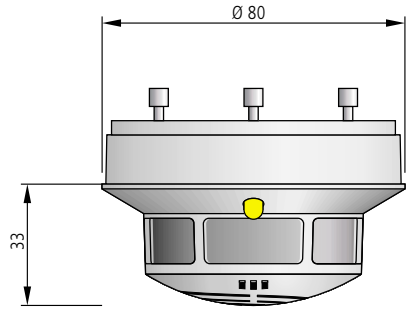
DIBt approvals for:

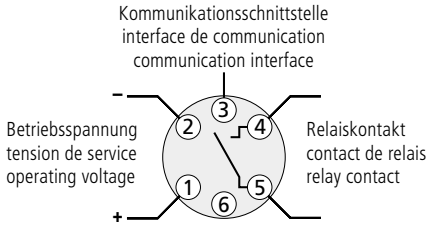
Hold-open systems	Z-6.5-1571 Z-6.5-1725
Powered smoke ventilation systems	Z-78.5-15

Technische Daten/Caractéristiques techniques/Technical data

nach/selon/to EN 54, Teil 7	Rauch	Fumée	Smoke
70 °C	Temperatur	Température	Temperature
18 bis/à/to 28 VDC	Betriebsspannung	Tension de service	Operating voltage
	Stromaufnahme bei 28 V_	Consommation pour 28 V_	Current draw at 28 V DC
max. 21 mA	in Ruhe	au repos	quiescent
max. 10 mA	bei Alarm	en cas d'alarme	in alarm
max. 25 mA	bei Störung	en cas de défaillance	in fault
Öffner/contact d'ouverture/NC	Relaiskontakte	Contacts de relais	Relay contact
max. 30 VDC	Schaltspannung	Tension d'enclenchement	switched voltage
max. 1 A	Schaltstrom	Courant d'enclenchement	switched current
max. 30 W	Schaltleistung	Puissance de rupture	switched power
IP 42	Schutzart	Indice de protection	Ingress protection
-20 bis/à/to +80 °C	Betriebsumgebungstemperatur	Température ambiante d'exploitation	Ambient operating temperature
120 g	Gewicht	Poids	Weight

Maßbild/Plan coté/Dimensioned drawing





Der ORS 142 darf nur an Hekatron-Netzgeräte angeschlossen werden und passt in die vorhandene Sockelserie 143.

L'ORS 142 doit être branché exclusivement sur des unités d'alimentation Hekatron et peut être monté dans les socles existants du type 143.

The ORS 142 may only be connected to Hekatron mains-power devices and matches the existing bases type 143.

Relais/Relais/Relay		**Einzelanzeige/Affichage individuel/LED**	
Betrieb en service in operation	4 5	grün/vert/green	———
leicht verschmutzt légèrement encrassé slight contamination	4 5	grün/vert/green gelb/jaune/yellow	⊓⊓⊓
stark verschmutzt encrassé heavy contamination	4 5	grün/vert/green gelb/jaune/yellow	⊓⊓⊓⊓
Störung défaillance fault	4 5	gelb/jaune/yellow	———
Alarm alarme alarm	4 5	rot/rouge/red	———
spannungslos hors tension power off	4 5	dunkel/sombre/dark	

Bestelldaten/Références/Ordering data

5 000 552	ORS 142	Rauchschalter, weiß nach RAL 9010	Détecteur de fumée, blanc RAL 9010	Smoke switch, white (DIN shade RAL 9010)
		andere Farben auf Anfrage	autres couleurs sur demande	other colours on request

Technische Änderungen sowie Liefermöglichkeiten vorbehalten.

Sous réserve de modifications techniques ainsi que de possibilités de livraison.

Specifications subject to change without notice. Delivery subject to availability.

HEKATRON Vertriebs GmbH
Brühlmatten 9
D-79295 Sulzburg
Telefon (07634) 500-264
Telefax (07634) 500-323

www.hekatron.de
info@hekatron.de

HEKATRON
Sicherheitssysteme

Ein Unternehmen der
Schweizer Securitas Gruppe

Une entreprise du
Groupe suisse Securitas

A member of the
Swiss Securitas Group

7050175.0402 TDB

WIND ENERGY CONVERTER CHARACTERISTICS E-101

Rotor	
Type	E-101
Rotor diameter	101 m
Swept area	8012 m^2
Power regulation	Pitch
RPM	4 –14,5 min^{-1}
Cut in wind	2,5 m/s
Cut out wind	28 – 34 m/s
Survival wind speed	59,5 m/s

Gear Box	
Not applicable	No gearbox

Blades	
Manufacturer	ENERCON
Blade length	48,5 m
Material	GRP (Epoxy)
Lightning protection	included

Generator	
Manufacturer	ENERCON
Nominal Power	3000 kW
Type (model)	Synchronous, direct-drive ringgenerator
Protection classification	IP 23
Insulation class	F

Yaw System	
Type	electrical motors
Yaw control	Active (based on wind vane signal)
Yaw rate	0,5°/sec

Controller	
Manufacturer	ENERCON
Type	microprocessor
Grid connection	Via ENERCON inverter
Remote communication	ENERCON Remote Monitoring System
UPS	included

Braking System	
Aerodynamic brake	- three independent blade pitch systems with emergency supply - rotor brake - rotor lock, locking at 30°

Tower			
Hub heights	99 m	135 m	
Tower	Prefab concrete	Prefab concrete	
Design Wind Class	**IIA**	**IIA**	

Sources: Design Assessment

FUNDAMENT-DATENBLATT
FOUNDATION DATA SHEET

E-101/BF/133/27/01

WZ III (DIBt- Richtlinie Fassung 2004, Anhang B)
WZ 4; GK I (DIN 1055-4: 2005-03)
WTC II A (IEC 61400-1, 3rd edition, 2005-08)
WEA-Klasse II A (DIN EN 61400-1, 2006-07)

Bauteil: **Fundament– Flachgründung ohne Auftriebswirkung**
Component: **Foundation – Flat Foundation without Buoyancy**

8107894074-7 E I
Reviewed
Essen, 20. April 2011
S. Möller Expert of
TÜV NORD SysTec GmbH & Co. KG

TÜV NORD
20. APR. 2011

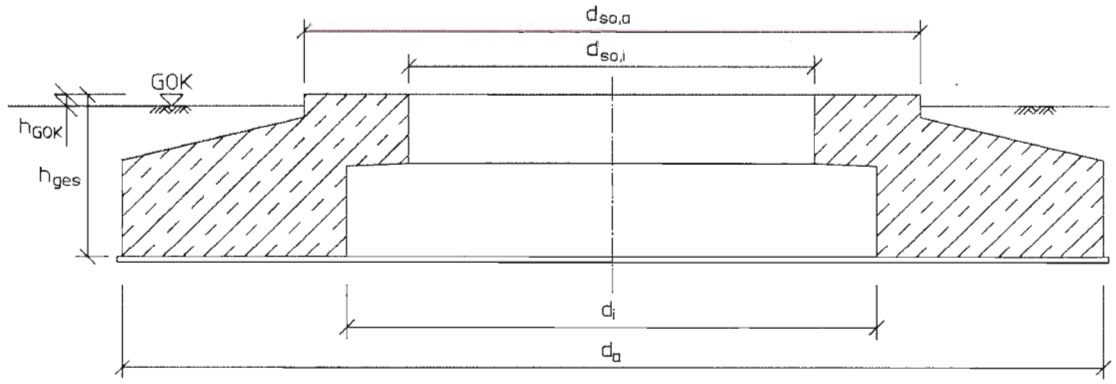
Document information:			
Author/ date:	MFE / 2011-02-09		
Department:	WRD-K	Translator / date:	-
Approved / date:	TE / 2011-02-09	Revisor / date:	-
Revision / date:	MFE 1 / 2011-03-14	Reference:	WRD-K-04-FDB-FEB-E-101_BF_133_27_01-Rev_1-EN

1.0 General information

Design-specific structural analysis:	Structural calculation by ENERCON GmbH, E-101/BF/133/27/01 Flat foundation without buoyancy – ∅ 20.90 m Revision 1 – 14.03.2011

2.0 Foundation dimensions

Outer diameter	d_a	20.90 m
Inner diameter	d_i	11.20 m
Base diameter – outside	$d_{so,a}$	13.50 m
Base diameter – inside	$d_{so,i}$	8.50 m
Foundation height	h_{ges}	3.10 m
Base height	h_{so}	0.40 m
Spur incline height	h_n	0.60 m
Spur height	h_{sp}	2.10 m
Difference between foundation top edge and ground level	h_{gok}	0.20 m
Concrete quality and volume	C 30/37	677 m³
Reinforcement steel and weight	B 500B	68.6 t



TÜV NORD
20. APR. 2011

3.0 Minimum rocking spring stiffness

Observe the following minimum values with regard to elastic clamping between foundation and subsoil:

Total system (tower and foundation)	**kφ,stat** **15000 [MNm/rad]**
	kφ,dyn **150000 [MNm/rad]**

The resulting required dynamic stiffness moduli ($E_{oed,dyn}$) depend on the foundation dimensions and Poisson's ratio.

Equivalent radius of a circle with the same stiffness:

r = 10.23 m

The following applies to circular foundations:

$$k_{\varphi} = \frac{8 \cdot G \cdot r^3}{3 \cdot (1 - \nu)}$$

This means that

$$E_{oed,dyn} = k_{\varphi} \cdot \frac{3}{4} \cdot \frac{1}{r^3} \cdot \frac{(1+\nu) \cdot (1-\nu)^2}{1 - \nu - 2 \cdot \nu^2}$$ where

G = shear modulus
r = radius
ν = Poisson's ratio

4.0 Allowed inclination

Maximum allowed inclination due to subsoil settlement within 20 years, related to the outer diameter.

$\Delta s \leq 40$ mm

5.0 Soil bearing pressure

The in-situ subsoil must be able to bear a minimum pressure of $\sigma_{k,vorh}$ **= 401 kN/m².**

TÜV NORD
20. APR. 2011

6.0 Loads at the bottom edge of the foundation

The F_Z loads indicated include the dead weight of the foundation γ = 25 kN/m³ and soil weight γ = 18 kN/m³ when dry.

6.1 Characteristic load cases

Load case	($\gamma_{aero}/\gamma_{mass}$)	F_{xy} [kN]	F_z [kN]	M_{xy} [kNm]	M_z [kNm]
DLC 1.0	(1.00/1.00)	1100	-36707	103954	-
DLC 3.2	(1.00/1.00)	1470	-36790	153801	-8420
DLC 6.2	(1.00/1.00)	1700	-36590	189565	-8590

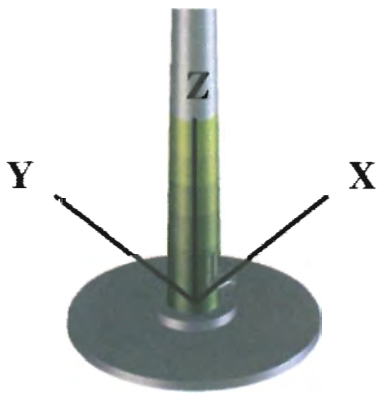
Loads do not include partial safety factor (γ_F = 1.0)

6.2 Load case design values

Load case	($\gamma_{aero}/\gamma_{mass}$)	F_{xy} [kN]	F_z [kN]	M_{xy} [kNm]	M_z [kNm]
DLC 3.2	(1.35/1.35)	2110	-49067	217115	-11600
DLC 3.2	(1.35/1.00)	2110	-36808	217115	-11600

All loads include partial safety factors

7.0 Coordinate system



TÜV NORD
20. APR. 2011

Gewichte / Weights E-101

In der folgenden Tabelle sind die Gewichte der Transport- und Aufbaueinheiten der E-101 angegeben. Es ist zu beachten, dass es sich dabei um ca.-Angaben handelt. Bei den Einzelgewichten sind jeweils die notwendigen Transport- und Aufbauvorrichtungen berücksichtigt, das angegebene Gondelgesamtgewicht entspricht der Turmkopfmasse nach Fertigstellung der Anlage.

In the following table the weights of the transport and installation component-assemblies of the E-101 are given. It is to be noted that the values are approximated. The weights include the necessary transport and installation devices, the given value for overall nacelle weight corresponds to the tower head mass after completion of the turbine.

Transport	**Transport**		
Rotorblatt mit HKS	Rotor blade with fin	ca. 21,0	t
3x HKS	3x Fin	ca. 2,4	t
Rotornabe	Rotor hub	ca. 50,0	t
Generator	Generator	ca. 83,0	t
Gondel (Maschinenträger etc.)	Nacelle (main carrier etc.)	ca. 59,0	t
Aufbau	**Installation**		
Rotornabe (incl. Rotorblätter)	Rotor hub (incl. rotor blades)	ca. 115,0	t
Generator	Generator	ca. 84,0	t
Generator-Stator	Generator stator	ca. 52,0	t
Generator-Rotor	Generator rotor	ca. 35,0	t
Gondel (Maschinenträger etc.)	Nacelle (main carrier etc.)	ca. 59,0	t
Gondelgesamtgewicht	**Overall nacelle weight**	**ca. 255,0**	**t**

Sound Power Level of the ENERCON E-101 3.0 MW

Publisher:

ENERCON Canada Inc.

1000, rue de La Gauchetière ouest Bureau 2310
Montréal, QC, H3B 4W5
+1 514 ENERCON (+1 514 363 7266)

The following represents the maximum sound power level of the E-101 3.0 MW for the entire operational range of wind speeds in accordance with the measurement technique IEC 61 400 – 11:2002 and A1:2006.

Sound Power Level for the E-101 with 3.0 MW rated power

Hub Height	124m	135m
95% rated power	104.8 dB(A)	104.8 dB(A)

1. A tonal audibility of $\Delta L_{a,k} \leq 2$ dB can be expected over the whole operational range and is valid in the near vicinity of the turbine according to IEC 61 400 -11 ed. 2.

2. Sound power level values provided in the table are valid for the **Operational Mode I**. The respective power curve is the calculated power curve E-101 dated October 2009 (Rev 2.0).

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

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

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

4. 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 cannot, and is not intended to, constitute an express or implied warranty towards the customer that the E-101 WEC will meet the exact sound power level as shown in this document at any project specific site.

KÖTTER CONSULTING ENGINEERS

Summary of Test Report
(Measured hub height of 99 m) /1/

Master Data Sheet "Geräusche" (*Noise*), in accordance with
"Technische Richtlinien für Windenergieanlagen, Teil 1: Bestimmung der Schallemissionswerte"
(Technical Guidelines for Wind Turbine Generators, 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 213122-02.01 IEC
on noise emission of wind turbine generator of type E-101

General Data		**Technical Data (manufacturer's specifications)**	
Manufacturer of WTG:	Enercon GmbH	Rated power (generator):	3,050 (3,250) kW
Serial number:	1010002	Diameter of rotor:	101 m
Location of WTG (approx.):	49733 Haren	Hub height above ground:	99 m
Geographic co-ordinates:	GK longitude: 25.76.214	Type of tower:	conical tubular concrete
	GK latitude: 58.59.856	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-101-1	Type of gear unit:	not applicable
Blade setting angle:	variable	Manufacturer of generator:	Enercon
Number of rotor blades:	3	Type of generator:	G-101/30-G2
Rotor speed range:	5 to 14.7 rpm. (mode OM I)	Rated speed of generator:	5 to 14.7 rpm. (mode OM I)

Calculated Performance Chart: Performance characteristic E101 3 MW OM I ; calculated by ENERCON (Rev. 1.0)

	Reference Point		**Noise emission parameters**	**Observations**
	standardized wind speed at a height of 10 m	true electrical power		
sound power level $L_{WA,P}$	6 ms^{-1}	1,414 kW	103.6 dB(A)	
	7 ms^{-1}	2,077 kW	104.3 dB(A)	
	8 ms^{-1}	2,751 kW	104.8 dB(A)	
	9 ms^{-1}	2,987 kW	104.6 dB(A)	(1)
	10 ms^{-1}	3,050 kW	--	(2)
tonal audibility ɜ $L_{a,k}$	6 ms^{-1}	1,414 kW	- 1.5 dB	
	7 ms^{-1}	2,077 kW	0 dB	
	8 ms^{-1}	2,751 kW	0 dB	
	9 ms^{-1}	2,987 kW	0 dB	(1)
	10 ms^{-1}	3,050 kW	--	(2)
impulse adjustment for immediate vicinity K_{IN}	6 ms^{-1}	1,414 kW	0 dB	
	7 ms^{-1}	2,077 kW	0 dB	
	8 ms^{-1}	2,751 kW	0 dB	
	9 ms^{-1}	2,987 kW	0 dB	(1)
	10 ms^{-1}	3,050 kW	--	(2)

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
$L_{WA,P}$	78.3	81.8*	83.0**	84.2	89.6	85.7*	89.2	92.7	94.1	94.6	95.1	94.9
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	93.5	91.6	90.0	89.0	85.4	84.1	82.3	79.3	74.8	67.8*	64.7**	65.3**

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
$L_{WA,P}$	85.6*	91.9	97.2	99.6	96.7	91.5	84.6	70.3*

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
$L_{WA,P}$	78.9	83.3	84.0	84.9	88.2	86.4*	89.6	94.7	94.9	95.4	95.8	95.5
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	94.0	92.0	90.4	89.3	86.1	84.7	82.9	79.9	74.4*	68.4*	64.6**	62.7**

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
$L_{WA,P}$	87.3	91.5	98.4	100.3	97.1	91.9	85.0	71.5**

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
$L_{WA,P}$	82.1	82.8	84.4	88.4	86.8	90.1	94.8	95.0	95.6	96.3	96.2	82.1
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	95.0	93.3	91.5	90.4	86.7	85.4	83.7	80.9	75.9	69.7*	67.1**	65.5**

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
$L_{WA,P}$	86.3	91.6	98.6	100.8	98.3	92.8	86.0	73.3**

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
$L_{WA,P}$	78.6	81.9	82.4*	83.9	87.8	85.9*	88.6	93.8	94.2	95.1	96.0	96.3
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	95.4	93.8	92.3	91.0	87.4	86.0	84.1	81.1	76.7	71.7	68.4	66.8*

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
$L_{WA,P}$	86.0	90.8	97.6	100.6	98.8	93.5	86.4	74.2

This summary of the test report is valid only in combination with the manufacturer's certificate dated 12/03/2013.

These specifications do not replace the test report mentioned above (particularly for noise immission predictions).

Observations:
(1) Maximum value of standardized wind speed during the WTG-operation measurement v_s = 8,9 m/s
(2) Due to weather conditions, no data available during WTG operation
* 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

/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: 23/04/2013

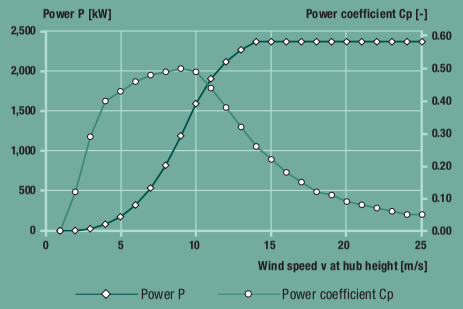
Dipl.-Ing. Oliver Bunk Matthias Humpohl, B.Sc.

KÖTTER CONSULTING ENGINEERS
Bonifatiusstraße 400 · 48432 Rheine
Tel. 0 59 71 - 97 10.0 · Fax 0 59 71 - 97 10.43

E82

2,300 kW

Calculated power curve



Wind [m/s]	Power P [kW]	Power coefficient Cp [-]
1	0.0	0.00
2	3.0	0.12
3	25.0	0.29
4	82.0	0.40
5	174.0	0.43
6	321.0	0.46
7	532.0	0.48
8	815.0	0.49
9	1,180.0	0.50
10	1,580.0	0.49
11	1,890.0	0.44
12	2,100.0	0.38
13	2,250.0	0.32
14	2,350.0	0.26
15	2,350.0	0.22
16	2,350.0	0.18
17	2,350.0	0.15
18	2,350.0	0.12
19	2,350.0	0.11
20	2,350.0	0.09
21	2,350.0	0.08
22	2,350.0	0.07
23	2,350.0	0.06
24	2,350.0	0.05
25	2,350.0	0.05

ρ = 1.225 kg/m³

For more information on the ENERCON power curve, please see the last page.

Technical specifications E-82 E2

Rated power:	2,300 kW
Rotor diameter:	82 m
Hub height:	78 m / 85 m / 98 m / 108 m / 138 m
Wind zone (DIBt):	WZ III
Wind class (IEC):	IEC/NVN IIA
WEC concept:	Gearless, variable speed Single blade adjustment
Rotor	
Type:	Upwind rotor with active pitch control
Rotational direction:	Clockwise
No. of blades:	3
Swept area:	5,281 m²
Blade material:	GRP (epoxy resin); Built-in lightning protection
Rotational speed:	Variable, 6 – 18 rpm
Pitch control:	ENERCON single blade pitch system; one independent pitch system per rotor blade with allocated emergency supply
Drive train with generator	
Hub:	Rigid
Main bearing:	Double-row tapered/cylindrical roller bearings
Generator:	ENERCON direct-drive annular generator
Grid feed:	ENERCON inverter
Brake systems:	– 3 independent pitch control systems with emergency power supply – Rotor brake – Rotor lock
Yaw system:	Active via yaw gear, load-dependent damping
Cut-out wind speed:	28 – 34 m/s (with ENERCON storm control*)
Remote monitoring:	ENERCON SCADA

*For more information on the ENERCON storm control feature, please see the last page.

1 Main carrier
2 Yaw drive
3 Annular generator
4 Blade adapter
5 Rotor hub
6 Rotor blade

WIND ENERGY CONVERTER CHARACTERISTICS

E-82 E2 2.3MW

Rotor	
Type	E82 E2
Rotor diameter	82 m
Swept area	5281 m^2
Power regulation	Pitch
RPM	6 –18 min^{-1}
Cut in wind	2,5 m/s
Cut out wind	28 – 34 m/s
Survival wind speed	59,5 m/s

Gear Box	
Not applicable	No gearbox

Blades	
Manufacturer	ENERCON
Blade length	38,8 m
Material	GRP (Epoxy)
Lightning protection	included

Generator	
Manufacturer	ENERCON
Nominal Power	2300 kW
Type (model)	Synchronous, direct-drive ringgenerator
Protection classification	IP 23
Insulation class	F

Yaw System	
Type	6 electrical motors
Yaw control	Active (based on wind vane signal)
Yaw rate	0,5°/sec

Controller	
Manufacturer	ENERCON
Type	microprocessor
Grid connection	Via ENERCON inverter
Remote communication	ENERCON Remote Monitoring System
UPS	included

Braking System	
Aerodynamic brake	- three independent blade pitch systems with emergency supply - rotor brake - rotor lock, locking at 30°

Tower					
Hub heights	78 m	85 m	98 m	108 m	138 m
Tower	Steel (4 + FS)	Steel + Prefab concrete (2 + 15)	Steel + Prefab concrete (2 + 18)	Steel + Prefab concrete (2 + 21)	Steel + Prefab concrete (2 + 21)
Design Wind Class	**II**	**II**	**II**	**II**	**II**

Weights	
Nacelle, excl. Rotor and hub	Approx. 18 to
Rotor incl. Hub/Main pin	Approx. 55 to
Generator	Approx. 62 to
Total Weight	**Approx. 135 to**

Sources: Design Assessment, Manufacturers Certificate

KÖTTER CONSULTING ENGINEERS

Summary of Test Report
(Measured hub height of 108 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 209244-04.01 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):	2.300 kW
Serial number:	82679	Diameter of rotor:	82 m
Location of WEC (ca.):	26629 Großefehn	Hub height above ground:	108 m
Geographic co-ordinates:	GK longitude: 34.15.287	Type of tower:	conical tube tower
	GK latitude: 59.14.701	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; calculated by ENERCON (Rev. 3.0)

	Reference Point		Noise emission parameters	Observations
	standardized wind speed in 10 m height	true electrical power		
sound power level $L_{WA,P}$	5 ms^{-1}	579 kW	96.4 dB(A)	
	6 ms^{-1}	1,089 kW	100.6 dB(A)	
	7 ms^{-1}	1,612 kW	102.5 dB(A)	
	8 ms^{-1}	2,032 kW	103.2 dB(A)	
	9 ms^{-1}	2,255 kW	103.3 dB(A)	
	10 ms^{-1}	2,300 kW	102.9 dB(A)	
tonal audibility $\Delta L_{a,k}$	5 ms^{-1}	kW	- 2.7 dB	
	6 ms^{-1}	kW	<- 3.0 dB	
	7 ms^{-1}	kW	- 1.8 dB	
	8 ms^{-1}	kW	- 0.7 dB	
	9 ms^{-1}	kW	0.2 dB	
	10 ms^{-1}	kW	- 0.4 dB	
impulse adjustment for small distances K_{IN}	5 ms^{-1}	kW	0 dB	
	6 ms^{-1}	kW	0 dB	
	7 ms^{-1}	kW	0 dB	
	8 ms^{-1}	kW	0 dB	
	9 ms^{-1}	kW	0 dB	
	10 ms^{-1}	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
$L_{WA,P}$	74.1	76.5*	80.0	85.6	82.2	81.7	81.9	83.7	85.6	85.1	85.5	87.6
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	86.9	86.2	84.8	82.4	78.8	75.3	70.6	65.5	60.3*	60.3*	63.0	70.3

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
$L_{WA,P}$	82.3	88.3	88.8	91.0	90.8	84.5	72.1	71.4

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
$L_{WA,P}$	78.2**	79.1*	82.2	85.2	87.4	84.3	85.0	87.3	88.7	88.5*	89.5*	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
$L_{WA,P}$	91.7	91.5	89.9	87.1	83.0	79.4	74.4	69.0	63.5	64.4	67.4	74.3

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
$L_{WA,P}$	84.9*	90.6	92.0	95.7	95.9	89.0	75.8	75.4

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
$L_{WA,P}$	78.6**	79.8	82.7	84.8	90.8	86.2	86.0	89.7	91.0	92.5	91.7	93.9
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	93.4	93.3	91.8	89.2	85.8	81.9	77.0	72.2	66.1	65.3	66.8	72.8

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
$L_{WA,P}$	85.5*	92.8	94.2	97.6	97.7	91.4	78.5	74.4

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
$L_{WA,P}$	77.4*	80.4	83.1	84.9	91.2	86.6	86.3	90.4	91.4	92.9	92.1*	94.8
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	94.2	94.1	92.6	90.1	86.7	82.7	77.8	73.3	67.7	65.8	66.6	71.4

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
$L_{WA,P}$	85.6	93.2	94.6	98.2	98.5	92.2	79.4	73.4

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
$L_{WA,P}$	78.5	81.4	83.9	85.7	92.6	88.2	86.4	90.2	90.7	91.8	91.5*	93.9
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	94.0	94.4	93.4	91.5	88.4	84.6	79.9	75.4	69.3	65.5*	66.4	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
$L_{WA,P}$	86.6	94.6	94.3	97.3*	98.7	93.8	81.5	73.4

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
$L_{WA,P}$	78.8	81.7	84.5	86.3	92.4	88.5	86.4	89.8	90.0*	91.2	90.9*	92.7*
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	93.3	93.9	93.3	91.5	88.8	85.2	80.7	76.5	71.9	70.4	68.5	71.8

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
$L_{WA,P}$	87.0	94.6	93.7	96.5*	98.3	94.0	82.5	75.2

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: * 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

/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: 08/02/2010 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

ADJACENT WIND FARM

Siemens states in an email (Youmans, 2011), "The enclosed noise test report [Windtest, 2005] for the SWT 2.3-93 has been used on other applications to demonstrate the lack of any tonal characteristics. A similar report will be issued for the SWT 2.3-101 in the near future, but in the meantime this report has been accepted for proof of tonality since both units share common gearbox, generator, and converter systems."

Uncertainty in the tonal analysis is mentioned in section 3.6.3 ("Tonality") of the Windtest (2005) report.

No tonal penalty has been applied to this turbine.

The 10 m broadband and octave band source sound power levels for the Siemens SWT-2.221-101 turbine under its power-reduced operation protocol for a hub height of 99.5 m are shown in Table 1. Note that the 'Manufacturer's emission levels' were only provided for 6 and 8 ms^{-1}. For 7-ms^{-1}, octave band SPoLs have been interpolated; the 9 and 10-ms^{-1} SPoLs have been set equal to the 8-ms^{-1} SpoLs.

Table 1 Siemens SWT-2.221-101 — Wind turbine acoustic emissions summary.

Make and Model: Siemens SWT-2.221-101										
Rating: 2,221 kW										
Hub height (m): 99.5										
Wind profile adjustment: summer night-time power-law wind shear coefficient = 0.45										
	Octave band sound power level (dB)									
	Manufacturer's emission levels (10 m a.g.l)					**Adjusted emission levels (10 m a.g.l.)**				
Wind speed (ms^{-1})	**6.0**	**7.0**	**8.0**	**9.0**	**10.0**	**6.0**	**7.0**	**8.0**	**9.0**	**10.0**
Frequency (Hz)										
63	108.3	n/a	108.6	n/a	n/a	108.6	108.6	108.6	108.6	108.6
125	109.4	n/a	109.1	n/a	n/a	109.1	109.1	109.1	109.1	109.1
250	105.1	n/a	104.6	n/a	n/a	104.6	104.6	104.6	104.6	104.6
500	102.2	n/a	103.0	n/a	n/a	103.0	103.0	103.0	103.0	103.0
1000	99.1	n/a	100.1	n/a	n/a	100.1	100.1	100.1	100.1	100.1
2000	95.4	n/a	95.3	n/a	n/a	95.3	95.3	95.3	95.3	95.3
4000	87.8	n/a	88.6	n/a	n/a	88.6	88.6	88.6	88.6	88.6
8000	85.5	n/a	86.8	n/a	n/a	86.8	86.8	86.8	86.8	86.8
A-weighted	**104.5**	**105.0**	**105.0**	**105.0**	**105.0**	**105.0**	**105.0**	**105.0**	**105.0**	**105.0**

5.1.2 Siemens SWT-2.126-101

Siemens SWT-2.126-101 turbine broadband source sound power level data for 10-m a.g.l. wind speeds of 4 to 12 ms^{-1} and octave band source sound power level data for 10-m a.g.l. wind speeds of 6 and 8 ms^{-1} are listed in Siemens A/S documents

Table 2 Siemens SWT-2.126-101 — Wind turbine acoustic emissions summary.

Make and Model: Siemens SWT-2.126-101										
Rating: 2,126 kW										
Hub height (m): 99.5										
Wind profile adjustment: summer night-time power-law wind shear coefficient = 0.45										
	Octave band sound power level (dB)									
	Manufacturer's emission levels (10 m a.g.o.)					**Adjusted emission levels (10 m a.g.l.)**				
Wind speed (ms^{-1})	**6.0**	**7.0**	**8.0**	**9.0**	**10.0**	**6.0**	**7.0**	**8.0**	**9.0**	**10.0**
Frequency (Hz)										
63	108.8	n/a	108.4	n/a	n/a	108.4	108.4	108.4	108.4	108.4
125	109.7	n/a	108.6	n/a	n/a	108.6	108.6	108.6	108.6	108.6
250	104.7	n/a	103.4	n/a	n/a	103.4	103.4	103.4	103.4	103.4
500	100.5	n/a	101.7	n/a	n/a	101.7	101.7	101.7	101.7	101.7
1000	97.4	n/a	99.1	n/a	n/a	99.1	99.1	99.1	99.1	99.1
2000	94.8	n/a	94.3	n/a	n/a	94.3	94.3	94.3	94.3	94.3
4000	86.9	n/a	88.0	n/a	n/a	88.0	88.0	88.0	88.0	88.0
8000	84.6	n/a	86.2	n/a	n/a	86.2	86.2	86.2	86.2	86.2
A-weighted	**103.5**	**104.0**	**104.0**	**104.0**	**104.0**	**104.0**	**104.0**	**104.0**	**104.0**	**104.0**

5.2 SWEC Wind Turbines

5.2.1 Siemens SWT-2.221-101

The 10 m broadband and octave source sound power levels for the Siemens SWT-2.221-101 turbine with a hub height of 80 m are shown in Table 3. These values have been taken directly from the Summerhaven project (draft) Noise Study Report (Golder, 2010). It should be noted that Zephyr North has modified the ' Adjusted' octave band source sound power level values for 6 and 7 ms^{-1} to match the remaining values at 8, 9 and 10 ms^{-1}. It is believed that this will more accurately represent the turbine noise characteristics at the relatively higher hub-height wind speeds corresponding to the 10-m wind speeds which would be driven by the high (0.45) summer night-time wind shear.

Golder (2010) makes no mention of tonality with regard to this turbine. Since this turbine is the same power- derated version of the SWT2.3-101 described for the GREP project, it has been assumed for the purposes of this noise assessment report that there is no tonal noise associated with the Summerhaven turbines. No tonal penalty has been applied.

Golder (2010) reports that a summer night-time vertical wind shear of 0.42 was used for hub-height wind speed adjustments.

V82-1.65 MW

Creating more from less

Optimised for low and medium winds

With its large rotor and powerful generator, the V82 outperforms any turbine in its megawatt class for sites with low and medium wind conditions. Our hydraulic Active-Stall® technology ensures that the rotor gathers the maximum power from the prevailing wind, while minimising loads and controlling output. Active-Stall® provides failsafe protection in all conditions and, at and above its rated wind speed, maintains a steady output of 1.65 MW. With the V82, we have designed a wind turbine that offers unparalleled performance at a cost-effective price.

Low sound level

Vestas has made a concerted effort to reduce the sound level of the V82 dramatically – with audible results. The operating sound levels are among the lowest on the market, regardless of wind speed. The V82 also comes with a two-speed generator, which makes it possible to cut sound even further to meet specific requirements, e.g. for night time or low-wind operations.

Excellent grid compatibility

As wind turbines capture more of the electricity market each year, they have an increasingly significant role to play in grid management. Fortunately, the V82 meets even the most stringent grid demands, and with the installation of our advanced grid compliance system, the V82 will actually help stabilise a weak grid. Vestas grid support features full load and dynamic phase compensation to enhance reactive power regulation and thus keep the power factor in range. It has an uninterrupted backup power supply, too, so that auxiliary systems run at full capacity during grid disturbances. Moreover, our grid support provides continuous active and reactive power regulation to maintain voltage balance in the grid, as well as fault ride-through in the event of disturbances.

High reliability

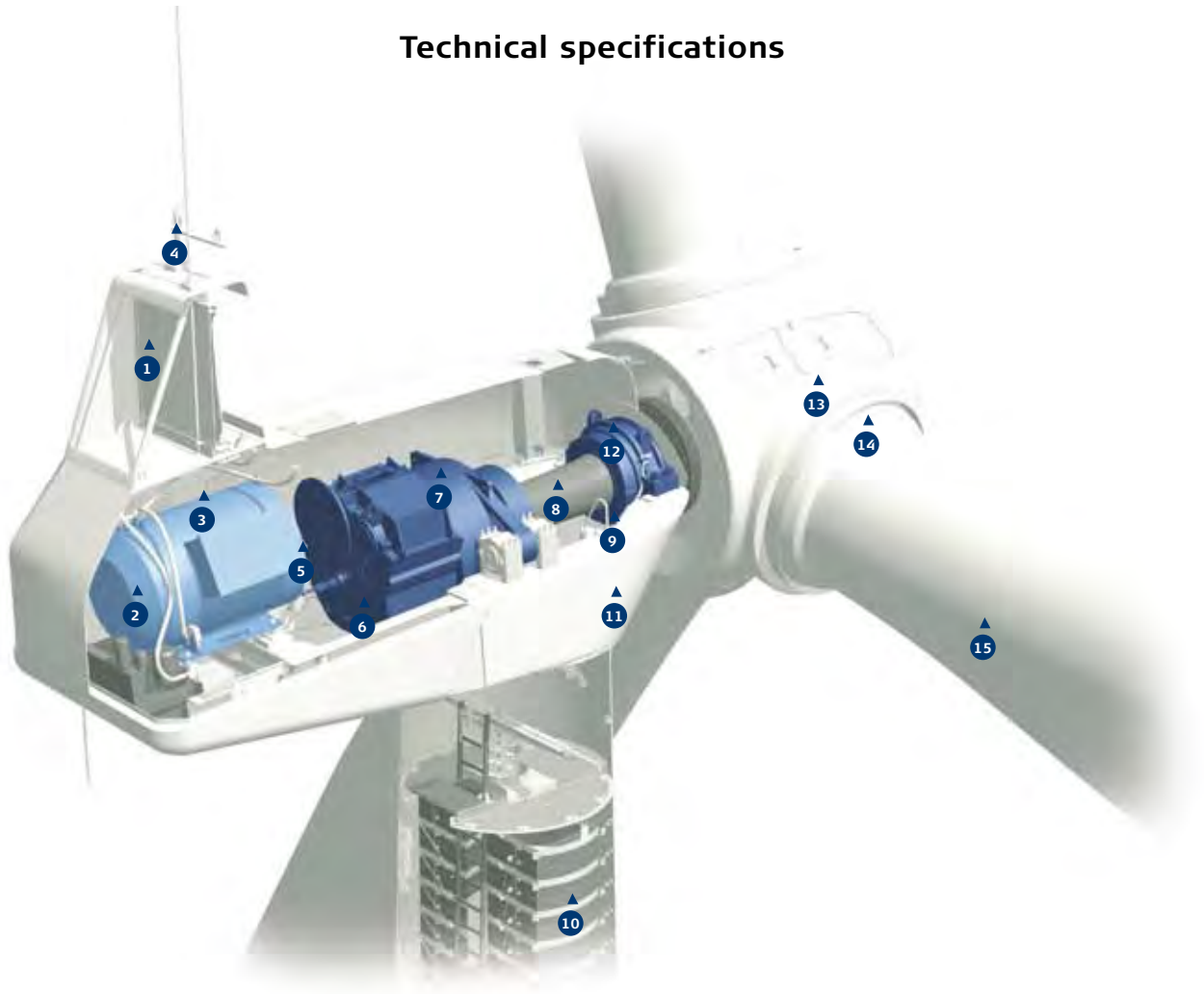
Det Norske Veritas (DNV) has certified the V82 as meeting the strictest standards in the wind industry. It has the capacity to tune up its own generator, which helps to give it a particularly high degree of operational availability. In addition, the nacelle is based on the thoroughly tested design of previous models. To date, more than 700 wind turbines featuring this platform design have been installed on sites with conditions ranging from arctic to tropical.

Proven performance

Wind power plants require substantial investments, and the process can be very complex. To assist in the evaluation and purchasing process, Vestas has identified four factors that are critical to wind turbine quality: energy production, operational availability, power quality and sound level.

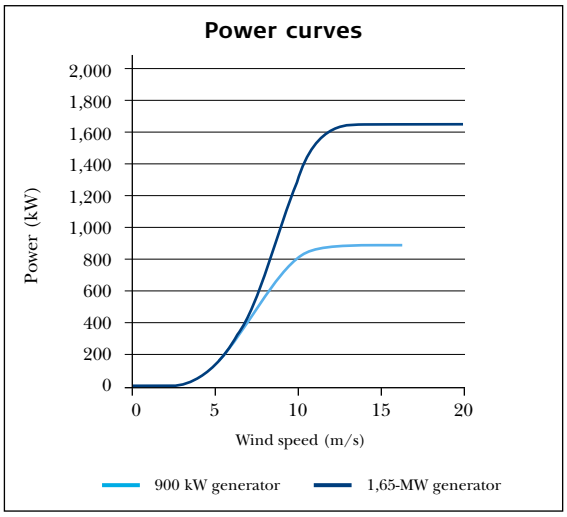
We spend months testing and documenting these performance areas for all Vestas turbines. When we are finally satisfied, we ask an independent testing organisation to verify the results – a practice we call Proven Performance. At Vestas we do not just talk about quality. We prove it.

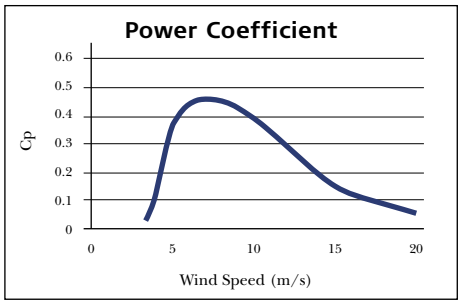
Technical specifications

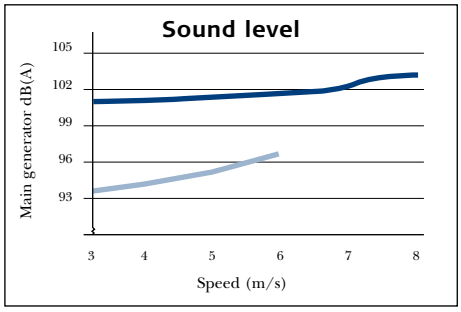


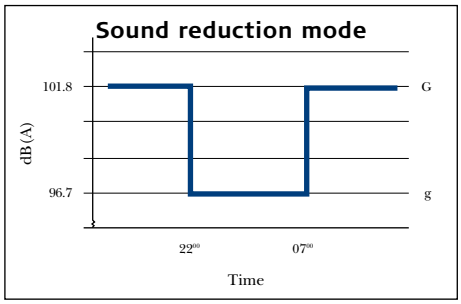
1. Cooler
2. Generator
3. Nacelle computer
4. Anemometer windvanes
5. Coupling
6. Mechanical brake
7. Gearbox
8. Main shaft
9. Yaw gears
10. Tower damper
11. Machine foundation
12. Main bearing
13. Hub computer
14. Pitch system
15. Blade
16. Dynamic converter (option)
17. Main panel
18. Phase compensation (full load option)
19. CPU
20. Transformer and switchgear

Example of tower internal configuration.









Rotor

Diameter:	82 m
Area swept:	5,281 m²
Nominal revolutions:	14.4 rpm, 14.4/10.8 rpm
Number of blades:	3
Power regulation:	Active-Stall®
Air brake:	Full blade pitch by three separate hydraulic pitch cylinders

Tower

Hub height (approx.): 59 m, 68.5 m, 70 m, 78 m

Operational data

	IEC IIB: 1,650 kW	IEC IIB: 900 kW/1,650 kW
Cut-in wind speed:	3.5 m/s	2.5 m/s
Nominal wind speed:	13 m/s	13 m/s
Cut-out wind speed (10 minutes):	20 m/s	20 m/s
Cut-out wind speed (1 minute):	24 m/s	24 m/s
Cut-out wind speed (1 second):	32 m/s	32 m/s

Generator

Type:	Asynchronous one or two speed generator water cooled
Nominal output:	1,650 kW
Operational data:	50/60 Hz 690 V

Gearbox

Type: Planetary/helical stages

Control

Type: Computer-based control of all turbine functions with the option of remote monitoring. Output regulation and optimisation via Active-Stall®.

Weight

Nacelle	52 t
Rotor	43 t

Towers:	
Hub height:	IEC IIB
59 m	75 t
68.5 m	105 t
70 m	110 t
78 m	130 t

t = metric tonnes

All specifications subject to change without notice.

Creating more from less

Ideally, it makes sense to generate electricity close to where it will be consumed so as to keep transmission, infrastructure and service costs low. However, since populous areas tend to have low winds and stringent requirements on sound levels, the wind industry often concentrates on coastal areas, deserted interiors and the open sea, where the wind is plentiful and sound restrictions are few.

With the V82 wind turbine, Vestas has made it easier to produce electricity close to where people live. Not only is the V82 extremely efficient in areas with low and medium winds, but it also provides the means to adjust sound levels to suit local requirements. This means that a large number of previously marginal sites can now be exploited profitably – and quietly.

The V82 is an extremely competitive turbine in its class in areas with low and medium winds. A stall-regulated wind turbine, it has been optimised for sites with an average wind speed of just 6.5 m/s at hub height, while a breeze of as little as 2.5 m/s is all that is needed to start production. The V82 is available with either a one or a two-speed generator.

Vestas Wind Systems A/S
Alsvej 21
8900 Randers
Denmark
Tel. +45 97 30 00 00
Fax +45 97 30 00 01
vestas@vestas.com
www.vestas.com

To see a complete list of our
sales and service units, visit
www.vestas.com

04/06 UK

Kossowski, Julia

From: Hickey, Maurice <Maurice.Hickey@gdfsuezna.com>
Sent: Wednesday, December 14, 2011 10:43 AM
To: Kossowski, Julia; Gafur, Ansar
Cc: Bultena, Carolyn
Subject: RE: Mohawk Point Coordinates
Attachments: A1-156508-MO-121-0100-Rev6-AsBuilt.pdf

Hi Julia

Please accept my apologies for not getting this to you sooner. It has been hectic as of late.

Please see the attached map with coordinates. The turbines at Mohawk are Vestas V 82-1.65Mw Mark IV 60 Hz units. They have a hub height of 80 meters.

If you need more info please feel free to let me know.

Maurice
647-271-9753

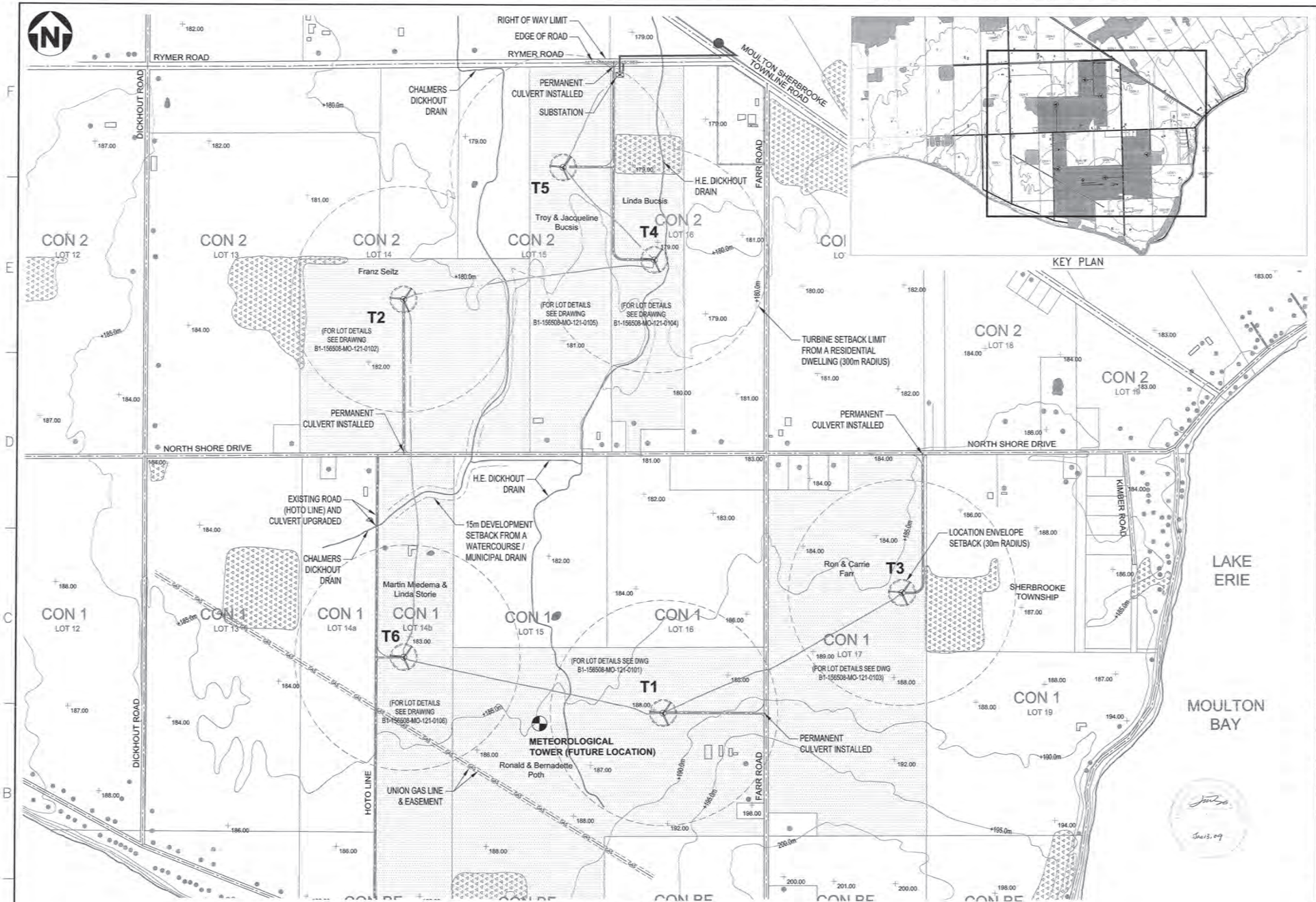
-----Original Message-----
From: Kossowski, Julia [mailto:Julia.Kossowski@stantec.com]
Sent: December-12-11 9:44 AM
To: Gafur, Ansar
Cc: Hickey, Maurice; Bultena, Carolyn
Subject: RE: Mohawk Point Coordinates

Thank you for the follow-up, Ansar.

Maurice, Carolyn; I would be so thankful if you could provide the coordinates and make/model to me today.

Thanks in advance,
Julia

Julia Kossowski
Project Manager
Stantec
49 Frederick Street
Kitchener ON N2H 6M7
Ph: (519) 569-4338
Fx: (519) 579-6733
Cell: (226) 989-5259
julia.kossowski@stantec.com
www.stantec.com



SITE PLAN LAYOUT

NOTES:

1. GRID COORDINATES SHOWN ON THIS DRAWING ARE BASED ON NAD 83, ZONE 17.
2. TOPOGRAPHIC INFORMATION AND PROPERTY BOUNDARIES WAS DERIVED FROM MACVIRO DRAWINGS #4877-G13A/B/C REV. F APRIL 29, 2005.
3. HOUSE LOCATIONS BASED ON LAYOUT FROM ZEPHYR NORTH RECEIVED ON JANUARY 25th, 2005. (LLKE02-21).
4. TURBINE LOCATIONS ARE BASED ON COORDINATES IN EMAIL FROM AIM POWER GEN. DATED JUNE 21st, 2007.

LEGEND

- TURBINE ACCESS ROAD
- MAJOR ROADS
- T1 TURBINE
- FARM BUILDING
- EXIST. RESIDENTIAL DWELLING
- EXISTING WOODED AREA
- MUNICIPAL DRAIN
- 27.6kV OVERHEAD COLLECTOR LINE TO EXISTING 27.6kV HONI OVERHEAD LINE
- 27.6kV OVERHEAD COLLECTOR LINE & FIBRE OPTIC CABLE
- 27.6kV UNDERGROUND & FIBRE OPTIC CABLE
- 300m TURBINE SETBACK FROM AN OFF-SITE RESIDENTIAL DWELLING
- SPOT HEIGHT ELEVATION

MOHAWK TURBINE COORDINATES	
TURBINE #	COORDINATES (E, N)
T1	E 623355, N 4745400
T2	E 622632, N 4746480
T3	E 623974, N 4745737
T4	E 623297, N 4746604
T5	E 623047, N 4746843
T6	E 622661, N 4745529

0m 100 200 300
SCALE 1:5,000

REV	DD/MM/YY	REVISION	DR	CHK	APP	APP	APP	APP
6	12/01/09	ACCESS ROAD TO TURBINE T3 REVISED	MBH	SL	GG			
5	19/06/08	ISSUED FOR AS BUILT	MBH	SL	GG			
4	14/05/08	ISSUED FOR AS BUILT	MBH	SL	GG			
3	12/11/07	ISSUED FOR CONSTRUCTION	MBH	SL	GG			
2	02/11/07	ISSUED FOR MUNICIPAL SITE PLAN APPROVAL	MBH	SL	GG			
1	15/10/07	ISSUED FOR CONSTRUCTION	MBH	MP	GG			
0	23/08/07	ISSUED FOR MUNICIPAL SITE PLAN APPROVAL	MBH	MP	GG			

ISS	DD/MM/YY	APP	ISSUED FOR
6	13/01/09		AS BUILT
5	19/06/08	GG	AS BUILT
4	14/05/08	GG	AS BUILT
3	12/11/07	GG	CONSTRUCTION
2	02/11/07	GG	MUNICIPAL SITE PLAN APPROVAL
1	15/10/07	GG	CONSTRUCTION
0	23/08/07	GG	MUNICIPAL SITE PLAN APPROVAL

REF	NUMBER	TITLE
REFERENCES		

STAMP/SEAL

PROPRIETARY INFORMATION: THIS DRAWING IS THE PROPERTY OF AMEC AMERICAS, INC. AND IS NOT TO BE LOANED OR REPRODUCED IN ANY WAY WITHOUT THE PERMISSION OF AMEC AMERICAS, INC.

CLIENT PROJECT MGR. ENGINEERING MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO. 156508 | ACTIVITY NO. | PACKAGE CODE.

SCALE 1:5000

	BY:	D/M/Y
DSN.	G.GRAHN	JUNE '07
DRN.	M.HALL	JUNE '07

AREA MO

LAKE ERIE S.O.C. PROJECTS MOHAWK POINT WIND FARM

SUBJECT: SITE PLAN LAYOUT

AMEC - BLACK & McDONALD JOINT VENTURE

CLIENT DWG NO.

DRAWING NO. A1-156508-MO-121-0100 | REV. 6

CADD FILE ADDRESS

1.0 Wind Turbine Specifications Report

The HAF Wind Energy Project ("the Project") is proposed to consist of five (5) Vestas V100-1.8MW turbines. The turbine model was selected based upon its technical performance, design characteristics, acoustic properties, power output, and site specific considerations.

The purpose of this report is to provide the technical information on the turbines to be used for the proposed Project. The Vineland Power Inc. is proposing a single Class 4 Wind Energy Facility consisting of five 1.8 MW wind turbines for a total nameplate capacity of 9.0 MW in the Township of West Lincoln in Niagara Region of the Province of Ontario.

1.1 Technical Specifications

The Vestas V100-1.8 MW wind turbine is a pitch regulated upwind turbine with active yaw and a three-blade rotor. The Vestas V100-1.8 MW turbine has a rotor diameter of 100 m with a generator rated at 1.8 MW. The turbine utilizes a microprocessor pitch control system called OptiTip®. With these features the wind turbine is able to optimize power output at different wind speeds.

A summary of the technical specifications is presented in **Table 1.1**with additional information provided by the manufacturer is included in **Appendix 1**.

Table 1.1a: Summary of Technical Specifications of the Vestas V100-1.8MW

Specification	Vestas V100-1.8MW
Nameplate Capacity	1.8 Megawatt
Hub Height (above grade)	95 m
Rotator Diameter	100 m
Blade Length	49 m
Swept Area	7850 m^2
Minimum Wind Speed (cut-in speed)	4.0 m/s
Maximum Wind Speed (cut-out speed)	20.0 m/s
Dynamic Rotational Speed Range	9.3 rpm to 16.6 rpm
Actual Rotational Speed	14.9 rpm

Each Vestas V100 turbine has a nameplate capacity of 1.8 MW and will be built to a hub height of 95 meters. The rotor diameter is 100 meters with swept area of 7850 m2.

The minimum operational wind speed (cut-in speed) is 4.0 m/s with a maximum operational speed (cut-out speed) of 20.0 m/s.

The V-100 Turbine is erected on a tabular steel tower which holds the nacelle at 95 meters above the ground. The nacelle houses the hub and electrical components. Each blade is constructed of light weight airfoil shells bonded to supporting beams

and connect to the hub forming a 100 meter rotor. The generator is asynchronous with wound rotor, slip rings and VCUS. The turbine's operational envelope is -20° to +40° C.

Table 1.1b summarizes the Wind Turbine General Specifications.

Table 1.1b: Wind Turbine General Specifications	
	Operational Envelope: **-20° to +40° C**
Rotor	Rotor Diameter: **100m**
	Swept Area: **7850m²**
	Speed, Dynamic Operation Range: **9.3 – 16.6 rpm**
	Rotational Direction: **Clockwise** (front view)
Tower	Type: **tubular steel tower**
	Hub: **95m**
Electrical	Frequency: **60 Hz**
	Rated Power: **1.8 MW**
	Generator: **Asynchronous with wound rotor, slip rings and VCUS**
Blade	Type: **airfoil shells bonded to supporting beam**
	Length: **49m**
	Max Chord: **3.9m**
Nacelle	Height for Transport: **4.0 m**
	Height Installed: **5.4 m**
	Width: **3.4 m**
	Length: **10.4 m**
Hub	Material: **cast ball shell hub**
	Height: **95m**
	Diameter: **3.3 m**

1.2 Acoustic Emissions Data

The V100 1.8 MW turbine model has a maximum sound power rating of **105.00 dBA.** Additional information on the acoustic data can be found in **Tables 1.2a, 1.2b, 1.2c,** and **1.3.** These tables summarize the wind turbine specifications provided in the Manufacture Technical Details provided in **Appendix 1.**

Table 1-2a provides the Sound Power Level Ratings (dBA) for **Mode 0** at a Hub Height of **95 meters.** The table shows the conditions for sound power levels at speeds of **3 m/s** to **13 m/s** at **10 meters** with the corresponding wind speed at hub height (HH). The sound power rating does not exceed 105.00 dBA.

Table 1-2a: Sound Power Level Ratings for Mode 0

Conditions for Sound Power Level	Hub Height 95 meters	Wind speed at hh [m/sec]
LwA @ **3 m/s** (10 m above ground) [dBA]	93.8	4.3
LwA @ **4 m/s** (10 m above ground) [dBA]	96.4	5.7
LwA @ **5 m/s** (10 m above ground) [dBA]	100.7	7.2
LwA @ **6 m/s** (10 m above ground) [dBA]	104.4	8.6
LwA @ **7 m/s** (10 m above ground) [dBA]	105.0	10.0
LwA @ **8 m/s** (10 m above ground) [dBA]	105.0	11.5
LwA @ **9 m/s** (10 m above ground) [dBA]	105.0	12.9
LwA @ **10 m/s** (10 m above ground) [dBA]	105.0	14.3
LwA @ **11 m/s** (10 m above ground) [dBA]	105.0	15.8
LwA @ **12 m/s** (10 m above ground) [dBA]	105.0	17.2
LwA @ **13 m/s** (10 m above ground) [dBA]	105.0	18.6

Table 1-2b (below) provides the Sound Power Level Ratings (dBA) for **Mode 1** at a Hub Height of **95 meters.** The table shows the conditions for sound power levels at speeds of **3 m/s** to **13 m/s** at **10 meters** with the corresponding wind speed at hub height (HH). The sound power rating does not exceed 105.00 dBA.

Table 1-2b: Sound Power Level Ratings for Mode 1		
Conditions for Sound Power Level	**Hub Height 95 meters**	**Wind speed at hh [m/sec]**
LwA @ **3 m/s** (10 m above ground) [dBA]	93.7	4.3
LwA @ **4 m/s** (10 m above ground) [dBA]	95.7	5.7
LwA @ **5 m/s** (10 m above ground) [dBA]	99.7	7.2
LwA @ **6 m/s** (10 m above ground) [dBA]	103.4	8.6
LwA @ **7 m/s** (10 m above ground) [dBA]	105.0	10.0
LwA @ **8 m/s** (10 m above ground) [dBA]	105.0	11.5
LwA @ **9 m/s** (10 m above ground) [dBA]	105.0	12.9
LwA @ **10 m/s** (10 m above ground) [dBA]	105.0	14.3
LwA @ **11 m/s** (10 m above ground) [dBA]	105.0	15.8
LwA @ **12 m/s** (10 m above ground) [dBA]	105.0	17.2
LwA @ **13 m/s** (10 m above ground) [dBA]	105.0	18.6

Table 1-2c provides the Sound Power Level Ratings (dBA) for **Mode 2** at a Hub Height of **95 meters**. The table shows the conditions for sound power levels at speeds of **3 m/s** to **13 m/s** at **10 meters** with the corresponding wind speed at hub height (HH). The sound power rating does not exceed 105.00 dBA.

Table 1-2c: Sound Power Level Ratings for Mode 2		
Conditions for Sound Power Level	**Hub Height 95 meters**	**Wind speed at hh [m/sec]**
LwA @ **3 m/s** (10 m above ground) [dBA]	93.8	4.3
LwA @ **4 m/s** (10 m above ground) [dBA]	96.4	5.7
LwA @ **5 m/s** (10 m above ground) [dBA]	100.7	7.2
LwA @ **6 m/s** (10 m above ground) [dBA]	103.0	8.6
LwA @ **7 m/s** (10 m above ground) [dBA]	103.0	10.0
LwA @ **8 m/s** (10 m above ground) [dBA]	103.0	11.5
LwA @ **9 m/s** (10 m above ground) [dBA]	103.0	12.9
LwA @ **10 m/s** (10 m above ground) [dBA]	103.0	14.3
LwA @ **11 m/s** (10 m above ground) [dBA]	103.0	15.8
LwA @ **12 m/s** (10 m above ground) [dBA]	103.0	17.2
LwA @ **13 m/s** (10 m above ground) [dBA]	103.0	18.6

Table 1-3 provides the Octave Band Spectra showing Octave in Hz from **16** Hz to **8000 Hz** with the corresponding Sound Power Level in dB(A). Sound Power Level does not exceed **99.7 dB**.

Table 1-3: Octave Band Spectra												
Wind Speed@10m [m/s]	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
16Hz [dB(A)]	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
31.5Hz [dB(A)]	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
63Hz [dB(A)]	NaN	NaN	NaN	85.2	87.4	87.1	86.7	86.6	NaN	NaN	NaN	NaN
125Hz [dB(A)]	NaN	NaN	NaN	89.6	92	91.7	91.3	91.4	NaN	NaN	NaN	NaN
250Hz [dB(A)]	NaN	NaN	NaN	93	94.7	94.2	93.6	93.5	NaN	NaN	NaN	NaN
500Hz [dB(A)]	NaN	NaN	NaN	95.4	97.1	96.7	96.1	96.1	NaN	NaN	NaN	NaN
1000Hz [dB(A)]	NaN	NaN	NaN	98.2	99.7	99.5	99	99.1	NaN	NaN	NaN	NaN
2000Hz [dB(A)]	NaN	NaN	NaN	96.6	98.2	98.4	98.2	98.2	NaN	NaN	NaN	NaN
4000Hz [dB(A)]	NaN	NaN	NaN	94.6	96.6	97.2	98.7	98.6	NaN	NaN	NaN	NaN
8000Hz [dB(A)]	NaN	NaN	NaN	85.4	89.8	90.3	91.4	92.3	NaN	NaN	NaN	NaN

Table 1-3 Notes:

1. "NAN" indicates data not available due to insufficient data collection at this wind speed.
2. Disclaimers from Vestas: The values are valid for the A-weighted sound power levels
   Octave band values must be regarded as informative
   Site specific values are not warranted
3. Measurement standard ICE 6140011:2002, using amendments procedure above 95% RP

1.3 Qualifications and Limitations

This summary report was produced, in part, to fulfill the requirements for the Turbine Specifications Report for the Renewable Energy Approval (REA). The contents of this document have been produced using the requirements outlined in O.Reg 359/09 as well as other applicable Acts and Regulations governing these projects.

Morrison Hershfield Limited's assessment was made in accordance with guidelines, regulations and procedures believed to be current at this time. Changes in guidelines, regulations and policies can occur at the discretion of the government and such changes could affect this report.

Morrison Hershfield Limited and the consulting team retained for this Project have prepared this report in accordance with information provided by its Client and their representatives. While we may have referred to and made use of this information and reporting, we assume no liability for the accuracy of this information.

WIND FARMS MENU

- Overview
- Planning a Wind Farm
- List of Wind Farms in Canada
- Wind Projection
- Spread the Word
- Case Studies

Wind Farms

home > wind farms

Dunnville Wind Turbine

Date Installed: 2006/10

Turbines: 1x Pfleiderer 650 kW

Total Installed Capacity (MW): 0.6500

Company: Rosa Flora Limited

Address: , Dunneville, ON, , Canada

Description: "At Rosa Flora we are constantly working towards reducing our fossil fuel requirements. We have achieved significant energy savings by implementing the latest green; technologies. By switching from natural gas boilers to biomass-fueled boilers, we have minimized the net carbon dioxide produced, as the biomass is a carbon dioxide neutral fuel. We also have a co-generation system and wind turbine, which provide us with alternative sources of electricity, reducing our reliance on fossil fuels.

In early 2006, we investigated the possibility of installing a wind turbine for our operations. Our interest in green energy technologies coupled with rising electricity prices prompted us to pursue a wind turbine that was the right size and fit. In February 2006, we purchased a brand new German engineered wind turbine - PWE650. By September 2006, we had the turbine commissioned and were producing 615 kW of electricity per kWh. The electricity is delivered directly into the Rosa Flora system and offsets electricity required from the Ontario grid."

Map

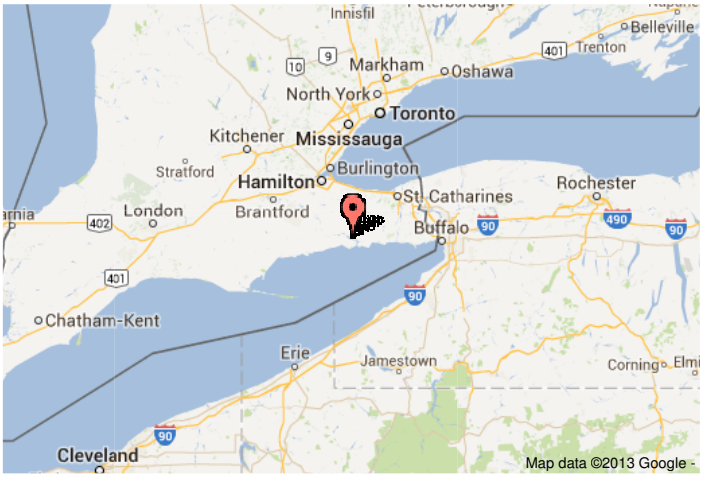


Table F1 Wind Turbine Sound Emission Summary

Make and Farm: German engineered wind turbine - PWE650 - Rosa Flora (See Attachement)

Model: PWE650

Electrical Rating: 650 kW

Hub Height: 75 m

Data Source:CanWEA; Taken higher sound level than three time the power capcality turbine E82 (2.3 MW) Model

Octave Band Sound Power Level (dB ref. 10^{-12} Watts)

		Manufacturer's Emission Level					Adjusted Emission Level				
10m Height Wind Speed (m/s)		6	7	8	9	10	6	7	8	9	10
Frequency (Hz)	63	n/a	n/a	n/a	n/a	n/a	113.8	113.8	113.8	113.8	113.8
	125	n/a	n/a	n/a	n/a	n/a	111.3	111.3	111.3	111.3	111.3
	250	n/a	n/a	n/a	n/a	n/a	102.9	102.9	102.9	102.9	102.9
	500	n/a	n/a	n/a	n/a	n/a	100.3	100.3	100.3	100.3	100.3
	1000	n/a	n/a	n/a	n/a	n/a	98.9	98.9	98.9	98.9	98.9
	2000	n/a	n/a	n/a	n/a	n/a	93.4	93.4	93.4	93.4	93.4
	4000	n/a	n/a	n/a	n/a	n/a	82.1	82.1	82.1	82.1	82.1
	8000	n/a	n/a	n/a	n/a	n/a	76.9	76.9	76.9	76.9	76.9
Overall (dBA ref. 10^{-12} Watts)		--	--	--	--	--	103.5	103.5	103.5	103.5	103.5

1.0 Wind Turbine Specifications Report

The Wainfleet Wind Energy Project ("the Project") is proposed to consist of five (5) Vestas V100-1.8MW turbines. The turbine model was selected based upon its technical performance, design characteristics, acoustic properties, power output, and site specific considerations.

The purpose of this report is to provide the technical information on the turbines to be used for the proposed Project. The Wainfleet Wind Energy Inc. is proposing a single Class 4 Wind Energy Facility consisting of five 1.8 MW wind turbines for a total nameplate capacity of 9.0 MW in the Township of Wainfleet in Niagara Region of the Province of Ontario.

1.1 Technical Specifications

The Vestas V100-1.8 MW wind turbine is a pitch regulated upwind turbine with active yaw and a three-blade rotor. The Vestas V100-1.8 MW turbine has a rotor diameter of 100 m with a generator rated at 1.8 MW. The turbine utilizes a microprocessor pitch control system called OptiTip®. With these features the wind turbine is able to optimize power output at different wind speeds.

A summary of the technical specifications is presented in **Table 1.1**with additional information provided by the manufacturer is included in **Appendix 1.**

Table 1.1a: Summary of Technical Specifications of the Vestas V100-1.8MW

Specification	Vestas V100-1.8MW
Nameplate Capacity	1.8 Megawatt
Hub Height (above grade)	95 m
Rotator Diameter	100 m
Blade Length	49 m
Swept Area	7850 m^2
Minimum Wind Speed (cut-in speed)	4.0 m/s
Maximum Wind Speed (cut-out speed)	20.0 m/s
Dynamic Rotational Speed Range	9.3 rpm to 16.6 rpm
Actual Rotational Speed	14.9 rpm

Each Vestas V100 turbine has a nameplate capacity of 1.8 MW and will be built to a hub height of 95 meters. The rotor diameter is 100 meters with swept area of 7850 m2.

The minimum operational wind speed (cut-in speed) is 4.0 m/s with a maximum operational speed (cut-out speed) of 20.0 m/s.

The V-100 Turbine is erected on a tabular steel tower which holds the nacelle at 95 meters above the ground. The nacelle houses the hub and electrical components. Each blade is constructed of light weight airfoil shells bonded to supporting beams

and connect to the hub forming a 100 meter rotor. The generator is asynchronous with wound rotor, slip rings and VCUS. The turbine's operational envelope is -20° to +40° C.

Table 1.1b summarizes the Wind Turbine General Specifications.

Table 1.1b: Wind Turbine General Specifications	
	Operational Envelope: **-20° to +40° C**
Rotor	Rotor Diameter: **100m**
	Swept Area: **7850m²**
	Speed, Dynamic Operation Range: **9.3 – 16.6 rpm**
	Rotational Direction: **Clockwise** (front view)
Tower	Type: **tubular steel tower**
	Hub: **95m**
Electrical	Frequency: **60 Hz**
	Rated Power: **1.8 MW**
	Generator: **Asynchronous with wound rotor, slip rings and VCUS**
Blade	Type: **airfoil shells bonded to supporting beam**
	Length: **49m**
	Max Chord: **3.9m**
Nacelle	Height for Transport: **4.0 m**
	Height Installed: **5.4 m**
	Width: **3.4 m**
	Length: **10.4 m**
Hub	Material: **cast ball shell hub**
	Height: **95m**
	Diameter: **3.3 m**

1.2 Acoustic Emissions Data

The V100 1.8 MW turbine model has a maximum sound power rating of **105.00 dBA**. Additional information on the acoustic data can be found in **Tables 1.2a, 1.2b, 1.2c,** and **1.3.** These tables summarize the wind turbine specifications provided in the Manufacture Technical Details provided in **Appendix 1.**

Table 1-2a provides the Sound Power Level Ratings (dBA) for **Mode 0** at a Hub Height of **95 meters**. The table shows the conditions for sound power levels at speeds of **3 m/s** to **13 m/s** at **10 meters** with the corresponding wind speed at hub height (HH). The sound power rating does not exceed 105.00 dBA.

Table 1-2a: Sound Power Level Ratings for Mode 0

Conditions for Sound Power Level	Hub Height 95 meters	Wind speed at hh [m/sec]
LwA @ **3 m/s** (10 m above ground) [dBA]	93.8	4.3
LwA @ **4 m/s** (10 m above ground) [dBA]	96.4	5.7
LwA @ **5 m/s** (10 m above ground) [dBA]	100.7	7.2
LwA @ **6 m/s** (10 m above ground) [dBA]	104.4	8.6
LwA @ **7 m/s** (10 m above ground) [dBA]	105.0	10.0
LwA @ **8 m/s** (10 m above ground) [dBA]	105.0	11.5
LwA @ **9 m/s** (10 m above ground) [dBA]	105.0	12.9
LwA @ **10 m/s** (10 m above ground) [dBA]	105.0	14.3
LwA @ **11 m/s** (10 m above ground) [dBA]	105.0	15.8
LwA @ **12 m/s** (10 m above ground) [dBA]	105.0	17.2
LwA @ **13 m/s** (10 m above ground) [dBA]	105.0	18.6

Table 1-2b (below) provides the Sound Power Level Ratings (dBA) for **Mode 1** at a Hub Height of **95 meters**. The table shows the conditions for sound power levels at speeds of **3 m/s** to **13 m/s** at **10 meters** with the corresponding wind speed at hub height (HH). The sound power rating does not exceed 105.00 dBA.

Table 1-2b: Sound Power Level Ratings for Mode 1		
Conditions for Sound Power Level	**Hub Height 95 meters**	**Wind speed at hh [m/sec]**
LwA @ **3 m/s** (10 m above ground) [dBA]	93.7	4.3
LwA @ **4 m/s** (10 m above ground) [dBA]	95.7	5.7
LwA @ **5 m/s** (10 m above ground) [dBA]	99.7	7.2
LwA @ **6 m/s** (10 m above ground) [dBA]	103.4	8.6
LwA @ **7 m/s** (10 m above ground) [dBA]	105.0	10.0
LwA @ **8 m/s** (10 m above ground) [dBA]	105.0	11.5
LwA @ **9 m/s** (10 m above ground) [dBA]	105.0	12.9
LwA @ **10 m/s** (10 m above ground) [dBA]	105.0	14.3
LwA @ **11 m/s** (10 m above ground) [dBA]	105.0	15.8
LwA @ **12 m/s** (10 m above ground) [dBA]	105.0	17.2
LwA @ **13 m/s** (10 m above ground) [dBA]	105.0	18.6

Table 1-2c provides the Sound Power Level Ratings (dBA) for **Mode 2** at a Hub Height of **95 meters**. The table shows the conditions for sound power levels at speeds of **3 m/s** to **13 m/s** at **10 meters** with the corresponding wind speed at hub height (HH). The sound power rating does not exceed 105.00 dBA.

Table 1-2c: Sound Power Level Ratings for Mode 2		
Conditions for Sound Power Level	**Hub Height 95 meters**	**Wind speed at hh [m/sec]**
LwA @ **3 m/s** (10 m above ground) [dBA]	93.8	4.3
LwA @ **4 m/s** (10 m above ground) [dBA]	96.4	5.7
LwA @ **5 m/s** (10 m above ground) [dBA]	100.7	7.2
LwA @ **6 m/s** (10 m above ground) [dBA]	103.0	8.6
LwA @ **7 m/s** (10 m above ground) [dBA]	103.0	10.0
LwA @ **8 m/s** (10 m above ground) [dBA]	103.0	11.5
LwA @ **9 m/s** (10 m above ground) [dBA]	103.0	12.9
LwA @ **10 m/s** (10 m above ground) [dBA]	103.0	14.3
LwA @ **11 m/s** (10 m above ground) [dBA]	103.0	15.8
LwA @ **12 m/s** (10 m above ground) [dBA]	103.0	17.2
LwA @ **13 m/s** (10 m above ground) [dBA]	103.0	18.6

Table 1-3 provides the Octave Band Spectra showing Octave in Hz from **16** Hz to **8000 Hz** with the corresponding Sound Power Level in dB(A). Sound Power Level does not exceed **99.7 dB**.

Table 1-3: Octave Band Spectra												
Wind Speed@10m [m/s]	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
16Hz [dB(A)]	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
31.5Hz [dB(A)]	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
63Hz [dB(A)]	NaN	NaN	NaN	85.2	87.4	87.1	86.7	86.6	NaN	NaN	NaN	NaN
125Hz [dB(A)]	NaN	NaN	NaN	89.6	92	91.7	91.3	91.4	NaN	NaN	NaN	NaN
250Hz [dB(A)]	NaN	NaN	NaN	93	94.7	94.2	93.6	93.5	NaN	NaN	NaN	NaN
500Hz [dB(A)]	NaN	NaN	NaN	95.4	97.1	96.7	96.1	96.1	NaN	NaN	NaN	NaN
1000Hz [dB(A)]	NaN	NaN	NaN	98.2	99.7	99.5	99	99.1	NaN	NaN	NaN	NaN
2000Hz [dB(A)]	NaN	NaN	NaN	96.6	98.2	98.4	98.2	98.2	NaN	NaN	NaN	NaN
4000Hz [dB(A)]	NaN	NaN	NaN	94.6	96.6	97.2	98.7	98.6	NaN	NaN	NaN	NaN
8000Hz [dB(A)]	NaN	NaN	NaN	85.4	89.8	90.3	91.4	92.3	NaN	NaN	NaN	NaN

Table 1-3 Notes:

1. "NAN" indicates data not available due to insufficient data collection at this wind speed.
2. Disclaimers from Vestas: The values are valid for the A-weighted sound power levels
   Octave band values must be regarded as informative
   Site specific values are not warranted
3. Measurement standard ICE 6140011:2002, using amendments procedure above 95% RP

1.3 Qualifications and Limitations

This summary report was produced, in part, to fulfill the requirements for the Turbine Specifications Report for the Renewable Energy Approval (REA). The contents of this document have been produced using the requirements outlined in O.Reg 359/09 as well as other applicable Acts and Regulations governing these projects.

Morrison Hershfield Limited's assessment was made in accordance with guidelines, regulations and procedures believed to be current at this time. Changes in guidelines, regulations and policies can occur at the discretion of the government and such changes could affect this report.

Morrison Hershfield Limited and the consulting team retained for this Project have prepared this report in accordance with information provided by its Client and their representatives. While we may have referred to and made use of this information and reporting, we assume no liability for the accuracy of this information.

SAMPLE CALCULATION
IN OCTAVE BAND (O_1153)

Receiver

Name: H1BIRD3890
ID: O_1153
X: 621067.4
Y: 4749725.2
Z: 180.6

Name	ID	X (m)	Y (m)	Z (m)	Dist (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	I/a dB	K0 (dB)	Dc (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahous (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
R11TO20	T20	620627.3	4749341.4	300.6	596.1	0	DEN	32	-39.4	0	0	0	66.5	0.0	-3.0	0	0	0	0	0	-102.9
		620627.3	4749341.4	300.6	596.1	0	DEN	63	83.6	0	0	0	66.5	0.1	-3.0	0	0	0	0	0	20.0
		620627.3	4749341.4	300.6	596.1	0	DEN	125	91.7	0	0	0	66.5	0.2	1.5	0	0	0	0	0	23.4
		620627.3	4749341.4	300.6	596.1	0	DEN	250	98.7	0	0	0	66.5	0.6	0.1	0	0	0	0	0	31.5
		620627.3	4749341.4	300.6	596.1	0	DEN	500	100.8	0	0	0	66.5	1.1	-0.9	0	0	0	0	0	34.0
		620627.3	4749341.4	300.6	596.1	0	DEN	1000	98.3	0	0	0	66.5	2.2	-0.9	0	0	0	0	0	30.5
		620627.3	4749341.4	300.6	596.1	0	DEN	2000	92.8	0	0	0	66.5	5.8	-0.9	0	0	0	0	0	21.4
		620627.3	4749341.4	300.6	596.1	0	DEN	4000	85.9	0	0	0	66.5	19.5	-0.9	0	0	0	0	0	0.8
		620627.3	4749341.4	300.6	596.1	0	DEN	8000	73.3	0	0	0	66.5	69.7	-0.9	0	0	0	0	0	-62.0
R11TS13	T96	621422.7	4750668.3	299.5	1014.8	0	DEN	32	-39.4	0	0	0	71.1	0.0	-3.0	0	0	0	0	0	-107.6
		621422.7	4750668.3	299.5	1014.8	0	DEN	63	83.6	0	0	0	71.1	0.1	-3.0	0	0	0	0	0	15.3
		621422.7	4750668.3	299.5	1014.8	0	DEN	125	91.7	0	0	0	71.1	0.4	1.7	0	0	0	0	0	18.4
		621422.7	4750668.3	299.5	1014.8	0	DEN	250	98.7	0	0	0	71.1	1.1	0.1	0	0	0	0	0	26.4
		621422.7	4750668.3	299.5	1014.8	0	DEN	500	100.8	0	0	0	71.1	2.0	-0.9	0	0	0	0	0	28.6
		621422.7	4750668.3	299.5	1014.8	0	DEN	1000	98.3	0	0	0	71.1	3.7	-0.9	0	0	0	0	0	24.4
		621422.7	4750668.3	299.5	1014.8	0	DEN	2000	92.8	0	0	0	71.1	9.8	-0.9	0	0	0	0	0	12.8
		621422.7	4750668.3	299.5	1014.8	0	DEN	4000	85.9	0	0	0	71.1	33.3	-0.9	0	0	0	0	0	-17.6
		621422.7	4750668.3	299.5	1014.8	0	DEN	8000	73.3	0	0	0	71.1	118.6	-0.9	0	0	0	0	0	-115.5
R11TO63	T63	621609.3	4751032.3	300.4	1420.1	0	DEN	32	-39.4	0	0	0	74.0	0.0	-3.0	0	0	0	0	0	-110.5
		621609.3	4751032.3	300.4	1420.1	0	DEN	63	83.6	0	0	0	74.0	0.2	-3.0	0	0	0	0	0	12.4
		621609.3	4751032.3	300.4	1420.1	0	DEN	125	91.7	0	0	0	74.0	0.6	1.8	0	0	0	0	0	15.3
		621609.3	4751032.3	300.4	1420.1	0	DEN	250	98.7	0	0	0	74.0	1.5	0.1	0	0	0	0	0	23.1
		621609.3	4751032.3	300.4	1420.1	0	DEN	500	100.8	0	0	0	74.0	2.7	-0.9	0	0	0	0	0	24.9
		621609.3	4751032.3	300.4	1420.1	0	DEN	1000	98.3	0	0	0	74.0	5.2	-0.9	0	0	0	0	0	20.0
		621609.3	4751032.3	300.4	1420.1	0	DEN	2000	92.8	0	0	0	74.0	13.7	-0.9	0	0	0	0	0	5.9
		621609.3	4751032.3	300.4	1420.1	0	DEN	4000	85.9	0	0	0	74.0	46.5	-0.9	0	0	0	0	0	-33.8
		621609.3	4751032.3	300.4	1420.1	0	DEN	8000	73.3	0	0	0	74.0	166.0	-0.9	0	0	0	0	0	-165.8
R11TO62	T62	621876.7	4751310.9	301.0	1784.4	0	DEN	32	-39.4	0	0	0	76.0	0.1	-3.0	0	0	0	0	0	-112.5
		621876.7	4751310.9	301.0	1784.4	0	DEN	63	83.6	0	0	0	76.0	0.2	-3.0	0	0	0	0	0	10.4
		621876.7	4751310.9	301.0	1784.4	0	DEN	125	91.7	0	0	0	76.0	0.7	1.8	0	0	0	0	0	13.2
		621876.7	4751310.9	301.0	1784.4	0	DEN	250	98.7	0	0	0	76.0	1.9	0.1	0	0	0	0	0	20.7
		621876.7	4751310.9	301.0	1784.4	0	DEN	500	100.8	0	0	0	76.0	3.4	-0.9	0	0	0	0	0	22.2
		621876.7	4751310.9	301.0	1784.4	0	DEN	1000	98.3	0	0	0	76.0	6.5	-0.9	0	0	0	0	0	16.6
		621876.7	4751310.9	301.0	1784.4	0	DEN	2000	92.8	0	0	0	76.0	17.2	-0.9	0	0	0	0	0	0.4
		621876.7	4751310.9	301.0	1784.4	0	DEN	4000	85.9	0	0	0	76.0	58.5	-0.9	0	0	0	0	0	-47.7
		621876.7	4751310.9	301.0	1784.4	0	DEN	8000	73.3	0	0	0	76.0	208.6	-0.9	0	0	0	0	0	-210.4

R11TO99 (formally R11TS82)	T99	619207.8	4749223.6	299.0	1929.6	0	DEN	32	-39.4	0	0	0	76.7	0.1	-3.0	0	0	0	0	0	-113.2
		619207.8	4749223.6	299.0	1929.6	0	DEN	63	83.6	0	0	0	76.7	0.2	-3.0	0	0	0	0	0	9.7
		619207.8	4749223.6	299.0	1929.6	0	DEN	125	91.7	0	0	0	76.7	0.8	1.8	0	0	0	0	0	12.4
		619207.8	4749223.6	299.0	1929.6	0	DEN	250	98.7	0	0	0	76.7	2.0	0.1	0	0	0	0	0	19.9
		619207.8	4749223.6	299.0	1929.6	0	DEN	500	100.8	0	0	0	76.7	3.7	-0.9	0	0	0	0	0	21.3
		619207.8	4749223.6	299.0	1929.6	0	DEN	1000	98.3	0	0	0	76.7	7.1	-0.9	0	0	0	0	0	15.4
		619207.8	4749223.6	299.0	1929.6	0	DEN	2000	92.8	0	0	0	76.7	18.6	-0.9	0	0	0	0	0	-1.7
		619207.8	4749223.6	299.0	1929.6	0	DEN	4000	85.9	0	0	0	76.7	63.2	-0.9	0	0	0	0	0	-53.1
		619207.8	4749223.6	299.0	1929.6	0	DEN	8000	73.3	0	0	0	76.7	225.5	-0.9	0	0	0	0	0	-228.0
R11TO05	T05	621171.0	4747754.0	303.8	1977.7	0	DEN	32	-39.4	0	0	0	76.9	0.1	-3.0	0	0	0	0	0	-113.4
		621171.0	4747754.0	303.8	1977.7	0	DEN	63	83.6	0	0	0	76.9	0.2	-3.0	0	0	0	0	0	9.4
		621171.0	4747754.0	303.8	1977.7	0	DEN	125	91.7	0	0	0	76.9	0.8	1.8	0	0	0	0	0	12.2
		621171.0	4747754.0	303.8	1977.7	0	DEN	250	98.7	0	0	0	76.9	2.1	0.1	0	0	0	0	0	19.6
		621171.0	4747754.0	303.8	1977.7	0	DEN	500	100.8	0	0	0	76.9	3.8	-0.9	0	0	0	0	0	21.0
		621171.0	4747754.0	303.8	1977.7	0	DEN	1000	98.3	0	0	0	76.9	7.2	-0.9	0	0	0	0	0	15.0
		621171.0	4747754.0	303.8	1977.7	0	DEN	2000	92.8	0	0	0	76.9	19.1	-0.9	0	0	0	0	0	-2.3
		621171.0	4747754.0	303.8	1977.7	0	DEN	4000	85.9	0	0	0	76.9	64.8	-0.9	0	0	0	0	0	-54.9
		621171.0	4747754.0	303.8	1977.7	0	DEN	8000	73.3	0	0	0	76.9	231.2	-0.9	0	0	0	0	0	-233.9
R11TO46	T46	622737.0	4748967.6	302.0	1837.5	0	DEN	32	-39.4	0	0	0	76.3	0.1	-3.0	0	0	0	0	0	-112.7
		622737.0	4748967.6	302.0	1837.5	0	DEN	63	83.7	0	0	0	76.3	0.2	-3.0	0	0	0	0	0	10.2
		622737.0	4748967.6	302.0	1837.5	0	DEN	125	92.0	0	0	0	76.3	0.8	1.8	0	0	0	0	0	13.2
		622737.0	4748967.6	302.0	1837.5	0	DEN	250	96.1	0	0	0	76.3	1.9	0.1	0	0	0	0	0	17.8
		622737.0	4748967.6	302.0	1837.5	0	DEN	500	98.4	0	0	0	76.3	3.5	-0.9	0	0	0	0	0	19.5
		622737.0	4748967.6	302.0	1837.5	0	DEN	1000	97.0	0	0	0	76.3	6.7	-0.9	0	0	0	0	0	14.9
		622737.0	4748967.6	302.0	1837.5	0	DEN	2000	90.2	0	0	0	76.3	17.8	-0.9	0	0	0	0	0	-2.9
		622737.0	4748967.6	302.0	1837.5	0	DEN	4000	85.2	0	0	0	76.3	60.2	-0.9	0	0	0	0	0	-50.4
		622737.0	4748967.6	302.0	1837.5	0	DEN	8000	81.9	0	0	0	76.3	214.8	-0.9	0	0	0	0	0	-208.3
R11TO47	T47	622482.9	4748446.9	303.3	1911.2	0	DEN	32	-39.4	0	0	0	76.6	0.1	-3.0	0	0	0	0	0	-113.1
		622482.9	4748446.9	303.3	1911.2	0	DEN	63	83.7	0	0	0	76.6	0.2	-3.0	0	0	0	0	0	9.8
		622482.9	4748446.9	303.3	1911.2	0	DEN	125	92.0	0	0	0	76.6	0.8	1.8	0	0	0	0	0	12.8
		622482.9	4748446.9	303.3	1911.2	0	DEN	250	96.1	0	0	0	76.6	2.0	0.1	0	0	0	0	0	17.4
		622482.9	4748446.9	303.3	1911.2	0	DEN	500	98.4	0	0	0	76.6	3.7	-0.9	0	0	0	0	0	19.0
		622482.9	4748446.9	303.3	1911.2	0	DEN	1000	97.0	0	0	0	76.6	7.0	-0.9	0	0	0	0	0	14.3
		622482.9	4748446.9	303.3	1911.2	0	DEN	2000	90.2	0	0	0	76.6	18.5	-0.9	0	0	0	0	0	-4.0
		622482.9	4748446.9	303.3	1911.2	0	DEN	4000	85.2	0	0	0	76.6	62.6	-0.9	0	0	0	0	0	-53.2
		622482.9	4748446.9	303.3	1911.2	0	DEN	8000	81.9	0	0	0	76.6	223.4	-0.9	0	0	0	0	0	-217.2
R11TO45	T45	623160.0	4748650.4	302.1	2355.6	0	DEN	32	-39.4	0	0	0	78.4	0.1	-3.0	0	0	0	0	0	-114.9
		623160.0	4748650.4	302.1	2355.6	0	DEN	63	83.7	0	0	0	78.4	0.3	-3.0	0	0	0	0	0	8.0
		623160.0	4748650.4	302.1	2355.6	0	DEN	125	92.0	0	0	0	78.4	1.0	1.8	0	0	0	0	0	10.8
		623160.0	4748650.4	302.1	2355.6	0	DEN	250	96.1	0	0	0	78.4	2.5	0.1	0	0	0	0	0	15.1
		623160.0	4748650.4	302.1	2355.6	0	DEN	500	98.4	0	0	0	78.4	4.5	-0.9	0	0	0	0	0	16.3
		623160.0	4748650.4	302.1	2355.6	0	DEN	1000	97.0	0	0	0	78.4	8.6	-0.9	0	0	0	0	0	10.8
		623160.0	4748650.4	302.1	2355.6	0	DEN	2000	90.2	0	0	0	78.4	22.8	-0.9	0	0	0	0	0	-10.1
		623160.0	4748650.4	302.1	2355.6	0	DEN	4000	85.2	0	0	0	78.4	77.2	-0.9	0	0	0	0	0	-69.5
		623160.0	4748650.4	302.1	2355.6	0	DEN	8000	81.9	0	0	0	78.4	275.3	-0.9	0	0	0	0	0	-271.0

R11TO16	T16	624153.0	4749242.9	300.3	3125.4	0	DEN	32	-39.4	0	0	0	80.9	0.1	-3.0	0	0	0	0	0	-117.4
		624153.0	4749242.9	300.3	3125.4	0	DEN	63	83.6	0	0	0	80.9	0.4	-3.0	0	0	0	0	0	5.3
		624153.0	4749242.9	300.3	3125.4	0	DEN	125	91.7	0	0	0	80.9	1.3	1.8	0	0	0	0	0	7.7
		624153.0	4749242.9	300.3	3125.4	0	DEN	250	98.7	0	0	0	80.9	3.3	0.1	0	0	0	0	0	14.5
		624153.0	4749242.9	300.3	3125.4	0	DEN	500	100.8	0	0	0	80.9	6.0	-0.9	0	0	0	0	0	14.8
		624153.0	4749242.9	300.3	3125.4	0	DEN	1000	98.3	0	0	0	80.9	11.4	-0.9	0	0	0	0	0	6.9
		624153.0	4749242.9	300.3	3125.4	0	DEN	2000	92.8	0	0	0	80.9	30.2	-0.9	0	0	0	0	0	-17.4
		624153.0	4749242.9	300.3	3125.4	0	DEN	4000	85.9	0	0	0	80.9	102.4	-0.9	0	0	0	0	0	-96.5
		624153.0	4749242.9	300.3	3125.4	0	DEN	8000	73.3	0	0	0	80.9	365.3	-0.9	0	0	0	0	0	-372.0
R11TO14	T14	624137.0	4748807.0	301.1	3206.3	0	DEN	32	-39.4	0	0	0	81.1	0.1	-3.0	0	0	0	0	0	-117.6
		624137.0	4748807.0	301.1	3206.3	0	DEN	63	83.6	0	0	0	81.1	0.4	-3.0	0	0	0	0	0	5.1
		624137.0	4748807.0	301.1	3206.3	0	DEN	125	91.7	0	0	0	81.1	1.3	1.8	0	0	0	0	0	7.5
		624137.0	4748807.0	301.1	3206.3	0	DEN	250	98.7	0	0	0	81.1	3.3	0.1	0	0	0	0	0	14.2
		624137.0	4748807.0	301.1	3206.3	0	DEN	500	100.8	0	0	0	81.1	6.2	-0.9	0	0	0	0	0	14.4
		624137.0	4748807.0	301.1	3206.3	0	DEN	1000	98.3	0	0	0	81.1	11.7	-0.9	0	0	0	0	0	6.4
		624137.0	4748807.0	301.1	3206.3	0	DEN	2000	92.8	0	0	0	81.1	31.0	-0.9	0	0	0	0	0	-18.4
		624137.0	4748807.0	301.1	3206.3	0	DEN	4000	85.9	0	0	0	81.1	105.1	-0.9	0	0	0	0	0	-99.4
		624137.0	4748807.0	301.1	3206.3	0	DEN	8000	73.3	0	0	0	81.1	374.8	-0.9	0	0	0	0	0	-381.7
R11TO44	T44	624350.0	4748471.0	301.8	3516.2	0	DEN	32	-39.4	0	0	0	81.9	0.1	-3.0	0	0	0	0	0	-118.4
		624350.0	4748471.0	301.8	3516.2	0	DEN	63	83.6	0	0	0	81.9	0.4	-3.0	0	0	0	0	0	4.3
		624350.0	4748471.0	301.8	3516.2	0	DEN	125	91.7	0	0	0	81.9	1.4	1.8	0	0	0	0	0	6.6
		624350.0	4748471.0	301.8	3516.2	0	DEN	250	98.7	0	0	0	81.9	3.7	0.1	0	0	0	0	0	13.0
		624350.0	4748471.0	301.8	3516.2	0	DEN	500	100.8	0	0	0	81.9	6.8	-0.9	0	0	0	0	0	13.0
		624350.0	4748471.0	301.8	3516.2	0	DEN	1000	98.3	0	0	0	81.9	12.9	-0.9	0	0	0	0	0	4.4
		624350.0	4748471.0	301.8	3516.2	0	DEN	2000	92.8	0	0	0	81.9	34.0	-0.9	0	0	0	0	0	-22.2
		624350.0	4748471.0	301.8	3516.2	0	DEN	4000	85.9	0	0	0	81.9	115.2	-0.9	0	0	0	0	0	-110.3
		624350.0	4748471.0	301.8	3516.2	0	DEN	8000	73.3	0	0	0	81.9	411.0	-0.9	0	0	0	0	0	-418.7
R11TO48	T48	624687.0	4749282.7	300.4	3648.6	0	DEN	32	-39.4	0	0	0	82.2	0.1	-3.0	0	0	0	0	0	-118.8
		624687.0	4749282.7	300.4	3648.6	0	DEN	63	83.6	0	0	0	82.2	0.4	-3.0	0	0	0	0	0	3.9
		624687.0	4749282.7	300.4	3648.6	0	DEN	125	91.7	0	0	0	82.2	1.5	1.8	0	0	0	0	0	6.2
		624687.0	4749282.7	300.4	3648.6	0	DEN	250	98.7	0	0	0	82.2	3.8	0.1	0	0	0	0	0	12.6
		624687.0	4749282.7	300.4	3648.6	0	DEN	500	100.8	0	0	0	82.2	7.0	-0.9	0	0	0	0	0	12.4
		624687.0	4749282.7	300.4	3648.6	0	DEN	1000	98.3	0	0	0	82.2	13.3	-0.9	0	0	0	0	0	3.6
		624687.0	4749282.7	300.4	3648.6	0	DEN	2000	92.8	0	0	0	82.2	35.3	-0.9	0	0	0	0	0	-23.8
		624687.0	4749282.7	300.4	3648.6	0	DEN	4000	85.9	0	0	0	82.2	119.6	-0.9	0	0	0	0	0	-115.0
		624687.0	4749282.7	300.4	3648.6	0	DEN	8000	73.3	0	0	0	82.2	426.5	-0.9	0	0	0	0	0	-434.5
R11TO43	T43	624815.3	4748952.0	301.1	3828.7	0	DEN	32	-39.4	0	0	0	82.7	0.1	-3.0	0	0	0	0	0	-119.2
		624815.3	4748952.0	301.1	3828.7	0	DEN	63	83.6	0	0	0	82.7	0.5	-3.0	0	0	0	0	0	3.5
		624815.3	4748952.0	301.1	3828.7	0	DEN	125	91.7	0	0	0	82.7	1.6	1.8	0	0	0	0	0	5.7
		624815.3	4748952.0	301.1	3828.7	0	DEN	250	98.7	0	0	0	82.7	4.0	0.1	0	0	0	0	0	12.0
		624815.3	4748952.0	301.1	3828.7	0	DEN	500	100.8	0	0	0	82.7	7.4	-0.9	0	0	0	0	0	11.7
		624815.3	4748952.0	301.1	3828.7	0	DEN	1000	98.3	0	0	0	82.7	14.0	-0.9	0	0	0	0	0	2.5
		624815.3	4748952.0	301.1	3828.7	0	DEN	2000	92.8	0	0	0	82.7	37.0	-0.9	0	0	0	0	0	-26.0
		624815.3	4748952.0	301.1	3828.7	0	DEN	4000	85.9	0	0	0	82.7	125.5	-0.9	0	0	0	0	0	-121.3
		624815.3	4748952.0	301.1	3828.7	0	DEN	8000	73.3	0	0	0	82.7	447.5	-0.9	0	0	0	0	0	-456.0

R11TO84	T84	622487.1	4753392.7	304.0	3934.7	0	DEN	32	-39.4	0	0	0	82.9	0.1	-3.1	0	0	0	0	0	-119.4
		622487.1	4753392.7	304.0	3934.7	0	DEN	63	83.6	0	0	0	82.9	0.5	-3.1	0	0	0	0	0	3.3
		622487.1	4753392.7	304.0	3934.7	0	DEN	125	91.7	0	0	0	82.9	1.6	1.8	0	0	0	0	0	5.4
		622487.1	4753392.7	304.0	3934.7	0	DEN	250	98.7	0	0	0	82.9	4.1	0.1	0	0	0	0	0	11.6
		622487.1	4753392.7	304.0	3934.7	0	DEN	500	100.8	0	0	0	82.9	7.6	-0.9	0	0	0	0	0	11.2
		622487.1	4753392.7	304.0	3934.7	0	DEN	1000	98.3	0	0	0	82.9	14.4	-0.9	0	0	0	0	0	1.9
		622487.1	4753392.7	304.0	3934.7	0	DEN	2000	92.8	0	0	0	82.9	38.0	-0.9	0	0	0	0	0	-27.2
		622487.1	4753392.7	304.0	3934.7	0	DEN	4000	85.9	0	0	0	82.9	128.9	-0.9	0	0	0	0	0	-125.0
		622487.1	4753392.7	304.0	3934.7	0	DEN	8000	73.3	0	0	0	82.9	459.9	-0.9	0	0	0	0	0	-468.6
R11TO22	T22	624829.2	4748510.0	302.0	3955.1	0	DEN	32	-39.4	0	0	0	82.9	0.1	-3.1	0	0	0	0	0	-119.4
		624829.2	4748510.0	302.0	3955.1	0	DEN	63	83.6	0	0	0	82.9	0.5	-3.1	0	0	0	0	0	3.3
		624829.2	4748510.0	302.0	3955.1	0	DEN	125	91.7	0	0	0	82.9	1.6	1.8	0	0	0	0	0	5.4
		624829.2	4748510.0	302.0	3955.1	0	DEN	250	98.7	0	0	0	82.9	4.1	0.1	0	0	0	0	0	11.6
		624829.2	4748510.0	302.0	3955.1	0	DEN	500	100.8	0	0	0	82.9	7.6	-0.9	0	0	0	0	0	11.2
		624829.2	4748510.0	302.0	3955.1	0	DEN	1000	98.3	0	0	0	82.9	14.5	-0.9	0	0	0	0	0	1.8
		624829.2	4748510.0	302.0	3955.1	0	DEN	2000	92.8	0	0	0	82.9	38.2	-0.9	0	0	0	0	0	-27.4
		624829.2	4748510.0	302.0	3955.1	0	DEN	4000	85.9	0	0	0	82.9	129.6	-0.9	0	0	0	0	0	-125.7
		624829.2	4748510.0	302.0	3955.1	0	DEN	8000	73.3	0	0	0	82.9	462.3	-0.9	0	0	0	0	0	-471.0
R11TO89	T89	623216.4	4753159.8	304.0	4053.5	0	DEN	32	-39.4	0	0	0	83.2	0.1	-3.1	0	0	0	0	0	-119.5
		623216.4	4753159.8	304.0	4053.5	0	DEN	63	83.6	0	0	0	83.2	0.5	-3.1	0	0	0	0	0	3.1
		623216.4	4753159.8	304.0	4053.5	0	DEN	125	91.7	0	0	0	83.2	1.7	1.7	0	0	0	0	0	5.1
		623216.4	4753159.8	304.0	4053.5	0	DEN	250	98.7	0	0	0	83.2	4.2	0.0	0	0	0	0	0	11.3
		623216.4	4753159.8	304.0	4053.5	0	DEN	500	100.8	0	0	0	83.2	7.8	-0.9	0	0	0	0	0	10.8
		623216.4	4753159.8	304.0	4053.5	0	DEN	1000	98.3	0	0	0	83.2	14.8	-0.9	0	0	0	0	0	1.3
		623216.4	4753159.8	304.0	4053.5	0	DEN	2000	92.8	0	0	0	83.2	39.2	-0.9	0	0	0	0	0	-28.6
		623216.4	4753159.8	304.0	4053.5	0	DEN	4000	85.9	0	0	0	83.2	132.8	-0.9	0	0	0	0	0	-129.1
		623216.4	4753159.8	304.0	4053.5	0	DEN	8000	73.3	0	0	0	83.2	473.8	-0.9	0	0	0	0	0	-482.7
R11TO42	T42	619935.0	4753628.0	304.0	4065.7	0	DEN	32	-39.4	0	0	0	83.2	0.1	-3.2	0	0	0	0	0	-119.6
		619935.0	4753628.0	304.0	4065.7	0	DEN	63	83.6	0	0	0	83.2	0.5	-3.2	0	0	0	0	0	3.1
		619935.0	4753628.0	304.0	4065.7	0	DEN	125	91.7	0	0	0	83.2	1.7	1.7	0	0	0	0	0	5.1
		619935.0	4753628.0	304.0	4065.7	0	DEN	250	98.7	0	0	0	83.2	4.2	0.0	0	0	0	0	0	11.2
		619935.0	4753628.0	304.0	4065.7	0	DEN	500	100.8	0	0	0	83.2	7.8	-0.9	0	0	0	0	0	10.7
		619935.0	4753628.0	304.0	4065.7	0	DEN	1000	98.3	0	0	0	83.2	14.9	-0.9	0	0	0	0	0	1.2
		619935.0	4753628.0	304.0	4065.7	0	DEN	2000	92.8	0	0	0	83.2	39.3	-0.9	0	0	0	0	0	-28.7
		619935.0	4753628.0	304.0	4065.7	0	DEN	4000	85.9	0	0	0	83.2	133.2	-0.9	0	0	0	0	0	-129.6
		619935.0	4753628.0	304.0	4065.7	0	DEN	8000	73.3	0	0	0	83.2	475.2	-0.9	0	0	0	0	0	-484.1
R11TO21	T21	625004.0	4748242.0	302.6	4208.5	0	DEN	32	-39.4	0	0	0	83.5	0.1	-3.3	0	0	0	0	0	-119.8
		625004.0	4748242.0	302.6	4208.5	0	DEN	63	83.6	0	0	0	83.5	0.5	-3.3	0	0	0	0	0	2.9
		625004.0	4748242.0	302.6	4208.5	0	DEN	125	91.7	0	0	0	83.5	1.7	1.7	0	0	0	0	0	4.8
		625004.0	4748242.0	302.6	4208.5	0	DEN	250	98.7	0	0	0	83.5	4.4	0.0	0	0	0	0	0	10.8
		625004.0	4748242.0	302.6	4208.5	0	DEN	500	100.8	0	0	0	83.5	8.1	-1.0	0	0	0	0	0	10.2
		625004.0	4748242.0	302.6	4208.5	0	DEN	1000	98.3	0	0	0	83.5	15.4	-1.0	0	0	0	0	0	0.4
		625004.0	4748242.0	302.6	4208.5	0	DEN	2000	92.8	0	0	0	83.5	40.7	-1.0	0	0	0	0	0	-30.4
		625004.0	4748242.0	302.6	4208.5	0	DEN	4000	85.9	0	0	0	83.5	137.9	-1.0	0	0	0	0	0	-134.5
		625004.0	4748242.0	302.6	4208.5	0	DEN	8000	73.3	0	0	0	83.5	491.9	-1.0	0	0	0	0	0	-501.1

R11TO61	T61	625177.0	4747970.0	302.9	4470.4	0	DEN	32	-39.4	0	0	0	84.0	0.1	-3.4	0	0	0	0	0	-120.1
		625177.0	4747970.0	302.9	4470.4	0	DEN	63	83.6	0	0	0	84.0	0.5	-3.4	0	0	0	0	0	2.5
		625177.0	4747970.0	302.9	4470.4	0	DEN	125	91.7	0	0	0	84.0	1.8	1.7	0	0	0	0	0	4.2
		625177.0	4747970.0	302.9	4470.4	0	DEN	250	98.7	0	0	0	84.0	4.7	-0.1	0	0	0	0	0	10.1
		625177.0	4747970.0	302.9	4470.4	0	DEN	500	100.8	0	0	0	84.0	8.6	-1.0	0	0	0	0	0	9.2
		625177.0	4747970.0	302.9	4470.4	0	DEN	1000	98.3	0	0	0	84.0	16.4	-1.0	0	0	0	0	0	-1.0
		625177.0	4747970.0	302.9	4470.4	0	DEN	2000	92.8	0	0	0	84.0	43.2	-1.0	0	0	0	0	0	-33.4
		625177.0	4747970.0	302.9	4470.4	0	DEN	4000	85.9	0	0	0	84.0	146.5	-1.0	0	0	0	0	0	-143.6
		625177.0	4747970.0	302.9	4470.4	0	DEN	8000	73.3	0	0	0	84.0	522.5	-1.0	0	0	0	0	0	-532.2
R11TO98	T98	617981.7	4753042.5	302.4	4532.3	0	DEN	32	-39.4	0	0	0	84.1	0.1	-3.4	0	0	0	0	0	-120.2
		617981.7	4753042.5	302.4	4532.3	0	DEN	63	83.6	0	0	0	84.1	0.6	-3.4	0	0	0	0	0	2.4
		617981.7	4753042.5	302.4	4532.3	0	DEN	125	91.7	0	0	0	84.1	1.9	1.6	0	0	0	0	0	4.1
		617981.7	4753042.5	302.4	4532.3	0	DEN	250	98.7	0	0	0	84.1	4.7	-0.1	0	0	0	0	0	9.9
		617981.7	4753042.5	302.4	4532.3	0	DEN	500	100.8	0	0	0	84.1	8.7	-1.0	0	0	0	0	0	9.0
		617981.7	4753042.5	302.4	4532.3	0	DEN	1000	98.3	0	0	0	84.1	16.6	-1.0	0	0	0	0	0	-1.4
		617981.7	4753042.5	302.4	4532.3	0	DEN	2000	92.8	0	0	0	84.1	43.8	-1.0	0	0	0	0	0	-34.1
		617981.7	4753042.5	302.4	4532.3	0	DEN	4000	85.9	0	0	0	84.1	148.5	-1.0	0	0	0	0	0	-145.7
		617981.7	4753042.5	302.4	4532.3	0	DEN	8000	73.3	0	0	0	84.1	529.7	-1.0	0	0	0	0	0	-539.5
Mohawk05(V82-1.65 MW-Vestas-103.2 dBA&Hu	MH05	623047.0	4746843.0	260.0	3497.4	0	DEN	32	-39.4	0	0	0	81.9	0.1	-3.8	0	0	0	0	0	-117.6
		623047.0	4746843.0	260.0	3497.4	0	DEN	63	57.5	0	0	0	81.9	0.4	-3.8	0	0	0	0	0	-21.0
		623047.0	4746843.0	260.0	3497.4	0	DEN	125	72.4	0	0	0	81.9	1.4	1.5	0	0	0	0	0	-12.4
		623047.0	4746843.0	260.0	3497.4	0	DEN	250	82.7	0	0	0	81.9	3.6	-0.2	0	0	0	0	0	-2.6
		623047.0	4746843.0	260.0	3497.4	0	DEN	500	90.4	0	0	0	81.9	6.7	-1.1	0	0	0	0	0	2.9
		623047.0	4746843.0	260.0	3497.4	0	DEN	1000	96.8	0	0	0	81.9	12.8	-1.1	0	0	0	0	0	3.3
		623047.0	4746843.0	260.0	3497.4	0	DEN	2000	97.2	0	0	0	81.9	33.8	-1.1	0	0	0	0	0	-17.3
		623047.0	4746843.0	260.0	3497.4	0	DEN	4000	96.0	0	0	0	81.9	114.6	-1.1	0	0	0	0	0	-99.3
		623047.0	4746843.0	260.0	3497.4	0	DEN	8000	89.2	0	0	0	81.9	408.8	-1.1	0	0	0	0	0	-400.3
Mohawk02(V82-1.65 MW-Vestas-103.2 dBA&Hu	MH02	622632.0	4746480.0	260.4	3603.5	0	DEN	32	-39.4	0	0	0	82.1	0.1	-3.9	0	0	0	0	0	-117.8
		622632.0	4746480.0	260.4	3603.5	0	DEN	63	57.5	0	0	0	82.1	0.4	-3.9	0	0	0	0	0	-21.2
		622632.0	4746480.0	260.4	3603.5	0	DEN	125	72.4	0	0	0	82.1	1.5	1.5	0	0	0	0	0	-12.7
		622632.0	4746480.0	260.4	3603.5	0	DEN	250	82.7	0	0	0	82.1	3.8	-0.2	0	0	0	0	0	-3.0
		622632.0	4746480.0	260.4	3603.5	0	DEN	500	90.4	0	0	0	82.1	6.9	-1.2	0	0	0	0	0	2.5
		622632.0	4746480.0	260.4	3603.5	0	DEN	1000	96.8	0	0	0	82.1	13.2	-1.2	0	0	0	0	0	2.7
		622632.0	4746480.0	260.4	3603.5	0	DEN	2000	97.2	0	0	0	82.1	34.8	-1.2	0	0	0	0	0	-18.6
		622632.0	4746480.0	260.4	3603.5	0	DEN	4000	96.0	0	0	0	82.1	118.1	-1.2	0	0	0	0	0	-103.1
		622632.0	4746480.0	260.4	3603.5	0	DEN	8000	89.2	0	0	0	82.1	421.2	-1.2	0	0	0	0	0	-413.0
Mohawk04(V82-1.65 MW-Vestas-103.2 dBA&Hu	MH04	623297.0	4746604.0	260.0	3836.6	0	DEN	32	-39.4	0	0	0	82.7	0.1	-4.0	0	0	0	0	0	-118.2
		623297.0	4746604.0	260.0	3836.6	0	DEN	63	57.5	0	0	0	82.7	0.5	-4.0	0	0	0	0	0	-21.6
		623297.0	4746604.0	260.0	3836.6	0	DEN	125	72.4	0	0	0	82.7	1.6	1.5	0	0	0	0	0	-13.3
		623297.0	4746604.0	260.0	3836.6	0	DEN	250	82.7	0	0	0	82.7	4.0	-0.2	0	0	0	0	0	-3.7
		623297.0	4746604.0	260.0	3836.6	0	DEN	500	90.4	0	0	0	82.7	7.4	-1.2	0	0	0	0	0	1.5
		623297.0	4746604.0	260.0	3836.6	0	DEN	1000	96.8	0	0	0	82.7	14.0	-1.2	0	0	0	0	0	1.3
		623297.0	4746604.0	260.0	3836.6	0	DEN	2000	97.2	0	0	0	82.7	37.1	-1.2	0	0	0	0	0	-21.3
		623297.0	4746604.0	260.0	3836.6	0	DEN	4000	96.0	0	0	0	82.7	125.7	-1.2	0	0	0	0	0	-111.2
		623297.0	4746604.0	260.0	3836.6	0	DEN	8000	89.2	0	0	0	82.7	448.4	-1.2	0	0	0	0	0	-440.7

R11TO65	T65	622983.8	4754678.9	299.0	5312.9	0	DEN	32	-39.4	0	0	0	85.5	0.2	-3.8	0	0	0	0	0	-121.3
		622983.8	4754678.9	299.0	5312.9	0	DEN	63	83.6	0	0	0	85.5	0.6	-3.8	0	0	0	0	0	1.3
		622983.8	4754678.9	299.0	5312.9	0	DEN	125	91.7	0	0	0	85.5	2.2	1.5	0	0	0	0	0	2.5
		622983.8	4754678.9	299.0	5312.9	0	DEN	250	98.7	0	0	0	85.5	5.5	-0.2	0	0	0	0	0	7.8
		622983.8	4754678.9	299.0	5312.9	0	DEN	500	100.8	0	0	0	85.5	10.2	-1.1	0	0	0	0	0	6.2
		622983.8	4754678.9	299.0	5312.9	0	DEN	1000	98.3	0	0	0	85.5	19.4	-1.1	0	0	0	0	0	-5.5
		622983.8	4754678.9	299.0	5312.9	0	DEN	2000	92.8	0	0	0	85.5	51.3	-1.1	0	0	0	0	0	-42.9
		622983.8	4754678.9	299.0	5312.9	0	DEN	4000	85.9	0	0	0	85.5	174.1	-1.1	0	0	0	0	0	-172.6
		622983.8	4754678.9	299.0	5312.9	0	DEN	8000	73.3	0	0	0	85.5	621.0	-1.1	0	0	0	0	0	-632.0
R11TO49	T49	626835.9	4748915.1	299.0	5826.4	0	DEN	32	-39.4	0	0	0	86.3	0.2	-4.0	0	0	0	0	0	-121.9
		626835.9	4748915.1	299.0	5826.4	0	DEN	63	83.6	0	0	0	86.3	0.7	-4.0	0	0	0	0	0	0.6
		626835.9	4748915.1	299.0	5826.4	0	DEN	125	91.7	0	0	0	86.3	2.4	1.5	0	0	0	0	0	1.5
		626835.9	4748915.1	299.0	5826.4	0	DEN	250	98.7	0	0	0	86.3	6.1	-0.2	0	0	0	0	0	6.5
		626835.9	4748915.1	299.0	5826.4	0	DEN	500	100.8	0	0	0	86.3	11.2	-1.2	0	0	0	0	0	4.5
		626835.9	4748915.1	299.0	5826.4	0	DEN	1000	98.3	0	0	0	86.3	21.3	-1.2	0	0	0	0	0	-8.1
		626835.9	4748915.1	299.0	5826.4	0	DEN	2000	92.8	0	0	0	86.3	56.3	-1.2	0	0	0	0	0	-48.6
		626835.9	4748915.1	299.0	5826.4	0	DEN	4000	85.9	0	0	0	86.3	190.9	-1.2	0	0	0	0	0	-190.1
		626835.9	4748915.1	299.0	5826.4	0	DEN	8000	73.3	0	0	0	86.3	681.0	-1.2	0	0	0	0	0	-692.8
R11TO19	T19	620379.6	4755516.1	299.0	5832.8	0	DEN	32	-39.4	0	0	0	86.3	0.2	-4.0	0	0	0	0	0	-121.9
		620379.6	4755516.1	299.0	5832.8	0	DEN	63	83.6	0	0	0	86.3	0.7	-4.0	0	0	0	0	0	0.6
		620379.6	4755516.1	299.0	5832.8	0	DEN	125	91.7	0	0	0	86.3	2.4	1.5	0	0	0	0	0	1.5
		620379.6	4755516.1	299.0	5832.8	0	DEN	250	98.7	0	0	0	86.3	6.1	-0.2	0	0	0	0	0	6.5
		620379.6	4755516.1	299.0	5832.8	0	DEN	500	100.8	0	0	0	86.3	11.2	-1.2	0	0	0	0	0	4.4
		620379.6	4755516.1	299.0	5832.8	0	DEN	1000	98.3	0	0	0	86.3	21.3	-1.2	0	0	0	0	0	-8.1
		620379.6	4755516.1	299.0	5832.8	0	DEN	2000	92.8	0	0	0	86.3	56.4	-1.2	0	0	0	0	0	-48.7
		620379.6	4755516.1	299.0	5832.8	0	DEN	4000	85.9	0	0	0	86.3	191.1	-1.2	0	0	0	0	0	-190.4
		620379.6	4755516.1	299.0	5832.8	0	DEN	8000	73.3	0	0	0	86.3	681.8	-1.2	0	0	0	0	0	-693.6
R11TO82	T82	618390.0	4754915.0	299.0	5841.0	0	DEN	32	-39.4	0	0	0	86.3	0.2	-4.0	0	0	0	0	0	-121.9
		618390.0	4754915.0	299.0	5841.0	0	DEN	63	83.6	0	0	0	86.3	0.7	-4.0	0	0	0	0	0	0.6
		618390.0	4754915.0	299.0	5841.0	0	DEN	125	91.7	0	0	0	86.3	2.4	1.5	0	0	0	0	0	1.5
		618390.0	4754915.0	299.0	5841.0	0	DEN	250	98.7	0	0	0	86.3	6.1	-0.2	0	0	0	0	0	6.5
		618390.0	4754915.0	299.0	5841.0	0	DEN	500	100.8	0	0	0	86.3	11.3	-1.2	0	0	0	0	0	4.4
		618390.0	4754915.0	299.0	5841.0	0	DEN	1000	98.3	0	0	0	86.3	21.4	-1.2	0	0	0	0	0	-8.2
		618390.0	4754915.0	299.0	5841.0	0	DEN	2000	92.8	0	0	0	86.3	56.4	-1.2	0	0	0	0	0	-48.8
		618390.0	4754915.0	299.0	5841.0	0	DEN	4000	85.9	0	0	0	86.3	191.4	-1.2	0	0	0	0	0	-190.6
		618390.0	4754915.0	299.0	5841.0	0	DEN	8000	73.3	0	0	0	86.3	682.7	-1.2	0	0	0	0	0	-694.5
Mohawk06(V82-1.65 MW-Vestas-103.2 dBA&Hu	MH06	622661.0	4745529.0	263.9	4489.4	0	DEN	32	-39.4	0	0	0	84.0	0.1	-4.3	0	0	0	0	0	-119.3
		622661.0	4745529.0	263.9	4489.4	0	DEN	63	57.5	0	0	0	84.0	0.5	-4.3	0	0	0	0	0	-22.8
		622661.0	4745529.0	263.9	4489.4	0	DEN	125	72.4	0	0	0	84.0	1.8	1.4	0	0	0	0	0	-14.9
		622661.0	4745529.0	263.9	4489.4	0	DEN	250	82.7	0	0	0	84.0	4.7	-0.3	0	0	0	0	0	-5.7
		622661.0	4745529.0	263.9	4489.4	0	DEN	500	90.4	0	0	0	84.0	8.7	-1.3	0	0	0	0	0	-1.0
		622661.0	4745529.0	263.9	4489.4	0	DEN	1000	96.8	0	0	0	84.0	16.4	-1.3	0	0	0	0	0	-2.4
		622661.0	4745529.0	263.9	4489.4	0	DEN	2000	97.2	0	0	0	84.0	43.4	-1.3	0	0	0	0	0	-28.9
		622661.0	4745529.0	263.9	4489.4	0	DEN	4000	96.0	0	0	0	84.0	147.1	-1.3	0	0	0	0	0	-133.9
		622661.0	4745529.0	263.9	4489.4	0	DEN	8000	89.2	0	0	0	84.0	524.7	-1.3	0	0	0	0	0	-518.3

Transformer2 (100/133/166 ONAN/ONAF/ONAF MVA)	ST2	622836.6	4754678.6	178.7	5259.9	0	DEN	32	50.6	0	0	0	85.4	0.2	-5.9	0	0	4.8	0	0	-33.9
		622836.6	4754678.6	178.7	5259.9	0	DEN	63	72.8	0	0	0	85.4	0.6	-5.9	0	0	4.8	0	0	-12.2
		622836.6	4754678.6	178.7	5259.9	0	DEN	125	87.9	0	0	0	85.4	2.2	3.8	0	0	1	0	0	-4.5
		622836.6	4754678.6	178.7	5259.9	0	DEN	250	94.4	0	0	0	85.4	5.5	1.0	0	0	3.8	0	0	-1.3
		622836.6	4754678.6	178.7	5259.9	0	DEN	500	99.8	0	0	0	85.4	10.1	-1.7	0	0	4.8	0	0	1.2
		622836.6	4754678.6	178.7	5259.9	0	DEN	1000	97.0	0	0	0	85.4	19.2	-1.8	0	0	4.8	0	0	-10.7
		622836.6	4754678.6	178.7	5259.9	0	DEN	2000	93.2	0	0	0	85.4	50.8	-1.8	0	0	4.8	0	0	-46.1
		622836.6	4754678.6	178.7	5259.9	0	DEN	4000	88.0	0	0	0	85.4	172.4	-1.8	0	0	4.8	0	0	-172.8
		622836.6	4754678.6	178.7	5259.9	0	DEN	8000	78.9	0	0	0	85.4	614.8	-1.8	0	0	4.8	0	0	-624.3
SWT-2.221-101 - Grand Renewable Energy Project	GREPT58	614974.0	4747470.0	283.2	6498.1	0	DEN	32	-39.4	0	0	0	87.3	0.2	-4.6	0	0	0	0	0	-122.3
		614974.0	4747470.0	283.2	6498.1	0	DEN	63	82.4	0	0	0	87.3	0.8	-4.6	0	0	0	0	0	-1.1
		614974.0	4747470.0	283.2	6498.1	0	DEN	125	93.0	0	0	0	87.3	2.7	1.3	0	0	0	0	0	1.8
		614974.0	4747470.0	283.2	6498.1	0	DEN	250	96.0	0	0	0	87.3	6.8	-0.4	0	0	0	0	0	2.4
		614974.0	4747470.0	283.2	6498.1	0	DEN	500	99.8	0	0	0	87.3	12.5	-1.4	0	0	0	0	0	1.4
		614974.0	4747470.0	283.2	6498.1	0	DEN	1000	100.1	0	0	0	87.3	23.8	-1.4	0	0	0	0	0	-9.6
		614974.0	4747470.0	283.2	6498.1	0	DEN	2000	96.5	0	0	0	87.3	62.8	-1.4	0	0	0	0	0	-52.2
		614974.0	4747470.0	283.2	6498.1	0	DEN	4000	89.6	0	0	0	87.3	212.9	-1.4	0	0	0	0	0	-209.2
		614974.0	4747470.0	283.2	6498.1	0	DEN	8000	85.2	0	0	0	87.3	759.5	-1.4	0	0	0	0	0	-760.2
R11TO13	T13	621410.0	4756122.0	299.0	6407.1	0	DEN	32	-39.4	0	0	0	87.1	0.2	-4.2	0	0	0	0	0	-122.5
		621410.0	4756122.0	299.0	6407.1	0	DEN	63	83.6	0	0	0	87.1	0.8	-4.2	0	0	0	0	0	-0.1
		621410.0	4756122.0	299.0	6407.1	0	DEN	125	91.7	0	0	0	87.1	2.6	1.4	0	0	0	0	0	0.5
		621410.0	4756122.0	299.0	6407.1	0	DEN	250	98.7	0	0	0	87.1	6.7	-0.3	0	0	0	0	0	5.2
		621410.0	4756122.0	299.0	6407.1	0	DEN	500	100.8	0	0	0	87.1	12.4	-1.3	0	0	0	0	0	2.6
		621410.0	4756122.0	299.0	6407.1	0	DEN	1000	98.3	0	0	0	87.1	23.4	-1.3	0	0	0	0	0	-11.0
		621410.0	4756122.0	299.0	6407.1	0	DEN	2000	92.8	0	0	0	87.1	61.9	-1.3	0	0	0	0	0	-55.0
		621410.0	4756122.0	299.0	6407.1	0	DEN	4000	85.9	0	0	0	87.1	210.0	-1.3	0	0	0	0	0	-209.9
		621410.0	4756122.0	299.0	6407.1	0	DEN	8000	73.3	0	0	0	87.1	748.9	-1.3	0	0	0	0	0	-761.5
SWT-2.221-101 - Grand Renewable Energy Project	GREPT60	614680.0	4748176.0	282.6	6573.3	0	DEN	32	-39.4	0	0	0	87.4	0.2	-4.6	0	0	0	0	0	-122.4
		614680.0	4748176.0	282.6	6573.3	0	DEN	63	82.4	0	0	0	87.4	0.8	-4.6	0	0	0	0	0	-1.2
		614680.0	4748176.0	282.6	6573.3	0	DEN	125	93.0	0	0	0	87.4	2.7	1.3	0	0	0	0	0	1.6
		614680.0	4748176.0	282.6	6573.3	0	DEN	250	96.0	0	0	0	87.4	6.9	-0.4	0	0	0	0	0	2.2
		614680.0	4748176.0	282.6	6573.3	0	DEN	500	99.8	0	0	0	87.4	12.7	-1.4	0	0	0	0	0	1.1
		614680.0	4748176.0	282.6	6573.3	0	DEN	1000	100.1	0	0	0	87.4	24.0	-1.4	0	0	0	0	0	-9.9
		614680.0	4748176.0	282.6	6573.3	0	DEN	2000	96.5	0	0	0	87.4	63.5	-1.4	0	0	0	0	0	-53.0
		614680.0	4748176.0	282.6	6573.3	0	DEN	4000	89.6	0	0	0	87.4	215.4	-1.4	0	0	0	0	0	-211.8
		614680.0	4748176.0	282.6	6573.3	0	DEN	8000	85.2	0	0	0	87.4	768.3	-1.4	0	0	0	0	0	-769.1
SWT-2.221-101 - Grand Renewable Energy Project	GREPT61	614750.0	4747811.0	284.5	6601.8	0	DEN	32	-39.4	0	0	0	87.4	0.2	-4.6	0	0	0	0	0	-122.4
		614750.0	4747811.0	284.5	6601.8	0	DEN	63	82.4	0	0	0	87.4	0.8	-4.6	0	0	0	0	0	-1.2
		614750.0	4747811.0	284.5	6601.8	0	DEN	125	93.0	0	0	0	87.4	2.7	1.3	0	0	0	0	0	1.6
		614750.0	4747811.0	284.5	6601.8	0	DEN	250	96.0	0	0	0	87.4	6.9	-0.4	0	0	0	0	0	2.1
		614750.0	4747811.0	284.5	6601.8	0	DEN	500	99.8	0	0	0	87.4	12.7	-1.4	0	0	0	0	0	1.1
		614750.0	4747811.0	284.5	6601.8	0	DEN	1000	100.1	0	0	0	87.4	24.1	-1.4	0	0	0	0	0	-10.1
		614750.0	4747811.0	284.5	6601.8	0	DEN	2000	96.5	0	0	0	87.4	63.8	-1.4	0	0	0	0	0	-53.3
		614750.0	4747811.0	284.5	6601.8	0	DEN	4000	89.6	0	0	0	87.4	216.3	-1.4	0	0	0	0	0	-212.8
		614750.0	4747811.0	284.5	6601.8	0	DEN	8000	85.2	0	0	0	87.4	771.6	-1.4	0	0	0	0	0	-772.4

R11TO23	T23	627539.7	4748974.3	299.0	6516.8	0	DEN	32	-39.4	0	0	0	87.3	0.2	-4.2	0	0	0	0	0	-122.7
		627539.7	4748974.3	299.0	6516.8	0	DEN	63	83.6	0	0	0	87.3	0.8	-4.2	0	0	0	0	0	-0.2
		627539.7	4748974.3	299.0	6516.8	0	DEN	125	91.7	0	0	0	87.3	2.7	1.4	0	0	0	0	0	0.3
		627539.7	4748974.3	299.0	6516.8	0	DEN	250	98.7	0	0	0	87.3	6.8	-0.3	0	0	0	0	0	4.9
		627539.7	4748974.3	299.0	6516.8	0	DEN	500	100.8	0	0	0	87.3	12.6	-1.3	0	0	0	0	0	2.2
		627539.7	4748974.3	299.0	6516.8	0	DEN	1000	98.3	0	0	0	87.3	23.8	-1.3	0	0	0	0	0	-11.5
		627539.7	4748974.3	299.0	6516.8	0	DEN	2000	92.8	0	0	0	87.3	63.0	-1.3	0	0	0	0	0	-56.2
		627539.7	4748974.3	299.0	6516.8	0	DEN	4000	85.9	0	0	0	87.3	213.6	-1.3	0	0	0	0	0	-213.7
		627539.7	4748974.3	299.0	6516.8	0	DEN	8000	73.3	0	0	0	87.3	761.7	-1.3	0	0	0	0	0	-774.4
SWT-2.221-101 - Grand Renewable Energy Project	GREPT62	614705.0	4747338.0	281.3	6796.2	0	DEN	32	-39.4	0	0	0	87.6	0.2	-4.6	0	0	0	0	0	-122.6
		614705.0	4747338.0	281.3	6796.2	0	DEN	63	82.4	0	0	0	87.6	0.8	-4.6	0	0	0	0	0	-1.4
		614705.0	4747338.0	281.3	6796.2	0	DEN	125	93.0	0	0	0	87.6	2.8	1.3	0	0	0	0	0	1.3
		614705.0	4747338.0	281.3	6796.2	0	DEN	250	96.0	0	0	0	87.6	7.1	-0.4	0	0	0	0	0	1.7
		614705.0	4747338.0	281.3	6796.2	0	DEN	500	99.8	0	0	0	87.6	13.1	-1.4	0	0	0	0	0	0.4
		614705.0	4747338.0	281.3	6796.2	0	DEN	1000	100.1	0	0	0	87.6	24.9	-1.4	0	0	0	0	0	-11.0
		614705.0	4747338.0	281.3	6796.2	0	DEN	2000	96.5	0	0	0	87.6	65.7	-1.4	0	0	0	0	0	-55.4
		614705.0	4747338.0	281.3	6796.2	0	DEN	4000	89.6	0	0	0	87.6	222.7	-1.4	0	0	0	0	0	-219.4
		614705.0	4747338.0	281.3	6796.2	0	DEN	8000	85.2	0	0	0	87.6	794.4	-1.4	0	0	0	0	0	-795.4
R11TO12	T12	621127.0	4756402.0	299.2	6678.2	0	DEN	32	-39.4	0	0	0	87.5	0.2	-4.3	0	0	0	0	0	-122.8
		621127.0	4756402.0	299.2	6678.2	0	DEN	63	83.6	0	0	0	87.5	0.8	-4.3	0	0	0	0	0	-0.4
		621127.0	4756402.0	299.2	6678.2	0	DEN	125	91.7	0	0	0	87.5	2.7	1.4	0	0	0	0	0	0.1
		621127.0	4756402.0	299.2	6678.2	0	DEN	250	98.7	0	0	0	87.5	7.0	-0.3	0	0	0	0	0	4.5
		621127.0	4756402.0	299.2	6678.2	0	DEN	500	100.8	0	0	0	87.5	12.9	-1.3	0	0	0	0	0	1.7
		621127.0	4756402.0	299.2	6678.2	0	DEN	1000	98.3	0	0	0	87.5	24.4	-1.3	0	0	0	0	0	-12.3
		621127.0	4756402.0	299.2	6678.2	0	DEN	2000	92.8	0	0	0	87.5	64.5	-1.3	0	0	0	0	0	-58.0
		621127.0	4756402.0	299.2	6678.2	0	DEN	4000	85.9	0	0	0	87.5	218.8	-1.3	0	0	0	0	0	-219.2
		621127.0	4756402.0	299.2	6678.2	0	DEN	8000	73.3	0	0	0	87.5	780.6	-1.3	0	0	0	0	0	-793.5
Mohawk01(V82-1.65 MW-Vestas-103.2 dBA&Hu	MH01	623355.0	4745400.0	268.2	4893.7	0	DEN	32	-39.4	0	0	0	84.8	0.2	-4.4	0	0	0	0	0	-119.9
		623355.0	4745400.0	268.2	4893.7	0	DEN	63	57.5	0	0	0	84.8	0.6	-4.4	0	0	0	0	0	-23.4
		623355.0	4745400.0	268.2	4893.7	0	DEN	125	72.4	0	0	0	84.8	2.0	1.3	0	0	0	0	0	-15.8
		623355.0	4745400.0	268.2	4893.7	0	DEN	250	82.7	0	0	0	84.8	5.1	-0.4	0	0	0	0	0	-6.8
		623355.0	4745400.0	268.2	4893.7	0	DEN	500	90.4	0	0	0	84.8	9.4	-1.3	0	0	0	0	0	-2.5
		623355.0	4745400.0	268.2	4893.7	0	DEN	1000	96.8	0	0	0	84.8	17.9	-1.3	0	0	0	0	0	-4.6
		623355.0	4745400.0	268.2	4893.7	0	DEN	2000	97.2	0	0	0	84.8	47.3	-1.3	0	0	0	0	0	-33.6
		623355.0	4745400.0	268.2	4893.7	0	DEN	4000	96.0	0	0	0	84.8	160.4	-1.3	0	0	0	0	0	-147.8
		623355.0	4745400.0	268.2	4893.7	0	DEN	8000	89.2	0	0	0	84.8	572.0	-1.3	0	0	0	0	0	-566.2
R11TO24	T24	627752.2	4750238.9	299.0	6705.6	0	DEN	32	-39.4	0	0	0	87.5	0.2	-4.3	0	0	0	0	0	-122.9
		627752.2	4750238.9	299.0	6705.6	0	DEN	63	83.6	0	0	0	87.5	0.8	-4.3	0	0	0	0	0	-0.5
		627752.2	4750238.9	299.0	6705.6	0	DEN	125	91.7	0	0	0	87.5	2.8	1.4	0	0	0	0	0	0.0
		627752.2	4750238.9	299.0	6705.6	0	DEN	250	98.7	0	0	0	87.5	7.0	-0.3	0	0	0	0	0	4.5
		627752.2	4750238.9	299.0	6705.6	0	DEN	500	100.8	0	0	0	87.5	12.9	-1.3	0	0	0	0	0	1.6
		627752.2	4750238.9	299.0	6705.6	0	DEN	1000	98.3	0	0	0	87.5	24.5	-1.3	0	0	0	0	0	-12.5
		627752.2	4750238.9	299.0	6705.6	0	DEN	2000	92.8	0	0	0	87.5	64.8	-1.3	0	0	0	0	0	-58.2
		627752.2	4750238.9	299.0	6705.6	0	DEN	4000	85.9	0	0	0	87.5	219.7	-1.3	0	0	0	0	0	-220.1
		627752.2	4750238.9	299.0	6705.6	0	DEN	8000	73.3	0	0	0	87.5	783.8	-1.3	0	0	0	0	0	-796.7

SWT-2.221-101 - Grand Renewable Energy Project	GREPT57	614355.0	4748118.0	284.5	6902.9	0	DEN	32	-39.4	0	0	0	87.8	0.2	-4.6	0	0	0	0	0	-122.8
		614355.0	4748118.0	284.5	6902.9	0	DEN	63	82.4	0	0	0	87.8	0.8	-4.6	0	0	0	0	0	-1.6
		614355.0	4748118.0	284.5	6902.9	0	DEN	125	93.0	0	0	0	87.8	2.8	1.3	0	0	0	0	0	1.1
		614355.0	4748118.0	284.5	6902.9	0	DEN	250	96.0	0	0	0	87.8	7.2	-0.4	0	0	0	0	0	1.4
		614355.0	4748118.0	284.5	6902.9	0	DEN	500	99.8	0	0	0	87.8	13.3	-1.4	0	0	0	0	0	0.1
		614355.0	4748118.0	284.5	6902.9	0	DEN	1000	100.1	0	0	0	87.8	25.2	-1.4	0	0	0	0	0	-11.5
		614355.0	4748118.0	284.5	6902.9	0	DEN	2000	96.5	0	0	0	87.8	66.7	-1.4	0	0	0	0	0	-56.6
		614355.0	4748118.0	284.5	6902.9	0	DEN	4000	89.6	0	0	0	87.8	226.2	-1.4	0	0	0	0	0	-223.0
		614355.0	4748118.0	284.5	6902.9	0	DEN	8000	85.2	0	0	0	87.8	806.8	-1.4	0	0	0	0	0	-808.0
Mohawk03(V82-1.65 MW-Vestas-103.2 dBA&Hu	MH03	623974.0	4745737.0	265.5	4935.7	0	DEN	32	-39.4	0	0	0	84.9	0.2	-4.5	0	0	0	0	0	-120.0
		623974.0	4745737.0	265.5	4935.7	0	DEN	63	57.5	0	0	0	84.9	0.6	-4.5	0	0	0	0	0	-23.5
		623974.0	4745737.0	265.5	4935.7	0	DEN	125	72.4	0	0	0	84.9	2.0	1.3	0	0	0	0	0	-15.8
		623974.0	4745737.0	265.5	4935.7	0	DEN	250	82.7	0	0	0	84.9	5.1	-0.4	0	0	0	0	0	-7.0
		623974.0	4745737.0	265.5	4935.7	0	DEN	500	90.4	0	0	0	84.9	9.5	-1.3	0	0	0	0	0	-2.6
		623974.0	4745737.0	265.5	4935.7	0	DEN	1000	96.8	0	0	0	84.9	18.1	-1.3	0	0	0	0	0	-4.8
		623974.0	4745737.0	265.5	4935.7	0	DEN	2000	97.2	0	0	0	84.9	47.7	-1.3	0	0	0	0	0	-34.0
		623974.0	4745737.0	265.5	4935.7	0	DEN	4000	96.0	0	0	0	84.9	161.7	-1.3	0	0	0	0	0	-149.3
		623974.0	4745737.0	265.5	4935.7	0	DEN	8000	89.2	0	0	0	84.9	576.9	-1.3	0	0	0	0	0	-571.2
R11TO91	T91	620503.9	4756520.8	299.1	6820.0	0	DEN	32	-39.4	0	0	0	87.7	0.2	-4.3	0	0	0	0	0	-123.0
		620503.9	4756520.8	299.1	6820.0	0	DEN	63	83.6	0	0	0	87.7	0.8	-4.3	0	0	0	0	0	-0.6
		620503.9	4756520.8	299.1	6820.0	0	DEN	125	91.7	0	0	0	87.7	2.8	1.4	0	0	0	0	0	-0.2
		620503.9	4756520.8	299.1	6820.0	0	DEN	250	98.7	0	0	0	87.7	7.1	-0.3	0	0	0	0	0	4.2
		620503.9	4756520.8	299.1	6820.0	0	DEN	500	100.8	0	0	0	87.7	13.1	-1.3	0	0	0	0	0	1.3
		620503.9	4756520.8	299.1	6820.0	0	DEN	1000	98.3	0	0	0	87.7	24.9	-1.3	0	0	0	0	0	-13.0
		620503.9	4756520.8	299.1	6820.0	0	DEN	2000	92.8	0	0	0	87.7	65.9	-1.3	0	0	0	0	0	-59.5
		620503.9	4756520.8	299.1	6820.0	0	DEN	4000	85.9	0	0	0	87.7	223.5	-1.3	0	0	0	0	0	-224.0
		620503.9	4756520.8	299.1	6820.0	0	DEN	8000	73.3	0	0	0	87.7	797.1	-1.3	0	0	0	0	0	-810.2
SWT-2.221-101 - Grand Renewable Energy Project	GREPT59	614326.0	4747732.0	284.5	7030.6	0	DEN	32	-39.4	0	0	0	87.9	0.2	-4.7	0	0	0	0	0	-122.9
		614326.0	4747732.0	284.5	7030.6	0	DEN	63	82.4	0	0	0	87.9	0.9	-4.7	0	0	0	0	0	-1.7
		614326.0	4747732.0	284.5	7030.6	0	DEN	125	93.0	0	0	0	87.9	2.9	1.3	0	0	0	0	0	0.9
		614326.0	4747732.0	284.5	7030.6	0	DEN	250	96.0	0	0	0	87.9	7.3	-0.4	0	0	0	0	0	1.2
		614326.0	4747732.0	284.5	7030.6	0	DEN	500	99.8	0	0	0	87.9	13.6	-1.4	0	0	0	0	0	-0.3
		614326.0	4747732.0	284.5	7030.6	0	DEN	1000	100.1	0	0	0	87.9	25.7	-1.4	0	0	0	0	0	-12.2
		614326.0	4747732.0	284.5	7030.6	0	DEN	2000	96.5	0	0	0	87.9	67.9	-1.4	0	0	0	0	0	-58.0
		614326.0	4747732.0	284.5	7030.6	0	DEN	4000	89.6	0	0	0	87.9	230.4	-1.4	0	0	0	0	0	-227.3
		614326.0	4747732.0	284.5	7030.6	0	DEN	8000	85.2	0	0	0	87.9	821.7	-1.4	0	0	0	0	0	-823.1
R11TO11	T11	620836.0	4756609.3	299.9	6889.1	0	DEN	32	-39.4	0	0	0	87.8	0.2	-4.3	0	0	0	0	0	-123.1
		620836.0	4756609.3	299.9	6889.1	0	DEN	63	83.6	0	0	0	87.8	0.8	-4.3	0	0	0	0	0	-0.7
		620836.0	4756609.3	299.9	6889.1	0	DEN	125	91.7	0	0	0	87.8	2.8	1.4	0	0	0	0	0	-0.3
		620836.0	4756609.3	299.9	6889.1	0	DEN	250	98.7	0	0	0	87.8	7.2	-0.3	0	0	0	0	0	4.1
		620836.0	4756609.3	299.9	6889.1	0	DEN	500	100.8	0	0	0	87.8	13.3	-1.3	0	0	0	0	0	1.1
		620836.0	4756609.3	299.9	6889.1	0	DEN	1000	98.3	0	0	0	87.8	25.2	-1.3	0	0	0	0	0	-13.4
		620836.0	4756609.3	299.9	6889.1	0	DEN	2000	92.8	0	0	0	87.8	66.6	-1.3	0	0	0	0	0	-60.2
		620836.0	4756609.3	299.9	6889.1	0	DEN	4000	85.9	0	0	0	87.8	225.8	-1.3	0	0	0	0	0	-226.3
		620836.0	4756609.3	299.9	6889.1	0	DEN	8000	73.3	0	0	0	87.8	805.2	-1.3	0	0	0	0	0	-818.4

R11TO41	T41	620998.0	4756851.0	300.4	7127.2	0	DEN	32	-39.4	0	0	0	88.1	0.2	-4.4	0	0	0	0	0	-123.3
		620998.0	4756851.0	300.4	7127.2	0	DEN	63	83.6	0	0	0	88.1	0.9	-4.4	0	0	0	0	0	-0.9
		620998.0	4756851.0	300.4	7127.2	0	DEN	125	91.7	0	0	0	88.1	2.9	1.4	0	0	0	0	0	-0.7
		620998.0	4756851.0	300.4	7127.2	0	DEN	250	98.7	0	0	0	88.1	7.4	-0.3	0	0	0	0	0	3.5
		620998.0	4756851.0	300.4	7127.2	0	DEN	500	100.8	0	0	0	88.1	13.7	-1.3	0	0	0	0	0	0.3
		620998.0	4756851.0	300.4	7127.2	0	DEN	1000	98.3	0	0	0	88.1	26.1	-1.3	0	0	0	0	0	-14.5
		620998.0	4756851.0	300.4	7127.2	0	DEN	2000	92.8	0	0	0	88.1	68.9	-1.3	0	0	0	0	0	-62.8
		620998.0	4756851.0	300.4	7127.2	0	DEN	4000	85.9	0	0	0	88.1	233.6	-1.3	0	0	0	0	0	-234.4
		620998.0	4756851.0	300.4	7127.2	0	DEN	8000	73.3	0	0	0	88.1	833.0	-1.3	0	0	0	0	0	-846.5
R11TO72	T72	620828.0	4757122.0	301.3	7401.7	0	DEN	32	-39.4	0	0	0	88.4	0.2	-4.4	0	0	0	0	0	-123.6
		620828.0	4757122.0	301.3	7401.7	0	DEN	63	83.6	0	0	0	88.4	0.9	-4.4	0	0	0	0	0	-1.3
		620828.0	4757122.0	301.3	7401.7	0	DEN	125	91.7	0	0	0	88.4	3.0	1.4	0	0	0	0	0	-1.1
		620828.0	4757122.0	301.3	7401.7	0	DEN	250	98.7	0	0	0	88.4	7.7	-0.4	0	0	0	0	0	2.9
		620828.0	4757122.0	301.3	7401.7	0	DEN	500	100.8	0	0	0	88.4	14.3	-1.3	0	0	0	0	0	-0.5
		620828.0	4757122.0	301.3	7401.7	0	DEN	1000	98.3	0	0	0	88.4	27.1	-1.3	0	0	0	0	0	-15.8
		620828.0	4757122.0	301.3	7401.7	0	DEN	2000	92.8	0	0	0	88.4	71.5	-1.3	0	0	0	0	0	-65.8
		620828.0	4757122.0	301.3	7401.7	0	DEN	4000	85.9	0	0	0	88.4	242.6	-1.3	0	0	0	0	0	-243.7
		620828.0	4757122.0	301.3	7401.7	0	DEN	8000	73.3	0	0	0	88.4	865.1	-1.3	0	0	0	0	0	-878.9
R11TO37	T37	623038.4	4758881.0	299.0	9366.4	0	DEN	32	-39.4	0	0	0	90.4	0.3	-4.8	0	0	0	0	0	-125.4
		623038.4	4758881.0	299.0	9366.4	0	DEN	63	83.6	0	0	0	90.4	1.1	-4.8	0	0	0	0	0	-3.2
		623038.4	4758881.0	299.0	9366.4	0	DEN	125	91.7	0	0	0	90.4	3.8	1.3	0	0	0	0	0	-3.8
		623038.4	4758881.0	299.0	9366.4	0	DEN	250	98.7	0	0	0	90.4	9.8	-0.5	0	0	0	0	0	-1.0
		623038.4	4758881.0	299.0	9366.4	0	DEN	500	100.8	0	0	0	90.4	18.1	-1.4	0	0	0	0	0	-6.3
		623038.4	4758881.0	299.0	9366.4	0	DEN	1000	98.3	0	0	0	90.4	34.3	-1.4	0	0	0	0	0	-25.0
		623038.4	4758881.0	299.0	9366.4	0	DEN	2000	92.8	0	0	0	90.4	90.5	-1.4	0	0	0	0	0	-86.7
		623038.4	4758881.0	299.0	9366.4	0	DEN	4000	85.9	0	0	0	90.4	306.9	-1.4	0	0	0	0	0	-310.0
		623038.4	4758881.0	299.0	9366.4	0	DEN	8000	73.3	0	0	0	90.4	1094.8	-1.4	0	0	0	0	0	-1110.5
R11TO10	T10	623259.5	4758989.9	299.0	9521.3	0	DEN	32	-39.4	0	0	0	90.6	0.3	-4.8	0	0	0	0	0	-125.5
		623259.5	4758989.9	299.0	9521.3	0	DEN	63	83.6	0	0	0	90.6	1.2	-4.8	0	0	0	0	0	-3.3
		623259.5	4758989.9	299.0	9521.3	0	DEN	125	91.7	0	0	0	90.6	3.9	1.2	0	0	0	0	0	-4.0
		623259.5	4758989.9	299.0	9521.3	0	DEN	250	98.7	0	0	0	90.6	9.9	-0.5	0	0	0	0	0	-1.3
		623259.5	4758989.9	299.0	9521.3	0	DEN	500	100.8	0	0	0	90.6	18.4	-1.4	0	0	0	0	0	-6.7
		623259.5	4758989.9	299.0	9521.3	0	DEN	1000	98.3	0	0	0	90.6	34.8	-1.4	0	0	0	0	0	-25.7
		623259.5	4758989.9	299.0	9521.3	0	DEN	2000	92.8	0	0	0	90.6	92.0	-1.4	0	0	0	0	0	-88.4
		623259.5	4758989.9	299.0	9521.3	0	DEN	4000	85.9	0	0	0	90.6	312.0	-1.4	0	0	0	0	0	-315.3
		623259.5	4758989.9	299.0	9521.3	0	DEN	8000	73.3	0	0	0	90.6	1112.9	-1.4	0	0	0	0	0	-1128.7
WF01(Wainfleet Wind Energy Project Vesta	WF01	631359.0	4751252.0	270.1	10404.7	0	DEN	32	-38.7	0	0	0	91.3	0.3	-5.1	0	0	0	0	0	-125.2
		631359.0	4751252.0	270.1	10404.7	0	DEN	63	86.0	0	0	0	91.3	1.3	-5.1	0	0	0	0	0	-1.5
		631359.0	4751252.0	270.1	10404.7	0	DEN	125	91.0	0	0	0	91.3	4.3	1.1	0	0	0	0	0	-5.8
		631359.0	4751252.0	270.1	10404.7	0	DEN	250	98.5	0	0	0	91.3	10.9	-0.6	0	0	0	0	0	-3.1
		631359.0	4751252.0	270.1	10404.7	0	DEN	500	95.4	0	0	0	91.3	20.1	-1.5	0	0	0	0	0	-14.5
		631359.0	4751252.0	270.1	10404.7	0	DEN	1000	98.5	0	0	0	91.3	38.1	-1.5	0	0	0	0	0	-29.4
		631359.0	4751252.0	270.1	10404.7	0	DEN	2000	97.7	0	0	0	91.3	100.6	-1.5	0	0	0	0	0	-92.7
		631359.0	4751252.0	270.1	10404.7	0	DEN	4000	96.7	0	0	0	91.3	341.0	-1.5	0	0	0	0	0	-334.1
		631359.0	4751252.0	270.1	10404.7	0	DEN	8000	92.1	0	0	0	91.3	1216.1	-1.5	0	0	0	0	0	-1213.8

Rosa Flora Turbine	RFT	615270.0	4756417.0	250.0	8854.1	0	DEN	32	-39.4	0	0	0	89.9	0.3	-5.2	0	0	0	0	0	-124.4
		615270.0	4756417.0	250.0	8854.1	0	DEN	63	87.6	0	0	0	89.9	1.1	-5.2	0	0	0	0	0	1.8
		615270.0	4756417.0	250.0	8854.1	0	DEN	125	95.2	0	0	0	89.9	3.6	1.1	0	0	0	0	0	0.5
		615270.0	4756417.0	250.0	8854.1	0	DEN	250	94.3	0	0	0	89.9	9.2	-0.6	0	0	0	0	0	-4.3
		615270.0	4756417.0	250.0	8854.1	0	DEN	500	97.1	0	0	0	89.9	17.1	-1.6	0	0	0	0	0	-8.4
		615270.0	4756417.0	250.0	8854.1	0	DEN	1000	98.9	0	0	0	89.9	32.4	-1.6	0	0	0	0	0	-21.9
		615270.0	4756417.0	250.0	8854.1	0	DEN	2000	94.6	0	0	0	89.9	85.6	-1.6	0	0	0	0	0	-79.4
		615270.0	4756417.0	250.0	8854.1	0	DEN	4000	83.1	0	0	0	89.9	290.1	-1.6	0	0	0	0	0	-295.4
		615270.0	4756417.0	250.0	8854.1	0	DEN	8000	75.8	0	0	0	89.9	1034.9	-1.6	0	0	0	0	0	-1047.5
WF02(Wainfleet Wind Energy Project Vesta	WF02	631758.0	4750750.0	270.9	10740.0	0	DEN	32	-38.7	0	0	0	91.6	0.3	-5.2	0	0	0	0	0	-125.5
		631758.0	4750750.0	270.9	10740.0	0	DEN	63	86.0	0	0	0	91.6	1.3	-5.2	0	0	0	0	0	-1.8
		631758.0	4750750.0	270.9	10740.0	0	DEN	125	91.0	0	0	0	91.6	4.4	1.1	0	0	0	0	0	-6.2
		631758.0	4750750.0	270.9	10740.0	0	DEN	250	98.5	0	0	0	91.6	11.2	-0.6	0	0	0	0	0	-3.7
		631758.0	4750750.0	270.9	10740.0	0	DEN	500	95.4	0	0	0	91.6	20.7	-1.5	0	0	0	0	0	-15.4
		631758.0	4750750.0	270.9	10740.0	0	DEN	1000	98.5	0	0	0	91.6	39.3	-1.5	0	0	0	0	0	-30.9
		631758.0	4750750.0	270.9	10740.0	0	DEN	2000	97.7	0	0	0	91.6	103.8	-1.5	0	0	0	0	0	-96.2
		631758.0	4750750.0	270.9	10740.0	0	DEN	4000	96.7	0	0	0	91.6	352.0	-1.5	0	0	0	0	0	-345.3
		631758.0	4750750.0	270.9	10740.0	0	DEN	8000	92.1	0	0	0	91.6	1255.3	-1.5	0	0	0	0	0	-1253.3
WF03(Wainfleet Wind Energy Project Vesta	WF03	631921.0	4750541.0	271.3	10884.7	0	DEN	32	-38.7	0	0	0	91.7	0.3	-5.2	0	0	0	0	0	-125.6
		631921.0	4750541.0	271.3	10884.7	0	DEN	63	86.0	0	0	0	91.7	1.3	-5.2	0	0	0	0	0	-1.9
		631921.0	4750541.0	271.3	10884.7	0	DEN	125	91.0	0	0	0	91.7	4.5	1.1	0	0	0	0	0	-6.3
		631921.0	4750541.0	271.3	10884.7	0	DEN	250	98.5	0	0	0	91.7	11.4	-0.6	0	0	0	0	0	-4.0
		631921.0	4750541.0	271.3	10884.7	0	DEN	500	95.4	0	0	0	91.7	21.0	-1.6	0	0	0	0	0	-15.8
		631921.0	4750541.0	271.3	10884.7	0	DEN	1000	98.5	0	0	0	91.7	39.8	-1.6	0	0	0	0	0	-31.5
		631921.0	4750541.0	271.3	10884.7	0	DEN	2000	97.7	0	0	0	91.7	105.2	-1.6	0	0	0	0	0	-97.7
		631921.0	4750541.0	271.3	10884.7	0	DEN	4000	96.7	0	0	0	91.7	356.7	-1.6	0	0	0	0	0	-350.2
		631921.0	4750541.0	271.3	10884.7	0	DEN	8000	92.1	0	0	0	91.7	1272.2	-1.6	0	0	0	0	0	-1270.3
R11TS09	T95	622816.6	4760851.0	304.0	11263.2	0	DEN	32	-39.4	0	0	0	92.0	0.4	-5.0	0	0	0	0	0	-126.8
		622816.6	4760851.0	304.0	11263.2	0	DEN	63	83.6	0	0	0	92.0	1.4	-5.0	0	0	0	0	0	-4.8
		622816.6	4760851.0	304.0	11263.2	0	DEN	125	91.7	0	0	0	92.0	4.6	1.2	0	0	0	0	0	-6.2
		622816.6	4760851.0	304.0	11263.2	0	DEN	250	98.7	0	0	0	92.0	11.8	-0.5	0	0	0	0	0	-4.6
		622816.6	4760851.0	304.0	11263.2	0	DEN	500	100.8	0	0	0	92.0	21.7	-1.5	0	0	0	0	0	-11.5
		622816.6	4760851.0	304.0	11263.2	0	DEN	1000	98.3	0	0	0	92.0	41.2	-1.5	0	0	0	0	0	-33.4
		622816.6	4760851.0	304.0	11263.2	0	DEN	2000	92.8	0	0	0	92.0	108.8	-1.5	0	0	0	0	0	-106.6
		622816.6	4760851.0	304.0	11263.2	0	DEN	4000	85.9	0	0	0	92.0	369.1	-1.5	0	0	0	0	0	-373.7
		622816.6	4760851.0	304.0	11263.2	0	DEN	8000	73.3	0	0	0	92.0	1316.5	-1.5	0	0	0	0	0	-1333.7
WF05(Wainfleet Wind Energy Project Vesta	WF05	632706.0	4748817.0	272.1	11674.4	0	DEN	32	-38.7	0	0	0	92.3	0.4	-5.2	0	0	0	0	0	-126.2
		632706.0	4748817.0	272.1	11674.4	0	DEN	63	86.0	0	0	0	92.3	1.4	-5.2	0	0	0	0	0	-2.5
		632706.0	4748817.0	272.1	11674.4	0	DEN	125	91.0	0	0	0	92.3	4.8	1.1	0	0	0	0	0	-7.3
		632706.0	4748817.0	272.1	11674.4	0	DEN	250	98.5	0	0	0	92.3	12.2	-0.6	0	0	0	0	0	-5.4
		632706.0	4748817.0	272.1	11674.4	0	DEN	500	95.4	0	0	0	92.3	22.5	-1.6	0	0	0	0	0	-17.9
		632706.0	4748817.0	272.1	11674.4	0	DEN	1000	98.5	0	0	0	92.3	42.7	-1.6	0	0	0	0	0	-35.0
		632706.0	4748817.0	272.1	11674.4	0	DEN	2000	97.7	0	0	0	92.3	112.8	-1.6	0	0	0	0	0	-105.9
		632706.0	4748817.0	272.1	11674.4	0	DEN	4000	96.7	0	0	0	92.3	382.6	-1.6	0	0	0	0	0	-376.6
		632706.0	4748817.0	272.1	11674.4	0	DEN	8000	92.1	0	0	0	92.3	1364.5	-1.6	0	0	0	0	0	-1363.2

WF04(Wainfleet Wind Energy Project Vesta	WF04	632750.0	4748389.0	273.8	11759.2	0	DEN	32	-38.7	0	0	0	92.4	0.4	-5.2	0	0	0	0	0	-126.2
		632750.0	4748389.0	273.8	11759.2	0	DEN	63	86.0	0	0	0	92.4	1.4	-5.2	0	0	0	0	0	-2.6
		632750.0	4748389.0	273.8	11759.2	0	DEN	125	91.0	0	0	0	92.4	4.8	1.1	0	0	0	0	0	-7.4
		632750.0	4748389.0	273.8	11759.2	0	DEN	250	98.5	0	0	0	92.4	12.3	-0.6	0	0	0	0	0	-5.6
		632750.0	4748389.0	273.8	11759.2	0	DEN	500	95.4	0	0	0	92.4	22.7	-1.6	0	0	0	0	0	-18.1
		632750.0	4748389.0	273.8	11759.2	0	DEN	1000	98.5	0	0	0	92.4	43.0	-1.6	0	0	0	0	0	-35.3
		632750.0	4748389.0	273.8	11759.2	0	DEN	2000	97.7	0	0	0	92.4	113.6	-1.6	0	0	0	0	0	-106.8
		632750.0	4748389.0	273.8	11759.2	0	DEN	4000	96.7	0	0	0	92.4	385.3	-1.6	0	0	0	0	0	-379.5
		632750.0	4748389.0	273.8	11759.2	0	DEN	8000	92.1	0	0	0	92.4	1374.4	-1.6	0	0	0	0	0	-1373.2
R11TO09	T09	616789.8	4762576.1	304.0	13544.8	0	DEN	32	-39.4	0	0	0	93.6	0.4	-5.1	0	0	0	0	0	-128.3
		616789.8	4762576.1	304.0	13544.8	0	DEN	63	83.6	0	0	0	93.6	1.6	-5.1	0	0	0	0	0	-6.5
		616789.8	4762576.1	304.0	13544.8	0	DEN	125	91.7	0	0	0	93.6	5.6	1.1	0	0	0	0	0	-8.6
		616789.8	4762576.1	304.0	13544.8	0	DEN	250	98.7	0	0	0	93.6	14.1	-0.6	0	0	0	0	0	-8.5
		616789.8	4762576.1	304.0	13544.8	0	DEN	500	100.8	0	0	0	93.6	26.1	-1.5	0	0	0	0	0	-17.4
		616789.8	4762576.1	304.0	13544.8	0	DEN	1000	98.3	0	0	0	93.6	49.5	-1.5	0	0	0	0	0	-43.3
		616789.8	4762576.1	304.0	13544.8	0	DEN	2000	92.8	0	0	0	93.6	130.9	-1.5	0	0	0	0	0	-130.2
		616789.8	4762576.1	304.0	13544.8	0	DEN	4000	85.9	0	0	0	93.6	443.9	-1.5	0	0	0	0	0	-450.1
		616789.8	4762576.1	304.0	13544.8	0	DEN	8000	73.3	0	0	0	93.6	1583.1	-1.5	0	0	0	0	0	-1601.9
R11TO51	T51	617020.3	4762751.8	304.0	13641.4	0	DEN	32	-39.4	0	0	0	93.7	0.4	-5.2	0	0	0	0	0	-128.4
		617020.3	4762751.8	304.0	13641.4	0	DEN	63	83.6	0	0	0	93.7	1.7	-5.2	0	0	0	0	0	-6.6
		617020.3	4762751.8	304.0	13641.4	0	DEN	125	91.7	0	0	0	93.7	5.6	1.1	0	0	0	0	0	-8.7
		617020.3	4762751.8	304.0	13641.4	0	DEN	250	98.7	0	0	0	93.7	14.2	-0.6	0	0	0	0	0	-8.7
		617020.3	4762751.8	304.0	13641.4	0	DEN	500	100.8	0	0	0	93.7	26.3	-1.5	0	0	0	0	0	-17.7
		617020.3	4762751.8	304.0	13641.4	0	DEN	1000	98.3	0	0	0	93.7	49.9	-1.5	0	0	0	0	0	-43.7
		617020.3	4762751.8	304.0	13641.4	0	DEN	2000	92.8	0	0	0	93.7	131.8	-1.5	0	0	0	0	0	-131.2
		617020.3	4762751.8	304.0	13641.4	0	DEN	4000	85.9	0	0	0	93.7	447.0	-1.5	0	0	0	0	0	-453.3
		617020.3	4762751.8	304.0	13641.4	0	DEN	8000	73.3	0	0	0	93.7	1594.4	-1.5	0	0	0	0	0	-1613.3
Transformer1 (100/133/166 ONAN/ONAF/ONAF MVA)	ST1	621959.7	4761728.0	182.3	12036.0	0	DEN	32	50.6	0	0	0	92.6	0.4	-5.9	0	0	4.8	0	0	-41.2
		621959.7	4761728.0	182.3	12036.0	0	DEN	63	72.8	0	0	0	92.6	1.5	-5.9	0	0	4.8	0	0	-20.1
		621959.7	4761728.0	182.3	12036.0	0	DEN	125	87.9	0	0	0	92.6	4.9	3.8	0	0	1	0	0	-14.4
		621959.7	4761728.0	182.3	12036.0	0	DEN	250	94.4	0	0	0	92.6	12.6	0.9	0	0	3.8	0	0	-15.5
		621959.7	4761728.0	182.3	12036.0	0	DEN	500	99.8	0	0	0	92.6	23.2	-1.8	0	0	4.8	0	0	-19.0
		621959.7	4761728.0	182.3	12036.0	0	DEN	1000	97.0	0	0	0	92.6	44.0	-1.8	0	0	4.8	0	0	-42.6
		621959.7	4761728.0	182.3	12036.0	0	DEN	2000	93.2	0	0	0	92.6	116.3	-1.8	0	0	4.8	0	0	-118.7
		621959.7	4761728.0	182.3	12036.0	0	DEN	4000	88.0	0	0	0	92.6	394.4	-1.8	0	0	4.8	0	0	-402.0
		621959.7	4761728.0	182.3	12036.0	0	DEN	8000	78.9	0	0	0	92.6	1406.8	-1.8	0	0	4.8	0	0	-1423.5
R11TO07	T07	618635.6	4764052.9	304.0	14533.2	0	DEN	32	-39.4	0	0	0	94.2	0.5	-5.2	0	0	0	0	0	-128.9
		618635.6	4764052.9	304.0	14533.2	0	DEN	63	83.6	0	0	0	94.2	1.8	-5.2	0	0	0	0	0	-7.2
		618635.6	4764052.9	304.0	14533.2	0	DEN	125	91.7	0	0	0	94.2	6.0	1.1	0	0	0	0	0	-9.6
		618635.6	4764052.9	304.0	14533.2	0	DEN	250	98.7	0	0	0	94.2	15.2	-0.6	0	0	0	0	0	-10.1
		618635.6	4764052.9	304.0	14533.2	0	DEN	500	100.8	0	0	0	94.2	28.0	-1.6	0	0	0	0	0	-19.9
		618635.6	4764052.9	304.0	14533.2	0	DEN	1000	98.3	0	0	0	94.2	53.2	-1.6	0	0	0	0	0	-47.5
		618635.6	4764052.9	304.0	14533.2	0	DEN	2000	92.8	0	0	0	94.2	140.4	-1.6	0	0	0	0	0	-140.3
		618635.6	4764052.9	304.0	14533.2	0	DEN	4000	85.9	0	0	0	94.2	476.3	-1.6	0	0	0	0	0	-483.0
		618635.6	4764052.9	304.0	14533.2	0	DEN	8000	73.3	0	0	0	94.2	1698.7	-1.6	0	0	0	0	0	-1718.1

R11TO75	T75	621356.9	4764542.6	304.0	14820.8	0	DEN	32	-39.4	0	0	0	94.4	0.5	-5.2	0	0	0	0	0	-129.1
		621356.9	4764542.6	304.0	14820.8	0	DEN	63	83.6	0	0	0	94.4	1.8	-5.2	0	0	0	0	0	-7.4
		621356.9	4764542.6	304.0	14820.8	0	DEN	125	91.7	0	0	0	94.4	6.1	1.1	0	0	0	0	0	-9.9
		621356.9	4764542.6	304.0	14820.8	0	DEN	250	98.7	0	0	0	94.4	15.5	-0.6	0	0	0	0	0	-10.6
		621356.9	4764542.6	304.0	14820.8	0	DEN	500	100.8	0	0	0	94.4	28.6	-1.6	0	0	0	0	0	-20.6
		621356.9	4764542.6	304.0	14820.8	0	DEN	1000	98.3	0	0	0	94.4	54.2	-1.6	0	0	0	0	0	-48.8
		621356.9	4764542.6	304.0	14820.8	0	DEN	2000	92.8	0	0	0	94.4	143.2	-1.6	0	0	0	0	0	-143.3
		621356.9	4764542.6	304.0	14820.8	0	DEN	4000	85.9	0	0	0	94.4	485.7	-1.6	0	0	0	0	0	-492.6
		621356.9	4764542.6	304.0	14820.8	0	DEN	8000	73.3	0	0	0	94.4	1732.3	-1.6	0	0	0	0	0	-1751.8
R11TO39	T39	617348.6	4764279.3	304.0	15022.2	0	DEN	32	-39.4	0	0	0	94.5	0.5	-5.2	0	0	0	0	0	-129.2
		617348.6	4764279.3	304.0	15022.2	0	DEN	63	83.6	0	0	0	94.5	1.8	-5.2	0	0	0	0	0	-7.5
		617348.6	4764279.3	304.0	15022.2	0	DEN	125	91.7	0	0	0	94.5	6.2	1.1	0	0	0	0	0	-10.1
		617348.6	4764279.3	304.0	15022.2	0	DEN	250	98.7	0	0	0	94.5	15.7	-0.6	0	0	0	0	0	-10.9
		617348.6	4764279.3	304.0	15022.2	0	DEN	500	100.8	0	0	0	94.5	29.0	-1.6	0	0	0	0	0	-21.1
		617348.6	4764279.3	304.0	15022.2	0	DEN	1000	98.3	0	0	0	94.5	54.9	-1.6	0	0	0	0	0	-49.6
		617348.6	4764279.3	304.0	15022.2	0	DEN	2000	92.8	0	0	0	94.5	145.2	-1.6	0	0	0	0	0	-145.3
		617348.6	4764279.3	304.0	15022.2	0	DEN	4000	85.9	0	0	0	94.5	492.3	-1.6	0	0	0	0	0	-499.3
		617348.6	4764279.3	304.0	15022.2	0	DEN	8000	73.3	0	0	0	94.5	1755.8	-1.6	0	0	0	0	0	-1775.5
R11TO32	T32	624780.5	4764409.8	304.0	15147.4	0	DEN	32	-39.4	0	0	0	94.6	0.5	-5.2	0	0	0	0	0	-129.3
		624780.5	4764409.8	304.0	15147.4	0	DEN	63	83.6	0	0	0	94.6	1.8	-5.2	0	0	0	0	0	-7.6
		624780.5	4764409.8	304.0	15147.4	0	DEN	125	91.7	0	0	0	94.6	6.2	1.1	0	0	0	0	0	-10.2
		624780.5	4764409.8	304.0	15147.4	0	DEN	250	98.7	0	0	0	94.6	15.8	-0.6	0	0	0	0	0	-11.1
		624780.5	4764409.8	304.0	15147.4	0	DEN	500	100.8	0	0	0	94.6	29.2	-1.6	0	0	0	0	0	-21.4
		624780.5	4764409.8	304.0	15147.4	0	DEN	1000	98.3	0	0	0	94.6	55.4	-1.6	0	0	0	0	0	-50.1
		624780.5	4764409.8	304.0	15147.4	0	DEN	2000	92.8	0	0	0	94.6	146.4	-1.6	0	0	0	0	0	-146.6
		624780.5	4764409.8	304.0	15147.4	0	DEN	4000	85.9	0	0	0	94.6	496.4	-1.6	0	0	0	0	0	-503.5
		624780.5	4764409.8	304.0	15147.4	0	DEN	8000	73.3	0	0	0	94.6	1770.5	-1.6	0	0	0	0	0	-1790.2
R11TO29	T29	628498.0	4763100.5	303.1	15301.3	0	DEN	32	-39.4	0	0	0	94.7	0.5	-5.2	0	0	0	0	0	-129.3
		628498.0	4763100.5	303.1	15301.3	0	DEN	63	83.6	0	0	0	94.7	1.9	-5.2	0	0	0	0	0	-7.7
		628498.0	4763100.5	303.1	15301.3	0	DEN	125	91.7	0	0	0	94.7	6.3	1.1	0	0	0	0	0	-10.4
		628498.0	4763100.5	303.1	15301.3	0	DEN	250	98.7	0	0	0	94.7	16.0	-0.6	0	0	0	0	0	-11.4
		628498.0	4763100.5	303.1	15301.3	0	DEN	500	100.8	0	0	0	94.7	29.5	-1.6	0	0	0	0	0	-21.8
		628498.0	4763100.5	303.1	15301.3	0	DEN	1000	98.3	0	0	0	94.7	56.0	-1.6	0	0	0	0	0	-50.8
		628498.0	4763100.5	303.1	15301.3	0	DEN	2000	92.8	0	0	0	94.7	147.9	-1.6	0	0	0	0	0	-148.2
		628498.0	4763100.5	303.1	15301.3	0	DEN	4000	85.9	0	0	0	94.7	501.4	-1.6	0	0	0	0	0	-508.6
		628498.0	4763100.5	303.1	15301.3	0	DEN	8000	73.3	0	0	0	94.7	1788.4	-1.6	0	0	0	0	0	-1808.3
R11TO34	T34	626486.0	4764591.4	304.0	15823.5	0	DEN	32	-39.4	0	0	0	95.0	0.5	-5.3	0	0	0	0	0	-129.6
		626486.0	4764591.4	304.0	15823.5	0	DEN	63	83.6	0	0	0	95.0	1.9	-5.3	0	0	0	0	0	-8.0
		626486.0	4764591.4	304.0	15823.5	0	DEN	125	91.7	0	0	0	95.0	6.5	1.1	0	0	0	0	0	-10.9
		626486.0	4764591.4	304.0	15823.5	0	DEN	250	98.7	0	0	0	95.0	16.5	-0.6	0	0	0	0	0	-12.2
		626486.0	4764591.4	304.0	15823.5	0	DEN	500	100.8	0	0	0	95.0	30.5	-1.6	0	0	0	0	0	-23.1
		626486.0	4764591.4	304.0	15823.5	0	DEN	1000	98.3	0	0	0	95.0	57.9	-1.6	0	0	0	0	0	-53.0
		626486.0	4764591.4	304.0	15823.5	0	DEN	2000	92.8	0	0	0	95.0	152.9	-1.6	0	0	0	0	0	-153.5
		626486.0	4764591.4	304.0	15823.5	0	DEN	4000	85.9	0	0	0	95.0	518.5	-1.6	0	0	0	0	0	-526.0
		626486.0	4764591.4	304.0	15823.5	0	DEN	8000	73.3	0	0	0	95.0	1849.5	-1.6	0	0	0	0	0	-1869.6

R11TO54	T54	619944.0	4765594.0	304.0	15909.0	0	DEN	32	-39.4	0	0	0	95.0	0.5	-5.3	0	0	0	0	0	-129.7
		619944.0	4765594.0	304.0	15909.0	0	DEN	63	83.6	0	0	0	95.0	1.9	-5.3	0	0	0	0	0	-8.1
		619944.0	4765594.0	304.0	15909.0	0	DEN	125	91.7	0	0	0	95.0	6.5	1.1	0	0	0	0	0	-11.0
		619944.0	4765594.0	304.0	15909.0	0	DEN	250	98.7	0	0	0	95.0	16.6	-0.6	0	0	0	0	0	-12.3
		619944.0	4765594.0	304.0	15909.0	0	DEN	500	100.8	0	0	0	95.0	30.7	-1.6	0	0	0	0	0	-23.3
		619944.0	4765594.0	304.0	15909.0	0	DEN	1000	98.3	0	0	0	95.0	58.2	-1.6	0	0	0	0	0	-53.3
		619944.0	4765594.0	304.0	15909.0	0	DEN	2000	92.8	0	0	0	95.0	153.7	-1.6	0	0	0	0	0	-154.4
		619944.0	4765594.0	304.0	15909.0	0	DEN	4000	85.9	0	0	0	95.0	521.3	-1.6	0	0	0	0	0	-528.9
		619944.0	4765594.0	304.0	15909.0	0	DEN	8000	73.3	0	0	0	95.0	1859.5	-1.6	0	0	0	0	0	-1879.6
R11TO35	T35	627163.5	4764483.1	304.0	15968.0	0	DEN	32	-39.4	0	0	0	95.1	0.5	-5.3	0	0	0	0	0	-129.7
		627163.5	4764483.1	304.0	15968.0	0	DEN	63	83.6	0	0	0	95.1	1.9	-5.3	0	0	0	0	0	-8.1
		627163.5	4764483.1	304.0	15968.0	0	DEN	125	91.7	0	0	0	95.1	6.6	1.1	0	0	0	0	0	-11.0
		627163.5	4764483.1	304.0	15968.0	0	DEN	250	98.7	0	0	0	95.1	16.7	-0.6	0	0	0	0	0	-12.4
		627163.5	4764483.1	304.0	15968.0	0	DEN	500	100.8	0	0	0	95.1	30.8	-1.6	0	0	0	0	0	-23.5
		627163.5	4764483.1	304.0	15968.0	0	DEN	1000	98.3	0	0	0	95.1	58.4	-1.6	0	0	0	0	0	-53.6
		627163.5	4764483.1	304.0	15968.0	0	DEN	2000	92.8	0	0	0	95.1	154.3	-1.6	0	0	0	0	0	-155.0
		627163.5	4764483.1	304.0	15968.0	0	DEN	4000	85.9	0	0	0	95.1	523.3	-1.6	0	0	0	0	0	-530.9
		627163.5	4764483.1	304.0	15968.0	0	DEN	8000	73.3	0	0	0	95.1	1866.4	-1.6	0	0	0	0	0	-1886.5
R11TO38	T38	620669.2	4765751.8	304.0	16032.0	0	DEN	32	-39.4	0	0	0	95.1	0.5	-5.3	0	0	0	0	0	-129.7
		620669.2	4765751.8	304.0	16032.0	0	DEN	63	83.6	0	0	0	95.1	2.0	-5.3	0	0	0	0	0	-8.2
		620669.2	4765751.8	304.0	16032.0	0	DEN	125	91.7	0	0	0	95.1	6.6	1.1	0	0	0	0	0	-11.1
		620669.2	4765751.8	304.0	16032.0	0	DEN	250	98.7	0	0	0	95.1	16.7	-0.6	0	0	0	0	0	-12.5
		620669.2	4765751.8	304.0	16032.0	0	DEN	500	100.8	0	0	0	95.1	30.9	-1.6	0	0	0	0	0	-23.6
		620669.2	4765751.8	304.0	16032.0	0	DEN	1000	98.3	0	0	0	95.1	58.6	-1.6	0	0	0	0	0	-53.9
		620669.2	4765751.8	304.0	16032.0	0	DEN	2000	92.8	0	0	0	95.1	154.9	-1.6	0	0	0	0	0	-155.6
		620669.2	4765751.8	304.0	16032.0	0	DEN	4000	85.9	0	0	0	95.1	525.4	-1.6	0	0	0	0	0	-533.0
		620669.2	4765751.8	304.0	16032.0	0	DEN	8000	73.3	0	0	0	95.1	1873.9	-1.6	0	0	0	0	0	-1894.1
R11TO01	T01	622985.8	4765745.3	306.3	16135.1	0	DEN	32	-39.4	0	0	0	95.2	0.5	-5.3	0	0	0	0	0	-129.8
		622985.8	4765745.3	306.3	16135.1	0	DEN	63	83.6	0	0	0	95.2	2.0	-5.3	0	0	0	0	0	-8.2
		622985.8	4765745.3	306.3	16135.1	0	DEN	125	91.7	0	0	0	95.2	6.6	1.1	0	0	0	0	0	-11.2
		622985.8	4765745.3	306.3	16135.1	0	DEN	250	98.7	0	0	0	95.2	16.8	-0.6	0	0	0	0	0	-12.7
		622985.8	4765745.3	306.3	16135.1	0	DEN	500	100.8	0	0	0	95.2	31.1	-1.6	0	0	0	0	0	-23.9
		622985.8	4765745.3	306.3	16135.1	0	DEN	1000	98.3	0	0	0	95.2	59.0	-1.6	0	0	0	0	0	-54.3
		622985.8	4765745.3	306.3	16135.1	0	DEN	2000	92.8	0	0	0	95.2	155.9	-1.6	0	0	0	0	0	-156.7
		622985.8	4765745.3	306.3	16135.1	0	DEN	4000	85.9	0	0	0	95.2	528.7	-1.6	0	0	0	0	0	-536.4
		622985.8	4765745.3	306.3	16135.1	0	DEN	8000	73.3	0	0	0	95.2	1885.9	-1.6	0	0	0	0	0	-1906.2
R11TO76	T76	623639.9	4765719.5	304.0	16200.3	0	DEN	32	-39.4	0	0	0	95.2	0.5	-5.3	0	0	0	0	0	-129.8
		623639.9	4765719.5	304.0	16200.3	0	DEN	63	83.6	0	0	0	95.2	2.0	-5.3	0	0	0	0	0	-8.3
		623639.9	4765719.5	304.0	16200.3	0	DEN	125	91.7	0	0	0	95.2	6.7	1.1	0	0	0	0	0	-11.2
		623639.9	4765719.5	304.0	16200.3	0	DEN	250	98.7	0	0	0	95.2	16.9	-0.6	0	0	0	0	0	-12.8
		623639.9	4765719.5	304.0	16200.3	0	DEN	500	100.8	0	0	0	95.2	31.2	-1.6	0	0	0	0	0	-24.0
		623639.9	4765719.5	304.0	16200.3	0	DEN	1000	98.3	0	0	0	95.2	59.3	-1.6	0	0	0	0	0	-54.6
		623639.9	4765719.5	304.0	16200.3	0	DEN	2000	92.8	0	0	0	95.2	156.6	-1.6	0	0	0	0	0	-157.4
		623639.9	4765719.5	304.0	16200.3	0	DEN	4000	85.9	0	0	0	95.2	530.9	-1.6	0	0	0	0	0	-538.6
		623639.9	4765719.5	304.0	16200.3	0	DEN	8000	73.3	0	0	0	95.2	1893.5	-1.6	0	0	0	0	0	-1913.8

R11TO97	T97	617214.7	4765641.9	306.9	16376.9	0	DEN	32	-39.4	0	0	0	95.3	0.5	-5.3	0	0	0	0	0	-129.9
		617214.7	4765641.9	306.9	16376.9	0	DEN	63	83.6	0	0	0	95.3	2.0	-5.3	0	0	0	0	0	-8.4
		617214.7	4765641.9	306.9	16376.9	0	DEN	125	91.7	0	0	0	95.3	6.7	1.1	0	0	0	0	0	-11.4
		617214.7	4765641.9	306.9	16376.9	0	DEN	250	98.7	0	0	0	95.3	17.1	-0.6	0	0	0	0	0	-13.1
		617214.7	4765641.9	306.9	16376.9	0	DEN	500	100.8	0	0	0	95.3	31.6	-1.6	0	0	0	0	0	-24.5
		617214.7	4765641.9	306.9	16376.9	0	DEN	1000	98.3	0	0	0	95.3	59.9	-1.6	0	0	0	0	0	-55.3
		617214.7	4765641.9	306.9	16376.9	0	DEN	2000	92.8	0	0	0	95.3	158.3	-1.6	0	0	0	0	0	-159.2
		617214.7	4765641.9	306.9	16376.9	0	DEN	4000	85.9	0	0	0	95.3	536.7	-1.6	0	0	0	0	0	-544.5
		617214.7	4765641.9	306.9	16376.9	0	DEN	8000	73.3	0	0	0	95.3	1914.2	-1.6	0	0	0	0	0	-1934.6
R11TO03	T03	629895.5	4763587.6	304.0	16435.3	0	DEN	32	-39.4	0	0	0	95.3	0.5	-5.3	0	0	0	0	0	-129.9
		629895.5	4763587.6	304.0	16435.3	0	DEN	63	83.6	0	0	0	95.3	2.0	-5.3	0	0	0	0	0	-8.4
		629895.5	4763587.6	304.0	16435.3	0	DEN	125	91.7	0	0	0	95.3	6.8	1.1	0	0	0	0	0	-11.5
		629895.5	4763587.6	304.0	16435.3	0	DEN	250	98.7	0	0	0	95.3	17.1	-0.6	0	0	0	0	0	-13.1
		629895.5	4763587.6	304.0	16435.3	0	DEN	500	100.8	0	0	0	95.3	31.7	-1.6	0	0	0	0	0	-24.6
		629895.5	4763587.6	304.0	16435.3	0	DEN	1000	98.3	0	0	0	95.3	60.1	-1.6	0	0	0	0	0	-55.5
		629895.5	4763587.6	304.0	16435.3	0	DEN	2000	92.8	0	0	0	95.3	158.8	-1.6	0	0	0	0	0	-159.8
		629895.5	4763587.6	304.0	16435.3	0	DEN	4000	85.9	0	0	0	95.3	538.6	-1.6	0	0	0	0	0	-546.4
		629895.5	4763587.6	304.0	16435.3	0	DEN	8000	73.3	0	0	0	95.3	1921.0	-1.6	0	0	0	0	0	-1941.4
R11TO08	T08	614544.5	4764911.4	304.7	16528.3	0	DEN	32	-39.4	0	0	0	95.4	0.5	-5.3	0	0	0	0	0	-130.0
		614544.5	4764911.4	304.7	16528.3	0	DEN	63	83.6	0	0	0	95.4	2.0	-5.3	0	0	0	0	0	-8.5
		614544.5	4764911.4	304.7	16528.3	0	DEN	125	91.7	0	0	0	95.4	6.8	1.1	0	0	0	0	0	-11.5
		614544.5	4764911.4	304.7	16528.3	0	DEN	250	98.7	0	0	0	95.4	17.2	-0.6	0	0	0	0	0	-13.3
		614544.5	4764911.4	304.7	16528.3	0	DEN	500	100.8	0	0	0	95.4	31.9	-1.6	0	0	0	0	0	-24.8
		614544.5	4764911.4	304.7	16528.3	0	DEN	1000	98.3	0	0	0	95.4	60.5	-1.6	0	0	0	0	0	-55.9
		614544.5	4764911.4	304.7	16528.3	0	DEN	2000	92.8	0	0	0	95.4	159.7	-1.6	0	0	0	0	0	-160.7
		614544.5	4764911.4	304.7	16528.3	0	DEN	4000	85.9	0	0	0	95.4	541.6	-1.6	0	0	0	0	0	-549.5
		614544.5	4764911.4	304.7	16528.3	0	DEN	8000	73.3	0	0	0	95.4	1931.9	-1.6	0	0	0	0	0	-1952.3
R11TO31	T31	625150.0	4765821.0	309.0	16606.1	0	DEN	32	-39.4	0	0	0	95.4	0.5	-5.3	0	0	0	0	0	-130.0
		625150.0	4765821.0	309.0	16606.1	0	DEN	63	83.6	0	0	0	95.4	2.0	-5.3	0	0	0	0	0	-8.5
		625150.0	4765821.0	309.0	16606.1	0	DEN	125	91.7	0	0	0	95.4	6.8	1.1	0	0	0	0	0	-11.6
		625150.0	4765821.0	309.0	16606.1	0	DEN	250	98.7	0	0	0	95.4	17.3	-0.6	0	0	0	0	0	-13.4
		625150.0	4765821.0	309.0	16606.1	0	DEN	500	100.8	0	0	0	95.4	32.0	-1.6	0	0	0	0	0	-25.0
		625150.0	4765821.0	309.0	16606.1	0	DEN	1000	98.3	0	0	0	95.4	60.7	-1.6	0	0	0	0	0	-56.3
		625150.0	4765821.0	309.0	16606.1	0	DEN	2000	92.8	0	0	0	95.4	160.5	-1.6	0	0	0	0	0	-161.5
		625150.0	4765821.0	309.0	16606.1	0	DEN	4000	85.9	0	0	0	95.4	544.2	-1.6	0	0	0	0	0	-552.1
		625150.0	4765821.0	309.0	16606.1	0	DEN	8000	73.3	0	0	0	95.4	1940.9	-1.6	0	0	0	0	0	-1961.5
R11TO74	T74	621655.8	4763002.3	303.7	13290.7	0	DEN	32	-39.4	0	0	0	93.5	0.4	-5.1	0	0	0	0	0	-128.2
		621655.8	4763002.3	303.7	13290.7	0	DEN	63	83.7	0	0	0	93.5	1.6	-5.1	0	0	0	0	0	-6.3
		621655.8	4763002.3	303.7	13290.7	0	DEN	125	92.0	0	0	0	93.5	5.5	1.1	0	0	0	0	0	-8.1
		621655.8	4763002.3	303.7	13290.7	0	DEN	250	96.1	0	0	0	93.5	13.9	-0.6	0	0	0	0	0	-10.7
		621655.8	4763002.3	303.7	13290.7	0	DEN	500	98.4	0	0	0	93.5	25.6	-1.5	0	0	0	0	0	-19.2
		621655.8	4763002.3	303.7	13290.7	0	DEN	1000	97.0	0	0	0	93.5	48.6	-1.5	0	0	0	0	0	-43.5
		621655.8	4763002.3	303.7	13290.7	0	DEN	2000	90.2	0	0	0	93.5	128.4	-1.5	0	0	0	0	0	-130.2
		621655.8	4763002.3	303.7	13290.7	0	DEN	4000	85.2	0	0	0	93.5	435.5	-1.5	0	0	0	0	0	-442.3
		621655.8	4763002.3	303.7	13290.7	0	DEN	8000	81.9	0	0	0	93.5	1553.4	-1.5	0	0	0	0	0	-1563.5

R11TO36	T36	622378.6	4763063.1	299.0	13402.8	0	DEN	32	-39.4	0	0	0	93.5	0.4	-5.1	0	0	0	0	0	-128.2
		622378.6	4763063.1	299.0	13402.8	0	DEN	63	83.7	0	0	0	93.5	1.6	-5.1	0	0	0	0	0	-6.3
		622378.6	4763063.1	299.0	13402.8	0	DEN	125	92.0	0	0	0	93.5	5.5	1.1	0	0	0	0	0	-8.2
		622378.6	4763063.1	299.0	13402.8	0	DEN	250	96.1	0	0	0	93.5	14.0	-0.6	0	0	0	0	0	-10.9
		622378.6	4763063.1	299.0	13402.8	0	DEN	500	98.4	0	0	0	93.5	25.8	-1.5	0	0	0	0	0	-19.4
		622378.6	4763063.1	299.0	13402.8	0	DEN	1000	97.0	0	0	0	93.5	49.0	-1.5	0	0	0	0	0	-44.0
		622378.6	4763063.1	299.0	13402.8	0	DEN	2000	90.2	0	0	0	93.5	129.5	-1.5	0	0	0	0	0	-131.3
		622378.6	4763063.1	299.0	13402.8	0	DEN	4000	85.2	0	0	0	93.5	439.2	-1.5	0	0	0	0	0	-446.0
		622378.6	4763063.1	299.0	13402.8	0	DEN	8000	81.9	0	0	0	93.5	1566.5	-1.5	0	0	0	0	0	-1576.6
R11TO78	T78	628581.0	4764783.0	304.0	16828.8	0	DEN	32	-39.4	0	0	0	95.5	0.5	-5.3	0	0	0	0	0	-130.1
		628581.0	4764783.0	304.0	16828.8	0	DEN	63	83.6	0	0	0	95.5	2.0	-5.3	0	0	0	0	0	-8.7
		628581.0	4764783.0	304.0	16828.8	0	DEN	125	91.7	0	0	0	95.5	6.9	1.1	0	0	0	0	0	-11.8
		628581.0	4764783.0	304.0	16828.8	0	DEN	250	98.7	0	0	0	95.5	17.6	-0.6	0	0	0	0	0	-13.8
		628581.0	4764783.0	304.0	16828.8	0	DEN	500	100.8	0	0	0	95.5	32.4	-1.6	0	0	0	0	0	-25.6
		628581.0	4764783.0	304.0	16828.8	0	DEN	1000	98.3	0	0	0	95.5	61.6	-1.6	0	0	0	0	0	-57.2
		628581.0	4764783.0	304.0	16828.8	0	DEN	2000	92.8	0	0	0	95.5	162.6	-1.6	0	0	0	0	0	-163.8
		628581.0	4764783.0	304.0	16828.8	0	DEN	4000	85.9	0	0	0	95.5	551.5	-1.6	0	0	0	0	0	-559.5
		628581.0	4764783.0	304.0	16828.8	0	DEN	8000	73.3	0	0	0	95.5	1967.0	-1.6	0	0	0	0	0	-1987.6
R11TO33	T33	626968.7	4765950.4	309.0	17265.6	0	DEN	32	-39.4	0	0	0	95.7	0.6	-5.3	0	0	0	0	0	-130.4
		626968.7	4765950.4	309.0	17265.6	0	DEN	63	83.6	0	0	0	95.7	2.1	-5.3	0	0	0	0	0	-8.9
		626968.7	4765950.4	309.0	17265.6	0	DEN	125	91.7	0	0	0	95.7	7.1	1.1	0	0	0	0	0	-12.2
		626968.7	4765950.4	309.0	17265.6	0	DEN	250	98.7	0	0	0	95.7	18.0	-0.6	0	0	0	0	0	-14.4
		626968.7	4765950.4	309.0	17265.6	0	DEN	500	100.8	0	0	0	95.7	33.3	-1.6	0	0	0	0	0	-26.6
		626968.7	4765950.4	309.0	17265.6	0	DEN	1000	98.3	0	0	0	95.7	63.2	-1.6	0	0	0	0	0	-59.0
		626968.7	4765950.4	309.0	17265.6	0	DEN	2000	92.8	0	0	0	95.7	166.9	-1.6	0	0	0	0	0	-168.2
		626968.7	4765950.4	309.0	17265.6	0	DEN	4000	85.9	0	0	0	95.7	565.8	-1.6	0	0	0	0	0	-574.0
		626968.7	4765950.4	309.0	17265.6	0	DEN	8000	73.3	0	0	0	95.7	2018.0	-1.6	0	0	0	0	0	-2038.9
R11TO02	T02	627379.8	4765942.2	309.0	17402.7	0	DEN	32	-39.4	0	0	0	95.8	0.6	-5.3	0	0	0	0	0	-130.4
		627379.8	4765942.2	309.0	17402.7	0	DEN	63	83.6	0	0	0	95.8	2.1	-5.3	0	0	0	0	0	-9.0
		627379.8	4765942.2	309.0	17402.7	0	DEN	125	91.7	0	0	0	95.8	7.2	1.1	0	0	0	0	0	-12.3
		627379.8	4765942.2	309.0	17402.7	0	DEN	250	98.7	0	0	0	95.8	18.2	-0.6	0	0	0	0	0	-14.6
		627379.8	4765942.2	309.0	17402.7	0	DEN	500	100.8	0	0	0	95.8	33.6	-1.6	0	0	0	0	0	-27.0
		627379.8	4765942.2	309.0	17402.7	0	DEN	1000	98.3	0	0	0	95.8	63.7	-1.6	0	0	0	0	0	-59.6
		627379.8	4765942.2	309.0	17402.7	0	DEN	2000	92.8	0	0	0	95.8	168.2	-1.6	0	0	0	0	0	-169.6
		627379.8	4765942.2	309.0	17402.7	0	DEN	4000	85.9	0	0	0	95.8	570.3	-1.6	0	0	0	0	0	-578.6
		627379.8	4765942.2	309.0	17402.7	0	DEN	8000	73.3	0	0	0	95.8	2034.1	-1.6	0	0	0	0	0	-2055.0
R11TO93	T93	618324.0	4767127.0	309.0	17617.2	0	DEN	32	-39.4	0	0	0	95.9	0.6	-5.3	0	0	0	0	0	-130.5
		618324.0	4767127.0	309.0	17617.2	0	DEN	63	83.6	0	0	0	95.9	2.1	-5.3	0	0	0	0	0	-9.1
		618324.0	4767127.0	309.0	17617.2	0	DEN	125	91.7	0	0	0	95.9	7.2	1.1	0	0	0	0	0	-12.5
		618324.0	4767127.0	309.0	17617.2	0	DEN	250	98.7	0	0	0	95.9	18.4	-0.6	0	0	0	0	0	-15.0
		618324.0	4767127.0	309.0	17617.2	0	DEN	500	100.8	0	0	0	95.9	34.0	-1.6	0	0	0	0	0	-27.5
		618324.0	4767127.0	309.0	17617.2	0	DEN	1000	98.3	0	0	0	95.9	64.4	-1.6	0	0	0	0	0	-60.5
		618324.0	4767127.0	309.0	17617.2	0	DEN	2000	92.8	0	0	0	95.9	170.3	-1.6	0	0	0	0	0	-171.8
		618324.0	4767127.0	309.0	17617.2	0	DEN	4000	85.9	0	0	0	95.9	577.3	-1.6	0	0	0	0	0	-585.7
		618324.0	4767127.0	309.0	17617.2	0	DEN	8000	73.3	0	0	0	95.9	2059.1	-1.6	0	0	0	0	0	-2080.2

R11TO06	T06	623095.6	4767244.5	310.0	17636.8	0	DEN	32	-39.4	0	0	0	95.9	0.6	-5.3	0	0	0	0	0	-130.5
		623095.6	4767244.5	310.0	17636.8	0	DEN	63	83.6	0	0	0	95.9	2.1	-5.3	0	0	0	0	0	-9.1
		623095.6	4767244.5	310.0	17636.8	0	DEN	125	91.7	0	0	0	95.9	7.2	1.1	0	0	0	0	0	-12.6
		623095.6	4767244.5	310.0	17636.8	0	DEN	250	98.7	0	0	0	95.9	18.4	-0.6	0	0	0	0	0	-15.0
		623095.6	4767244.5	310.0	17636.8	0	DEN	500	100.8	0	0	0	95.9	34.0	-1.6	0	0	0	0	0	-27.5
		623095.6	4767244.5	310.0	17636.8	0	DEN	1000	98.3	0	0	0	95.9	64.5	-1.6	0	0	0	0	0	-60.5
		623095.6	4767244.5	310.0	17636.8	0	DEN	2000	92.8	0	0	0	95.9	170.4	-1.6	0	0	0	0	0	-172.0
		623095.6	4767244.5	310.0	17636.8	0	DEN	4000	85.9	0	0	0	95.9	578.0	-1.6	0	0	0	0	0	-586.4
		623095.6	4767244.5	310.0	17636.8	0	DEN	8000	73.3	0	0	0	95.9	2061.4	-1.6	0	0	0	0	0	-2082.4
R11TO81a	T81	616342.8	4766967.0	309.0	17877.9	0	DEN	32	-39.4	0	0	0	96.0	0.6	-5.4	0	0	0	0	0	-130.7
		616342.8	4766967.0	309.0	17877.9	0	DEN	63	83.6	0	0	0	96.0	2.2	-5.4	0	0	0	0	0	-9.3
		616342.8	4766967.0	309.0	17877.9	0	DEN	125	91.7	0	0	0	96.0	7.3	1.1	0	0	0	0	0	-12.8
		616342.8	4766967.0	309.0	17877.9	0	DEN	250	98.7	0	0	0	96.0	18.7	-0.6	0	0	0	0	0	-15.4
		616342.8	4766967.0	309.0	17877.9	0	DEN	500	100.8	0	0	0	96.0	34.5	-1.6	0	0	0	0	0	-28.1
		616342.8	4766967.0	309.0	17877.9	0	DEN	1000	98.3	0	0	0	96.0	65.4	-1.6	0	0	0	0	0	-61.5
		616342.8	4766967.0	309.0	17877.9	0	DEN	2000	92.8	0	0	0	96.0	172.8	-1.6	0	0	0	0	0	-174.4
		616342.8	4766967.0	309.0	17877.9	0	DEN	4000	85.9	0	0	0	96.0	585.9	-1.6	0	0	0	0	0	-594.4
		616342.8	4766967.0	309.0	17877.9	0	DEN	8000	73.3	0	0	0	96.0	2089.6	-1.6	0	0	0	0	0	-2110.7
R11TO52	T52	614214.8	4766530.6	309.7	18149.3	0	DEN	32	-39.4	0	0	0	96.2	0.6	-5.4	0	0	0	0	0	-130.8
		614214.8	4766530.6	309.7	18149.3	0	DEN	63	83.6	0	0	0	96.2	2.2	-5.4	0	0	0	0	0	-9.4
		614214.8	4766530.6	309.7	18149.3	0	DEN	125	91.7	0	0	0	96.2	7.5	1.1	0	0	0	0	0	-13.0
		614214.8	4766530.6	309.7	18149.3	0	DEN	250	98.7	0	0	0	96.2	18.9	-0.6	0	0	0	0	0	-15.8
		614214.8	4766530.6	309.7	18149.3	0	DEN	500	100.8	0	0	0	96.2	35.0	-1.6	0	0	0	0	0	-28.8
		614214.8	4766530.6	309.7	18149.3	0	DEN	1000	98.3	0	0	0	96.2	66.4	-1.6	0	0	0	0	0	-62.7
		614214.8	4766530.6	309.7	18149.3	0	DEN	2000	92.8	0	0	0	96.2	175.4	-1.6	0	0	0	0	0	-177.2
		614214.8	4766530.6	309.7	18149.3	0	DEN	4000	85.9	0	0	0	96.2	594.8	-1.6	0	0	0	0	0	-603.4
		614214.8	4766530.6	309.7	18149.3	0	DEN	8000	73.3	0	0	0	96.2	2121.3	-1.6	0	0	0	0	0	-2142.6
R11TO55	T55	623610.3	4764393.4	304.0	14887.6	0	DEN	32	-39.4	0	0	0	94.5	0.5	-5.2	0	0	0	0	0	-129.1
		623610.3	4764393.4	304.0	14887.6	0	DEN	63	83.7	0	0	0	94.5	1.8	-5.2	0	0	0	0	0	-7.3
		623610.3	4764393.4	304.0	14887.6	0	DEN	125	92.0	0	0	0	94.5	6.1	1.1	0	0	0	0	0	-9.7
		623610.3	4764393.4	304.0	14887.6	0	DEN	250	96.1	0	0	0	94.5	15.5	-0.6	0	0	0	0	0	-13.3
		623610.3	4764393.4	304.0	14887.6	0	DEN	500	98.4	0	0	0	94.5	28.7	-1.6	0	0	0	0	0	-23.2
		623610.3	4764393.4	304.0	14887.6	0	DEN	1000	97.0	0	0	0	94.5	54.5	-1.6	0	0	0	0	0	-50.3
		623610.3	4764393.4	304.0	14887.6	0	DEN	2000	90.2	0	0	0	94.5	143.9	-1.6	0	0	0	0	0	-146.6
		623610.3	4764393.4	304.0	14887.6	0	DEN	4000	85.2	0	0	0	94.5	487.9	-1.6	0	0	0	0	0	-495.6
		623610.3	4764393.4	304.0	14887.6	0	DEN	8000	81.9	0	0	0	94.5	1740.1	-1.6	0	0	0	0	0	-1751.1
R11TO66	T66	619127.0	4768529.0	314.0	18904.2	0	DEN	32	-39.4	0	0	0	96.5	0.6	-5.4	0	0	0	0	0	-131.1
		619127.0	4768529.0	314.0	18904.2	0	DEN	63	83.6	0	0	0	96.5	2.3	-5.4	0	0	0	0	0	-9.8
		619127.0	4768529.0	314.0	18904.2	0	DEN	125	91.7	0	0	0	96.5	7.8	1.1	0	0	0	0	0	-13.7
		619127.0	4768529.0	314.0	18904.2	0	DEN	250	98.7	0	0	0	96.5	19.7	-0.6	0	0	0	0	0	-16.9
		619127.0	4768529.0	314.0	18904.2	0	DEN	500	100.8	0	0	0	96.5	36.4	-1.6	0	0	0	0	0	-30.6
		619127.0	4768529.0	314.0	18904.2	0	DEN	1000	98.3	0	0	0	96.5	69.1	-1.6	0	0	0	0	0	-65.8
		619127.0	4768529.0	314.0	18904.2	0	DEN	2000	92.8	0	0	0	96.5	182.7	-1.6	0	0	0	0	0	-184.8
		619127.0	4768529.0	314.0	18904.2	0	DEN	4000	85.9	0	0	0	96.5	619.5	-1.6	0	0	0	0	0	-628.5
		619127.0	4768529.0	314.0	18904.2	0	DEN	8000	73.3	0	0	0	96.5	2209.6	-1.6	0	0	0	0	0	-2231.2

R11TO27	T27	622534.5	4768708.0	314.0	19039.9	0	DEN	32	-39.4	0	0	0	96.6	0.6	-5.4	0	0	0	0	0	-131.2
		622534.5	4768708.0	314.0	19039.9	0	DEN	63	83.6	0	0	0	96.6	2.3	-5.4	0	0	0	0	0	-9.9
		622534.5	4768708.0	314.0	19039.9	0	DEN	125	91.7	0	0	0	96.6	7.8	1.1	0	0	0	0	0	-13.8
		622534.5	4768708.0	314.0	19039.9	0	DEN	250	98.7	0	0	0	96.6	19.9	-0.6	0	0	0	0	0	-17.1
		622534.5	4768708.0	314.0	19039.9	0	DEN	500	100.8	0	0	0	96.6	36.7	-1.6	0	0	0	0	0	-30.9
		622534.5	4768708.0	314.0	19039.9	0	DEN	1000	98.3	0	0	0	96.6	69.6	-1.6	0	0	0	0	0	-66.3
		622534.5	4768708.0	314.0	19039.9	0	DEN	2000	92.8	0	0	0	96.6	184.0	-1.6	0	0	0	0	0	-186.2
		622534.5	4768708.0	314.0	19039.9	0	DEN	4000	85.9	0	0	0	96.6	623.9	-1.6	0	0	0	0	0	-633.0
		622534.5	4768708.0	314.0	19039.9	0	DEN	8000	73.3	0	0	0	96.6	2225.4	-1.6	0	0	0	0	0	-2247.1
R11TO04	T04	627524.4	4767739.7	309.0	19137.2	0	DEN	32	-39.4	0	0	0	96.6	0.6	-5.4	0	0	0	0	0	-131.3
		627524.4	4767739.7	309.0	19137.2	0	DEN	63	83.6	0	0	0	96.6	2.3	-5.4	0	0	0	0	0	-10.0
		627524.4	4767739.7	309.0	19137.2	0	DEN	125	91.7	0	0	0	96.6	7.9	1.1	0	0	0	0	0	-13.9
		627524.4	4767739.7	309.0	19137.2	0	DEN	250	98.7	0	0	0	96.6	20.0	-0.6	0	0	0	0	0	-17.3
		627524.4	4767739.7	309.0	19137.2	0	DEN	500	100.8	0	0	0	96.6	36.9	-1.6	0	0	0	0	0	-31.1
		627524.4	4767739.7	309.0	19137.2	0	DEN	1000	98.3	0	0	0	96.6	70.0	-1.6	0	0	0	0	0	-66.7
		627524.4	4767739.7	309.0	19137.2	0	DEN	2000	92.8	0	0	0	96.6	184.9	-1.6	0	0	0	0	0	-187.2
		627524.4	4767739.7	309.0	19137.2	0	DEN	4000	85.9	0	0	0	96.6	627.1	-1.6	0	0	0	0	0	-636.2
		627524.4	4767739.7	309.0	19137.2	0	DEN	8000	73.3	0	0	0	96.6	2236.8	-1.6	0	0	0	0	0	-2258.5
R11TO94	T94	618752.1	4768764.2	314.0	19179.8	0	DEN	32	-39.4	0	0	0	96.7	0.6	-5.4	0	0	0	0	0	-131.3
		618752.1	4768764.2	314.0	19179.8	0	DEN	63	83.6	0	0	0	96.7	2.3	-5.4	0	0	0	0	0	-10.0
		618752.1	4768764.2	314.0	19179.8	0	DEN	125	91.7	0	0	0	96.7	7.9	1.1	0	0	0	0	0	-13.9
		618752.1	4768764.2	314.0	19179.8	0	DEN	250	98.7	0	0	0	96.7	20.0	-0.6	0	0	0	0	0	-17.3
		618752.1	4768764.2	314.0	19179.8	0	DEN	500	100.8	0	0	0	96.7	37.0	-1.6	0	0	0	0	0	-31.2
		618752.1	4768764.2	314.0	19179.8	0	DEN	1000	98.3	0	0	0	96.7	70.2	-1.6	0	0	0	0	0	-66.9
		618752.1	4768764.2	314.0	19179.8	0	DEN	2000	92.8	0	0	0	96.7	185.4	-1.6	0	0	0	0	0	-187.6
		618752.1	4768764.2	314.0	19179.8	0	DEN	4000	85.9	0	0	0	96.7	628.5	-1.6	0	0	0	0	0	-637.7
		618752.1	4768764.2	314.0	19179.8	0	DEN	8000	73.3	0	0	0	96.7	2241.8	-1.6	0	0	0	0	0	-2263.5
R11TO57	T57	624435.2	4768696.0	309.0	19267.9	0	DEN	32	-39.4	0	0	0	96.7	0.6	-5.4	0	0	0	0	0	-131.3
		624435.2	4768696.0	309.0	19267.9	0	DEN	63	83.6	0	0	0	96.7	2.3	-5.4	0	0	0	0	0	-10.0
		624435.2	4768696.0	309.0	19267.9	0	DEN	125	91.7	0	0	0	96.7	7.9	1.1	0	0	0	0	0	-14.0
		624435.2	4768696.0	309.0	19267.9	0	DEN	250	98.7	0	0	0	96.7	20.1	-0.6	0	0	0	0	0	-17.5
		624435.2	4768696.0	309.0	19267.9	0	DEN	500	100.8	0	0	0	96.7	37.1	-1.6	0	0	0	0	0	-31.4
		624435.2	4768696.0	309.0	19267.9	0	DEN	1000	98.3	0	0	0	96.7	70.5	-1.6	0	0	0	0	0	-67.3
		624435.2	4768696.0	309.0	19267.9	0	DEN	2000	92.8	0	0	0	96.7	186.2	-1.6	0	0	0	0	0	-188.5
		624435.2	4768696.0	309.0	19267.9	0	DEN	4000	85.9	0	0	0	96.7	631.4	-1.6	0	0	0	0	0	-640.6
		624435.2	4768696.0	309.0	19267.9	0	DEN	8000	73.3	0	0	0	96.7	2252.1	-1.6	0	0	0	0	0	-2273.8
R11TO58	T58	628473.0	4767629.0	309.0	19375.5	0	DEN	32	-39.4	0	0	0	96.7	0.6	-5.4	0	0	0	0	0	-131.4
		628473.0	4767629.0	309.0	19375.5	0	DEN	63	83.6	0	0	0	96.7	2.4	-5.4	0	0	0	0	0	-10.1
		628473.0	4767629.0	309.0	19375.5	0	DEN	125	91.7	0	0	0	96.7	8.0	1.1	0	0	0	0	0	-14.1
		628473.0	4767629.0	309.0	19375.5	0	DEN	250	98.7	0	0	0	96.7	20.2	-0.6	0	0	0	0	0	-17.6
		628473.0	4767629.0	309.0	19375.5	0	DEN	500	100.8	0	0	0	96.7	37.4	-1.6	0	0	0	0	0	-31.7
		628473.0	4767629.0	309.0	19375.5	0	DEN	1000	98.3	0	0	0	96.7	70.9	-1.6	0	0	0	0	0	-67.7
		628473.0	4767629.0	309.0	19375.5	0	DEN	2000	92.8	0	0	0	96.7	187.2	-1.6	0	0	0	0	0	-189.6
		628473.0	4767629.0	309.0	19375.5	0	DEN	4000	85.9	0	0	0	96.7	634.9	-1.6	0	0	0	0	0	-644.2
		628473.0	4767629.0	309.0	19375.5	0	DEN	8000	73.3	0	0	0	96.7	2264.6	-1.6	0	0	0	0	0	-2286.5

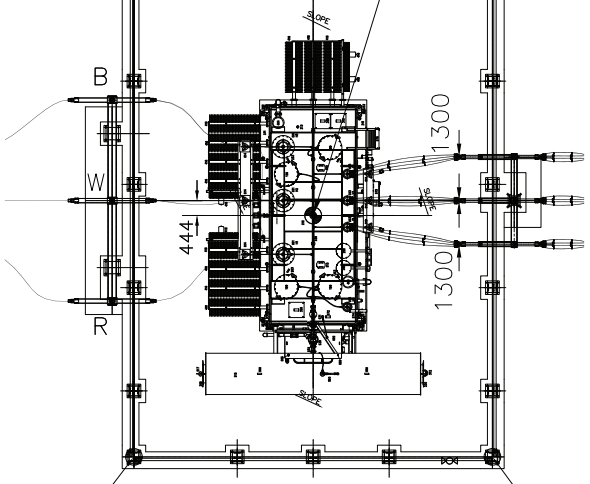
R11TO28	T28	622516.5	4769095.7	309.0	19425.1	0	DEN	32	-39.4	0	0	0	96.8	0.6	-5.4	0	0	0	0	0	-131.4
		622516.5	4769095.7	309.0	19425.1	0	DEN	63	83.6	0	0	0	96.8	2.4	-5.4	0	0	0	0	0	-10.1
		622516.5	4769095.7	309.0	19425.1	0	DEN	125	91.7	0	0	0	96.8	8.0	1.1	0	0	0	0	0	-14.1
		622516.5	4769095.7	309.0	19425.1	0	DEN	250	98.7	0	0	0	96.8	20.3	-0.6	0	0	0	0	0	-17.7
		622516.5	4769095.7	309.0	19425.1	0	DEN	500	100.8	0	0	0	96.8	37.4	-1.6	0	0	0	0	0	-31.8
		622516.5	4769095.7	309.0	19425.1	0	DEN	1000	98.3	0	0	0	96.8	71.1	-1.6	0	0	0	0	0	-67.9
		622516.5	4769095.7	309.0	19425.1	0	DEN	2000	92.8	0	0	0	96.8	187.7	-1.6	0	0	0	0	0	-190.1
		622516.5	4769095.7	309.0	19425.1	0	DEN	4000	85.9	0	0	0	96.8	636.6	-1.6	0	0	0	0	0	-645.8
		622516.5	4769095.7	309.0	19425.1	0	DEN	8000	73.3	0	0	0	96.8	2270.4	-1.6	0	0	0	0	0	-2292.3
R11TO85	T85	619135.8	4769107.8	314.0	19479.1	0	DEN	32	-39.4	0	0	0	96.8	0.6	-5.4	0	0	0	0	0	-131.4
		619135.8	4769107.8	314.0	19479.1	0	DEN	63	83.6	0	0	0	96.8	2.4	-5.4	0	0	0	0	0	-10.2
		619135.8	4769107.8	314.0	19479.1	0	DEN	125	91.7	0	0	0	96.8	8.0	1.1	0	0	0	0	0	-14.2
		619135.8	4769107.8	314.0	19479.1	0	DEN	250	98.7	0	0	0	96.8	20.3	-0.6	0	0	0	0	0	-17.8
		619135.8	4769107.8	314.0	19479.1	0	DEN	500	100.8	0	0	0	96.8	37.6	-1.6	0	0	0	0	0	-31.9
		619135.8	4769107.8	314.0	19479.1	0	DEN	1000	98.3	0	0	0	96.8	71.2	-1.6	0	0	0	0	0	-68.1
		619135.8	4769107.8	314.0	19479.1	0	DEN	2000	92.8	0	0	0	96.8	188.2	-1.6	0	0	0	0	0	-190.6
		619135.8	4769107.8	314.0	19479.1	0	DEN	4000	85.9	0	0	0	96.8	638.3	-1.6	0	0	0	0	0	-647.6
		619135.8	4769107.8	314.0	19479.1	0	DEN	8000	73.3	0	0	0	96.8	2276.8	-1.6	0	0	0	0	0	-2298.6
R11TO56	T56	626599.0	4768825.0	309.0	19885.2	0	DEN	32	-39.4	0	0	0	97.0	0.6	-5.4	0	0	0	0	0	-131.6
		626599.0	4768825.0	309.0	19885.2	0	DEN	63	83.6	0	0	0	97.0	2.4	-5.4	0	0	0	0	0	-10.4
		626599.0	4768825.0	309.0	19885.2	0	DEN	125	91.7	0	0	0	97.0	8.2	1.1	0	0	0	0	0	-14.5
		626599.0	4768825.0	309.0	19885.2	0	DEN	250	98.7	0	0	0	97.0	20.7	-0.7	0	0	0	0	0	-18.4
		626599.0	4768825.0	309.0	19885.2	0	DEN	500	100.8	0	0	0	97.0	38.3	-1.6	0	0	0	0	0	-32.9
		626599.0	4768825.0	309.0	19885.2	0	DEN	1000	98.3	0	0	0	97.0	72.7	-1.6	0	0	0	0	0	-69.8
		626599.0	4768825.0	309.0	19885.2	0	DEN	2000	92.8	0	0	0	97.0	192.2	-1.6	0	0	0	0	0	-194.7
		626599.0	4768825.0	309.0	19885.2	0	DEN	4000	85.9	0	0	0	97.0	651.6	-1.6	0	0	0	0	0	-661.1
		626599.0	4768825.0	309.0	19885.2	0	DEN	8000	73.3	0	0	0	97.0	2324.2	-1.6	0	0	0	0	0	-2346.3
R11TO53	T53	614455.8	4766402.4	309.0	17940.5	0	DEN	32	-39.4	0	0	0	96.1	0.6	-5.4	0	0	0	0	0	-130.7
		614455.8	4766402.4	309.0	17940.5	0	DEN	63	83.7	0	0	0	96.1	2.2	-5.4	0	0	0	0	0	-9.2
		614455.8	4766402.4	309.0	17940.5	0	DEN	125	92.0	0	0	0	96.1	7.4	1.1	0	0	0	0	0	-12.5
		614455.8	4766402.4	309.0	17940.5	0	DEN	250	96.1	0	0	0	96.1	18.7	-0.6	0	0	0	0	0	-18.1
		614455.8	4766402.4	309.0	17940.5	0	DEN	500	98.4	0	0	0	96.1	34.6	-1.6	0	0	0	0	0	-30.7
		614455.8	4766402.4	309.0	17940.5	0	DEN	1000	97.0	0	0	0	96.1	65.6	-1.6	0	0	0	0	0	-63.1
		614455.8	4766402.4	309.0	17940.5	0	DEN	2000	90.2	0	0	0	96.1	173.4	-1.6	0	0	0	0	0	-177.6
		614455.8	4766402.4	309.0	17940.5	0	DEN	4000	85.2	0	0	0	96.1	587.9	-1.6	0	0	0	0	0	-597.2
		614455.8	4766402.4	309.0	17940.5	0	DEN	8000	81.9	0	0	0	96.1	2096.9	-1.6	0	0	0	0	0	-2109.5
R11TO18	T18	630122.5	4766228.8	309.0	18825.1	0	DEN	32	-39.4	0	0	0	96.5	0.6	-5.4	0	0	0	0	0	-131.1
		630122.5	4766228.8	309.0	18825.1	0	DEN	63	83.7	0	0	0	96.5	2.3	-5.4	0	0	0	0	0	-9.7
		630122.5	4766228.8	309.0	18825.1	0	DEN	125	92.0	0	0	0	96.5	7.7	1.1	0	0	0	0	0	-13.3
		630122.5	4766228.8	309.0	18825.1	0	DEN	250	96.1	0	0	0	96.5	19.6	-0.6	0	0	0	0	0	-19.4
		630122.5	4766228.8	309.0	18825.1	0	DEN	500	98.4	0	0	0	96.5	36.3	-1.6	0	0	0	0	0	-32.8
		630122.5	4766228.8	309.0	18825.1	0	DEN	1000	97.0	0	0	0	96.5	68.9	-1.6	0	0	0	0	0	-66.7
		630122.5	4766228.8	309.0	18825.1	0	DEN	2000	90.2	0	0	0	96.5	181.9	-1.6	0	0	0	0	0	-186.6
		630122.5	4766228.8	309.0	18825.1	0	DEN	4000	85.2	0	0	0	96.5	616.9	-1.6	0	0	0	0	0	-626.6
		630122.5	4766228.8	309.0	18825.1	0	DEN	8000	81.9	0	0	0	96.5	2200.3	-1.6	0	0	0	0	0	-2213.3

TRANSFORMER BARRIER COORDINATES

COORDINATE ARE BASE ON ACAD
SURVEY DRAWING
E=621960.000
N=4761728.000

E=621952.906
N=4761722.650

E=621952.906
N=4761733.350

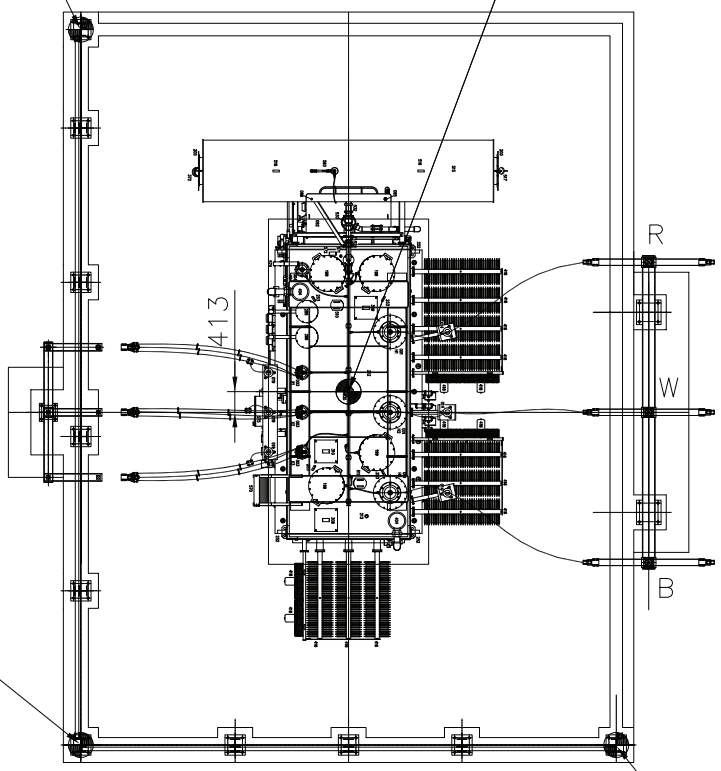


E=621967.206
N=4761722.650

E=621967.206
N=4761733.350

NORTH STATION

SCALE 1:200



SOUTH STATION

SCALE 1:150

1. Substation ST1 (100/133/166 ONAN/ONAF/ONAF MVA Transformer noise source modeled at a height of 3.7m with UTM Coordinates 621960, 4761728) will require a four sided barrier of 5 metres in height above grade. Barrier corner coordinates are:

Four sided barrier's 4 corner points are provided below

4 corners	Easting [m]	Northing [m]
Corner 1	621957	4761731
Corner 2	621957	4761723
Corner 3	621964	4761723
Corner 4	621964	4761732

2. Substation ST2 (100/133/166 ONAN/ONAF/ONAF MVA Transformer noise source modeled at a height of 3.7m with UTM Coordinates 622837, 4754679) will require a two sided barrier of 5 metres in height above grade. This barrier should be placed on south and west side of the transformer and extended at least 2 meters beyond the transformer such that noise flanking is negligible. Barrier corner coordinates are:

Two sided barrier's 3 corner points are provided below

3 corners	Easting [m]	Northing [m]
Corner 1	622832	4754687
Corner 2	622832	4754670
Corner 3	622842	4754671

Appendix G Response to Ministry of the Environment Technical Review Comments

G1 – Verification of Specific Noise Receptors
G2 – Supplemental Information to Address MOE Comments
G3 – Sound Power Level Rationale
G4 – Supplemental MOECC Receptor Verification Comments
G5 – REA Amendment (October, 2015) - Info. Request #1, #2 and #3

Appendix G1 – Verification of Specific Noise Receptors

During the Ministry of the Environment (MOE) Technical Review process and through correspondence received through the 60-day Environmental Bill of Rights (EBR) comment period for this Project, specific noise receptors were identified as requiring additional rationale to justify their location and / or classification in the noise model. These specific receptors were identified, reviewed and discussed with the MOE.

As appropriate, additional information was provided to the MOE to rationalize each of the noise receptors. Where amendments were required, the noise model and associated mapping was updated accordingly. The responses provided below summarize the result of discussions with the MOE.0

The following information provides a summary of the issues raised regarding specific noise receptors identified for this Project and the rationale and resulting actions taken to either support or amend the Noise Assessment Report (NAR). Copies of applicable correspondence with the MOE and others in regards to these items are attached:

Info Request 3: Eric Gillespie Letters

Concern:
Correspondence received from Mr. Eric Gillespie dated January 28, 2014 (see attached) indicated that at least 2 dwellings have been omitted from the maps in the NAR.

Response:
Stikeman Elliot, on behalf of NRWC, responded on January 31, 2014 (see attached) requesting further information about the location of potential noise receptors suggested to be missing from the Noise Assessment Report. A response was received from Mr. Gillespie dated February 11, 2014 (see attached) stating that at least two houses were omitted from the maps within the northeast portion of the Study Area, although the location of these dwellings was not provided citing a “lack of necessary equipment” and rationale for it being “impossible … to pinpoint the exact coordinates of these dwellings”.

Further attempts to contact Mr. Gillespie via email (February 12th and February 27th, 2014) (see attached) by Stikeman Elliot, as well as verbal discussions and phone messages, have not been successful and no further information has been provided as to the location of these omitted dwellings.

In the absence of further information, several supplemental reviews of the existing information were completed by Stantec to confirm the presence of any additional noise receptors within the Study Area.

Areas within the 40 dBA noise contour and the 550 m setback, which were determined to be the most sensitive area, were targeted for more detailed review. Aerial photographs, GIS parcels comparisons and information provided by the area municipalities with respect to new building permits or Planning Act approvals prior to the issuance of the draft site plan in August 2012 were reviewed. The results of this review identified no additional noise receptors within the 40 dBA contour or within 550m of a proposed turbine.

Further, 2 receptors were identified within 1.5 km of the proposed turbines that were not previously identified, including receptor O_4001 (described below under Info Request 6) and receptor V_4000, which is located on a vacant property along the west side of Caistor Gainsborough Rd. in the Township of West Lincoln.

The predicted noise level at receptor V_4000 is 36.5 dBA and the nearest turbine (T08) is located 928 m from this receptor. As discussed below, O_4001 is located 780 m from the closest turbine (T27) and the noise level at this receptor is 38.7 dBA. Both of these receptors are below the 40.0 dBA threshold and more than 550 m from the nearest turbine, and meet the requirements in accordance with O. Reg. 359/09.

Action:
Two new receptors have been added to the noise model and summarized in the NAR. There are no impacts on the location of the proposed turbines as a result of these new receptors as they comply with the setbacks and noise thresholds established in O. Reg. 359/09.

Info Request 4: Receptor 1750

Concern:
Concerns were raised by the landowner that the existing residence on the property was not identified as such in the NAR. The landowner noted that a dwelling exists on the property, which is part of an operational farm, and that the turbine is located closer to the dwelling than what is identified in the NAR.

Response:
Through site investigations, this property was initially identified as a commercial operation and it was determined to be unclear whether the structure in question was used as a residence or as part of the commercial operation. While commercial operations are exempt from assessment, this structure was conservatively identified as a point of reception (POR) and classified as V_1750 (i.e. “vacant or future, if not currently” considered a receptor) and included in the noise model.

Despite the conflict in naming convention, the POR representing this structure was placed at the exact location of this dwelling. The predicted noise level at this receptor is 39.7 dBA and the nearest turbine (T06) is located at 697 m from the receptor. As such, the minimum REA setback of 550m has been accommodated for this structure and the noise model demonstrates that the sound level was predicted to be less than 40.0 dBA.

See correspondence dated February 12, 2014 (attached).

Action:
Based on the supplemental information provided by the landowner, this receptor label has been amended from V_1750 to O_1750 to recognize the existing residential use on the property. There are no impacts to the Project since this receptor complies with the minimum setback and noise threshold requirements under O. Reg. 359/09.

Info Request 5: Receptor 3582 and 3583

Concern:
Concerns were raised by the landowner with respect to the placement of the receptors on the subject property. The landowner claimed that the existing barn, while not currently a dwelling, could be converted to a residential use and therefore should be recognized as a noise receptor. The landowner also claimed that they intend to build a new house on the subject property at a location different than where receptor V_3583 is located.

Response:
The subject property consists of two distinct parcels, one of which consists of an agricultural field and the other as a former rail line. Receptor V_3583 is located on the former rail line parcel, while V_3582 is identified on the property to the east where the existing barn is located. Both receptors are identified as vacant lot receptors as there are no dwellings constructed, or approved for construction, on the subject property.

The existing barn structure does not meet the definition of a noise receptor under O. Reg. 359/09, based on the size, shape and orientation of the structure and surrounding gravel parking area, construction equipment and outside storage containers. Further, the landowner and Township of West Lincoln have acknowledged that the structure is not currently used as a dwelling. In order to be converted to permit a residential use, the structure would have to be changed to comply with the Building Code and approved through the issuance of a building permit, which has not been completed to date (or prior to the issuance of the draft site plan).

The vacant lot receptor (V_3582) located on this parcel was located between the barn and the road, consistent with the pattern of the area (i.e. houses are typically located between the road and the barn, not behind) and in line with the existing dwelling to the east, in accordance with the MOE Noise Guidelines. It is also located in proximity to a second access to the property. While the landowner may claim to have future plans for a house elsewhere on the property, there is no rationale for this alternate location over others nor an approved building permit or planning approvals for this work (as confirmed by the landowner).

In the absence of a building permit confirming the location of an approved dwelling prior to issuance of the draft site plan, the location of Receptor 3582 reflects a location where a building would “reasonably” be expected to be located, having regard to the existing zoning by-laws and the typical building pattern of lots in the area, in accordance with the requirements of O. Reg. 359/09 and MOE Noise Guidelines.

Further, the location of Turbine T93 complies with all applicable property line and waterbody setback distances defined under O. Reg. 359/09, as illustrated in the supporting REA technical reports under separate cover. See correspondence dated February 12, 2014 (attached).
See correspondence dated February 13, 2014, April 17, 2014, April 23, 2014 and May 9, 2014 (attached).

Action:
No amendments to the NAR or no revision of model are required. Confirmation of the information summarized above and included in the attached correspondence has been requested through a *Freedom of Information Act* request to the Township of West Lincoln. This

request is being process at the time of the preparation of this report, and once available, this will be provided to the MOE.

Info Request 6: Receptors 735, 794, 1762, 582, 674 and 148

V_735 – Regional Road 65, West Lincoln

Concern:
Concern was raised that this lot was incorrectly identified as a vacant property.

Response:
During the site investigations, this property was identified as a potential commercial property and it was determined to be unclear whether the structure in question was used as a residence or as part of the commercial operation. While commercial operations are exempt from assessment, this structure was conservatively identified as a point of reception (POR) and classified as V_735 (i.e. "vacant or future, if not currently" considered a receptor) and included in the noise model.

Despite the conflict in naming convention, the POR representing this structure was placed at the exact location of this dwelling. The predicted noise level at this receptor is 36.9 dBA and the nearest turbine (T54) is located at 920 m from the receptor. As such, the minimum REA setback of 550m has been accommodated for this structure and the noise model demonstrates that the sound level was predicted to be less than 40.0 dBA. See correspondence dated March 6, 2014 (attached).

Action:
Based on the supplemental information provided by the landowner, this receptor label has been amended from V_735 to O_735 to recognize the existing residential use on the property. There are no impacts to the Project since this receptor complies with the minimum setback and noise threshold requirements under O. Reg. 359/09.

V_794 – Regional Road 65, West Lincoln

Concern:
Concern was raised that this lot was incorrectly identified as a vacant property.

Response:
Based on our review of the current aerial photography, field verification during the initial development of the noise model to identify POR's, and review of building permits prior to issuance of the draft site plan, this property is a correctly identified as a vacant property. There is no existing dwelling on this property and no dwelling was approved prior to the issuance of the draft site plan. Receptor V_794 was appropriately located on the subject property within the noise model. See correspondence dated March 6, 2014 (attached).

Action:
No change to the noise model is required.

V_1762 – Concession Road 4, West Lincoln

Concern:
Concern was raised that this lot was incorrectly identified as a vacant property.

Response:
The subject property is located at the intersection of 2 unopened road allowances - Concession 4 (running east-west along the south side of the property) and Dengo Road (running north-south along 2 the east side of the property. The property is also entirely comprised of significant woodland and wetland with no open areas. There is no existing dwelling on the subject property. However, a vacant lot receptor was conservatively identified in the noise model for the subject property.

It is possible that questions arising regarding the location of V_1762 may be in regards to its location relative to a potential dwelling located on the property to the north. While this adjacent property is represented in the noise model by receptor O_1758, a second structure is visible at the south of the property closer to V_1762.

Through air photo interpretation, this second structure could be a dwelling; however verification of this structure was not possible through the physical verification process due to property access and isolation of the property. It appears to be accessible only from a private road that extends from Dengo Rd. at the north of the property and is not visible from a municipal right of way.
While not identified in the noise model, this structure was recognized during the development of the project layout and the appropriate receptor setback and noise threshold were maintained. This structure is located 780 m from the closest turbine (T27) and the noise level at this receptor is 38.7 dBA, which is below the 40.0 dBA threshold. See correspondence dated March 6, 2014 (attached).

Action:
No change is required to the location of V_1762. However, in recognition of the information provided through the EBR and upon further review of the aerial photography, an additional receptor (O_4001) has been added to the noise model to reflect the location of the apparent dwelling and the NAR has been updated accordingly.

O_148 – Concession 4 Road, West Lincoln

Concern:
Concerns were raised as to the proximity of this receptor to the closest proposed turbine, which was suggested to be Turbine T08.

Response:
This receptor is correctly positioned on an existing dwelling that fronts onto Concession 4. Turbine T81 is correctly identified as the closest turbine to receptor O_148 at a distance of approximately 1,180 m. Turbine T08 is not even the second closest turbine to this receptor, as Turbines T52 and T53 are closer. Turbine T08 is located approximately 2,806 m from receptor O_148. See correspondence dated March 6, 2014 (attached).

Action:
No change is required to the NAR tables.

O_582 and O_674 – Elcho Road, West Lincoln

Concern:
Concerns were raised as to the proximity of this receptor to the closest proposed turbine, which was suggested to be Turbine T08.

Response:
The location of receptor O_582 and O_674 are correctly positioned on exiting dwellings fronting onto Elcho Rd. The closest turbine to these receptors is confirmed to be Turbine T07, which is located 612 m and 558 m away, respectively. See correspondence dated March 6, 2014 (attached).

Action:
No changes are required to the NAR tables.

Info Request 7: Alleged Receptor between Receptors 1481 and 1598

Concern:
Concern was raised that an occupied home between receptors 1481 and 1598 is that is not shown on the maps or included in the NAR reports as a receptor.

Response:
Upon further reviewing the aerial photographs, property mapping and site photographs of the various structures along this stretch of Regional Rd. 20, all parcels between Receptors 1481 and 1598 are represented by a noise receptor and there are no “occupied homes” that have been missed in the noise model.
See correspondence dated March 13, 2014 (attached).

Action:
No changes to the noise model or NAR are required.

EKG ERIC K. GILLESPIE PROFESSIONAL CORPORATION
BARRISTERS & SOLICITORS

Eric K. Gillespie, LL.B.
Direct Tel: 416.703.6362
Email: egillespie@gillespielaw.ca

FACSIMILE TRANSMISSION

TO	FIRM	FACSIMILE NO.
President	Niagara Region Wind Corporation	416-314-8452

From: ERIC K. GILLESPIE

Firm: ERIC K. GILLESPIE PROFESSIONAL CORPORATION

Date: January 28, 2014

Re: **Niagara Region Wind Farm – Unidentified Noise Receptors**
Our File No.: **00717**

PAGES (including cover sheet): 2
If you do not receive all pages, please phone Sarah Quildon at (416) 703-5400

MESSAGE: **Our letter dated January 28, 2014**

EKG ERIC K. GILLESPIE PROFESSIONAL CORPORATION
BARRISTERS & SOLICITORS

Eric K. Gillespie, LL.B.
Direct Tel: 416.703.6362
Email: egillespie@gillespielaw.ca

January 28, 2014

By Post

President
Niagara Region Wind Corporation
277 Lakeshore Road East, Suite 211
Oakville, Ontario
L6J 6J3

Dear Sir or Madam:

Re: Niagara Region Wind Farm – Unidentified Noise Receptors
Our File No. 00717

We have been retained by individuals concerned with the improper identification of noise receptors in the Niagara Region Wind Farm (the "Project") as required under the Guidelines for Renewable Energy Approval Applications and under Ontario Regulation 359/09. Specifically the maps made publically available for the Project do not include at least two noise receptors that were in existence long prior to the publication of the Notice of Draft Site Plan and as such as considered dwellings for the purposes of the Renewable Energy Approval Application. As a result it is impossible to properly calculate the required noise levels and setback distances for these dwellings and for the Project as a whole.

We look forward to your prompt response to these concerns.

Yours truly,

ERIC K. GILLESPIE
PROFESSIONAL CORPORATION

Eric K. Gillespie
EKG/ga

cc Sarah Raetsen, Senior Program Support Coordinator, Ministry of the Environment, Fax: 416-314-8452

STIKEMAN ELLIOTT

Stikeman Elliott LLP Barristers & Solicitors

5300 Commerce Court West, 199 Bay Street, Toronto, Canada M5L 1B9
Tel: (416) 869-5500 Fax: (416) 947-0866 www.stikeman.com

Direct: (416) 869-5257
Fax: (416) 947-0866
E-mail: pduffy@stikeman.com

BY E-MAIL
(egillespie@gillespielaw.ca)

January 31, 2014
File No.: 130367-1001

Mr. Eric Gillespie
Eric K. Gillespie Professional Corporation
Barristers and Solicitors
10 King Street East, Suite 600
Toronto, ON M5C 1C3

Dear Sirs/Mesdames:

Re: Niagara Region Wind Farm – Unidentified Noise Receptors

We are the solicitors for Niagara Region Wind Corporation ("**NRWC**") and write with respect to your letter of January 28, 2014. Your letter provides insufficient information for NRWC to address the concerns your clients have raised. Please provide us with further information about the potential noise receptors that you believe qualify as dwellings for the purposes of Regulation 359/09. At a minimum, we require municipal addresses for each of the potential receptors. Any additional information you could provide about the potential receptors (i.e. a description of the dwelling, photographs, etc.) would also be helpful.

We ask that you provide the requested information as soon as possible so that NRWC can respond to these concerns in a timely manner.

Yours truly,

Patrick Duffy

PD/il

c.c.: Jim Harbell, *Stikeman Elliott LLP*
Sarah Raetsen, *Ministry of Environment, (via fax (416) 314-8452)*

EKG ERIC K. GILLESPIE PROFESSIONAL CORPORATION
BARRISTERS & SOLICITORS

Eric K. Gillespie, LL.B.
Direct Tel: 416.703.6362
Email: egillespie@gillespielaw.ca

February 11, 2014

By Facsimile

Sarah Raetsen
Senior Program Support Coordinator
Environmental Approvals Branch, Ministry of the Environment
2 St. Clair Avenue West, Floor 12 A
Toronto, Ontario M4V 1L5
Fax: (416) 314-8452

Dear Ms. Raetsen:

Re: Niagara Region Wind Farm – Unidentified Noise Receptors
Our File No. 00717

Thank you for your letter of January 29, 2014. Our clients are aware of at least two houses located within the block bounded by Regional Road 69 to the north, Regional Road 24/Victoria Avenue to the east, and Regional Road 20 to the west and south in the West Lincoln area that have been omitted from the maps made publicly available and, presumably, submitted to the Ministry as part of Niagara Region Wind Corporation's Renewable Energy Approval application package. These dwellings were in existence for a number of years prior to the beginning of this project and, as a result, there does not appear to be any reason why they should have been omitted from the maps. Not having the necessary equipment, it is impossible for our clients to pinpoint the exact coordinates of these dwellings. However, we look forward to hearing from you regarding Niagara Region Wind Corporation's response to these omissions and the results of their review of the project's receptor location maps.

Yours truly,

ERIC K. GILLESPIE
PROFESSIONAL CORPORATION

Eric K. Gillespie
EKG/ga

Powell, Chris

From: Patrick Duffy <PDuffy@stikeman.com>
Sent: Thursday, February 27, 2014 12:39 PM
To: 'egillespie@gillespielaw.ca'
Cc: Jim Harbell
Subject: RE: NRWC re Unidentified Noise Receptors
Attachments: NRWC - Letter to Gilespie re Unidentified Noise Receptors (Dated Jan 31,....pdf

Eric – Further to my emails below, please get back to us as soon as possible with details of the potential noise receptors referenced in your letter of January 28.

Patrick Duffy
Tel : (416) 869-5257
pduffy@stikeman.com

From: Patrick Duffy
Sent: Wednesday, February 12, 2014 12:38 PM
To: 'egillespie@gillespielaw.ca'
Cc: Jim Harbell
Subject: RE: NRWC re Unidentified Noise Receptors

Eric - I appreciate you have a few other things going on this week, but can you get back to us on the attached letter as soon as possible. If there is someone else in our office we should be dealing with on this matter, just let me know. Thanks.

Patrick Duffy
Tel : (416) 869-5257
pduffy@stikeman.com

From: Ivy C Lee **On Behalf Of** Patrick Duffy
Sent: Friday, January 31, 2014 2:57 PM
To: 'egillespie@gillespielaw.ca'
Cc: Jim Harbell; Patrick Duffy
Subject: NRWC re Unidentified Noise Receptors

Dear Mr. Gillespie,

Please see attached.

Regards,
Ivy

Ivy Lee
Legal Administrative Assistant to Patrick Duffy
Tel : (416) 869-5569
ilee@stikeman.com

Powell, Chris

From: Powell, Chris
Sent: Thursday, March 06, 2014 1:45 PM
To: Miller, Denton (ENE)
Cc: Raetsen, Sarah (ENE); Darren Croghan; Leggett, Al; Patrick Duffy
Subject: RE: NWCF Info Request - 3b MOE ref file # 1175-972NB9

Denton,

To my knowledge, there has been no response to the letter sent to Mr. Gellespie's office regarding this issue dated January 31, 2014. However, I will follow-up with NRWC to confirm if any further contact has been made with / received from Mr. Gillespie's office and will advise you as soon as possible with an update.

Sincerely,

Chris

Chris Powell, M.A.
Project Manager, Environmental Planner
Associate, Environmental Services
Stantec Consulting Ltd.

Office: (519) 585-7416
Cell: (519) 501-2368
chris.powell@stantec.com

From: Miller, Denton (ENE) [Denton.Miller@ontario.ca]
Sent: March 6, 2014 12:58 PM
To: Powell, Chris
Cc: Raetsen, Sarah (ENE)
Subject: RE: NWCF Info Request - 3b MOE ref file # 1175-972NB9

Hello Chris

Did you receive a response from Eric Gillespie re our Jan 30, 2014 e-mail info request 3 to your office ?

Attached is a letter that EAB received from Eric Gillespie addressing the same issue .

Regards
Denton Miller
416-314-8310

From: Powell, Chris [mailto:Chris.Powell@stantec.com]
Sent: January 31, 2014 3:39 PM
To: Raetsen, Sarah (ENE); Miller, Denton (ENE)
Cc: Leggett, Al; 'mervcroghan@nrwc.ca'; 'darrenc@nrwc.ca'; 'sberriman@nrwc.ca'; 'pduffy@stikeman.com'; 'JHarbell@stikeman.com'
Subject: Fw: Niagara Region Wind Farm Information request - 3 MOE ref file # 1175-972NB9

Sarah / Denton,

In regards to the letter from Mr. Gillespie, NRWC has followed up with his firm to seek clarification on the location of the referenced noise receptors (see attached).

We will keep you informed of any response and once confirmed, will advise of the outcome.

Chris

Chris Powell, M.A.
Project Manager
Environmental Planner
Stantec
Cell: (519) 501-2368

Sent from my Blackberry

From: Patrick Duffy [mailto:PDuffy@stikeman.com]
Sent: Friday, January 31, 2014 02:56 PM
To: 'egillespie@gillespielaw.ca' <egillespie@gillespielaw.ca>
Cc: Jim Harbell <JHarbell@stikeman.com>; Patrick Duffy <PDuffy@stikeman.com>
Subject: NRWC re Unidentified Noise Receptors

Dear Mr. Gillespie,

Please see attached.

Regards,
Ivy

Ivy Lee
Legal Administrative Assistant to Patrick Duffy
Tel : (416) 869-5569
ilee@stikeman.com

Appendix G2 – Supplemental Information to Address MOE Comments

During the Ministry of the Environment (MOE) Technical Review process and through correspondence received through the 60-day Environmental Bill of Rights (EBR) comment period for this Project, additional information was requested by the MOE to complete their technical review of the NAR.

The following information provides a summary of the additional information requested by the MOE for this Project and the corresponding response from the project team. Copies of applicable correspondence with the MOE and others in regards to these items are attached:

Munich Higher Regional Court's Decision

Concern:
MOE requested comments from Enercon on the following court decision identified via an EBR comment:

> The Munich Higher Regional Court's decision pertinent to impulsive sound from Enercon E-82 wind turbines in a wind farm located in Rennertshofen in the district of Neuburg-Schrobenhausen. Judgment OLG München 14.08.2012

Response:
The following comments were provided by Enercon, the manufacturer of the E-82 turbine, in response to MOE's request for information on this issue:

> The article referenced is in regard to a claim and subsequent ruling which has been made against Enercon regarding the impulsivity of E-82 turbines in one of its wind parks near Munich, Germany. Enercon is in full disagreement with the ruling and are launching a full appeal against the region.
>
> In response, as per the official comments from Enercon GmbH made on this issue:
>
> > "for us, this ruling is completely incomprehensible", says Felix Rehwald, Spokesperson for Europe's largest wind turbine manufacturer Enercon.
>
> He continues to comment that Enercon manufactures, sells and guarantees its turbines worldwide against tonality (in accordance with the IEC standards) and furthermore that Enercon's own specialists in sound power have yet to yield any measurements which would indicate impulsivity of the turbines and as such, Enercon is launching counter-proceedings in the way of an appeal against the ruling.
>
> The court case in Germany is not related to the NRWC project from a technical and environmental permitting perspective. See correspondence dated April 16, 2014 (attached).

Action:
The noise model has been completed in accordance with the sound power level information provided by Enercon, as supported by Kotter. No adjustments are required.

Rosa Flora Turbine

Concern:
The source data for the Rosa Flora turbine described in the NAR and as identified in the supporting Cadna files provided to the MOE reference different sound power levels for this existing turbine.

Response:
The Rosa Flora turbine is a 0.65 MW (650 kW) turbine located approximately 3,500 m from the nearest NRWC turbine. The maximum sound power level for this turbine as used in the noise model is 103.5 dBA, as noted in Section 3.3 (page 3.9). This is further confirmed in the sample calculation and Cadna/A input/outputs table provided in Appendix E of the NAR and in the adjusted emission level for the Rosa Flora turbine identified in Table F1 of Appendix F of the NAR. This value was rounded to 104 dBA in Table 3.8 of the NAR.

Further, the version of the Cadna file that was provided to the MOE as part of the technical review process consisted a lower number. The correct version of this file representing the 103.5 dBA sound pressure level, as used in the noise model for this Project, was provided to the MOE. See correspondence dated April 16, 2014 (attached).

Action:
To avoid confusion, Table 3.8 has been amended to illustrate a maximum sound power level of 103.5 dBA, as used in the noise model for this individual turbine. No changes to the tables in Appendix C, E or F of the NAR are required.

Powell, Chris

From: Miller, Denton (ENE) <Denton.Miller@ontario.ca>
Sent: Thursday, February 13, 2014 10:40 AM
To: Powell, Chris
Cc: Raetsen, Sarah (ENE)
Subject: RE: NRWF Information request - 4 MOE ref file # 1175-972NB9

Hello Chris

We are satisfied with your explanation.

NRWC will be required to update the current noise study (or submit an amendment) addressing the noted oversights in the September 2013 noise study.

Regards

DM

From: Powell, Chris [mailto:Chris.Powell@stantec.com]
Sent: February 10, 2014 2:57 PM
To: Miller, Denton (ENE)
Cc: Raetsen, Sarah (ENE); Ganesh, Kana; Leggett, Al; Darren Croghan; Merv Croghan; Shiloh Berriman (sberriman@nrwc.ca)
Subject: RE: NRWF Information request - 4 MOE ref file # 1175-972NB9

Denton,

We have looked into this request and offer the following rationale for the identification of this receptor as identified in the Noise Assessment Report:

During the initial development of the noise model, and identification of receptors (POR's), our field crews reviewed each of the potential POR's to confirm and verify the appropriate classification of these structures. Based on their site investigations, our field crew identified this particular property as "potentially commercial" due to several exhaust fans and dust collector style structures within the property. The following are two photographs of the subject property, with Receptor 1750 visible in both photos (behind trees in photo 1, more visible in photo 2):

Photo 1:

Photo 2:

The guidelines for wind farms suggest the following:

For the purpose of approval of new sources, including verifying compliance with section 9 of the Environmental Protection Act, the Point of Reception may be located on any of the following existing or zoned for future use premises: permanent or seasonal residences, hotels/motels, nursing/retirement homes, rental residences,

hospitals, camp grounds, and noise sensitive buildings such as schools and places of worship. A point of receptor is defined as a sensitive land use.

Typically, commercial properties are exempted from assessment, however, it was not possible to verify whether this structure was in fact commercial or supporting a residential use. Therefore, we conservatively identified this structure as a receptor (1750). Our initial thought was to identify this structure as "Other", but later decided to have a "V_" suffix applied to this structure to mean "vacant or future, if not currently" considered a receptor.

Despite the conflict in naming convention, the POR representing this structure was placed at the exact location as the current location of this house. The predicted noise level at this POR is 39.7 dBA and the nearest turbine (T06) is located at 697 m from the receptor. As such, the minimum REA setback of 550m has been accommodated for this structure and the model demonstrates that the sound level was predicted to be less than 40.0 dBA

We trust that this clarifies the question from the public and for your consideration during the technical review process.

If you have any further questions, please do not hesitate to ask.

Sincerely,

Chris

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Monday, February 03, 2014 11:02 AM
To: Powell, Chris
Cc: Raetsen, Sarah (ENE)
Subject: RE: NRWF Information request - 4 MOE ref file # 1175-972NB9

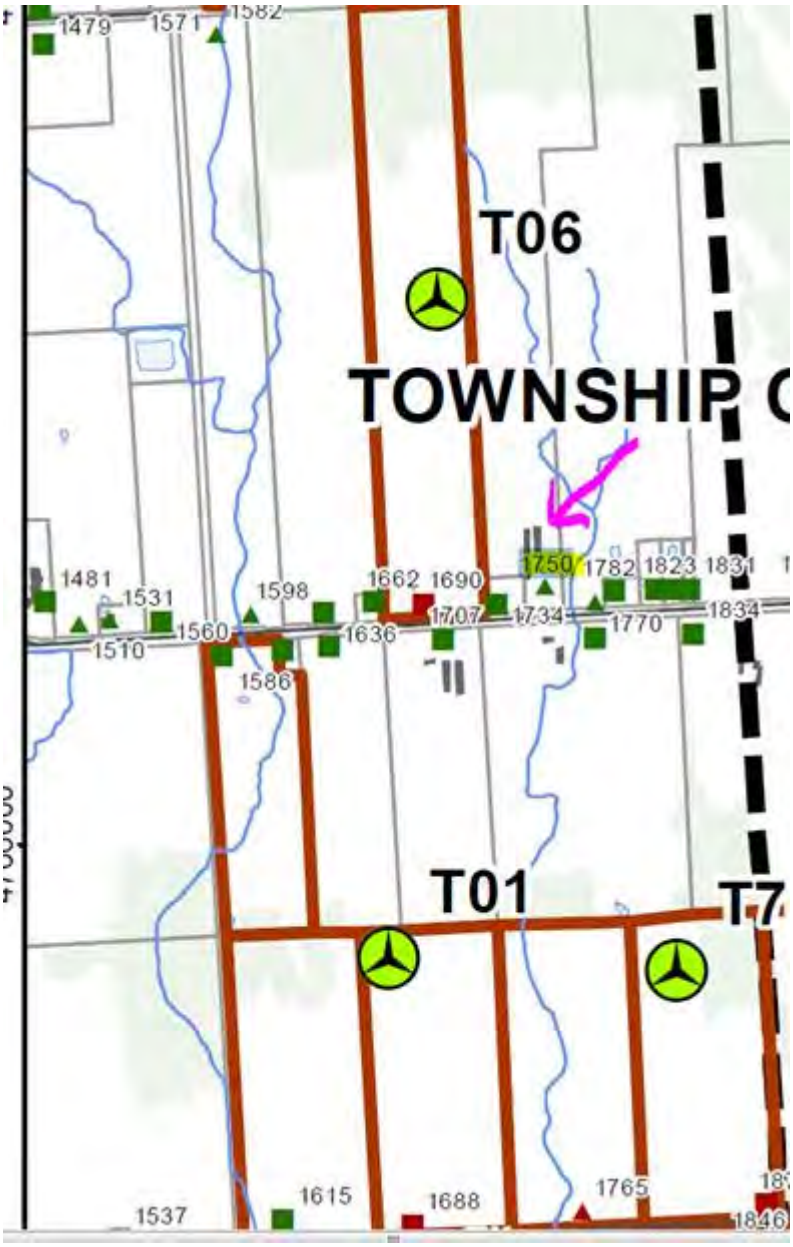
Hi Chris

We have been approached by the owner of the lot that contains V_1750 (re: your Sept 30 , 2013 noise report). He has made the following assertion:

> I am the OPERATIONAL FARM that has been in business since 1958 and I am marked as VACANT and the turbine is much closer than what NRWC has submitted.

The following is additional information about V_1750 as noted in the Sept 30 , 2013 noise report .

Receiver ID	Night	Height	Coordinates		
			X	Y	Z
	(dBA)	(m)	(m)	(m)	(m)
V_1750	39.7	4.5	623,336.69	4,766,590.11	189.5



Please provide rationale why this receptor was deemed to be a vacant lot.

Regards
Denton Miller
416-314-8310

Powell, Chris

From: Powell, Chris
Sent: Thursday, February 13, 2014 2:16 PM
To: 'Miller, Denton (ENE)'
Cc: Raetsen, Sarah (ENE); Leggett, Al; Darren Croghan
Subject: RE: NRWC info request -5 Letter dated Jan 22, 2014 Receptor 3583
Attachments: Attachment 1 - Subject Properties.jpg; Attachment 2 - Aerial of Barn Building.jpg; Attachment 3 - BarnBldgNearT93.jpg

Denton,

The property on which receptor V_3583 is located is a former rail line, which extends from Concession 4 to Silver Street. This property is a separate parcel from the one immediately to the east where the barn is located (see Attachment 1). These properties may be under common ownership, however remain as two distinct parcels. As such, we have identified two distinct receptors on these parcels (V_3583 and V_3582), both fronting onto Concession 4. V_3583 is located on the former rail line parcel, while V_3582 is identified on the property to the east where the barn is located.

For the purpose of approval of new sources, including verifying compliance with section 9 of the Environmental Protection Act, the Point of Reception may be located on any of the following existing or zoned for future use premises:

- permanent or seasonal residences;
- hotels/motels;
- nursing/retirement homes;
- rental residences;
- hospitals;
- camp grounds; and
- noise sensitive buildings such as schools and places of worship.

The existing barn does not satisfy any of these criteria.

This barn was reviewed by our field staff when verifying the presence and location of Points of Reception for this project. During their surveys, the following observations were made specific to the barn:

1. The size of the building is larger than a 'typical house' (see Attachment 2 - aerial imagery);
2. The shape of the building resembles that of a barn and not of a dwelling (see Attachment 3 – building photograph);
3. The orientation of the building was perpendicular to Concession 4, while houses typically (but not always) face the road; and
4. The building is also surrounded on all sides by gravel, construction equipment and outside storage containers, which are atypical of a residential use (see Attachment 3 – building photograph).

Based on these observations, we concluded this building could be a barn or a similar structure and does not meet the criteria for a residential dwelling.

Correspondence received from this landowner between September 2012 and February 2013, after issuance of the draft site plan, confirmed that there was no dwelling on the property but they intended to build a dwelling on the property in the future. As part of our due diligence in preparing the draft site plan, we consulted in advance with the Township to confirm whether any building permits had been issued for this property, and others in the Project study area. It was confirmed that no building permit was issued by the Township of West Lincoln for a residence or residential use on the subject property prior to the issuance of the draft site plan in August 2012.

The future potential conversion of a barn is not considered as a residential use or structure, and this barn structure did not contain an existing residential use at the time the draft site plan was issued. As noted by this landowner in the information attached to your email, "there is no dwelling on the property", and while the Township has informed this landowner that the upper floor could be converted to a residential use, it would require "changes … to comply with the building code".

Vacant Lots are defined as receptors that have been zoned by the local municipality to permit residential or similar noise-sensitive uses. The receptor location, if unknown at the time of the proposal (i.e. no building permit issued for construction), shall be based on a 1 hectare (10,000 m²) building envelope within the vacant lot property that would reasonably be expected to contain the use, and that conforms with the municipal zoning by-laws in effect. The specific receptor location for assessment purposes should be assumed to be 4.5 m above grade and:

1. consistent with the typical building pattern in the area, or
2. at the centre of the 1 hectare building envelope.

Since there is a barn on the property (and no existing receiver), vacant lot receptor V_3582 is located between the barn and the road consistent with the pattern of the area, and in line with the existing dwelling to the east. It is not typical to have receivers behind a barn in the entire study area.

Therefore, while this landowner may not agree with the location of the vacant lot receptor on the subject property, it has been identified and appropriately located in accordance with the requirements of O. Reg. 359/09.

We trust that this supports the Noise Assessment Report and clarifies any questions you may have in this regard. If you have any further questions, please do not hesitate to ask.

Sincerely,

Chris

Chris Powell, M.A.
Project Manager, Environmental Planner
Stantec
49 Frederick Street Kitchener ON N2H 6M7
Phone: (519) 585-7416
Cell: (519) 501-2368
Fax: (519) 579-6733
Chris.Powell@stantec.com

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Thursday, February 13, 2014 8:28 AM
To: Powell, Chris
Cc: Raetsen, Sarah (ENE); Leggett, Al; Darren Croghan
Subject: RE: NRWC info request -5 Letter dated Jan 22, 2014 Receptor 3583

Hello Chris

Further to my previous E-mail (info request -5) of Wednesday, February 12, 2014 1:57 PM , please also consider the following set back distance issues noted in the following excerpt from an e-mail I received yesterday from the owner of the lot identified with the vacant lot receptor ID 3583.

Thank You

Regards
Denton Miller
416-314-8310

From: XXXXX
Sent: February 12, 2014 8:28 PM
To: Miller, Denton (ENE)
Subject: Re: FW: Re: Letter dated Jan 22, 2014 XXXXXXX

Hello Mr. Miller

My property is the one with the number 3583 under the green triangle, immediately west of the property where T 93 is proposed. The western property line (the gray diagonal line) is a former railroad right-of-way. Our property is 32.61 acres, zoned A 2 agricultural, with provision for one private residence. I do not know what the green triangle on the right-of-way represents. Does it refer to our barn? The barn is 66 meters (216 feet) from the front property line and 23 meters (75 feet) from the west side property line.

XXXXXXXX

The green square 542, is a privately owned natural gas pumping station that is not currently pumping. XXXXXXXXX

T93 is less than 70 meters from the property line and approximately 440 meters (1445 feet) from the site of our proposed house. The future house location was set in 2005 and all the infrastructure on the property was built to suit our choice of house site. There is a raised filter bed for the septic system for the barn which is fully plumbed and drained. The building has natural gas which supplies the boiler for the in-floor radiant heating and the furnace to heat the upper floor.

Due to the septic bed location and the gas line location, it is impossible to build a house where NRWC says we should build it. There is a driveway, installed in 2005, that is 50 feet from the property line. Do I build the house on the driveway? How do I get to the barn? As you can see, not one clear thinking person has even physically looked at our property.

Putting a rural home 15 meters from a gravel road is absurd for a family that is trying to escape the noise and congestion of Mississauga. Not one home built in the last few years in West Lincoln on a property one acre or more, has been built 15 m (50 ft) from the road.

Between the two driveways, there are berms installed that slope away from the roadway to allow for drainage for the fruit and nut trees we intend to plant there. The slope drains into a swale that empties into the watercourse that runs along the eastern side of the property.

If you view aerial photos of the property, you can clearly see how we have prepared the property to accommodate a house that will be at least 320 feet from the road.

I have provided all this information to show that the building of the house was to be the culmination of a well thought out plan that predates the Green Energy Act., the Niagara Region Wind Corporation and this industrial Wind Turbine Proposal.

Our plan allowed for a sustainable and enhanced use of this property to keep employing the land for agricultural purposes while also having an energy efficient residence.

If there are any further questions or if you need more information, do not hesitate to contact me.

With Thanks

XXXXXXXXX

Regards
Denton Miller
416-314-8310

From: Powell, Chris [mailto:Chris.Powell@stantec.com]
Sent: February 12, 2014 2:51 PM
To: Miller, Denton (ENE)
Cc: Raetsen, Sarah (ENE); Leggett, Al; Darren Croghan
Subject: RE: NRWC info request -5 Letter dated Jan 22, 2014 Receptor 3583

Denton,

We are familiar with these two properties and consulted with this landowner during the REA process. We will prepare a response to this comment and send it to you shortly.

Chris

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Wednesday, February 12, 2014 1:57 PM
To: Powell, Chris
Cc: Raetsen, Sarah (ENE)
Subject: NRWC info request -5 Letter dated Jan 22, 2014 Receptor 3583

Hello Chris

We have been approached by the owner of the lot that contains vacant lot receptor 3583 (re: your Sept 30 , 2013 noise report; see diagram below). He has made the following assertion:

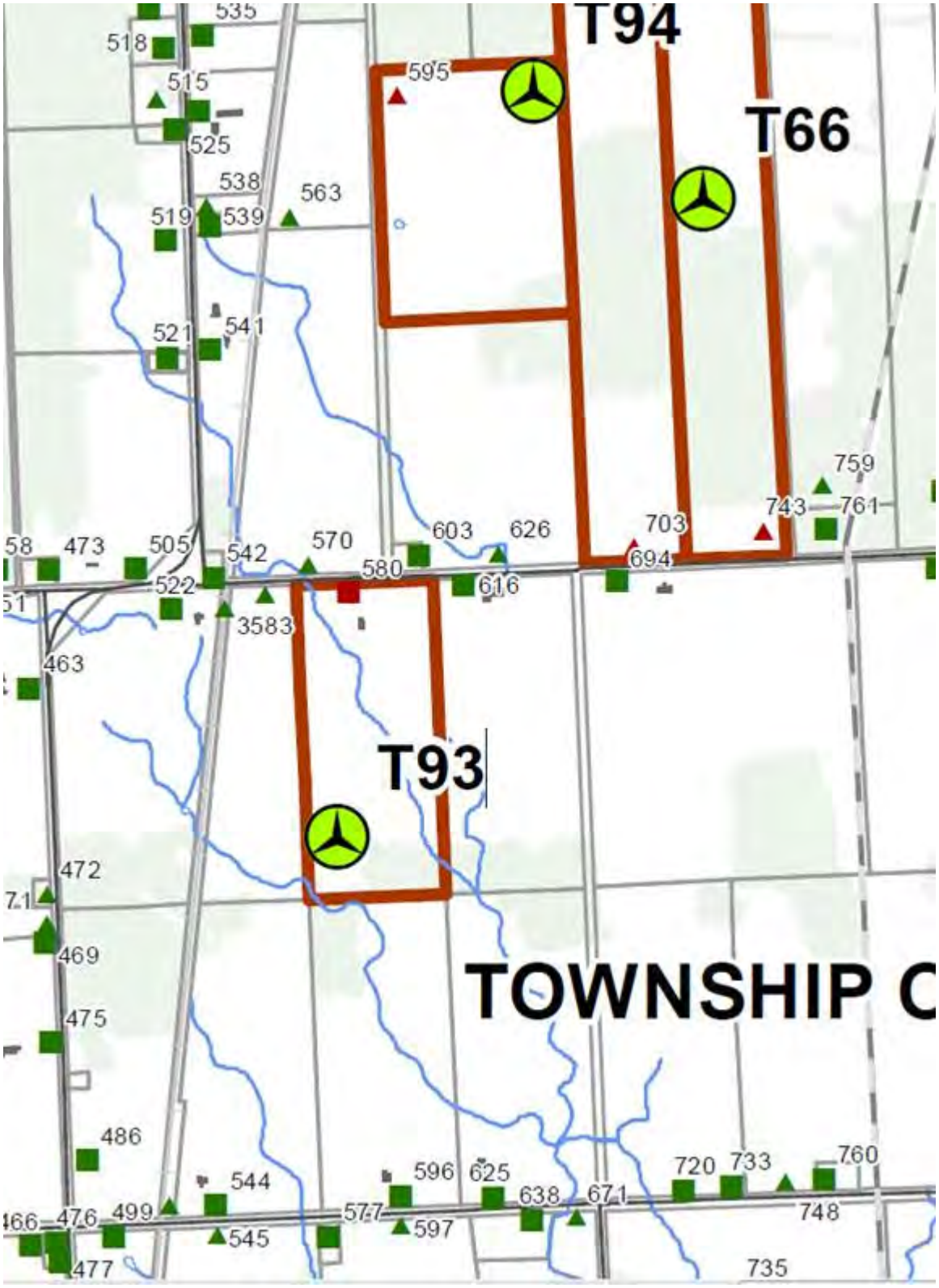
> There is currently no dwelling on the property, although there is a new barn. The Township of West Lincoln now says can have the upper floor used as a dwelling, provided that changes are made to comply with the building code. The center of the existing building, erected in 2007 is 513 meters from the proposed turbine {T 93}. This building was built by us long before there was an NRWC.
>
> All of the infrastructure on this property was placed there by us after taking possession on January 15, 2004.

Please refer to the attached document for a detailed description of all the noise issues identified by the owner of the lot and provide EAB with a response.

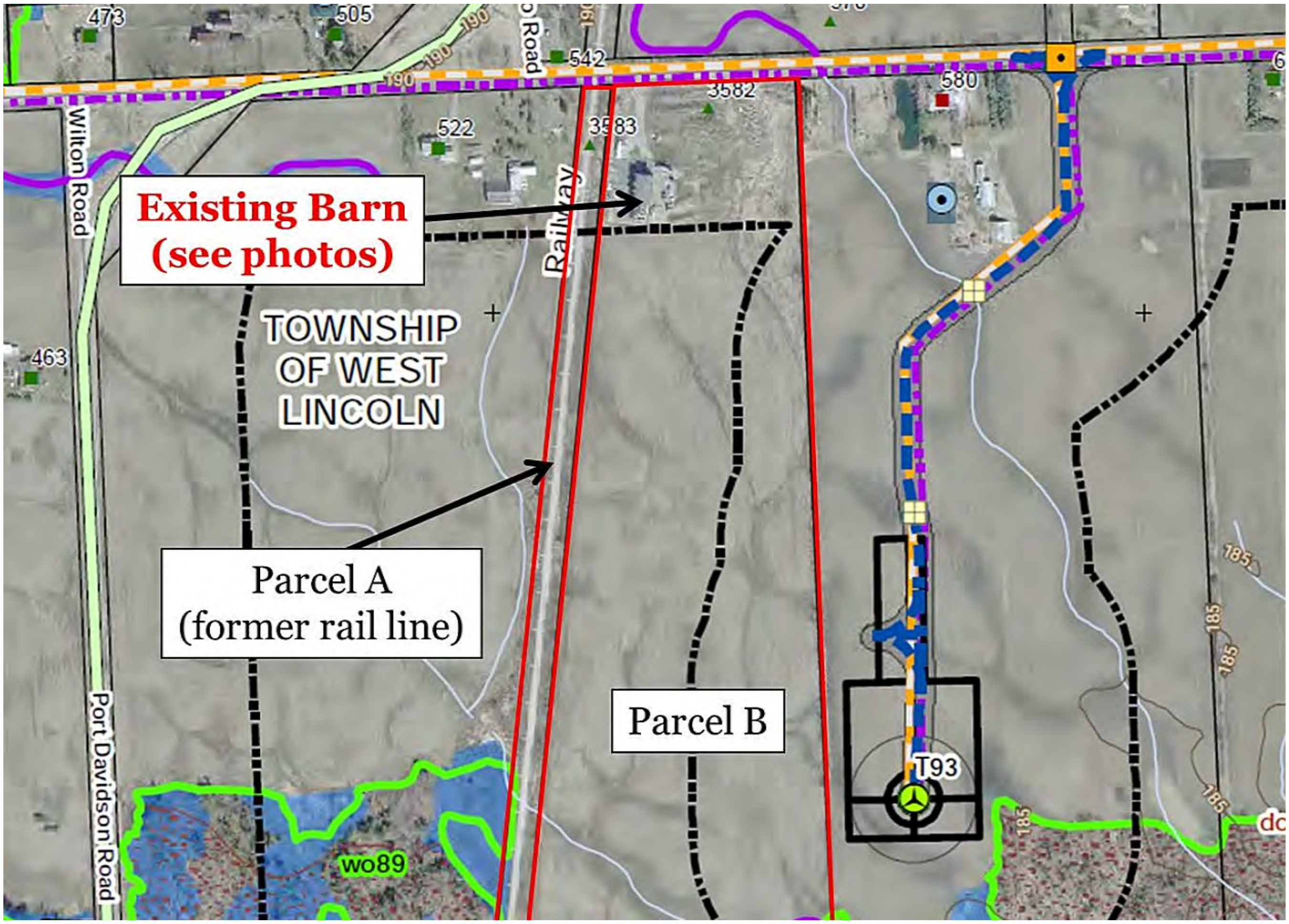
Your response should also address the definition of dwelling as defined Ontario Regulation 359/09 and how it applies to the existing barn on the subject property.

Thank You

DM


T94
T66
T93
TOWNSHIP C
595
525
538
563
519
539
521
541
759
743
761
703
694
603
626
58
473
505
542
570
580
616
522
3583
463
472
469
475
486
544
596
625
720
733
760
638
671
748
499
577
597
545
735
477

Denton Miller | Senior Review Engineer | Team 5 | Environmental Approvals Branch I Ministry of the Environment
2 St. Clair Ave W. 12a Floor Toronto, Ontario, M4V 1L5 | Phone: 416-314-8310 | Denton.Miller@ontario.ca|



Existing Barn
(see photos)
TOWNSHIP
OF WEST
LINCOLN
Parcel A
(former rail line)
Parcel B
Railway
Wilton Road
Port Davidson Road
T93
wo89
473
505
542
522
3583
3582
580
463
185
190


16
Concession Road 4 W
© 2012 Google
Image © 2013 GeoEye
Google earth

Powell, Chris

From: Powell, Chris
Sent: Thursday, April 17, 2014 4:43 PM
To: Denton.Miller@ontario.ca; Raetsen, Sarah (ENE)
Cc: Darren Croghan; Merv Croghan; Shiloh Berriman (sberriman@nrwc.ca); Leggett, Al (Al.Leggett@stantec.com); Ganesh, Kana
Subject: FW: Building Permit in West Lincoln - (RE: NRWC info request -5 Letter dated Jan 22, 2014 Receptor 3583)
Attachments: let_FOI_for_6374_Conc_4_West_Lincoln_2014_03_20.pdf; 2 - Twp - FOI Update_ 04apr14.pdf; 3 - Janzen Google Streetview - June 2012.pdf; 4 - MOE - 5a - Receptor 3583_12feb14.pdf

Importance: High

Denton / Barbara,

Further to our call on April 9, 2014, the purpose of this email is to follow up on the status of our Freedom of Information Act (FOI) and to provide additional information with respect to the setbacks and receptor location identified for the subject property. Previous responses to this string of emails were provided to the MOE on February 13, March 20 and March 27, 2014 and should be read in conjunction with the following information.

Freedom of Information Act Request

A copy of the Freedom of Information Act (FOI) request sent to the Township on March 25, 2014 is attached. Also attached is the response we received from the Township of West Lincoln with respect to our FOI request for the building permit for 6374 Concession Road 4, West Lincoln (i.e. property west of T93). This response indicates that they may not be able to respond to our request within the timeframe allotted by the MOE, and beyond that will be subject to potential further delays awaiting confirmation from the landowner who will be provided the opportunity to object to the release of the requested information in accordance with the Freedom of Information Act. To date, we have not received the requested information from the Township in this regard.

As soon as a copy of the building permit information is available, we will forward it to your attention. However, based on the FOI process currently underway with the Township, it may not be possible to provide the MOE with a copy of the building permit by the requested deadline of April 17, 2014.

Existing Barn Structure

Stantec, on behalf of NRWC, has undertaken to clarify that the existing structure on the subject property is not a dwelling, and was not a dwelling at the time of crystallization (August 2012). We have incorporated observations of current site conditions into the identification of noise receptors, have corresponded with the landowner during the REA consultation process, and have discussed this specific property with Township staff. We have also provided supporting information to the MOE during the review for completeness and further during the technical review process, all of which suggests that the existing structure is not a dwelling, including comments received from the landowner (per your email dated February 12, 2014) confirming that "there is currently no dwelling on the property , although there is a new barn" (see attached).

While we currently do not have a copy of the building permit issued for the construction of the barn, we have requested this information from the Township and will continue to follow up with them to obtain this information. We have discussed this issue on several occasions with Brian Treble from the Township of West Lincoln who has verbally confirmed that the existing structure is not permitted for a residential use and would be subject to further building permits and approvals in order to convert this structure to permit a residential use.

No evidence has been presented by the landowner confirming that the existing barn structure is in fact a dwelling, and by identifying a desire to construct a dwelling elsewhere on the property suggests his intent is not to use the existing structure as a dwelling. While their long term plans may be to establish a residential structure on the subject property, either utilizing the existing structure or constructing a new dwelling on the property, to our knowledge no building permits have been issued permitting a residential structure on the subject property, or permitting use of the existing structure as a dwelling. This will be confirmed through the Township of West Lincoln FOI request.

Location of Receptor 3583

For the purposes of defining the location of a noise receptor on vacant land, the applicant must specify the position on the lot where a building would reasonably be expected to be located, having regard to the existing zoning by-laws and the typical building pattern of lots in the area (MOE, 2012). Rationale for the location of Receptor 3583 was discussed in our email dated February 13, 2014.

Further to that email, questions have been raised as to the existence of a second driveway entrance to the property and its influence on determining the location of a vacant lot receptor on the subject property. We acknowledge that a secondary entrance to the property existed at the time the draft site plan was issued, as illustrated in the attached photograph (dated June 2012), however there is no evidence that a gravel driveway existed prior to the issuance of the draft site plan for this Project (August 2012). The location of Receptor 3583 is in proximity to this secondary entrance, which could accommodate a proposed future dwelling subject to the issuance of Building Permit.

While there is evidence of grading on the subject property, as visible in the available aerial photography, there is no obvious building location evident based on the information available. While the landowner may have future plans for a house on the property to be located 320 feet (97.5m) from the front of the property, there is no rationale for this location over others nor approved building permits (as confirmed by the landowner) that would support this location.

Furthermore, we suggest that the existence of Turbine T93 would not preclude the landowner from building a house at this location at some point in the future. While minimum setbacks apply for turbines being proposed in proximity to existing and/or approved dwellings, similar setbacks do not apply for proposed dwellings in proximity to existing and/or approved turbine locations. As such, the location of T93 would not preclude construction of a house on the subject property.

The test of an applicant for determining what is "reasonable" in terms of the location of a vacant lot receptor is not based on the future plans of a landowner but rather documentation approved by a municipality to justify the proposed location, such as an approved Building Permit, Site Plan or Planning Act approval. Taking into account all existing property entrances, driveways or farm access lanes when siting vacant lot receptors would be unreasonable.

In the absence of a building permit confirming the location of an approved dwelling prior to issuance of the draft site plan, the location of Receptor 3583 reflects a location where a building would reasonably be expected to be located, having regard to the existing zoning by-laws and the typical building pattern of lots in the area.

Summary

We trust that this update will address your concerns in regards to Receptor 3583 pending resolution of the FOI request currently in front of the Township of West Lincoln.

Please do not hesitate to give me a call on my cell phone if you have any questions or would like to discuss this further.

Sincerely,

Chris

Chris Powell, M.A.
Project Manager, Environmental Planner
Stantec
49 Frederick Street Kitchener ON N2H 6M7
Phone: (519) 585-7416
Cell: (519) 501-2368
Fax: (519) 579-6733
Chris.Powell@stantec.com

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Thursday, April 03, 2014 3:12 PM
To: Slattery, Barbara (ENE); Kossowski, Julia
Cc: Powell, Chris; Raetsen, Sarah (ENE)
Subject: RE: Building Permit in West Lincoln,

Hi Julia

Could you please provide this information by April 17, 2014.

Thank you

Regards
Denton Miller
416-314-8310

From: Slattery, Barbara (ENE)
Sent: April 3, 2014 3:04 PM
To: Kossowski, Julia (Julia.Kossowski@stantec.com)
Cc: Chris.Powell@stantec.com; Miller, Denton (ENE)
Subject: Building Permit in West Lincoln,
Importance: High

Julia, I was wondering whether you have obtained a copy of the building and septic system permits for the property in question in West Lincoln to enable the completion of our review of the circumstances for Receptor 3583?

49 Frederick St.
Kitchener, ON
N2H 6M7

March 24, 2014
File: 160950269

Attention: Ms. Carolyn Langley, Clerk
Township of West Lincoln, Clerk's Department
318 Canborough St, PO Box 400
Smithville, ON
L0R 2A0

Dear Ms. Langley,

Reference: Freedom of Information Request –Approvals re: 6374 Concession Road 4

On behalf of the Niagara Region Wind Corporation, I would like to submit this request for access to records under the Freedom of Information and Protection of Privacy Act. Specifically, I would like to request a copy of any land use approvals, building permits, building permit applications and supporting documentation relating to existing and/or proposed structures or land uses on the property located at 6374 Concession Road 4, in the Township of West Lincoln.

More specifically, we are requesting any and all building permits, building permit applications and supporting documentation for the following:

- Existing barn, believed to have been issued in 2006 (or after 2004). Specifically, any documentation that confirms the intended and/or approved use of the existing structure;
- Renewal of the 2006 building permit, believed to have been issued in 2007 (or after 2004);
- Any existing / proposed septic beds, including size, date of approval, construction date, etc.;
- Any entrance driveway, including size, date of approval, construction date, etc.; and
- Any other structures or land uses relating to the subject property since 2004.

A figure illustrating the location of the subject property is attached.

Please find enclosed a personal cheque for $5 for the cost of this request. The documentation would be preferred to be received via email, if possible, or alternatively by regular mail. Please contact me at the number below if you require further information.

Regards,

Stantec Consulting Ltd.

Julia Kossowski, P.Eng.
Project Manager - Power
Phone: 519 569 4338
Julia.kossowski@stantec.com

c. Darren Croghan, NRWC, Chris Powell, Stantec

jk m:\01609\active\160950269\planning\correspondence\municipalities\west lincoln\let_foi_for_6374_conc_4_west_lincoln_2014_03_20.docx

618000

Concession 4

Wilton Road

Port Davidson Road

TOWNSHIP OF WEST LINCOLN

Railway

Port Davidson Road

6374 CONCESSION 4:
PT LT 5 CON 4 GAINSBOROUGH
PT 2 30R9578; WEST LINCOLN

N

0 60 120 m

1:4,000

4767000

618000

V:\01609\Active\160950269\planning\drawing\mxd\20140224_MOE_Receptor_Queries\160950269_Fig_01_Site_Plan_V_3582.mxd
Revised: 2014-03-21 by kaswabel

March 2014
160950269

Stantec

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2013.
3. Orthoimagery © First Base Solutions, 2010.

Legend

Property Boundary

Existing Features

Road

Abandoned Railway

Watercourse (MNR)

Property Boundary

Client/Project

Niagara Region Wind Corporation

1

PRELIMINARY

6374 Concession 4

Powell, Chris

From: Kossowski, Julia
Sent: Friday, April 04, 2014 5:31 PM
To: Powell, Chris; Leggett, Al
Subject: Fw: FOI Request for building permit information

Chris. See email below. Please forward to Darren and MOE if you feel it necessary.

Julia

From: Carolyn Langley [mailto:clangley@westlincoln.ca]
Sent: Friday, April 04, 2014 03:16 PM Mountain Standard Time
To: Kossowski, Julia
Cc: Brian Treble <btreble@westlincoln.ca>
Subject: RE: FOI Request for building permit information

Dear Julia:

Thank you for your email.

I have been gathering information in order to respond to your FOI request. I am sorry but I cannot confirm if I will be able to meet your April 15th deadline as I am still reviewing the information. Also, I must advise you that if my decision is to release the documents to you that you have requested, I will have to notify the owner of the property who will have the opportunity to appeal my decision which may further delay the provision of documentation to you.

With respect to releasing the documents to the MOE, please be advised that, in this instance, the MOE would be required to follow the same FOI request procedure that you are following.

Carolyn Langley, Clerk
Township of West Lincoln
318 Canborough Street
P.O. Box 400
Smithville, Ontario.
L0R 2A0
Tel: (905) 957-3346 ext. 6720
Fax: (905) 957-3219

From: Kossowski, Julia [mailto:Julia.Kossowski@stantec.com]
Sent: April-04-14 9:29 AM
To: Carolyn Langley; Brian Treble
Cc: Powell, Chris
Subject: FOI Request for building permit information

Good Morning Brian and Carolyn,

I am just following up on my FOI request submitted last week for 6374 Concession Road 4. This information has been requested so that we can respond to questions from the Ministry of Environment. The MOE has now

placed a deadline for us to submit the information by April 15th. Would it be possible for you to provide us with the information before this date? Alternatively, did you have any luck acquiring approval from your lawyers to provide the information directly to the MOE?

Regards,
Julia

Julia Kossowski, P. Eng.
Project Manager - Power
Stantec
49 Frederick Street
Kitchener ON N2H 6M7
Ph: (519) 569-4338
Fx: (519) 579-4239
Cell: (226) 989-5259
julia.kossowski@stantec.com

Secondary Entrance at 6374 Concession Road 4, West Lincoln (Source: Google Streetview, Photo Taken June 2012)

Powell, Chris

From: Miller, Denton (ENE) <Denton.Miller@ontario.ca>
Sent: Wednesday, February 12, 2014 1:57 PM
To: Powell, Chris
Cc: Raetsen, Sarah (ENE)
Subject: NRWC info request -5 Letter dated Jan 22, 2014 Receptor 3583
Attachments: EBR Comment re por 3583.docx

Hello Chris

We have been approached by the owner of the lot that contains vacant lot receptor 3583 (re: your Sept 30 , 2013 noise report; see diagram below). He has made the following assertion:

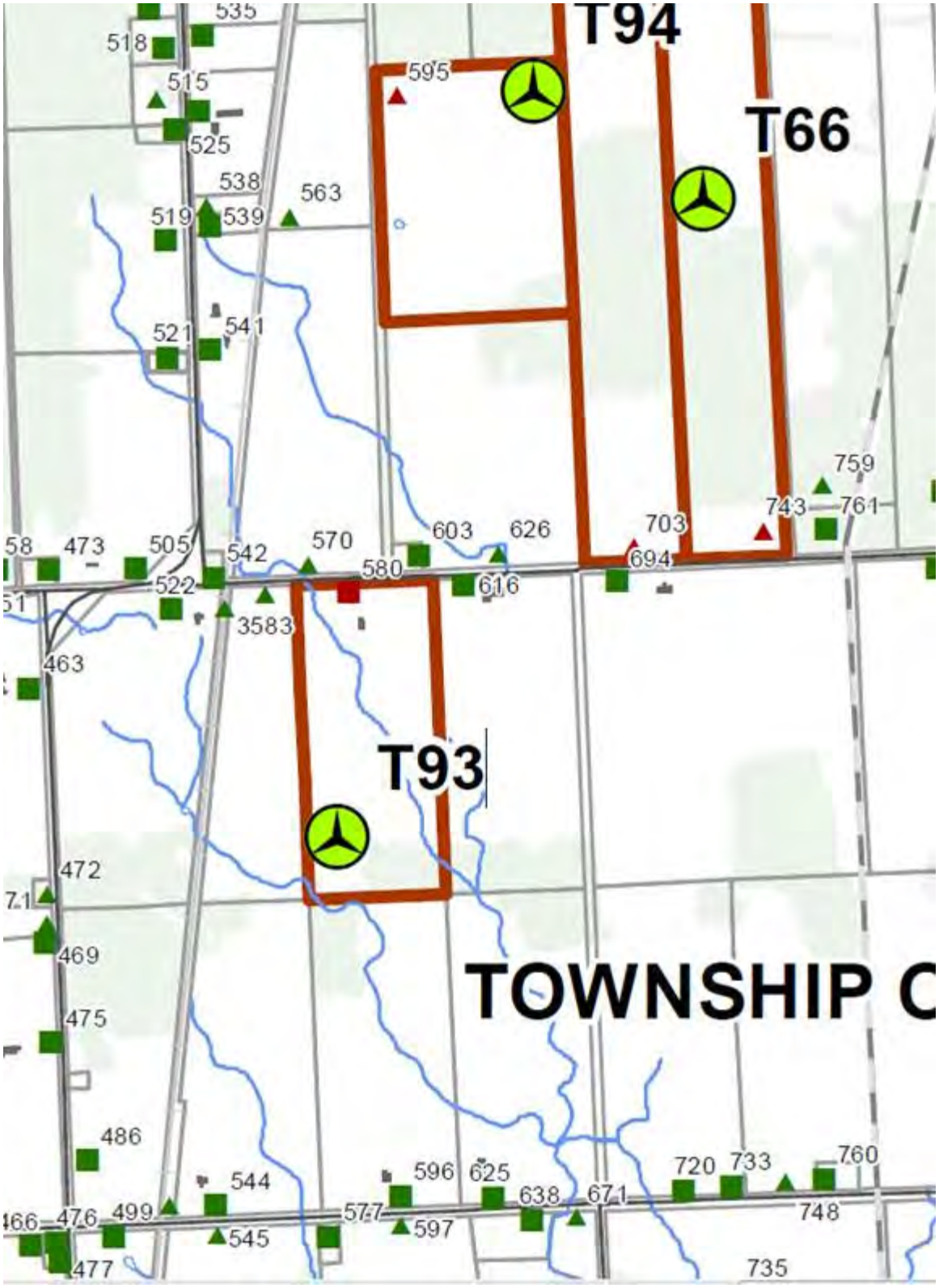
> There is currently no dwelling on the property, although there is a new barn. The Township of West Lincoln now says can have the upper floor used as a dwelling, provided that changes are made to comply with the building code. The center of the existing building, erected in 2007 is 513 meters from the proposed turbine {T 93}. This building was built by us long before there was an NRWC.
>
> All of the infrastructure on this property was placed there by us after taking possession on January 15, 2004.

Please refer to the attached document for a detailed description of all the noise issues identified by the owner of the lot and provide EAB with a response.

Your response should also address the definition of dwelling as defined Ontario Regulation 359/09 and how it applies to the existing barn on the subject property.

Thank You

DM



Denton Miller | Senior Review Engineer | Team 5 | Environmental Approvals Branch I Ministry of the Environment
2 St. Clair Ave W. 12a Floor Toronto, Ontario, M4V 1L5 | Phone: 416-314-8310 | Denton.Miller@ontario.ca|

Powell, Chris

From: Powell, Chris
Sent: Thursday, March 06, 2014 12:08 PM
To: Denton.Miller@ontario.ca
Cc: Raetsen, Sarah (ENE); Leggett, Al; Ganesh, Kana; Darren Croghan
Subject: RE: NRWC Info Request 6 MOE ref file # 1175-972NB9
Attachments: Attachments 1 to 4.pdf; Photo 1 - 5648 Regional Road 65.PNG; Photo 2 - V794 Property.jpg

Denton,

In response to your email below, our GIS and noise leads have reviewed the receptor and turbine information contained in the REA reports to generate a response to the EBR suggestions about the accuracy of individual noise receptors. The following information is provided in regards to receptors V_735, V_794 and V_1762:

1. **V_735** – Property: 5648 Regional Road 65 (Silver Street in MNR data and Bismark Road in Niagara Explorer), West Lincoln (see Attachment 1).

   During the initial development of the noise model, and identification of receptors (POR's), our field crews reviewed each of the potential POR's to confirm and verify the appropriate classification of existing structures. Based on their site investigations, our field crew identified this particular property as "potentially commercial – similar to a nursery" due to the presence of similar structures within the property. The location of the receptor is correct, however, the designation could be revised. Regardless, this residence is located 920 m from the closest turbine (T54) and the noise level at this receptor is 36.9 dBA, which is below the 40.0 dBA threshold. A photograph of the subject property is attached for reference (see Photo 1).

   Action: The designation of this existing structure will be revised from "vacant" to "existing" in order to reflect the existing dwelling.

2. **V_794** – Property: No specific mailing address exists for this property, which is located on Regional Road 65 (Silver Street in MNR data and Bismark Road in Niagara Explorer), West Lincoln – east of V_735 discussed above (see Attachment 1).

   Based on our review of the current aerial photography, field verification during the initial development of the noise model to identify POR's, and review of building permits prior to issuance of the draft site plan, this property is a vacant property. Based on our information, there is no existing dwelling on this property (see Photo 2) and no dwelling was approved prior to the issuance of the draft site plan. As such, a vacant lot receptor (V_794) was appropriately located on the subject property within the noise model. The existing dwelling to the east of receptor V_794 is located on a separate parcel of land and represented by receptor O_3887. Both receptors comply with the minimum distance from a turbine and the noise threshold.

   Action: Additional information regarding the alleged location of an existing dwelling on the subject property is requested, if available. Otherwise, our information confirms that there is no existing dwelling on the subject property and no approved dwelling prior to the issuance of the draft site plan.

3. **V_1762** – Property: No specific mailing address exists for this property, which is located on Concession Road 4, West Lincoln (see Attachment 2).

   The subject property is located at the intersection of 2 unopened road allowances - Concession 4 (running east-west along the south side of the property) and Dengo Road (running north-south along

the east side of the property. The property is also entirely comprised of significant woodland and wetland with no open areas. There is no existing dwelling on the subject property, however, a vacant lot receptor was identified for the purposes of the noise model.

It is possible that questions arising regarding the location of V_1762 may be in regards to its location relative to a potential dwelling located on the property to the north (2090 Dengo Road, West Lincoln). This property is represented in the noise model by receptor O_1758 (2090 Dengo Road, West Lincoln coordinate 623376.46; 623376.46), which is located at the north of the property adjacent to the open portion of Dengo Rd.

Through air photo interpretation, a second structure is also located at the south of this property (i.e. closer to V_1762 but on the adjacent parcel)(see Attachment 2). This second structure could be a dwelling, however verification of this structure was not possible through the physical verification process due to property access and isolation of the property. It appears to be accessible only from a private road that extends from the end of the opened section of Dengo Rd. at the north of the property and is not visible from a municipal right of way.

Nonetheless, this structure was recognized during the development of the noise model and project layout. While not confirmed as a receptor in the noise model, our noise team ensured that it remained outside of the appropriate setbacks and below the noise threshold. As a result, this structure is located 780 m from the closest turbine (T27) and the noise level at this receptor is 38.7 dBA, which is below the 40.0 dBA threshold.

Action: We defer to the MOE as to how to address this potential second noise receptor on the property (i.e. shift location O_1958, or add an additional receptor to the model). In terms of V_1762, our information confirms that there is no existing dwelling on that property or no approved dwelling prior to the issuance of the draft site plan.

The following information is provided in regards to the closest turbine to receptors O_148, O_582 and O_674:

4. **O_148** – Property 7057 Concession 4 Road, West Lincoln (see Attachment 3).

   This receptor is correctly positioned on an existing dwelling that fronts onto Concession 4. As illustrated on Attachment 3, Turbine T81 is correctly identified as the closest turbine to receptor O_148 (distance = approx. 1,180 m). Despite the EBR comments below, Turbine T08 is not even the second closest turbine to this receptor (Turbines T52 and T53 are the next nearest). Turbine T08 is located approximately 2806 m from receptor O_148.

5. **O_582** – Property: 6367 Elcho Road, West Lincoln (see Attachment 4).
   O_674 – Property: 6227 Elcho Road, West Lincoln (see Attachment 4).

   Both of these receptors are correctly positioned on exiting dwellings fronting onto Elcho Rd. As illustrated on Attachment 4, the closest turbine to these receptors is Turbine T07, located 612 m and 558 m away, respectively.

These responses are based on the information collected during the preparation of the noise model and project layout, including existing mapping, air photo interpretation, site investigations and consultation with the Township of West Lincoln to identify newly approved / potentially unconstructed dwellings or other possible noise receptors.

We trust that this additional information addresses the comments provided in the EBR comment below.

If you have any further questions, please do not hesitate to let us know.

Sincerely,

Chris

Chris Powell, M.A.
Project Manager, Environmental Planner
Stantec
49 Frederick Street Kitchener ON N2H 6M7
Phone: (519) 585-7416
Cell: (519) 501-2368
Fax: (519) 579-6733
Chris.Powell@stantec.com

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Friday, February 21, 2014 2:49 PM
To: Powell, Chris
Cc: Raetsen, Sarah (ENE)
Subject: NRWC Info Request 6 MOE ref file # 1175-972NB9

Hello Chris

Comments via the EBR allege that the following three lots were incorrectly identified as vacant lots (existing dwellings are alleged to be present) .

1. 735,
2. 794 and
3. 1762

The correspondence further states that following three receptors are not correctly referenced from a distance perspective to the closest proposed turbine.

1. 582,
2. 674 and
3. 148

Please review the above issues and respond to this E-mail by **March 7, 2014.**

The EBR comment is copied below for your reference (yellow highlight).

Thank you

Regards
Denton Miller
416-314-8310

From: XXXXXXXX
Sent: February 17, 2014 6:03 PM
To: XXXXXX
Cc: XXXXXX
Subject: Fw: Mistakes

Ladies
It is difficult to respect and support the role that the MOE is taking in the supervisory role of the two wind projects in West Lincoln. I refer of course to the HAF/IPC project and the pending NRWC project. (012-0613). Several years ago MOE guidelines which we have respected were written to guide the big business wind enterprises that would invade our province. The only problem which is evidencing itself now is that those guidelines can have numerous exceptions in favour of the wind companies....they can BE changed, omitted, redirected or ignored. ALL those guidelines were supposedly developed to protect rural Ontario. Rural residents can no longer demand respect from the bullies you call Wind Companies.

There have been five infractions during the HAF/IPC development. I have already listed these for you in a previous e-mail dated February 9th, 2014. The most recent mistake....the positioning of 3 out of 5 turbines too close to non host property lines is the ultimate mistake. Unfortunately.... the wind developer is not prepared to correct his mistakes. The MOE is prepared to allow the company to correct their errors retroactively. The non host property owners may have to take the company to further litigation in a court of law.

Also the MOE did not complete due diligence in the Burnaby Skydiving facility in Wainfleet when IWTs were approved so close to a functioning skydiving business. This tells me that the provincial government MOE agency just slides along and shows neglect instead of working in a supervisory capacity.

Does the MOE not appreciate that the lives of rural Ontarians are in the hands of this supervisory division??? The outline of rules and regulations devised by the MOE with regard to monitoring BIG WIND COMPANIES appears to have evolved into a complete waste of time. Like all policing efforts.... rules mean nothing if they are not enforced. You break the rules. You pay the cost. In the case of HAF/IPC the non compliant wind turbines MUST come down or be moved!!! The decision is simple. The solution is simple.

The residents of West Lincoln living in the area for the proposed NRWC project have made a commitment and mission (beyond all others) to find all the mistakes within the project. I am reluctant to help the MOE complete it's job. I would assume that the NRWC proposal is checked by the MOE for inaccuracies. There are hundreds of mistakes. Most recently we have found so many properties marked as Vacant in the Stantec/NRWC paperwork. In actuality these are occupied Non Host properties. This raises many additional questions about mistakes. How many more properties marked Vacant are really occupied properties??? They will not have been measured for accurate distances from the proposed wind turbines. (For example ....Receptors 1750, 735, 794 and 1762) Other indicated non host properties have incorrect distances from turbines. (For

example...Receptors 582 and 674 in relation to each other and T07.....and Receptor 148 is actually closest to T08 but Stantec says T81) And so on it goes.....

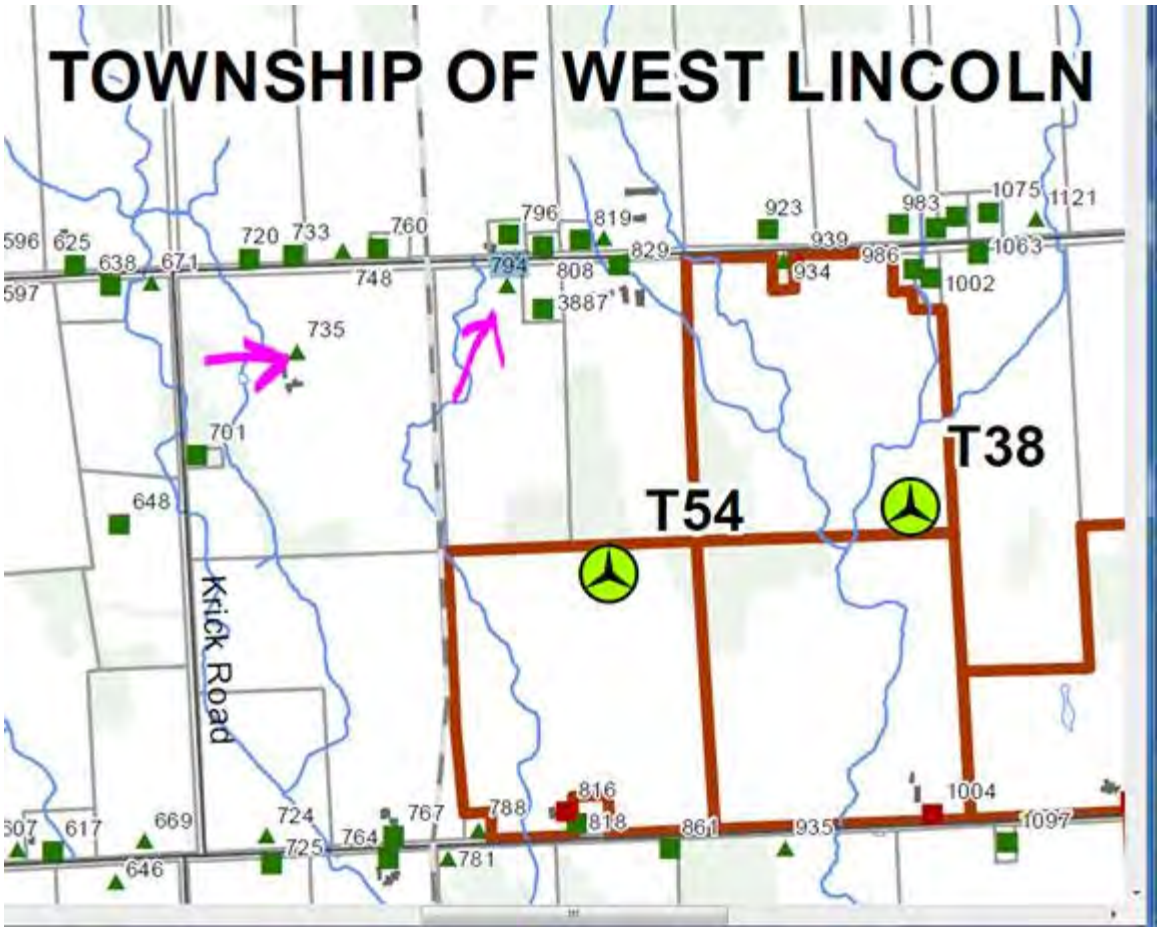
The supervising, monitoring and correcting tasks involved in the NRWC project are not the responsibilities of the residents of West Lincoln. These are the responsibilities of the MOE. If the NRWC wind turbines are erected without caution....the MOE will be facing numerous challenges to correct the whiffle and waffle and mess which should have been corrected long before the project was approved. I think that the MOE will find that when true coordinates are found and accurate locations are indicated, the NRWC project of 77-80 3MW IWTs may not fit into our community. And all future corrections and manoeuvring of the MOE will never make it work.

It is the task of the MOE to check everything the residents of West Lincoln have questioned ...the Natural Heritage details, distances, noise/decibel inaccuracies, the safety of our children, turbine locations, receptor inaccuracies. It is the task of the MOE to respond with due diligence.

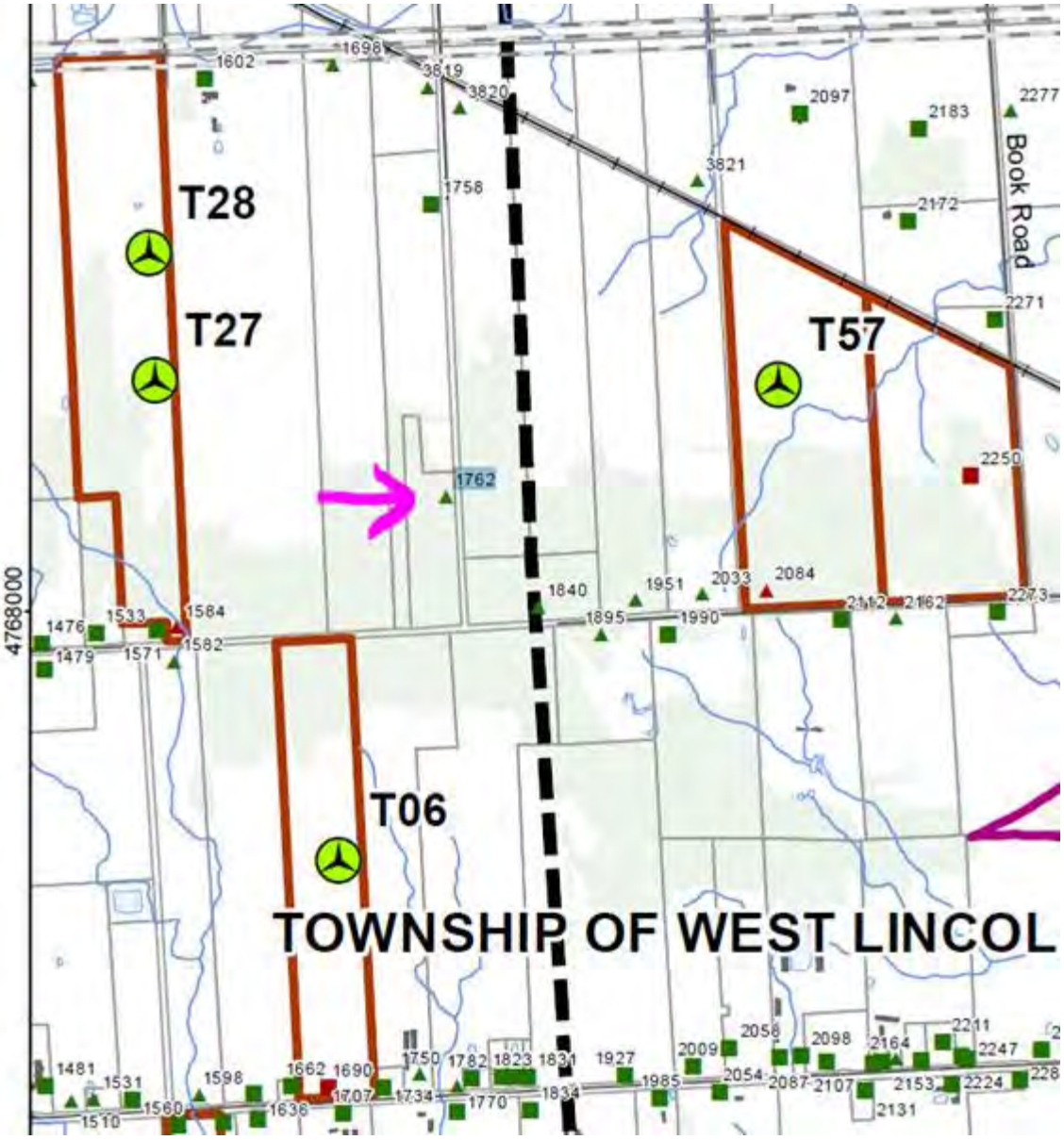
The alternative is to cancel this project 012-0613.

Thank you,
XXXXX

Vacant Lot 735 & 794



Vacant Lot 1762


T28
T27
T57
T06
Book Road
TOWNSHIP OF WEST LINCOL
4768000
1602
1698
3819
3820
2097
2183
2277
3821
1758
2172
2271
2250
1762
1840
1951
2033
2084
1895
1990
2162
2273
1476
1533
1584
1479
1571
1582
1481
1531
1598
1662
1690
1750
1782
1823
1831
1927
2009
2058
2098
2164
2211
2247
1510
1560
1636
1707
1734
1770
1834
1985
2054
2087
2107
2153
2224
2131

618000 619000 620000

N

Silver Street

V_794

Vacant Receptor

TOWNSHIP OF WEST LINCOLN

V_735

Existing Residence Marked as Vacant Receptor

Krick Road

0.92 km

T54

0 90 180 m

1:6,000

March, 2014
160950269

4766000

V:\01609\Active\160950269\planning\drawing\mxd\20140224_MOE_Receptor_Queries\160950269_Fig_01_Site_Plan.mxd
Revised: 2014-03-05 By: bcowper

Stantec

Legend

Project Study Area

Proposed Project Components

Proposed Turbine Location

Existing Features

Road

Abandoned Railway

Watercourse (MNR)

Property Boundary

Sound Level Contours 40dBA

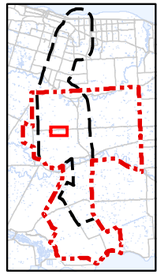
Non-participating Receptors

Occupied

Vacant

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthoimagery source: First Base Solutions, Date Spring 2010.



Client/Project
Niagara Region Wind Corporation

Figure No.
1

Title
Attachment 1

621000 622000 623000 624000 625000

4769000

4768000

N

Dengo Road

Regional Road 20

CPR Railway

Book Road

Silverdale Road

Concession 4

Concession 4

T28

T27

T57

T06

0.87 km

1.17 km

0.78 km

0.95 km

0.70 km

O_1758

V_1762

Existing Building Previously Shown as Receptor O_1758

New Location - Revised

Vacant Receptor

TOWNSHIP OF WEST LINCOLN

0 190 380 m

1:12,500

March, 2014
160950269

V:\01609\Active\160950269\planning\drawing\mxd\20140224_MOE_Receptor_Queries\160950269_Fig_01_Site_Plan.mxd
Revised: 2014-03-05 By: bcowper

Legend

Project Study Area

Sound Level Contours 40dBA

Proposed Project Components

Proposed Turbine Location

Non-participating Receptors

Occupied

Vacant

Existing Features

Road

Active Railway

Watercourse (MNR)

Property Boundary

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthoimagery source: First Base Solutions, Date Spring 2010.

Client/Project

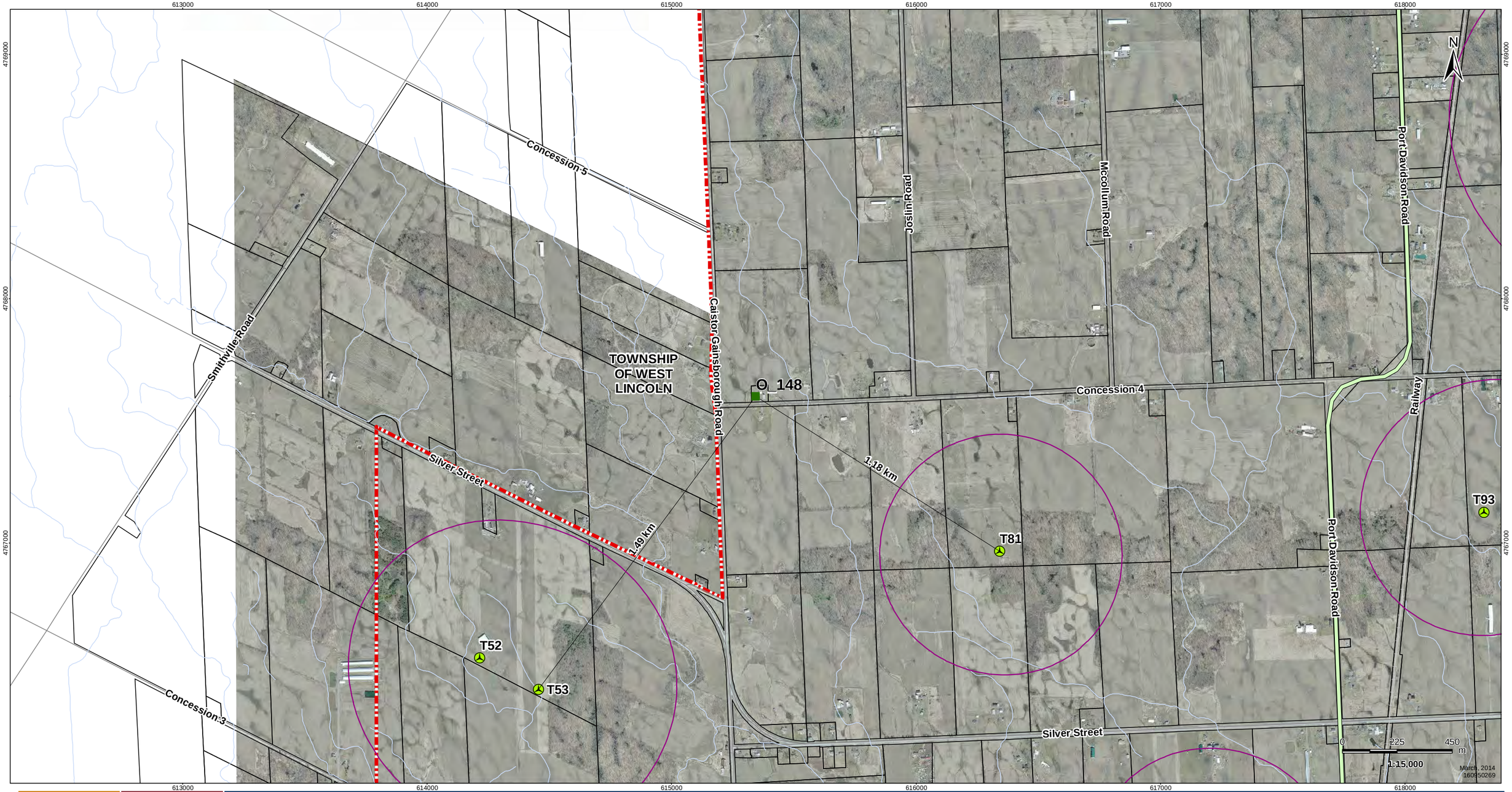
Niagara Region Wind Corporation

Figure No.

2

Title

Attachment 2



V:\01609\Active\160950269\planning\drawing\mxd\20140224_MOE_Receptor_Queries\160950269_Fig_01_Site_Plan.mxd
Revised: 2014-03-05 By: bcowper

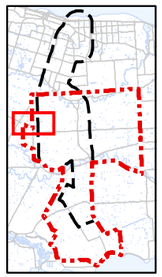
Stantec

Legend

- Project Study Area
- Proposed Project Components
  - Proposed Turbine Location
  - Preferred Transmission Line Route
- Existing Features
  - Road
  - Abandoned Railway
  - Watercourse (MNR)
  - Property Boundary
- Sound Level Contours 40dBA
- Non-participating Receptors
  - Occupied
  - Vacant

Notes

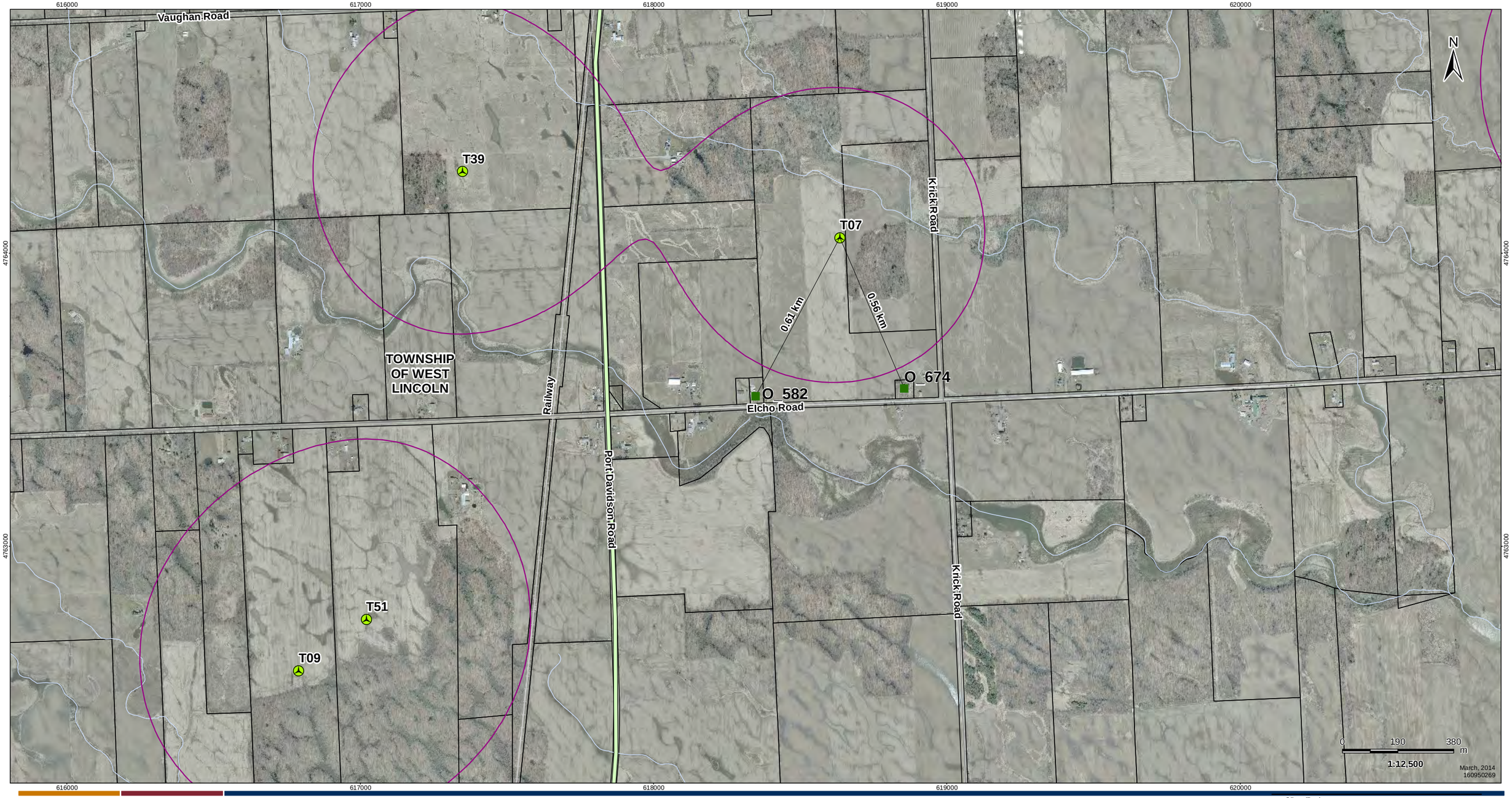
1. Coordinate System: NAD 1983 UTM Zone 17N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthoimagery source: First Base Solutions, Date Spring 2010.



Client/Project
Niagara Region Wind Corporation

Figure No.
3

Title
Attachment 3



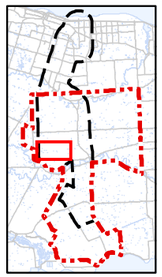
V:\01609\Active\160950269\planning\drawing\mxd\20140224_MOE_Receptor_Queries\160950269_Fig_01_Site_Plan.mxd
Revised: 2014-03-05 By: bcowper

Legend

- Project Study Area
- Proposed Project Components
  - Proposed Turbine Location
  - Preferred Transmission Line Route
- Existing Features
  - Road
  - Abandoned Railway
  - Watercourse (MNR)
  - Property Boundary
- Sound Level Contours 40dBA
- Non-participating Receptors
  - Occupied
  - Vacant

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthoimagery source: First Base Solutions, Date Spring 2010.



Client/Project
Niagara Region Wind Corporation

Figure No.
4

Title
Attachment 4


© 2014 Google Image Date: June 2012
Report a problem

Powell, Chris

From: Powell, Chris
Sent: Thursday, March 13, 2014 6:04 PM
To: Denton.Miller@ontario.ca
Cc: Raetsen, Sarah (ENE); Darren Croghan; Leggett, Al (Al.Leggett@stantec.com); Ganesh, Kana
Subject: Re: NRWC Info request 7
Attachments: Receptors 1481 to 1598 - Fig 2-27.jpg; Photo 1560.png; Photo_1510_1531.png

Denton,

The following noise receptors are identified between Receptors 1481 and 1598 in the noise model and on the site plan figures (see attached screen capture from Figure 2.27 of the PDR):

Receptor	Noise	Setback to Turbine	Closest Turbine	Description (see attached photos)
V_1510	37.1 dBA	1039 m	T01	"Photo 1510_1531" – large house like building (similar to a hotel or Bed and Breakfast) at left of photo;
V_1531	37.4 dBA	998 m	T01	"Photo 1510_1531" – existing building with garages
O_1560	37.9 dBA	927 m	T01	"Photo 1560" – existing dwelling

All of these receivers satisfy the noise threshold of 40.0 dBA and are setback a minimum of 550m from the nearest turbine in accordance with O. Reg. 359/09.

Upon further reviewing our information for this area, we can confirm that all parcels between Receptors 1481 and 1598 are represented by a noise receptor and that there are no "occupied homes" that have been missed in the noise model.

We trust this addresses the comment from the public with respect the apparent missing occupied home in this area.

Sincerely,

Chris

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Thursday, March 13, 2014 1:50 PM
To: Powell, Chris
Cc: Raetsen, Sarah (ENE)
Subject: NRWC Info request 7

Hello Chris

Please review the e-mail below and :

Comment on the statement;

> Between receptors 1481 and 1598, there is an occupied home that is not shown on their diagrams at all nor is it included in the NRWC reports as a receptor.

Please provide your comments by March 28, 2014.

Thank you

Regards
Denton Miller
416-314-8310

From:
Sent: March 12, 2014 12:00 PM
To: Garcia-Wright, Agatha (ENE)
Subject: Fwd: Fw: Fwd: Letter Response- Ms. Shellie Correia- Dated March 6, 2014

Ms. Garcia-Wright,

I am in receipt of your response to my letter. However, I note that you did not comment on the MOE's processes or your intentions with regard to the errors that residents are finding in the NRWC application. I have pasted two paragraphs from my original letter in red below. What does the MOE intend to do about the abundance of errors that we have found and that we continue to find?

Mothers Against Wind Turbines and many Niagara residents have written to the MOE about gaps and errors in the application of the Niagara Region Wind Corporation (NRWC) project documents. We continue to find more and more errors in the NRWC documents and that is of great concern since these are the first 3MW wind turbines proposed for Ontario. Further to the issues/errors that have already been reported to you about the NRWC application, it would seem that additional mistakes have been made with respect to their "vacant" designations and some of these have already been reported to you. We have been finding more with alarming regularity and quite easily. Again, that brings into question the diligence of the MOE as well as that of the wind developers and the accuracy of their applications. As a sample, receptors 1750, 735, 794 and 1762 are all occupied homes within the definition contained in the regulations yet they show as vacant in the NRWC's reports. Between receptors 1481 and 1598, there is an occupied home that is not shown on their diagrams at all nor is it included in the NRWC reports as a receptor. We have other examples as well and we will continue to explore other parts of the project area to identify additional errors. Considering that we have barely initiated this exercise, it is appalling that we have already detected this many errors. Shouldn't that be the MOE's role?

It would also appear that inaccuracy in measuring distances is another issue that is common among wind developers. Mothers Against Wind Turbines is well aware of the correspondence sent to you by a resident of our community regarding the errors in the NRWC application whereby geocoded address data was used to estimate distances. Significant errors were pointed out to you in that correspondence and we will be following the MOE response and reaction in that regard. It, is yet another example of the arrogance and disrespect that wind developers display and that the MOE ignores. Why does the MOE permit this type of engineering sloppiness and why has the process been set up so that wind developers can so readily submit inaccurate data in error and by design?


Regional Road 20
1481
1510
1531
1560
1598
1586
1412
1380
1431
1376
1367
185

Powell, Chris

From: Powell, Chris
Sent: Wednesday, April 16, 2014 9:46 AM
To: Denton.Miller@ontario.ca; Raetsen, Sarah (ENE)
Cc: Darren Croghan; Merv Croghan; Shiloh Berriman (sberriman@nrwc.ca); Leggett, Al (Al.Leggett@stantec.com); Ganesh, Kana; Hung, Timothy; Hassan.Shahriar@enercon.de
Subject: FW: Niagara Region Wind Farm Info Request - 2e , 8 and 9 MOE ref file # 1175-972NB9
Attachments: Letter regarding Sound Power Levels.pdf; Sound Power Level E-101 NRWC 140415.pdf; Sound Power Level E-82 NRWC 140415.pdf; KCE measurement excerpts E-101.pdf; KCE measurement excerpt E-82.pdf

Importance: High

Denton,

In response to your email dated April 3, 2014, and further to our conference calls over this past week, we provide the following information to address your comments:

1. Info Request 2e - Sound Power Levels of the Subject Turbines

Based on follow-up discussions with Enercon, a more definitive statement confirming the use of the 104.8 dBA noise data for the E101 turbines proposed for the NRWC Project has been obtained from Enercon. Attached to this email are the following documents confirming the use of the appropriate data in the noise assessment report for this Project:

a. Letter from Enercon entitled *Sound Power Level (SPL) documents of the ENERCON Wind Energy Converters (WECs) E-101 3.0MW and the E-82 2.3MW for Niagara Region Wind Corporation (NRWC)* dated April 15, 2014, and corresponding attachments.

1) Sound Power Level E-101 NRWC dated April 15, 2014
2) KÖTTER measurement excerpts dated April 23, 2013 and March 13, 2013
3) Sound Power Level E-82 NRWC dated April 15, 2014
4) KÖTTER measurement excerpt dated February 8, 2010

This letter provides the additional confirmation requested in your last email and greater certainty with respect to the sound power level information for the turbines being proposed for the NRWC Project.

2. Info Request 8 – Munich Higher Regional Court's Decision pertinent to impulsive sound from Enercon E-82 wind turbines

The following comments have been provided by Enercon in response to MOE's request for information on this issue:

The article referenced is in regard to a claim and subsequent ruling which has been made against ENERCON regarding the impulsivity of E-82 turbines in one of its wind parks near Munich, Germany.

ENERCON is in full disagreement with the ruling and are launching a full appeal against the region. In response, as per the official comments from ENERCON GmbH made on this issue.

"for us, this ruling is completely incomprehensible", says Felix Rehwald, Spokesperson for Europe's largest wind turbine manufacturer Enercon.

He continues to comment that ENERCON manufactures, sells and guarantees its turbines worldwide against tonality (in accordance with the IEC standards) and furthermore that Enercon's own specialists in sound power have yet to yield any measurements which would indicate impulsivity of the turbines and as such, Enercon is launching counter-proceedings in the way of an appeal against the ruling.

The court case in Germany is not related to the NRWC project from a technical and environmental permitting perspective.

3. Info Request 9 – Cadna files for Existing Rosa Flora Turbine

In regards to the questions raised pertaining to the Cadna files, we will circulate the correct Cadna files to the MOE under a separate email, which will be available via an FTP site for your review. The Cadna file will illustrate the correct sound power level (103.5 dBA) for the Rosa Flora Turbine, as it was used in the noise model to generate the results in the Noise Assessment Report dated September 201**3**.

The Cadna file previously provided on March 17, 2014 identifying a sound power level for this turbine of 101 dBA (correction factor of -2.5 dBA) was not used in the modelling exercise for this Project.

The Rosa Flora turbine is a 0.65 MW turbine located approximately 3,500 m from the nearest NRWC turbine. As per the Noise Assessment Report, the maximum sound power level for this turbine used in the model was 103.5 dBA (Section 3.3, page 3.9), which was rounded to 104 in Table 3.8. This is further confirmed in the sample calculation and Cadna/A input/outputs table provided in Appendix E and in the adjusted emission level for the Rosa Flora turbine identified in Table F1 of Appendix F of the Noise Assessment Report (Stantec, September 2014).

Based on the above, we trust that the above information is sufficient to address MOE's concerns as expressed in your email dated April 3, 2014.

If you have any questions, please do not hesitate to call.

Sincerely,

Chris

Chris Powell, M.A.
Project Manager, Environmental Planner
Stantec
49 Frederick Street Kitchener ON N2H 6M7
Phone: (519) 585-7416
Cell: (519) 501-2368
Fax: (519) 579-6733
Chris.Powell@stantec.com

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Thursday, April 03, 2014 1:40 PM
To: Kossowski, Julia
Cc: Raetsen, Sarah (ENE); Powell, Chris; Ganesh, Kana; Leggett, Al; darrenc@nrwc.ca; Shiloh Berriman; mervcroghan@nrwc.ca; Hung, Timothy
Subject: FW: Niagara Region Wind Farm Info Request - 2e , 8 and 9 MOE ref file # 1175-972NB9

Hi Chris / Julia

Below are:

1. Additional comments to info request 2 (Sound Power Levels of the subject turbines) ,
2. Two new information requests (8 & 9), and
3. A summary of the information requests to date (attached).

---

1. Additional comments to Info Request 2

With respect to Enercon's attached document, I still have concerns with their specification of the applicable sound power level {RE: Section 6.2.2. of Noise Guidelines for Wind Farms}.

Specifically the use of the word **suggests** is problematic. (reference copied below) .

> The 104.8 dBA as presented in the Kotter document dated April 23, 2013 coincides with the Sound Power Level guarantee (95% rated power or higher) provided by ENERCON to the Niagara Region Wind Corporation. As such, ENERCON suggests that this document is more applicable to the Niagara Region Wind Corporation facility as opposed to the estimated 106 dBA presented in the ENERCON document.

Consequently, in the absence of a definitive statement from Enercon , I will be contacting you next week to discuss how my review will address this issue.

---

2. Info Request 8

Please ask Enercon to comment on the following court decision identified via an EBR comment:

> *The Munich Higher Regional Court's decision pertinent to impulsive sound from Enercon E-82 wind turbines in a wind farm located in Rennertshofen in the district of Neuburg-Schrobenhausen. Judgment OLG München 14.08.2012*

Specifically;

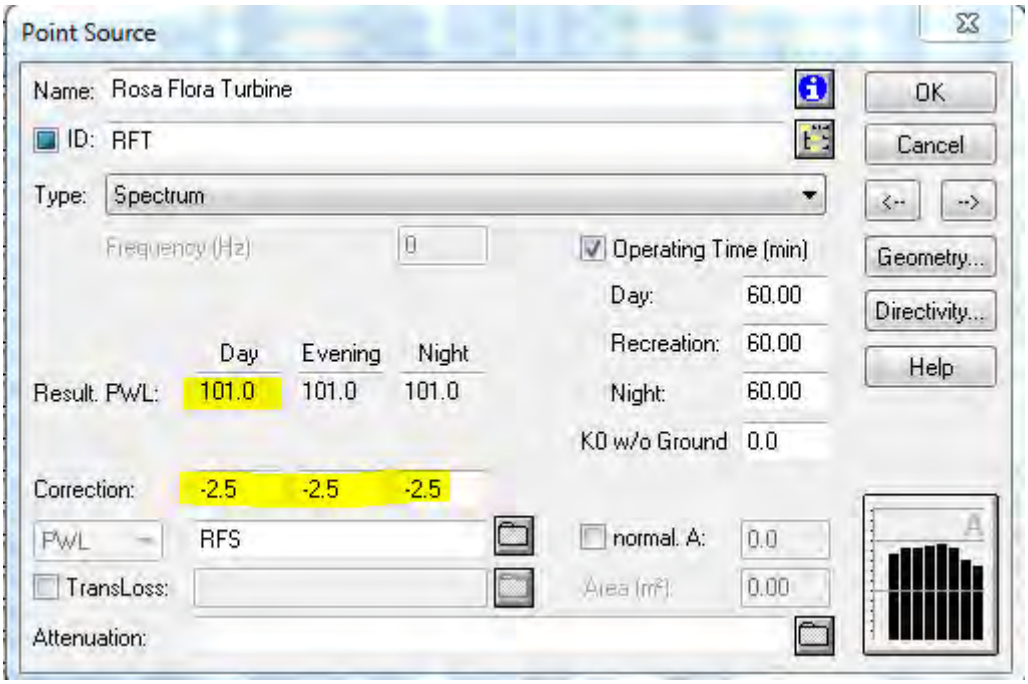
1. What was the issue?
2. What was the outcome? and
3. How is this issue related to the turbines proposed in the NRWC

Please provide comments by April 17, 2014.

---

3. Info Request 9:

The Cadna files note the following sound power level (101.0 dBA) for Rosa Flora Turbine:



The Noise Report notes the following sound power level (104 dBA) for the same turbine .

Table 3.8 Assessed Noise Sources Associated with Adjacent or Proposed Wind Farms within 5 km

Source ID	Source Description	Sound Power Level [dBA]	UTM Coordinates		
			X [m]	Y [m]	Z [m]
RF	Rosa Flora Turbine	104	615270	4756417	75

Please comment on the oversight between both sources of data, and the potential impact on the calculated sound pressure levels.

Please provide comments by April 17, 2014.

Regards
Denton Miller
416-314-8310

From: Kossowski, Julia [mailto:Julia.Kossowski@stantec.com]
Sent: March 25, 2014 4:35 PM
To: Miller, Denton (ENE)
Cc: Raetsen, Sarah (ENE); Powell, Chris; Ganesh, Kana; Leggett, Al; darrenc@nrwc.ca; Shiloh Berriman (sberriman@nrwc.ca); mervcroghan@nrwc.ca; Hung, Timothy
Subject: FW: Niagara Region Wind Farm Info Request -2e MOE ref file # 1175-972NB9

Hello Denton,

On behalf of Chris Powell and NRWC, please find attached ENERCON's request to your email below dated March 17, 2014.

Please contact us if you require additional information.

Kind Regards,
Julia

Julia Kossowski, P. Eng.
Project Manager - Power
Stantec
49 Frederick Street
Kitchener ON N2H 6M7
Ph: (519) 569-4338
Fx: (519) 579-4239
Cell: (226) 989-5259
julia.kossowski@stantec.com

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Monday, March 17, 2014 02:37 PM
To: Powell, Chris; Raetsen, Sarah (ENE) <Sarah.Raetsen@ontario.ca>; Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; 'darrenc@nrwc.ca' <darrenc@nrwc.ca>; 'sberriman@nrwc.ca' <sberriman@nrwc.ca>; 'mervcroghan@nrwc.ca' <mervcroghan@nrwc.ca>
Subject: RE: Niagara Region Wind Farm Info Request -2e MOE ref file # 1175-972NB9

Thank you for your response Chris.

Summary :

ENERCON considers the measurements values to be satisfactory representative values of the E-101 3,050 kW and E-82 E2 2,300 kW noise
levels.

	Octave band sound power level in dB(A)							
Frequency (Hz)	63	125	250	500	1,000	2,000	4,000	8,000
E-101 3,050 kW @ 8.3m/s	86.3	91.6	98.6	100.8	98.3	92.8	85.9	73.3
E-82 E2 2,300 kW @ 9 m/s	86.6	94.6	94.3	97.3	98.7	93.8	81.5	73.4

ISSUE:

Unfortunately the response from Enercon (satisfactory representative) is not definitive enough for our review purposes. It is requested that Enercon explain why they have published at least two different data sheets for the

same equipment (E-101), that have different values for the 95% rated capacity sound power levels (106 dBA and 104.8 dBA)?

It is also requested that Enercon explain why the above sound power levels for the E-101 are applicable to the Niagara Region Wind Corporation facility as opposed to the 106 dBA data that was referenced in a previous e-mail ?

Please provide a response by **March 25, 2014**.

Regards
Denton Miller
416-314-8310

From: Powell, Chris [mailto:Chris.Powell@stantec.com]
Sent: March 17, 2014 1:25 PM
To: Miller, Denton (ENE); Raetsen, Sarah (ENE); Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; 'darrenc@nrwc.ca'; 'sberriman@nrwc.ca'; 'mervcroghan@nrwc.ca'
Subject: RE: Niagara Region Wind Farm Info Request -2d MOE ref file # 1175-972NB9

Denton,

The attached information has been provided by Enercon in response to your email dated March 12, 2014. The values contained in the attachment provide the A-weighted values for the E-101 and E-82 turbines to 95% rated capacity, while the values included in Table 3.2 of the Noise Assessment Report (as attached to your email) are linear weighted values. The A-weighted values provided by Enercon in the attached table are consistent with the information provided previously by Enercon to Stantec for use in the noise model. These values were converted to linear weighted values following standard conversion methods and incorporated accordingly into the noise model and Noise Assessment Report.

In regards to your second comment, the requested Cadna-A file has been provided under a separate email earlier today for your review.

We trust that this information will be sufficient. If you have any further questions, please do not hesitate to ask.

Sincerely,

Chris

Chris Powell, M.A.
Project Manager, Environmental Planner
Associate, Environmental Services
Stantec Consulting Ltd.

Office: (519) 585-7416
Cell: (519) 501-2368
chris.powell@stantec.com

From: Miller, Denton (ENE) [Denton.Miller@ontario.ca]
Sent: March 12, 2014 12:22 PM
To: Powell, Chris; Raetsen, Sarah (ENE); Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; 'darrenc@nrwc.ca'; 'sberriman@nrwc.ca'; 'mervcroghan@nrwc.ca'
Subject: RE: Niagara Region Wind Farm Info Request -2d MOE ref file # 1175-972NB9

Thank you for your response Chris

Summary:

In accordance with Section 6.2.2 of the Noise Guidelines for Wind Farms your firm was requested to provide the sound power levels, frequency spectra in octave bands (63 to 8000 Hz), and tonality at integer wind speeds from 6 to 10 m/s for the subject wind turbines. (E-82 & E-101)

Your firm responded (para-phrased) that this information is not necessary, as your analysis based on the 95% rated capacity sound power levels of the turbines. (This approach is acceptable to MOE.)

Enercon further notes (Mar 7, 2014 e-mail) that the SPL of the E-82 and the E-101 Wind Energy Converters (WECs) do not exceed beyond the values at 95% rated capacity for hub heights specified in its **Sound Power Level documents.**

Issue:

There are several different Enercon documents noting different values for the 95% rated capacity sound power levels. For example:

1. There is a April 2013 Enercon document (attached) noting that the 95% rated capacity sound power level for the E-101 3050 kW turbine is **106 dBA**. (NRWC report states this value to be **104.8 dBA**) {it is acknowledged that the ratings differ by 50 kW, Niagara turbines are smaller}

2. There is a April 2010 Enercon document (attached) noting that the 95% rated capacity sound power level for the E-82 2000 kW turbine is 103.**5** dBA; (NRWC report states this value to be 103.**3** dBA) {it is acknowledged that the ratings differ by 300 kW – Niagara turbines are larger}

Requests:

1. Please provide by **March 20, 2014,** a written statement from Enercon confirming that the values noted in Table 3.2 of your Report (Sept 30, 2013) are accurate. (For reference the table is copied below.)

Table 3.2 Highest Wind Turbine Sound Emission Corresponding to 95% or above Rated Electrical Output Power

Description	Octave Band Sound Power Level (dB ref. 10-12 Watts)								
Frequency [Hz]	63	125	250	500	1k	2k	4k	8k	dB/dBA
ENERCON model E101 model at 8.3 m/s	112.5	107.7	107.2	104.0	98.3	91.6	85	74.4	113.9/ 104.8
ENERCON model E82 model at 9 m/s	112.8	110.8	103	100.5	98.7	92.6	80.5	74.5	115.5/ 103.3

2. Please also forward the cadna A file (s) to this office.

Regards
Denton Miller
416-314-8310

From: Powell, Chris [mailto:Chris.Powell@stantec.com]
Sent: March 7, 2014 4:17 PM
To: Miller, Denton (ENE); Raetsen, Sarah (ENE); Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; 'darrenc@nrwc.ca'; 'sberriman@nrwc.ca'; 'mervcroghan@nrwc.ca'
Subject: RE: Niagara Region Wind Farm Info Request -2c MOE ref file # 1175-972NB9

Denton,

In preparing the Noise Assessment Report, Stantec and NRWC understood this issue and the requirements outlined in the MOE Noise Guidelines for Wind Farms. This issue was raised by NRWC and discussed during the project design stage with the manufacturer, who confirmed that despite the change in power with wind speed and height their guaranteed maximum sound power at rated capacity would not change for the proposed turbine models, and that tonality would not result at these higher turbine heights or wind speeds. This was confirmed and guaranteed through a separate letter from Enercon, which has been provided to the MOE as part of the Noise Assessment Report.

Following your email, we have discussed this further with Enercon and they have prepared additional information to address your specific comment with respect to hub height and tonality (see attached). In the supplemental information, they have reconfirmed the following:

1. that the sound power levels of the E82 and E101 turbines do not exceed beyond the values at 95% rated capacity,
2. that the turbines shall not exceed the guaranteed maximum sound power levels for hub heights specified; and
3. that the tonal audibility shall be equal to or less than 2 dB over the whole operational range, including at wind speeds of 10m/s.

Stantec confirms that the analysis provided in the Noise Assessment Report considered the spectral sound power data (i.e. frequency based data) based on the IEC test and overall sound power level corresponding to 95% rated electrical output power as guaranteed by the manufacturer (Enercon). The manufacturer has confirmed that the sound power level at 95% rated capacity is independent of height and wind speeds and has addressed the tonality concerns in a separate letter attached.

The MOE raised similar concerns during the screening of REA application for completeness and we provided additional discussion and rationale at that time. We understood that this additional information was sufficient to address your concern, but trust that the supplemental information now provided by Enercon further supports the completion of your technical review.

If you require further information in this regard, we request that a meeting be held to review and discuss this issue with our noise experts as soon as possible.

Sincerely,

Chris

Chris Powell, M.A.
Project Manager, Environmental Planner
Stantec
49 Frederick Street Kitchener ON N2H 6M7
Phone: (519) 585-7416
Cell: (519) 501-2368
Fax: (519) 579-6733
Chris.Powell@stantec.com

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Friday, February 21, 2014 12:39 PM
To: Powell, Chris; Raetsen, Sarah (ENE); Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; 'darrenc@nrwc.ca'; 'sberriman@nrwc.ca'; 'mervcroghan@nrwc.ca'
Subject: RE: Niagara Region Wind Farm Info Request -2c MOE ref file # 1175-972NB9

Hello Chris

I have yet to receive a response to the e-mails I sent to your office on January 24, and 30 , 2014 regarding the sound power levels of the proposed turbines (questions 2 & 3 in the January 24, 2014 email to your office; copied below).

Please provide a response by **March 7, 2014**. If your firm is unable to provide a response by this date I will have to stop the clock on our service guarantee time.

If you have any questions , please feel free to contact me.

PS:
I also have additional questions via EBR comments pertinent to vacant lots which I will send to you in a separate e-mail later today.

Regards
Denton Miller
416-314-8310

From: Powell, Chris [mailto:Chris.Powell@stantec.com]
Sent: January 30, 2014 8:29 AM
To: Miller, Denton (ENE); Raetsen, Sarah (ENE); Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; 'darrenc@nrwc.ca'; 'sberriman@nrwc.ca'; 'mervcroghan@nrwc.ca'
Subject: Re: Niagara Region Wind Farm Information request -2 MOE ref file # 1175-972NB9

Ok. I'll follow up with Kana and we will get back to you shortly.

Chris
Chris Powell, M.A.
Project Manager
Environmental Planner
Stantec
Cell: (519) 501-2368

Sent from my Blackberry

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Thursday, January 30, 2014 08:26 AM
To: Powell, Chris; Raetsen, Sarah (ENE) <Sarah.Raetsen@ontario.ca>; Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; Darren Croghan <darrenc@nrwc.ca>; Shiloh Berriman (sberriman@nrwc.ca) <sberriman@nrwc.ca>; Merv Croghan <mervcroghan@nrwc.ca>

Subject: RE: Niagara Region Wind Farm Information request -2 MOE ref file # 1175-972NB9

Hello Chris.

Thank you for your response to my questions noted in your previous e-mail (January 29, 2014 10:40 AM).

The e-mail has answered question # 1 (RE: Participating Receptors), however questions 2 and 3 still require attention.

Below is additional rationale as to why questions # 2 and 3 will require further clarification from your firm:

Rationale:

Documents prepared by the International Electrotechnical Commission note that the apparent sound power level is correlated to the acoustic reference wind speed and not to the wind speed at hub height. An increase in hub height will increase the apparent sound power level and might have an unpredictable effect on tonality.

The following examples from Enercon publications note this phenomenon:

Example 1: Sound Power Level for the E-82 with 2300 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
5 m/s	96,3 dB(A)	96.6 dB(A)	97.2 dB(A)	97.5 dB(A)
6 m/s	100.7 dB(A)	101.0 dB(A)	101.6 dB(A)	101.9 dB(A)
7 m/s	103.3 dB(A)	103.5 dB(A)	103.6 dB(A)	103.6 dB(A)
8 m/s	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)
9 m/s	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)
10 m/s	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)
95% rated power	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)

Example 2:

Sound Power Level for the E-33 with 330 kW rated power

in relation to standardized wind speed v_s at 10 m height					
hub height / v_s at 10 m height	37 m	44 m	49 m	50 m	
5 m/s	90.9 dB(A)	91.0 dB(A)	91.3 dB(A)	91.3 dB(A)	
6 m/s	95.1 dB(A)	96.0 dB(A)	96.5 dB(A)	96.5 dB(A)	
7 m/s	98.6 dB(A)	98.9 dB(A)	99.0 dB(A)	99.0 dB(A)	
8 m/s	99.7 dB(A)	99.8 dB(A)	99.9 dB(A)	99.9 dB(A)	
9 m/s	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	
10 m/s	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	
95% rated power	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	

Therefore in accordance with Section 6.2.2 of the Noise Guidelines for Wind Farms please provide the sound power levels, frequency spectra in octave bands (63 to 8000 Hz), and tonality at integer wind speeds from 6 to 10 m/s for the subject wind turbines.

I have another question which I send in a separate e-mail later today.

Regards
Denton Miller
416-314-8310

From: Powell, Chris [mailto:Chris.Powell@stantec.com]
Sent: January 29, 2014 10:40 AM
To: Miller, Denton (ENE); Raetsen, Sarah (ENE); Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; Darren Croghan; Shiloh Berriman (sberriman@nrwc.ca); Merv Croghan
Subject: RE: Niagara Region Wind Farm Information request MOE ref file # 1175-972NB9

Denton,

In response to your email from Friday, January 24, 2014, Kana has provided the justification you are seeking to address your specific questions. Based on his input, we offer the following responses:

Question 1: Participating Receptors
All of the participating receptors will include project infrastructure and adhere to the definition provided in O. Reg. 359/09 and include a project component.

The REA application considered 80 turbines during the project planning and design stages, including the completion of the various technical reports. The 80 turbine layout is compliant with the noise requirements of the regulation. In order to meet the FIT contract requirements of 230 MW, only 77 of these 80 turbines are to be built (each rated at 3 MW - one or more to be de-rated to satisfy the 230MW requirement).

The specific turbines to be constructed will depend on the detailed engineering and wind resourcing studies to be completed. The decision to drop a turbine depends highly on wind power, and it is likely that a turbine may be dropped from a cluster of turbines where more than one turbine is located within the same property (due to wind resources). Based on that understanding, all participating receptors will continue to fit the definition of participating receptors.

In the event that a turbine is dropped from a property with only one turbine, the design of the wind farm will ensure that project infrastructure remains on that property to ensure its compliance as a participating receptor, in the event that it violates the 40.0 dBA noise threshold, as defined in the regulation.

Question 2: Re Table 3.1 ; Sound Power Levels for the E-101
In preparing the noise model and assessment, Stantec concluded the data is valid based on the following:

a. Stantec used sound power levels in the analysis, which is a parameter independent of height of the source;
b. The manufacturer has guaranteed /confirmed to NRWC that their machine will meet the sound power requirements as specified in the test sheet (included with the report); and
c. IEC 61400-11 (i.e. international standard CAN/CSA-C61400-11-07) uses normalized height so that measurements are independent of height and terrain (i.e. location, where it was measured).

As such, the manufacturer's data values used in the noise model for predicting sound power levels at the various receptors are valid for the E-101 turbines.

Question 3: Re Table 3.1 ; Sound Power Levels for the E-82
Similar to the above rationale, the manufacturer's data values used in the noise model for predicting sound power levels at the various receptors are valid for the E-82 turbines.

We trust that this information is of assistance. If you have any further questions, please do not hesitate to give Kana or myself a call.

Sincerely,

Chris

Chris Powell, M.A.
Project Manager, Environmental Planner
Stantec
49 Frederick Street Kitchener ON N2H 6M7
Phone: (519) 585-7416
Cell: (519) 501-2368
Fax: (519) 579-6733
Chris.Powell@stantec.com

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Friday, January 24, 2014 3:15 PM
To: Ganesh, Kana; Hung, Timothy; Raetsen, Sarah (ENE)
Cc: Raetsen, Sarah (ENE); Powell, Chris; Leggett, Al
Subject: RE: Niagara Region Wind Farm Information request MOE ref file # 1175-972NB9

Hello Kana

He have started review of the subject application and to date have the following preliminary questions.

Question 1: Participating Receptors

Background:

Section 1 of the report notes the following:

> The facility is comprised of 80 wind turbine. However, only **77** of the wind turbines will be constructed.

Section 4.2 of the report notes the following:

> There are a total of 96 Participating Receptors.

Issue:

Please confirm that the participating Noise Receptors adhere with the definition in Section 1(6) of O. Reg. 359/09. Specifically will all participating receptors have infrastructure located on them?

If this is not the case then some of these participating receptors must be considered as points of reception and the analysis in the report updated to address these points of reception.

Question 2: Re Table 3.1 ; Sound Power Levels for the E-101

It is noted that the data in Appendix D (Enercon E-101) is for a turbine with a hub height of **99 m**. The proposal (Sept 30, 2013 report) notes the turbine nacelles will be at **124 m** and/or **135 m** height. Please comment on the implication of using the 99 m data in your analysis to represent turbines at **124 m** and/or **135 m** height .

Question 3: Re Table 3.1 ; Sound Power Levels for the E-82

It is noted that the data in Appendix D (Enercon E-82) is for a turbine with a hub height of **108 m**. The proposal (Sept 30, 2013 report) notes the turbine nacelles will be at **135 m** height. Please comment on the implication of using the 108 m data in your analysis to represent turbines at **135 m** height .

Thank you.

Regards
Denton Miller

Denton Miller | Senior Review Engineer | Team 5 | Environmental Approvals Branch I Ministry of the Environment
2 St. Clair Ave W. 12a Floor Toronto, Ontario, M4V 1L5 | Phone: 416-314-8310 | Denton.Miller@ontario.ca|

From: Ganesh, Kana [mailto:Kana.Ananthaganeshan@stantec.com]
Sent: January 7, 2014 4:18 PM
To: Miller, Denton (ENE); Hung, Timothy

Cc: Raetsen, Sarah (ENE); Powell, Chris; Leggett, Al
Subject: RE: Niagara Region Wind Farm Information request MOE ref file # 1175-972NB9

Thanks for the email Denton and happy New Year to you.

Please find attached the Tables; I have some of them in Word format (readily available) and some in Excel format.
Please let me know word format is acceptable for your purpose.

Best regards
Kana Ganesh, PhD., P.Eng
Sr. Acoustics Noise and Vibration Engineer
300 - 675 Cochrane Drive West Tower Markham ON L3R 0B8
Phone: 905-415-6332
Fax: 905-474-9889
kana.ganesh@stantec.com

Design with community in mind

stantec.com

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Tuesday, January 07, 2014 3:27 PM
To: Ganesh, Kana; Hung, Timothy
Cc: Raetsen, Sarah (ENE); Powell, Chris
Subject: Niagara Region Wind Farm Information request MOE ref file # 1175-972NB9

Hello Kana / Timothy

I am the review engineer assigned to this file. To facilitate my review , please forward excel copies of the following tables in the noise assessment report.

Tables:

2.1	3.3	3.6	4.1
3.1	3.4	3.7	6.2
3.2	3.5	3.8	6.3

F.5 Appendix E
F.6 Barrier Co-ordinates

your file # 160950269 dated September 30, 2013.

Thank you

APPLICATION SUMMARY

Status	**New Application**	**Assigned**	
IDS Reference #	**1175-972NB9**	**File #**	**R- 0018 -13**
REA #			
Application Type	**New Renewable Energy Approval**		
Media	**Noise**		
Facility Type:			
Client Name	**Niagara Region Wind Corporation**	**Client #**	**2349-**972N8X
Client Aliases			
Site Name	**Niagara Region Wind Farm**	**Site #**	**9527-**972NA9

Denton Miller | Senior Review Engineer | Team 5 | Environmental Approvals Branch I Ministry of the Environment
2 St. Clair Ave W. 12a Floor Toronto, Ontario, M4V 1L5 | Phone: 416-314-8310 | Denton.Miller@ontario.ca|

Appendix G3 – Sound Power Level Rationale

Concern:
Concerns were raised by the MOE with respect to Enercon's specification of the applicable sound power level for the E-82 and E101 turbines for this Project. Specifically, MOE requested clarification regarding the applicability of different data sheets available from Enercon noting different values for the 95% rated capacity sound power levels for the E-82 and E101 turbines.

Response:
Based on follow-up discussions with Enercon, and discussions with the MOE, a more definitive statement confirming the use of the 104.8 dBA noise data for the E101 turbines proposed for the NRWC Project has been obtained from Enercon. The following documents are attached confirming the use of the appropriate data in the NAR for this Project:

a. Letter from Enercon entitled Sound Power Level (SPL) documents of the ENERCON Wind Energy Converters (WECs) E101 3.0MW and the E-82 2.3MW for Niagara Region Wind Corporation (NRWC) dated April 15, 2014, and corresponding attachments:

    1) Sound Power Level E101 NRWC dated April 15, 2014
    2) KÖTTER measurement excerpts dated April 23, 2013 and March 13, 2013
    3) Sound Power Level E-82 NRWC dated April 15, 2014
    4) KÖTTER measurement excerpt dated February 8, 2010

This letter provides the additional confirmation and greater certainty with respect to the sound power level information for the turbines being proposed for the NRWC Project.

As noted in the attached documents, Enercon is continuously optimizing the mechanical and aerodynamic characteristics of its turbines to reduce the overall SPL. Specific actions include the addition of dampers as well as design modifications, where possible. As such, Enercon has confirmed the validity of using the maximum sound power level 104.8 dBA for the E101turbine and 103.3 dBA for the E-82 turbine for the NRWC facility in accordance with the attached supporting documents. See correspondence dated April 16, 2014 and April 24, 2014 (attached).

ENERCON
CANADA INC.

Hassan Shahriar
Commercial Manager
Direct Line: (416) 572-8912
Email: hassan.shahriar@enercon.de

April 15, 2014

By email

Niagara Region Wind Corporation
277 Lakeshore Road East, Suite 211
Oakville, ON L6J 6J3

Attn: Mr. Mervin Croghan

Subject: Sound Power Level (SPL) documents of the ENERCON Wind Energy Converters (WECs) E-101 3.0MW and the E-82 2.3MW for Niagara Region Wind Corporation (NRWC).

Dear Sir,

It is our understanding that a document titled "Sound Power Level of the E-101, Operational Mode I (Data Sheet)" has been obtained by the Ministry of Environment of Ontario. This document differs from the one ENERCON provided to NRWC for the purpose of its facility. In order to prevent any confusion, please find below clarification on the relevancy of the SPL documents provided to NRWC.

The document "Sound Power Level of the E-101, Operational Mode I (Data Sheet)" contains estimated values, which are based on the theoretical estimation of sound characteristics of turbine technology, as well as modeling of mechanical and aerodynamic properties. ENERCON is continuously optimizing the mechanical and aerodynamic characteristics of its turbines to reduce the overall SPL. Specific actions include the addition of dampers as well as design modifications, where possible. These led to improved sound characteristics which were subsequently measured by KÖTTER Consulting Engineers GmbH & Co. KG, an independent engineering firm.

KÖTTER's measurements for the E-101 and the E-82 form the basis of the SPL documents provided to NRWC. ENERCON confirms the validity of using the maximum SPL of E-101 at 104.8 dBA and of E-82 at 103.3 dBA for the NRWC facility. As such, ENERCON confirms that the attached Sound Power Level documents (dated April 15, 2014) be used for the noise assessment of the NRWC facility.

Sincerely,

Hassan Shahriar
Commercial Manager
ENERCON Canada Inc.

cc : Darren Croghan, Michael Weidemann, Mark Smith

attached: Sound Power Level E-101 NRWC dated April 15, 2014
KÖTTER measurement excerpts dated April 23, 2013 and March 13, 2013
Sound Power Level E-82 NRWC dated April 15, 2014
KÖTTER measurement excerpt dated February 8, 2010

Sound Power Level of the ENERCON E-82 2.3 MW

Publisher:

ENERCON Canada Inc.

1000, rue de La Gauchetière ouest Bureau 2310
Montréal, QC, H3B 4W5
+1 514 ENERCON (+1 514 363 7266)

The following represents the sound power level of the E-82 2.3 MW for the entire operational range of wind speeds in accordance with the measurement technique IEC 61 400 – 11:2002 and A1:2006.

Sound Power Level (SPL) for the E-82 with 2.3 MW rated power

Hub Height / Vs in 10m height	108m	138m
6 m/s	**100.6 dB(A)**	**101.1 dB(A)**
7 m/s	**102.5 dB(A)**	**102.8 dB(A)**
8 m/s	**103.2 dB(A)**	**103.3 dB(A)**
9 m/s	**103.3 dB(A)**	**103.3 dB(A)**
10 m/s	**103.3 dB(A)**	**103.3 dB(A)**
95% rated power	**103.3 dB(A)**	**103.3 dB(A)**

Measurement results of the octave band corresponding to 95% or higher rated power are presented in the table below. ENERCON confirms the measurements values to be representative values of the E-82 2.3 MW noise levels.

	Octave band sound power level in dB(A)								
Frequency (Hz)	63	125	250	500	1,000	2,000	4,000	8,000	dB(A)
E-82 2.3 MW @ 9m/s	86.6	94.6	94.3	97.3	98.7	93.8	81.5	73.4	103.3

1. The relation between the sound power level and the standardized wind speed Vs in 10 m height as shown above is valid on the premise of a logarithmic wind profile with a roughness length of 0.05m. The relation between the sound power level and the wind speed at hub heights 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 $\mathbf{\Delta L_{a,k} \leq 2\ dB}$ can be expected over the whole operational range and is valid in the near vicinity of the turbine according to IEC 61 400 -11 ed. 2.

3. Sound power level values provided in the table are valid for the **Operational Mode I**. The respective power curve is the calculated power curve of the E-82 E2 dated November 2009 (Rev 3.0).

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

   Accepted measurement method:
   IEC 61400-11 ed.2 (“Wind turbine generator systems – Part 11: Acoustic noise measurement techniques; Second edition, 2002 – 12”).

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

5. 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.

KÖTTER CONSULTING ENGINEERS

Summary of Test Report
(Measured hub height of 108 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 209244-04.01 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):	2.300 kW
Serial number:	82679	Diameter of rotor:	82 m
Location of WEC (ca.):	26629 Großefehn	Hub height above ground:	108 m
Geographic co-ordinates:	GK longitude: 34.15.287	Type of tower:	conical tube tower
	GK latitude: 59.14.701	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; calculated by ENERCON (Rev. 3.0)

	Reference Point		Noise emission parameters	Observations
	standardized wind speed in 10 m height	true electrical power		
sound power level $L_{WA,P}$	5 ms^{-1}	579 kW	96.4 dB(A)	
	6 ms^{-1}	1,089 kW	100.6 dB(A)	
	7 ms^{-1}	1,612 kW	102.5 dB(A)	
	8 ms^{-1}	2,032 kW	103.2 dB(A)	
	9 ms^{-1}	2,255 kW	103.3 dB(A)	
	10 ms^{-1}	2,300 kW	102.9 dB(A)	
tonal audibility $\Delta L_{a,k}$	5 ms^{-1}	kW	- 2.7 dB	
	6 ms^{-1}	kW	<- 3.0 dB	
	7 ms^{-1}	kW	- 1.8 dB	
	8 ms^{-1}	kW	- 0.7 dB	
	9 ms^{-1}	kW	0.2 dB	
	10 ms^{-1}	kW	- 0.4 dB	
impulse adjustment for small distances K_{IN}	5 ms^{-1}	kW	0 dB	
	6 ms^{-1}	kW	0 dB	
	7 ms^{-1}	kW	0 dB	
	8 ms^{-1}	kW	0 dB	
	9 ms^{-1}	kW	0 dB	
	10 ms^{-1}	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
$L_{WA,P}$	74.1	76.5*	80.0	85.6	82.2	81.7	81.9	83.7	85.6	85.1	85.5	87.6
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	86.9	86.2	84.8	82.4	78.8	75.3	70.6	65.5	60.3*	60.3*	63.0	70.3

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
$L_{WA,P}$	82.3	88.3	88.8	91.0	90.8	84.5	72.1	71.4

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
$L_{WA,P}$	78.2**	79.1*	82.2	85.2	87.4	84.3	85.0	87.3	88.7	88.5*	89.5*	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
$L_{WA,P}$	91.7	91.5	89.9	87.1	83.0	79.4	74.4	69.0	63.5	64.4	67.4	74.3

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
$L_{WA,P}$	84.9*	90.6	92.0	95.7	95.9	89.0	75.8	75.4

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
$L_{WA,P}$	78.6**	79.8	82.7	84.8	90.8	86.2	86.0	89.7	91.0	92.5	91.7	93.9
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	93.4	93.3	91.8	89.2	85.8	81.9	77.0	72.2	66.1	65.3	66.8	72.8

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
$L_{WA,P}$	85.5*	92.8	94.2	97.6	97.7	91.4	78.5	74.4

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
$L_{WA,P}$	77.4*	80.4	83.1	84.9	91.2	86.6	86.3	90.4	91.4	92.9	92.1*	94.8
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	94.2	94.1	92.6	90.1	86.7	82.7	77.8	73.3	67.7	65.8	66.6	71.4

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
$L_{WA,P}$	85.6	93.2	94.6	98.2	98.5	92.2	79.4	73.4

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
$L_{WA,P}$	78.5	81.4	83.9	85.7	92.6	88.2	86.4	90.2	90.7	91.8	91.5*	93.9
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	94.0	94.4	93.4	91.5	88.4	84.6	79.9	75.4	69.3	65.5*	66.4	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
$L_{WA,P}$	86.6	94.6	94.3	97.3*	98.7	93.8	81.5	73.4

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
$L_{WA,P}$	78.8	81.7	84.5	86.3	92.4	88.5	86.4	89.8	90.0*	91.2	90.9*	92.7*
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	93.3	93.9	93.3	91.5	88.8	85.2	80.7	76.5	71.9	70.4	68.5	71.8

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
$L_{WA,P}$	87.0	94.6	93.7	96.5*	98.3	94.0	82.5	75.2

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: * 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

/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: 08/02/2010 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

Sound Power Level of the ENERCON E-101 3.0 MW

Publisher:

ENERCON Canada Inc.

1000, rue de La Gauchetière ouest Bureau 2310
Montréal, QC, H3B 4W5
+1 514 ENERCON (+1 514 363 7266)

The following represents the sound power level of the E-101 3.0 MW for the entire operational range of wind speeds in accordance with the measurement technique IEC 61 400 – 11:2002 and A1:2006.

Sound Power Level (SPL) for the E-101 with 3.0 MW rated power

Hub Height / Vs in 10m height	99m	124m	135m
6 m/s	**103.6 dB(A)**	**103.6 dB(A)**	**103.8 dB(A)**
7 m/s	**104.3 dB(A)**	**104.3 dB(A)**	**104.5 dB(A)**
8 m/s	**104.8 dB(A)**	**104.8 dB(A)**	**104.8 dB(A)**
9 m/s	**104.8 dB(A)**	**104.8 dB(A)**	**104.8 dB(A)**
10 m/s	**104.8 dB(A)**	**104.8 dB(A)**	**104.8 dB(A)**
95% rated power	**104.8 dB(A)**	**104.8 dB(A)**	**104.8 dB(A)**

Measurement results of the octave band corresponding to 95% or higher rated power are presented in the table below. ENERCON confirms the measurements values to be representative values of the E-101 3.0 MW noise levels.

	Octave band sound power level in dB(A)								
Frequency (Hz)	63	125	250	500	1,000	2,000	4,000	8,000	dB(A)
E-101 3.0 MW @ 8.3m/s	86.3	91.6	98.6	100.8	98.3	92.8	85.9	73.3	104.8

1. The relation between the sound power level and the standardized wind speed Vs in 10 m height as shown above is valid on the premise of a logarithmic wind profile with a roughness length of 0.05m. The relation between the sound power level and the wind speed at hub heights 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 $\mathbf{\Delta L_{a,k} \leq 2\ dB}$ can be expected over the whole operational range and is valid in the near vicinity of the turbine according to IEC 61 400 -11 ed. 2.

3. Sound power level values provided in the table are valid for the **Operational Mode I**. The respective power curve is the calculated power curve of the E-101 dated October 2009 (Rev 2.0).

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

   Accepted measurement method:
   IEC 61400-11 ed.2 (“Wind turbine generator systems – Part 11: Acoustic noise measurement techniques; Second edition, 2002 – 12”).

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

5. 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.

KÖTTER CONSULTING ENGINEERS

Summary of Test Report (Measured hub height of 99 m) /1/

Master Data Sheet "Geräusche" (*Noise*), in accordance with "Technische Richtlinien für Windenergieanlagen, Teil 1: Bestimmung der Schallemissionswerte" *(Technical Guidelines for Wind Turbine Generators, 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 213122-02.01 IEC
on noise emission of wind turbine generator of type E-101

General Data			Technical Data (manufacturer's specifications)	
Manufacturer of WTG:	Enercon GmbH		Rated power (generator):	3,050 (3,250) kW
Serial number:	1010002		Diameter of rotor:	101 m
Location of WTG (approx.):	49733 Haren		Hub height above ground:	99 m
Geographic co-ordinates:	GK longitude:	25.76.214	Type of tower:	conical tubular concrete
	GK latitude:	58.59.856	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-101-1		Type of gear unit:	not applicable
Blade setting angle:	variable		Manufacturer of generator:	Enercon
Number of rotor blades:	3		Type of generator:	G-101/30-G2
Rotor speed range:	5 to 14.7 rpm. (mode OM I)		Rated speed of generator:	5 to 14.7 rpm. (mode OM I)

Calculated Performance Chart: Performance characteristic E101 3 MW OM I ; calculated by ENERCON (Rev. 1.0)

	Reference Point: standardized wind speed at a height of 10 m	Reference Point: true electrical power	Noise emission parameters	Observations
sound power level $L_{WA,P}$	6 ms^{-1}	1,414 kW	103.6 dB(A)	
	7 ms^{-1}	2,077 kW	104.3 dB(A)	
	8 ms^{-1}	2,751 kW	104.8 dB(A)	
	9 ms^{-1}	2,987 kW	104.6 dB(A)	(1)
	10 ms^{-1}	3,050 kW	--	(2)
tonal audibility $\Delta L_{a,k}$	6 ms^{-1}	1,414 kW	- 1.5 dB	
	7 ms^{-1}	2,077 kW	0 dB	
	8 ms^{-1}	2,751 kW	0 dB	
	9 ms^{-1}	2,987 kW	0 dB	(1)
	10 ms^{-1}	3,050 kW	--	(2)
impulse adjustment for immediate vicinity K_{IN}	6 ms^{-1}	1,414 kW	0 dB	
	7 ms^{-1}	2,077 kW	0 dB	
	8 ms^{-1}	2,751 kW	0 dB	
	9 ms^{-1}	2,987 kW	0 dB	(1)
	10 ms^{-1}	3,050 kW	--	(2)

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
$L_{WA,P}$	78.3	81.8*	83.0**	84.2	89.6	85.7*	89.2	92.7	94.1	94.6	95.1	94.9
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	93.5	91.6	90.0	89.0	85.4	84.1	82.3	79.3	74.8	67.8*	64.7**	65.3**

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
$L_{WA,P}$	85.6*	91.9	97.2	99.6	96.7	91.5	84.6	70.3*

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
$L_{WA,P}$	78.9	83.3	84.0	84.9	88.2	86.4*	89.6	94.7	94.9	95.4	95.8	95.5
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	94.0	92.0	90.4	89.3	86.1	84.7	82.9	79.9	74.4*	68.4*	64.6**	62.7**

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
$L_{WA,P}$	87.3	91.5	98.4	100.3	97.1	91.9	85.0	71.5**

KÖTTER
CONSULTING ENGINEERS

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
$L_{WA,P}$	82.1	82.8	84.4	88.4	86.8	90.1	94.8	95.0	95.6	96.3	96.2	82.1
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	95.0	93.3	91.5	90.4	86.7	85.4	83.7	80.9	75.9	69.7*	67.1**	65.5**

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
$L_{WA,P}$	86.3	91.6	98.6	100.8	98.3	92.8	86.0	73.3**

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
$L_{WA,P}$	78.6	81.9	82.4*	83.9	87.8	85.9*	88.6	93.8	94.2	95.1	96.0	96.3
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	95.4	93.8	92.3	91.0	87.4	86.0	84.1	81.1	76.7	71.7	68.4	66.8*

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
$L_{WA,P}$	86.0	90.8	97.6	100.6	98.8	93.5	86.4	74.2

This summary of the test report is valid only in combination with the manufacturer's certificate dated 12/03/2013.

These specifications do not replace the test report mentioned above (particularly for noise immission predictions).

Observations:
(1) Maximum value of standardized wind speed during the WTG-operation measurement v_s = 8,9 m/s
(2) Due to weather conditions, no data available during WTG operation
* 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

/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: 23/04/2013

Dipl.-Ing. Oliver Bunk Matthias Humpohl, B.Sc.

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

KÖTTER CONSULTING ENGINEERS

Vorläufiger Auszug aus dem Prüfbericht

Stammblatt "Geräusche", entsprechend den *"Technischen Richtlinien für Windenergieanlagen, Teil 1: Bestimmung der Schallemissionswerte"*

Rev. 18 vom 01.Februar 2008 (Herausgeber: Fördergesellschaft Windenergie e.V. Stresemannplatz 4, D-24103 Kiel)

Auszug aus dem Prüfbericht 213121-01.01
zur Schallemission einer Windenergieanlage vom Typ E-101

Allgemeine Angaben		Technische Daten (Herstellerangaben)	
Anlagenhersteller	Enercon GmbH	Nennleistung (Generator):	3.0 (3.25) MW
Seriennummer:	1010002	Rotordurchmesser:	101 m
WEA-Standort (ca.):	49733 Haren	Nabenhöhe über Grund:	99 m
Standortkoordinaten:	RW: 25.76.214	Turmbauart:	Beton
	HW: 58.59.856	Leistungsregelung:	Pitch
Ergänzende Daten zum Rotor (Herstellerangaben)		**Ergänzende Daten zu Getriebe und Generator (Herstellerangaben)**	
Rotorblatthersteller	Enercon	Getriebehersteller	entfällt
Typenbezeichnung Blatt:	E-101-1	Typenbezeichnung Getriebe:	entfällt
Blatteinstellwinkel:	variabel	Generatorhersteller	Enercon
Rotorblattanzahl:	3	Typenbezeichnung Generator:	G-101/30-G2
Rotordrehzahlbereich:	5 - 14,7 U/min	Generatornenndrehzahl:	14,7 U/min

Leistungskurve: Leistungskennlinie E101 3 MW OM I (berechnet) der Enercon GmbH zur E-101 vom 05.07.2012

	Referenzpunkt: Normierte Windgeschwindigkeit in 10 m Höhe	Referenzpunkt: Elektrische Wirkleistung	Schallemissions-Parameter	Bemerkungen
Schallleistungs-Pegel $L_{WA,P}$	6 ms^{-1}	1.414 kW	103,6 dB(A)	
	7 ms^{-1}	2.077 kW	104,3 dB(A)	
	8 ms^{-1}	2.751 kW	104,7 dB(A)	
	9 ms^{-1}	2.987 kW	104,6 dB(A)	
	10 ms^{-1}	3.050 kW	-- dB(A)	(2)
	8,3 ms^{-1}	*2.850 kW*	*104,8 dB(A)*	*(1)*
Tonzuschlag für den Nahbereich K_{TN}	6 ms^{-1}	1.414 kW	0 dB bei 116 Hz	
	7 ms^{-1}	2.077 kW	0 dB	
	8 ms^{-1}	2.751 kW	0 dB	
	9 ms^{-1}	2.987 kW	0 dB	
	10 ms^{-1}	3.050 kW	-- dB	(2)
	8,3 ms^{-1}	*2.850 kW*	*0 dB*	*(1)*
Impulszuschlag für den Nahbereich K_{IN}	6 ms^{-1}	1.414 kW	0 dB	
	7 ms^{-1}	2.077 kW	0 dB	
	8 ms^{-1}	2.751 kW	0 dB	
	9 ms^{-1}	2.987 kW	0 dB	
	10 ms^{-1}	3.050 kW	-- dB	(2)
	8,3 ms^{-1}	*2.850 kW*	*0 dB*	*(1)*

Terz-Schallleistungspegel für v_s = 8,3 ms^{-1} in dB(A) entsprechend dem maximalen Schallleistungspegel

Frequenz	50	63	80	100	125	160	200	250	315	400	500	630
$L_{WA,P,max}$	78,8	82,1	82,7	84,4	88,4	86,7	90,0	94,8	95,0	95,6	96,3	96,2
Frequenz	800	1.000	1.250	1.600	2.000	2.500	3.150	4.000	5.000	6.300	8.000	10.000
$L_{WA,P,max}$	95,0	93,3	91,5	90,4	86,6	85,4	83,7	80,8	75,8	69,7*	67,1**	65,5**

Oktav-Schallleistungspegel für v_s = 8,3 ms^{-1} in dB(A) entsprechend dem maximalen Schallleistungspegel

Frequenz	63	125	250	500	1.000	2.000	4.000	8.000
$L_{WA,P,max}$	86,3	91,6	98,6	100,8	98,3	92,8	85,9	73,3**

Dieser Auszug aus dem Prüfbericht gilt nur in Verbindung mit der Herstellerbescheinigung vom 13.03.2013.

Die Angaben ersetzen nicht den o. g. Prüfbericht (insbesondere bei Schallimmissionsprognosen).

Bemerkungen:
(1) Die normierte Windgeschwindigkeit von v_s = 8,3 ms^{-1} entspricht 95 % der Nennleistung.
(2) Witterungsbedingt keine Daten vorhanden
* Abstand zwischen Anlagengeräusch und Fremdgeräusch < 6 dB, Pegelkorrektur um 1,3 dB
** Abstand zwischen Anlagengeräusch und Fremdgeräusch < 3 dB, keine Pegelkorrektur

Gemessen durch: KÖTTER Consulting Engineers GmbH & Co. KG

Datum: 13.03.2013 i. V. Dipl.-Ing. Oliver Bunk i. A. Matthias Humpohl, B. Sc.

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

Powell, Chris

From: Miller, Denton (ENE) <Denton.Miller@ontario.ca>
Sent: Thursday, April 24, 2014 12:03 PM
To: Powell, Chris; Raetsen, Sarah (ENE)
Cc: Darren Croghan; Merv Croghan; Shiloh Berriman (sberriman@nrwc.ca); Leggett, Al; Ganesh, Kana; Hung, Timothy
Subject: RE: NRWC Info Request - 2e , 8 and 9 MOE ref file # 1175-972NB9

Chris

Yes, the information provided previously has addressed our concerns.

Thank you

Regards
Denton Miller
416-314-8310

From: Powell, Chris [mailto:Chris.Powell@stantec.com]
Sent: April 24, 2014 12:00 PM
To: Miller, Denton (ENE); Raetsen, Sarah (ENE)
Cc: Darren Croghan; Merv Croghan; Shiloh Berriman (sberriman@nrwc.ca); Leggett, Al; Ganesh, Kana; Hung, Timothy
Subject: RE: NRWC Info Request - 2e , 8 and 9 MOE ref file # 1175-972NB9

Denton,

Thank you for the comments and we trust the information we provided satisfies your concerns. We will work to get the report updated as soon as possible to provide to you on or before May 9, 2014.

Sincerely,

Chris

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Thursday, April 24, 2014 11:56 AM
To: Powell, Chris; Raetsen, Sarah (ENE)
Cc: Darren Croghan; Merv Croghan; Shiloh Berriman (sberriman@nrwc.ca); Leggett, Al; Ganesh, Kana; Hung, Timothy
Subject: RE: NRWC Info Request - 2e , 8 and 9 MOE ref file # 1175-972NB9

Hello Chris

Thank you for your response.

Moving forward please update the noise report as noted below:

1. **Info request 2: Sound Power Levels**

   - Include the turbine data sheets provided by Enercon , that address the E-101 and E-82 turbines specifications (April 16,2014 email)

2. Add an appendix to the report that summarize :

i) Info request 3: Eric Gillespie Letters

- summarize the efforts made to date to address the concerns raised by Eric Gillespie (include your Jan 31, 2014 letter)

ii) **Info request 4: Receptor 1750**

- summarize the issues associated with receptor 1750. Also note the resolution. (your Feb 12, 2014 e-mail)
- Also update the noise report accordingly (vacant lot changed to existing lot)

iii) **Info request 5: Receptor 3583**

- summarize the issues associated with receptor 3583. (your Feb 13, 2014 and April 17 , 2014 e-mails)

iv) **Info request 6: Receptors 735,794, 1762, 582, 674, 148**

- summarize the issues associated with the receptors identified above (your Mar 6, 2014 e-mail)
- Also update the noise report accordingly (vacant lots changed to existing lot)
- Include the new point of reception, that is in close proximity to O_1958, in the POR Results Summary Table (Appendix C)

v) **Info request 7: Alleged receptor between receptors 1481 and 1598**

- summarize the issues associated with the receptors identified above (your Mar 13, 2014 e-mail)

vi) **Info request 8: Munich Higher Regional Court's decision**

- summarize the issues and Enercon's opinion associated with the Munich Higher Regional Court's decision (your April 16, 2014 e-mail)

vii) **Info request 9: Rosa Flora Turbine**

- summarize the issues associated with the assessment of the turbine and provide the updated Cadna files (your April 16, 2014 e-mail)

viii) **Info request 2: Sound Power Levels**

- summarize the issues associated with the different sound power level datasheets for the subject turbines (your April 16, 2014 e-mail)

3. Please submit a signed hard copy of the report and a PDF version of the report. (Please also provide a word document with the track changes noted for the first seven sections of the report.)
4. Please submit the updated report by **May 9, 2014**.

Regards
Denton Miller
416-314-8310

From: Powell, Chris [mailto:Chris.Powell@stantec.com]
Sent: April 16, 2014 9:46 AM
To: Miller, Denton (ENE); Raetsen, Sarah (ENE)
Cc: Darren Croghan; Merv Croghan; Shiloh Berriman (sberriman@nrwc.ca); Leggett, Al; Ganesh, Kana; Hung, Timothy; Hassan.Shahriar@enercon.de
Subject: FW: Niagara Region Wind Farm Info Request - 2e , 8 and 9 MOE ref file # 1175-972NB9
Importance: High

Denton,

In response to your email dated April 3, 2014, and further to our conference calls over this past week, we provide the following information to address your comments:

1. Info Request 2e - Sound Power Levels of the Subject Turbines

   Based on follow-up discussions with Enercon, a more definitive statement confirming the use of the 104.8 dBA noise data for the E101 turbines proposed for the NRWC Project has been obtained from Enercon. Attached to this email are the following documents confirming the use of the appropriate data in the noise assessment report for this Project:

   a. Letter from Enercon entitled *Sound Power Level (SPL) documents of the ENERCON Wind Energy Converters (WECs) E-101 3.0MW and the E-82 2.3MW for Niagara Region Wind Corporation (NRWC)* dated April 15, 2014, and corresponding attachments.

      1) Sound Power Level E-101 NRWC dated April 15, 2014
      2) KÖTTER measurement excerpts dated April 23, 2013 and March 13, 2013
      3) Sound Power Level E-82 NRWC dated April 15, 2014
      4) KÖTTER measurement excerpt dated February 8, 2010

   This letter provides the additional confirmation requested in your last email and greater certainty with respect to the sound power level information for the turbines being proposed for the NRWC Project.

2. Info Request 8 – Munich Higher Regional Court's Decision pertinent to impulsive sound from Enercon E-82 wind turbines

   The following comments have been provided by Enercon in response to MOE's request for information on this issue:

   The article referenced is in regard to a claim and subsequent ruling which has been made against ENERCON regarding the impulsivity of E-82 turbines in one of its wind parks near Munich, Germany.

   ENERCON is in full disagreement with the ruling and are launching a full appeal against the region. In response, as per the official comments from ENERCON GmbH made on this issue.

   "for us, this ruling is completely incomprehensible", says Felix Rehwald, Spokesperson for Europe's largest wind turbine manufacturer Enercon.

   He continues to comment that ENERCON manufactures, sells and guarantees its turbines worldwide against tonality (in accordance with the IEC standards) and furthermore that Enercon's own specialists in sound power

have yet to yield any measurements which would indicate impulsivity of the turbines and as such, Enercon is launching counter-proceedings in the way of an appeal against the ruling.

The court case in Germany is not related to the NRWC project from a technical and environmental permitting perspective.

3. Info Request 9 – Cadna files for Existing Rosa Flora Turbine

In regards to the questions raised pertaining to the Cadna files, we will circulate the correct Cadna files to the MOE under a separate email, which will be available via an FTP site for your review. The Cadna file will illustrate the correct sound power level (103.5 dBA) for the Rosa Flora Turbine, as it was used in the noise model to generate the results in the Noise Assessment Report dated September 201**3**.

The Cadna file previously provided on March 17, 2014 identifying a sound power level for this turbine of 101 dBA (correction factor of -2.5 dBA) was not used in the modelling exercise for this Project.

The Rosa Flora turbine is a 0.65 MW turbine located approximately 3,500 m from the nearest NRWC turbine. As per the Noise Assessment Report, the maximum sound power level for this turbine used in the model was 103.5 dBA (Section 3.3, page 3.9), which was rounded to 104 in Table 3.8. This is further confirmed in the sample calculation and Cadna/A input/outputs table provided in Appendix E and in the adjusted emission level for the Rosa Flora turbine identified in Table F1 of Appendix F of the Noise Assessment Report (Stantec, September 2014).

Based on the above, we trust that the above information is sufficient to address MOE's concerns as expressed in your email dated April 3, 2014.

If you have any questions, please do not hesitate to call.

Sincerely,

Chris

Chris Powell, M.A.
Project Manager, Environmental Planner
Stantec
49 Frederick Street Kitchener ON N2H 6M7
Phone: (519) 585-7416
Cell: (519) 501-2368
Fax: (519) 579-6733
Chris.Powell@stantec.com

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Thursday, April 03, 2014 1:40 PM
To: Kossowski, Julia
Cc: Raetsen, Sarah (ENE); Powell, Chris; Ganesh, Kana; Leggett, Al; darrenc@nrwc.ca; Shiloh Berriman; mervcroghan@nrwc.ca; Hung, Timothy
Subject: FW: Niagara Region Wind Farm Info Request - 2e , 8 and 9 MOE ref file # 1175-972NB9

Hi Chris / Julia

Below are:

1. Additional comments to info request 2 (Sound Power Levels of the subject turbines) ,
2. Two new information requests (8 & 9), and
3. A summary of the information requests to date (attached).

---

1. Additional comments to Info Request 2

With respect to Enercon's attached document, I still have concerns with their specification of the applicable sound power level {RE: Section 6.2.2. of Noise Guidelines for Wind Farms}.

Specifically the use of the word **suggests** is problematic. (reference copied below) .

> The 104.8 dBA as presented in the Kotter document dated April 23, 2013 coincides with the Sound Power Level guarantee (95% rated power or higher) provided by ENERCON to the Niagara Region Wind Corporation. As such, ENERCON suggests that this document is more applicable to the Niagara Region Wind Corporation facility as opposed to the estimated 106 dBA presented in the ENERCON document.

Consequently, in the absence of a definitive statement from Enercon , I will be contacting you next week to discuss how my review will address this issue.

---

2. Info Request 8

Please ask Enercon to comment on the following court decision identified via an EBR comment:

> *The Munich Higher Regional Court's decision pertinent to impulsive sound from Enercon E-82 wind turbines in a wind farm located in Rennertshofen in the district of Neuburg-Schrobenhausen. Judgment OLG München 14.08.2012*

Specifically;

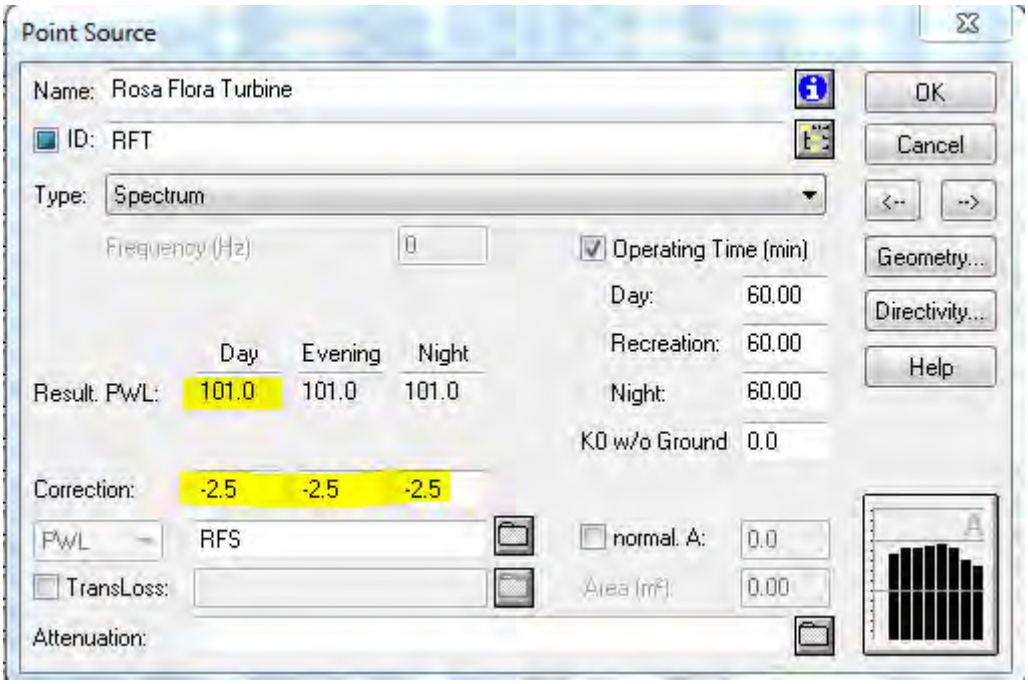
1. What was the issue?
2. What was the outcome? and
3. How is this issue related to the turbines proposed in the NRWC

Please provide comments by April 17, 2014.

---

3. Info Request 9:

The Cadna files note the following sound power level (101.0 dBA) for Rosa Flora Turbine:



The Noise Report notes the following sound power level (104 dBA) for the same turbine .

Table 3.8 Assessed Noise Sources Associated with Adjacent or Proposed Wind Farms within 5 km

Source ID	Source Description	Sound Power Level [dBA]	UTM Coordinates		
			X [m]	Y [m]	Z [m]
RF	Rosa Flora Turbine	104	615270	4756417	75

Please comment on the oversight between both sources of data, and the potential impact on the calculated sound pressure levels.

Please provide comments by April 17, 2014.

Regards
Denton Miller
416-314-8310

From: Kossowski, Julia [mailto:Julia.Kossowski@stantec.com]
Sent: March 25, 2014 4:35 PM
To: Miller, Denton (ENE)
Cc: Raetsen, Sarah (ENE); Powell, Chris; Ganesh, Kana; Leggett, Al; darrenc@nrwc.ca; Shiloh Berriman (sberriman@nrwc.ca); mervcroghan@nrwc.ca; Hung, Timothy
Subject: FW: Niagara Region Wind Farm Info Request -2e MOE ref file # 1175-972NB9

Hello Denton,

On behalf of Chris Powell and NRWC, please find attached ENERCON's request to your email below dated March 17, 2014.

Please contact us if you require additional information.

Kind Regards,
Julia

Julia Kossowski, P. Eng.
Project Manager - Power
Stantec
49 Frederick Street
Kitchener ON N2H 6M7
Ph: (519) 569-4338
Fx: (519) 579-4239
Cell: (226) 989-5259
julia.kossowski@stantec.com

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Monday, March 17, 2014 02:37 PM
To: Powell, Chris; Raetsen, Sarah (ENE) <Sarah.Raetsen@ontario.ca>; Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; 'darrenc@nrwc.ca' <darrenc@nrwc.ca>; 'sberriman@nrwc.ca' <sberriman@nrwc.ca>; 'mervcroghan@nrwc.ca' <mervcroghan@nrwc.ca>
Subject: RE: Niagara Region Wind Farm Info Request -2e MOE ref file # 1175-972NB9

Thank you for your response Chris.

Summary :

ENERCON considers the measurements values to be satisfactory representative values of the E-101 3,050 kW and E-82 E2 2,300 kW noise
levels.

	Octave band sound power level in dB(A)							
Frequency (Hz)	63	125	250	500	1,000	2,000	4,000	8,000
E-101 3,050 kW @ 8.3m/s	86.3	91.6	98.6	100.8	98.3	92.8	85.9	73.3
E-82 E2 2,300 kW @ 9 m/s	86.6	94.6	94.3	97.3	98.7	93.8	81.5	73.4

ISSUE:

Unfortunately the response from Enercon (satisfactory representative) is not definitive enough for our review purposes. It is requested that Enercon explain why they have published at least two different data sheets for the

same equipment (E-101), that have different values for the 95% rated capacity sound power levels (106 dBA and 104.8 dBA)?

It is also requested that Enercon explain why the above sound power levels for the E-101 are applicable to the Niagara Region Wind Corporation facility as opposed to the 106 dBA data that was referenced in a previous e-mail ?

Please provide a response by **March 25, 2014**.

Regards
Denton Miller
416-314-8310

From: Powell, Chris [mailto:Chris.Powell@stantec.com]
Sent: March 17, 2014 1:25 PM
To: Miller, Denton (ENE); Raetsen, Sarah (ENE); Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; 'darrenc@nrwc.ca'; 'sberriman@nrwc.ca'; 'mervcroghan@nrwc.ca'
Subject: RE: Niagara Region Wind Farm Info Request -2d MOE ref file # 1175-972NB9

Denton,

The attached information has been provided by Enercon in response to your email dated March 12, 2014. The values contained in the attachment provide the A-weighted values for the E-101 and E-82 turbines to 95% rated capacity, while the values included in Table 3.2 of the Noise Assessment Report (as attached to your email) are linear weighted values. The A-weighted values provided by Enercon in the attached table are consistent with the information provided previously by Enercon to Stantec for use in the noise model. These values were converted to linear weighted values following standard conversion methods and incorporated accordingly into the noise model and Noise Assessment Report.

In regards to your second comment, the requested Cadna-A file has been provided under a separate email earlier today for your review.

We trust that this information will be sufficient. If you have any further questions, please do not hesitate to ask.

Sincerely,

Chris

Chris Powell, M.A.
Project Manager, Environmental Planner
Associate, Environmental Services
Stantec Consulting Ltd.

Office: (519) 585-7416
Cell: (519) 501-2368
chris.powell@stantec.com

From: Miller, Denton (ENE) [Denton.Miller@ontario.ca]
Sent: March 12, 2014 12:22 PM
To: Powell, Chris; Raetsen, Sarah (ENE); Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; 'darrenc@nrwc.ca'; 'sberriman@nrwc.ca'; 'mervcroghan@nrwc.ca'
Subject: RE: Niagara Region Wind Farm Info Request -2d MOE ref file # 1175-972NB9

Thank you for your response Chris

Summary:

In accordance with Section 6.2.2 of the Noise Guidelines for Wind Farms your firm was requested to provide the sound power levels, frequency spectra in octave bands (63 to 8000 Hz), and tonality at integer wind speeds from 6 to 10 m/s for the subject wind turbines. (E-82 & E-101)

Your firm responded (para-phrased) that this information is not necessary, as your analysis based on the 95% rated capacity sound power levels of the turbines. (This approach is acceptable to MOE.)

Enercon further notes (Mar 7, 2014 e-mail) that the SPL of the E-82 and the E-101 Wind Energy Converters (WECs) do not exceed beyond the values at 95% rated capacity for hub heights specified in its **Sound Power Level documents.**

Issue:

There are several different Enercon documents noting different values for the 95% rated capacity sound power levels. For example:

1. There is a April 2013 Enercon document (attached) noting that the 95% rated capacity sound power level for the E-101 3050 kW turbine is **106 dBA**. (NRWC report states this value to be **104.8 dBA**) {it is acknowledged that the ratings differ by 50 kW, Niagara turbines are smaller}

2. There is a April 2010 Enercon document (attached) noting that the 95% rated capacity sound power level for the E-82 2000 kW turbine is 103.**5** dBA; (NRWC report states this value to be 103.**3** dBA) {it is acknowledged that the ratings differ by 300 kW – Niagara turbines are larger}

Requests:

1. Please provide by **March 20, 2014,** a written statement from Enercon confirming that the values noted in Table 3.2 of your Report (Sept 30, 2013) are accurate. (For reference the table is copied below.)

Table 3.2 Highest Wind Turbine Sound Emission Corresponding to 95% or above Rated Electrical Output Power

Description	Octave Band Sound Power Level (dB ref. 10-12 Watts)								
Frequency [Hz]	63	125	250	500	1k	2k	4k	8k	dB/dBA
ENERCON model E101 model at 8.3 m/s	112.5	107.7	107.2	104.0	98.3	91.6	85	74.4	113.9/ 104.8
ENERCON model E82 model at 9 m/s	112.8	110.8	103	100.5	98.7	92.6	80.5	74.5	115.5/ 103.3

2. Please also forward the cadna A file (s) to this office.

Regards
Denton Miller
416-314-8310

From: Powell, Chris [mailto:Chris.Powell@stantec.com]
Sent: March 7, 2014 4:17 PM
To: Miller, Denton (ENE); Raetsen, Sarah (ENE); Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; 'darrenc@nrwc.ca'; 'sberriman@nrwc.ca'; 'mervcroghan@nrwc.ca'
Subject: RE: Niagara Region Wind Farm Info Request -2c MOE ref file # 1175-972NB9

Denton,

In preparing the Noise Assessment Report, Stantec and NRWC understood this issue and the requirements outlined in the MOE Noise Guidelines for Wind Farms. This issue was raised by NRWC and discussed during the project design stage with the manufacturer, who confirmed that despite the change in power with wind speed and height their guaranteed maximum sound power at rated capacity would not change for the proposed turbine models, and that tonality would not result at these higher turbine heights or wind speeds. This was confirmed and guaranteed through a separate letter from Enercon, which has been provided to the MOE as part of the Noise Assessment Report.

Following your email, we have discussed this further with Enercon and they have prepared additional information to address your specific comment with respect to hub height and tonality (see attached). In the supplemental information, they have reconfirmed the following:

1. that the sound power levels of the E82 and E101 turbines do not exceed beyond the values at 95% rated capacity,
2. that the turbines shall not exceed the guaranteed maximum sound power levels for hub heights specified; and
3. that the tonal audibility shall be equal to or less than 2 dB over the whole operational range, including at wind speeds of 10m/s.

Stantec confirms that the analysis provided in the Noise Assessment Report considered the spectral sound power data (i.e. frequency based data) based on the IEC test and overall sound power level corresponding to 95% rated electrical output power as guaranteed by the manufacturer (Enercon). The manufacturer has confirmed that the sound power level at 95% rated capacity is independent of height and wind speeds and has addressed the tonality concerns in a separate letter attached.

The MOE raised similar concerns during the screening of REA application for completeness and we provided additional discussion and rationale at that time. We understood that this additional information was sufficient to address your concern, but trust that the supplemental information now provided by Enercon further supports the completion of your technical review.

If you require further information in this regard, we request that a meeting be held to review and discuss this issue with our noise experts as soon as possible.

Sincerely,

Chris

Chris Powell, M.A.
Project Manager, Environmental Planner
Stantec
49 Frederick Street Kitchener ON N2H 6M7
Phone: (519) 585-7416
Cell: (519) 501-2368
Fax: (519) 579-6733
Chris.Powell@stantec.com

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Friday, February 21, 2014 12:39 PM
To: Powell, Chris; Raetsen, Sarah (ENE); Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; 'darrenc@nrwc.ca'; 'sberriman@nrwc.ca'; 'mervcroghan@nrwc.ca'
Subject: RE: Niagara Region Wind Farm Info Request -2c MOE ref file # 1175-972NB9

Hello Chris

I have yet to receive a response to the e-mails I sent to your office on January 24, and 30 , 2014 regarding the sound power levels of the proposed turbines (questions 2 & 3 in the January 24, 2014 email to your office; copied below).

Please provide a response by **March 7, 2014**. If your firm is unable to provide a response by this date I will have to stop the clock on our service guarantee time.

If you have any questions , please feel free to contact me.

PS:
I also have additional questions via EBR comments pertinent to vacant lots which I will send to you in a separate e-mail later today.

Regards
Denton Miller
416-314-8310

From: Powell, Chris [mailto:Chris.Powell@stantec.com]
Sent: January 30, 2014 8:29 AM
To: Miller, Denton (ENE); Raetsen, Sarah (ENE); Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; 'darrenc@nrwc.ca'; 'sberriman@nrwc.ca'; 'mervcroghan@nrwc.ca'
Subject: Re: Niagara Region Wind Farm Information request -2 MOE ref file # 1175-972NB9

Ok. I'll follow up with Kana and we will get back to you shortly.

Chris
Chris Powell, M.A.
Project Manager
Environmental Planner
Stantec
Cell: (519) 501-2368

Sent from my Blackberry

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Thursday, January 30, 2014 08:26 AM
To: Powell, Chris; Raetsen, Sarah (ENE) <Sarah.Raetsen@ontario.ca>; Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; Darren Croghan <darrenc@nrwc.ca>; Shiloh Berriman (sberriman@nrwc.ca) <sberriman@nrwc.ca>; Merv Croghan <mervcroghan@nrwc.ca>

Subject: RE: Niagara Region Wind Farm Information request -2 MOE ref file # 1175-972NB9

Hello Chris.

Thank you for your response to my questions noted in your previous e-mail (January 29, 2014 10:40 AM).

The e-mail has answered question # 1 (RE: Participating Receptors), however questions 2 and 3 still require attention.

Below is additional rationale as to why questions # 2 and 3 will require further clarification from your firm:

Rationale:

Documents prepared by the International Electrotechnical Commission note that the apparent sound power level is correlated to the acoustic reference wind speed and not to the wind speed at hub height. An increase in hub height will increase the apparent sound power level and might have an unpredictable effect on tonality.

The following examples from Enercon publications note this phenomenon:

Example 1: Sound Power Level for the E-82 with 2300 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
5 m/s	96,3 dB(A)	96.6 dB(A)	97.2 dB(A)	97.5 dB(A)
6 m/s	100.7 dB(A)	101.0 dB(A)	101.6 dB(A)	101.9 dB(A)
7 m/s	103.3 dB(A)	103.5 dB(A)	103.6 dB(A)	103.6 dB(A)
8 m/s	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)
9 m/s	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)
10 m/s	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)
95% rated power	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)	104.0 dB(A)

Example 2:

Sound Power Level for the E-33 with 330 kW rated power

in relation to standardized wind speed v_s at 10 m height					
hub height / v_s at 10 m height	37 m	44 m	49 m	50 m	
5 m/s	90.9 dB(A)	91.0 dB(A)	91.3 dB(A)	91.3 dB(A)	
6 m/s	95.1 dB(A)	96.0 dB(A)	96.5 dB(A)	96.5 dB(A)	
7 m/s	98.6 dB(A)	98.9 dB(A)	99.0 dB(A)	99.0 dB(A)	
8 m/s	99.7 dB(A)	99.8 dB(A)	99.9 dB(A)	99.9 dB(A)	
9 m/s	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	
10 m/s	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	
95% rated power	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	

Therefore in accordance with Section 6.2.2 of the Noise Guidelines for Wind Farms please provide the sound power levels, frequency spectra in octave bands (63 to 8000 Hz), and tonality at integer wind speeds from 6 to 10 m/s for the subject wind turbines.

I have another question which I send in a separate e-mail later today.

Regards
Denton Miller
416-314-8310

From: Powell, Chris [mailto:Chris.Powell@stantec.com]
Sent: January 29, 2014 10:40 AM
To: Miller, Denton (ENE); Raetsen, Sarah (ENE); Hung, Timothy
Cc: Ganesh, Kana; Leggett, Al; Darren Croghan; Shiloh Berriman (sberriman@nrwc.ca); Merv Croghan
Subject: RE: Niagara Region Wind Farm Information request MOE ref file # 1175-972NB9

Denton,

In response to your email from Friday, January 24, 2014, Kana has provided the justification you are seeking to address your specific questions. Based on his input, we offer the following responses:

Question 1: Participating Receptors
All of the participating receptors will include project infrastructure and adhere to the definition provided in O. Reg. 359/09 and include a project component.

The REA application considered 80 turbines during the project planning and design stages, including the completion of the various technical reports. The 80 turbine layout is compliant with the noise requirements of the regulation. In order to meet the FIT contract requirements of 230 MW, only 77 of these 80 turbines are to be built (each rated at 3 MW - one or more to be de-rated to satisfy the 230MW requirement).

The specific turbines to be constructed will depend on the detailed engineering and wind resourcing studies to be completed. The decision to drop a turbine depends highly on wind power, and it is likely that a turbine may be dropped from a cluster of turbines where more than one turbine is located within the same property (due to wind resources). Based on that understanding, all participating receptors will continue to fit the definition of participating receptors.

In the event that a turbine is dropped from a property with only one turbine, the design of the wind farm will ensure that project infrastructure remains on that property to ensure its compliance as a participating receptor, in the event that it violates the 40.0 dBA noise threshold, as defined in the regulation.

Question 2: Re Table 3.1 ; Sound Power Levels for the E-101
In preparing the noise model and assessment, Stantec concluded the data is valid based on the following:

a. Stantec used sound power levels in the analysis, which is a parameter independent of height of the source;
b. The manufacturer has guaranteed /confirmed to NRWC that their machine will meet the sound power requirements as specified in the test sheet (included with the report); and
c. IEC 61400-11 (i.e. international standard CAN/CSA-C61400-11-07) uses normalized height so that measurements are independent of height and terrain (i.e. location, where it was measured).

As such, the manufacturer's data values used in the noise model for predicting sound power levels at the various receptors are valid for the E-101 turbines.

Question 3: Re Table 3.1 ; Sound Power Levels for the E-82
Similar to the above rationale, the manufacturer's data values used in the noise model for predicting sound power levels at the various receptors are valid for the E-82 turbines.

We trust that this information is of assistance. If you have any further questions, please do not hesitate to give Kana or myself a call.

Sincerely,

Chris

Chris Powell, M.A.
Project Manager, Environmental Planner
Stantec
49 Frederick Street Kitchener ON N2H 6M7
Phone: (519) 585-7416
Cell: (519) 501-2368
Fax: (519) 579-6733
Chris.Powell@stantec.com

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Friday, January 24, 2014 3:15 PM
To: Ganesh, Kana; Hung, Timothy; Raetsen, Sarah (ENE)
Cc: Raetsen, Sarah (ENE); Powell, Chris; Leggett, Al
Subject: RE: Niagara Region Wind Farm Information request MOE ref file # 1175-972NB9

Hello Kana

He have started review of the subject application and to date have the following preliminary questions.

Question 1: Participating Receptors

Background:

Section 1 of the report notes the following:

> The facility is comprised of 80 wind turbine. However, only **77** of the wind turbines will be constructed.

Section 4.2 of the report notes the following:

> There are a total of 96 Participating Receptors.

Issue:

Please confirm that the participating Noise Receptors adhere with the definition in Section 1(6) of O. Reg. 359/09. Specifically will all participating receptors have infrastructure located on them?

If this is not the case then some of these participating receptors must be considered as points of reception and the analysis in the report updated to address these points of reception.

Question 2: Re Table 3.1 ; Sound Power Levels for the E-101

It is noted that the data in Appendix D (Enercon E-101) is for a turbine with a hub height of **99 m**. The proposal (Sept 30, 2013 report) notes the turbine nacelles will be at **124 m** and/or **135 m** height. Please comment on the implication of using the 99 m data in your analysis to represent turbines at **124 m** and/or **135 m** height .

Question 3: Re Table 3.1 ; Sound Power Levels for the E-82

It is noted that the data in Appendix D (Enercon E-82) is for a turbine with a hub height of **108 m**. The proposal (Sept 30, 2013 report) notes the turbine nacelles will be at **135 m** height. Please comment on the implication of using the 108 m data in your analysis to represent turbines at **135 m** height .

Thank you.

Regards
Denton Miller

Denton Miller | Senior Review Engineer | Team 5 | Environmental Approvals Branch I Ministry of the Environment
2 St. Clair Ave W. 12a Floor Toronto, Ontario, M4V 1L5 | Phone: 416-314-8310 | Denton.Miller@ontario.ca|

From: Ganesh, Kana [mailto:Kana.Ananthaganeshan@stantec.com]
Sent: January 7, 2014 4:18 PM
To: Miller, Denton (ENE); Hung, Timothy

Cc: Raetsen, Sarah (ENE); Powell, Chris; Leggett, Al
Subject: RE: Niagara Region Wind Farm Information request MOE ref file # 1175-972NB9

Thanks for the email Denton and happy New Year to you.

Please find attached the Tables; I have some of them in Word format (readily available) and some in Excel format.
Please let me know word format is acceptable for your purpose.

Best regards
Kana Ganesh, PhD., P.Eng
Sr. Acoustics Noise and Vibration Engineer
300 - 675 Cochrane Drive West Tower Markham ON L3R 0B8
Phone: 905-415-6332
Fax: 905-474-9889
kana.ganesh@stantec.com

Design with community in mind

stantec.com

From: Miller, Denton (ENE) [mailto:Denton.Miller@ontario.ca]
Sent: Tuesday, January 07, 2014 3:27 PM
To: Ganesh, Kana; Hung, Timothy
Cc: Raetsen, Sarah (ENE); Powell, Chris
Subject: Niagara Region Wind Farm Information request MOE ref file # 1175-972NB9

Hello Kana / Timothy

I am the review engineer assigned to this file. To facilitate my review , please forward excel copies of the following tables in the noise assessment report.

Tables:

2.1	3.3	3.6	4.1
3.1	3.4	3.7	6.2
3.2	3.5	3.8	6.3

F.5 Appendix E
F.6 Barrier Co-ordinates

your file # 160950269 dated September 30, 2013.

Thank you

APPLICATION SUMMARY

Status	**New Application**	**Assigned**	
IDS Reference #	**1175-972NB9**	**File #**	**R- 0018 -13**
REA #			
Application Type	**New Renewable Energy Approval**		
Media	**Noise**		
Facility Type:			
Client Name	**Niagara Region Wind Corporation**	**Client #**	**2349-**972N8X
Client Aliases			
Site Name	**Niagara Region Wind Farm**	**Site #**	**9527-**972NA9

Denton Miller | Senior Review Engineer | Team 5 | Environmental Approvals Branch I Ministry of the Environment
2 St. Clair Ave W. 12a Floor Toronto, Ontario, M4V 1L5 | Phone: 416-314-8310 | Denton.Miller@ontario.ca|

Appendix G4 – Supplemental MOECC Receptor Verification Comments

Info Request 12: Receptors 986, 1002, 856, 3139, 3142, 2922
On September 26, 2014, the Ministry of the Environment and Climate Change (MOECC) raised concerns with respect to the location of 6 PORs that had been identified by members of the public. The rationale for the location of these PORs was requested, along with an update to the NAR is adjustments were required.

O_986 – Regional Road 65, West Lincoln

Concern:
The following questions were posed by the MOECC:

1. Please confirm the location (UTM Coordinates) of the POR on this lot.
2. Does the current UTM Coordinates represent a POR?
3. Please identify the building immediately south of the current location of this POR. (Approximately 546 m away from T38).
4. If a POR please amend noise report accordingly.

Response:
Upon review of the aerial photography, the location of this POR does not represent the centre of a noise receptor. As such, the location has been adjusted to the centre of the dwelling, located to the southwest of the original POR location. This adjustment has been reflected in the noise model and corresponding updates to the NAR above. The result of this change is a reduction in the separation between the centre of the closest turbine (T38) and this POR from 573 m to 559 m, and a minor increase in the sound level from 39.5 to 39.8 dBA.
The building immediately south of the current location (i.e. to the southeast of the dwelling) is not a noise receptor. This building, as evidenced by the photograph below, is a garage, and is therefore not reflected in the noise model as a POR.

Action:
The noise model, mapping and appropriate tables in the NAR have been amended to reflect the minor shift in the location of this POR. There are no impacts to the Project since this receptor complies with the minimum setback and noise threshold requirements under O. Reg. 359/09.

O_1002 – Regional Road 65, West Lincoln

Concern:
The following questions were posed by the MOECC:

1. Please confirm the location (UTM Coordinates) of the POR on this lot.
2. Does the current UTM Coordinates represent centre of the POR?

Response:
Upon review of the aerial photography, the location of this POR does not represent the centre of the noise receptor. As such, the location has been adjusted to the centre of the dwelling, which has been reflected in the noise model and corresponding updates to the NAR above. The result of this change is an increase in the separation between the centre of the closest turbine (T38) and this POR from 551 m to 555 m, and a minor decrease in the sound level from 39.8 dBA to 39.7 dBA.

Action:
The noise model, mapping and appropriate tables in the NAR have been amended to reflect the minor shift in the location of this POR. There are no impacts to the Project since this receptor complies with the minimum setback and noise threshold requirements under O. Reg. 359/09.

O_856 – Inman Rd, Haldimand

Concern:
The following questions were posed by the MOECC:

1. Please confirm the location (UTM Coordinates) of the POR on this lot.
2. Does the current UTM Coordinates represent centre of the POR?

Response:
Upon review of the aerial photography, the location of this POR does not represent the centre of the noise receptor. As such, the location has been adjusted to the centre of the dwelling, which has been reflected in the noise model and corresponding updates to the NAR above. The result of this change is an increase in the separation between the centre of the closest turbine (T20) and this POR from 552 m to 556 m, and there is no change in the predicted sound level, which remains at 40.0 dBA.

Action:
The noise model, mapping and appropriate tables in the NAR have been amended to reflect the minor shift in the location of this POR. There are no impacts to the Project since this receptor complies with the minimum setback and noise threshold requirements under O. Reg. 359/09.

O_3139 and O_3142 – Regional Road 65, West Lincoln

Concern:
The following questions were posed by the MOECC:

1. Please confirm the rationale used to determine the location (UTM Coordinates) of the POR on this lot.
2. Should the POR be a vacant lot receptor?

Response:
Both receptors represent vacant lot receptors as there are no dwellings constructed, or approved for construction, on the subject properties. These receptors were mis-labelled in the original noise model but have been corrected above.
Further, both of these PORs are located on land-locked parcels created as a result of the existing Hydro One transmission lines bisecting the farms (i.e. to the north and south of these parcels). These parcels are legally identified as separate properties with no road frontage. However, noise receptors were conservatively identified on these properties in the unlikely event that future road access was provided from the south along the unopened road allowance. The POR's were located near the south of these properties, closest to the unopened road allowance, similar to the development pattern in the area (i.e. located closest to the potential location where access would be considered). Access from the north is not available.
Despite the conflict in naming convention, the location of these POR's represents the location where a potential structure would reasonably be constructed in the event that access from the

south was provided. The minimum REA setback of 550m has been accommodated for these receptors and the noise model demonstrates that the sound level does not exceed 40.0 dBA.

Action:
The noise model, mapping and appropriate tables in the NAR have been amended to re-label these noise receptors as V_3139 and V_3142 to reflect the fact that they represent vacant lots. There are no impacts to the Project since this receptor complies with the minimum setback and noise threshold requirements under O. Reg. 359/09.

O_2922 – Vaughn Rd, West Lincoln

Concern:
The following questions were posed by the MOECC:

1. Please confirm the location (UTM Coordinates) of the POR on this lot.
2. Does the current UTM Coordinates represent a POR?
3. Please identify the buildings immediately south of the current location of this POR. (Approximately 520 m away from the closest turbine). If a POR please amend noise report accordingly.
4. Please identify the building immediately north of the current location of this POR. If a POR please amend noise report accordingly.

Response:
Upon review of the aerial photography, the location of this POR does not represent the centre of a noise receptor. Instead, it is located on a shed (or similar storage structure) south of the house and closer to the nearest turbine (T78). As such, the location has been adjusted to the centre of the dwelling north of this shed, which has been reflected in the noise model and corresponding updates to the NAR above. The result of this change is an increase in the separation between the centre of the closest turbine (T78) and this POR from 563 m to 582 m, and a minor decrease in the sound level from 39.6 dBA to 39.4 dBA.
The building immediately south of the current location (i.e. to the southeast of the dwelling) is not a noise receptor. This building is a barn and is therefore not reflected in the noise model as a POR.

Action:
The noise model, mapping and appropriate tables in the NAR have been amended to reflect the minor shift in the location of this POR. There are no impacts to the Project since this receptor complies with the minimum setback and noise threshold requirements under O. Reg. 359/09.

Appendix G5 – REA Amendment (October, 2015) - Info. Request #1, #2 and #3

Info Request #1 and #2:

From: Miller, Denton (MOECC) [mailto:Denton.Miller@ontario.ca]
Sent: Tuesday, January 19, 2016 2:41 PM
To: Mallinen, Keni
Cc: Ganesh, Kana; Raetsen, Sarah (MOECC)
Subject: FW: FWRN Non-Compliance

Hello Keni

Please comment on the highlighted sections of the e-mail below.

Thank you

Regards
Denton Miller
416-314-8310

From:
Sent: January 17, 2016 10:20 PM
To: (MOECC)
Cc:
Subject: FWRN Non-Compliance

Ms. Hedley, Mr. Murray, Ms. Paul, Mr. Evans:

After looking at the modification documents for the FWRN LP (formerly NRWC) project, there is a non-compliance issue. Receptor O_2550 was formerly a participating receptor but is now a non-participating receptor.

In the noise assessment dated September 2014, P_2550 was predicted to have a noise level of 40.9 dBA. P_2550 has now changed to O_2550 a non-participating home in the project. When Stantec did the noise modeling for the report dated October 2, 2015, the loudest turbine was not used for all of the turbines. Using 104.8 dBA (really should be 106 dBA) for all of the turbines will predict that the home at O_2550 will be 40.9 dBA.

The report dated October 2, 2015 has O_2550 near turbine T49 which is incorrect. How many more mistakes are in the document?

The new amendments must not be approved and the existing REA must be revoked. Please respond to this concern.

Response #1 to "Using 104.8 dBA (really should be 106 dBA) for all of the turbines will predict that the home at O_2550 will be 40.9 dBA":

The Sound Power Level of 104.8 dBA does not represent all the Project Turbines. Table 2.1 provides the sound power level of two turbines used in the project; Table 3.1 and Table 3.2 provide additional details. Equipment sound power data is included in Appendix D. As

indicated in the manufacturer's data, the correct sound power level is 104.8 dBA for the E101 models, and 102.9 dBA for E101 G2 models. Table 3.4 identifies turbines that are E101 (with 104.8 dBA) and E101 G2 (102.9 dBA).

Response #2 to "O_2550 near turbine T49 which is incorrect":

Yes; the Cadna A model used for the REA amendment application correctly predicts the results and identifies turbines. This model was shared with the MOECC in October 2015. When preparing results tables in Excel, there was a shift in Excel rows during formatting. This has been revised in the summary Table 6.3 and detailed Table in Appendix C. This report revision (Revision 9) includes these changes.

Stantec stands by the model shared with the MOECC.

Info Request #3 and Repeat of #2:

From: Miller, Denton (MOECC) [mailto:Denton.Miller@ontario.ca]
Sent: Thursday, January 28, 2016 12:12 PM
To: adam.rosso@boralex.com
Cc: Ganesh, Kana; Raetsen, Sarah (MOECC)
Subject: RE: FWRN info request # 3

Hello Adam :

(Info request # 3)

The amendment application notes that a customized E 101 2.9 MW G2/G3 turbine will now be part of the application. It further notes that this turbine will be approximately 2dB quieter than the E 101, 3.0 MW turbine also proposed in this wind facility.

Please provide a qualitative and/or quantitative description of the differences between the two turbines. Specifically what changes were made to enable the customized E 101, 2.9 MW G2/G3 turbine to be 2 dB quieter than the E 101, 3.0 MW turbine.

Kana

(re: Info request # 2)

With respect to my January 19, 2016 email below, it is acknowledged that Section 4.2, Appendix C and Figure 2.1b of your October 2nd, 2015 Report addresses the subject issue. However I require confirmation that your firm stands behind the information in the Report.

Response to Info Request #3:

Boralex has obtained further clarifications from the equipment manufacturer and provided the response to Stantec to include in the report (included following Page G.16). The following is an excerpt from the letter:

The E-101 2.9MW G2/G3 WEC is an evolution of the E-101 WEC platform employing key characteristics aimed at reducing overall WEC SPL. These characteristics, which differ from the E-101 3.0MW WEC, include: (i) limitation of power output to 2.9MW, (ii) adjusted power curve for the entire range of operational wind speeds, and (iii) updates to generator design.

The E-101 2.9MW G2/G3 WEC has been measured according to IEC standards by T&H Ingenieure, an independent engineering firm. The results of the measurement form the basis of the SPL datasheet for the E-101 2.9MW G2/G3 WEC. As such, ENERCON confirms the validity of using the information provided in the datasheet for the Niagara Region wind farm facility.

In addition the manufacturer Enercon has confirmed that the quantitative implications of these changes lead to reduced rotational speed of the turbine from 14.7 rpm (as in the E-101 3.0MW) to 14.1 rpm (as in the E-101 2.9MW) as well as reduced maximum SPL.
Note: the measured SPL documents specify the difference in rpm as mentioned above.

Response to Info Request #2 (repeat): Stantec stands by the model shared with the MOECC in October 2015, and acknowledges that a row shift occurred during formatting of Table 6.3 presented in October 2015 Report, which has now been updated.

Niagara Region Wind Farm – W-06795

Hassan Shahriar
Commercial Manager, Ontario
Telephone: (416)572 8912
Email: hassan.shahriar@enercon.de

By email

July 03, 2015

Adam Rosso
Manager of Project Development
Boralex Inc.
174 Mill Street,
Milton, Ontario L9T 1S2

Subject: Supplementary information on Sound Power Level of the E-101 2.9 MW G2/G3

Dear Mr. Rosso:

The information provided in this letter is for clarification purposes pertaining to Sound Power Level (SPL) of the E-101 Wind Energy Converter (WEC). For specific technical information, please refer to the SPL datasheet.

The E-101 2.9MW G2/G3 WEC is an evolution of the E-101 WEC platform employing key characteristics aimed at reducing overall WEC SPL. These characteristics, which differ from the E-101 3.0MW WEC, include: (i) limitation of power output to 2.9MW, (ii) adjusted power curve for the entire range of operational wind speeds, and (iii) updates to generator design.

The E-101 2.9MW G2/G3 WEC has been measured according to IEC standards by T&H Ingenieure, an independent engineering firm. The results of the measurement form the basis of the SPL datasheet for the E-101 2.9MW G2/G3 WEC. As such, ENERCON confirms the validity of using the information provided in the datasheet for the Niagara Region wind farm facility.

I trust the above information is satisfactory for your needs.

Sincerely,

Hassan Shahriar
ENERCON Canada Inc.

cc: Étienne Champagne, Boralex Inc.
Andrew Kuhn, ENERCON Canada Inc.

Appendix E:

Correspondence with MOECC

Ministry of the Environment and Climate Change

Environmental Approvals Branch

135 St. Clair Avenue West
1st Floor
Toronto ON M4V 1P5
Tel.: 416 314-8001
Fax: 416 314-8452

Ministère de l'Environnement et de l'Action en matière de changement climatique

Direction des autorisations environnementales

135, avenue St. Clair Ouest
Rez-de-chaussée
Toronto ON M4V 1P5
Tél : 416 314-8001
Téléc. : 416 314-8452

Ontario

August 5, 2015

Adam Rosso, P.Eng., M.Sc.
Director of Development
Boralex
c/o FWRN LP
4672 Bartlett Road South
Beamsville ON L0R 1B1
e-mail: adam.rosso@boralex.com

Dear Mr. Rosso:

The Ministry of the Environment and Climate Change (MOECC) has reviewed the July 24, 2015 letter (received on July 30, 2015) regarding proposed modifications to the Niagara Region Wind Farm (Project). The MOECC issued Renewable Energy Approval (REA) No. 4353-9HMP2R to Niagara Region Wind Corporation on November 6, 2014. The MOECC understands that the company is seeking amendments to the Project as it was described in the REA application and approved by the MOECC. The MOECC also understands that the company has submitted a REA amendment application to the MOECC with respect to an ownership name change from Niagara Region Wind Corporation to FWRN LP. This amendment application is currently under review.

From the July 24, 2015 letter, the MOECC understands that the company is requesting the following changes:

1) Relocation of the Smithville transmission line (at the request of the Township of West Lincoln, to avoid the Town of Smithville and areas proposed for future urban expansion);
2) Expansion of the footprint for the Interconnect Station on Mountainview Road (to accommodate additional equipment in response to Hydro One Networks Inc.'s connection requirements);
3) Addition of permanent alternative access road from T12 to T11 and from T11 to T41 (to enable the Project to potentially avoid delivery of components from Gore A Road);
4) Adjustment of the footprint of the North Substation (to avoid archaeological resources that would require a Stage 3 Archaeological Assessment);
5) Addition of operational flexibility to install junction boxes within either the municipal right-of-way or on participating properties within previously assessed areas along the proposed collector line routes (to provide greater flexibility during the detailed design process to address municipal comments);
6) Changing 11 of the 80 approved wind turbine models to a customized ENERCON E101 wind turbine, which reduces the hub height of the 11 turbines from 135 metres (m) to 124 m. The number of turbines to be installed will remain the same at 77, and all will be located in the exact same locations as approved;

7) Removal of Schedule C from the approval, as the sound power level of the transformer selected for the Project is less than that modelled in the Noise Assessment Report as submitted with the REA application. As such, the reduced sound power level negates the need for sound barriers; and
8) Adjustments to access road entrances on private land owned by participating landowners, based on detailed design and the need for turning radius at nine entrance locations.

The MOECC has completed a cursory review of the information provided; however additional information and revised reports will be need to be submitted for the MOECC to complete a comprehensive assessment of the proposed changes. This submission should be submitted in the form of a *Draft Modifications Document.* Details of the components of a Modification Document are provided in Section 3.1.1 of Chapter 10 of the *Technical Guide to Renewable Energy Approvals.* Upon receipt of this submission the MOECC will make a determination regarding the category of project change and provide guidance on next steps.

The *Draft Modification Document* should include:

- A summary of the proposed project changes, including the reason for each change.
- An explanation of how the desired change will resolve any issue(s) identified, whether there are any new negative environmental effects that will or are likely to occur as a result of the proposed change, and if required, how those effects are proposed to be mitigated.
- A list of each report and study submitted with the REA application and a description of the amendments/updates to each, including:
    - where reports or studies do not require a material change to the content, explain how the proposed project change does not impact the document;
    - a table that shows the page number, section, original text and revised text, where appropriate;
    - a summary of the discussions with the Ministry of Natural Resources and Forestry (MNRF) and Ministry of Tourism, Culture and Sport (MTCS) with respect to the proposed change(s) and, if required, what additional work was imposed by the respective ministries; and
    - any new letter or addendum to the original letter issued by MNRF and/or MTCS.
- Identification and a summary of new documents that are now required with respect to the proposed project change(s) that were not part of the consultation process.
- A copy of the original site plan and a revised site plan if it has been changed.
- A revised noise assessment report (NAR) which reflects the proposed project changes and includes:
    - a chart which summarizes the difference in the modelled impact at each noise receptor, comparing the revised model output to that in the previously approved NAR;
    - manufacture's acoustic emission summary for all wind speeds;
    - manufacture's statement for tonal audibility and measurement uncertainty;
    - manufacturer's emission test report for the de-rated (2.9 MW) ENERCON E101 wind turbine;
    - manufactuter's guarantee letter with new name plate capacity all in accordance with CAN/CSA-IEC-61400-11.

Upon receipt and review of the *Draft Modifications Document* the Director will categorize the proposed project change (as per Chapter 10 of the Ministry's *Technical Guide to Renewable Energy Approvals*) and will outline any additional requirements which may include notifications,

public meetings and potentially an additional Environmental Registry (EBR) posting.

If you have any questions, please feel free to contact Sarah Raetsen at (416) 326-6089.

Sincerely,

Mohsen Keyvani, P.Eng.
Supervisor – Team 5
MOECC, Environmental Approvals Branch

cc. Kathleen Hedley, Director, MOECC, Environmental Approvals Branch
Mansoor Mahmood, Manager, MOECC, Environmental Approvals Branch
Rich Vickers, District Manager, MOECC Niagara District Office
Steve Green, Provincial Officer, MOECC Niagara District Office
Jim Beal, A/Renewable Energy Coordinator, MNRF
Chris Schiller, Manager, Culture Services Unit, MTCS
Irena Jurakic, A/Archaeology Review Officer, MTCS
Chris Powell, Stantec
Kerrie Skillen, Stantec
Shiloh Berriman, Enercon

FWRN LP
4672 Bartlett Road South
Beamsville, ON L0R 1B1

July 24, 2015

Ms. Kathleen Hedley
Director
Environmental Approvals Branch
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, Floor 4
Toronto, Ontario
M4V 1P5

Attention: **Kathleen Hedley, Director, Environmental Approvals Branch**

Reference: **Niagara Region Wind Farm (the Project) – Proposed Modifications**
MOECC reference # 4353-9HMP2R

Dear Ms. Hedley;

As you know, Niagara Region Wind Corporation (NRWC) is developing the Niagara Region Wind Farm (the Project), a proposed 230 MW wind energy project within the Townships of West Lincoln and Wainfleet and the Town of Lincoln within the Niagara Region and within Haldimand County in Southern Ontario. Renewable Energy Approval (REA) for the Project was received on November 6, 2014. Since receipt of the REA, and completion of the Environmental Review Tribunal, NRWC has identified the need to make minor amendments to the Project as it was described in the REA Application documents and subsequently approved by the Ministry of the Environment and Climate Change (MOECC).

We are writing to seek confirmation from the MOECC that these changes would be assessed as Technical or Project Design Changes under the MOECC's Technical Guide to Renewable Energy Approvals as per the description provided in this letter.

The proposed modifications include relocation of the transmission line, expansion of interconnect station footprint, alternate access road alignments, reorientation of North substation, relocation of junction boxes, revisions to proposed turbine model / tower height, revision of transformer noise characteristics, and adjustments to the location of access road entrances.

An application to acknowledge the change in ownership has been submitted to acknowledge the change in ownership of the Project from "Niagara Region Wind Corporation to "FWRN LP" as FWRN LP purchased the Project (submitted previously under separate cover).

Further detail is outlined below regarding why these modifications meet the factors for a Technical or Project Design Change classification as outlined in Chapter 10 of the Technical Guide to Renewable Energy Approvals.

I. Project Design Change:

A. Smithville Transmission Line Relocation

This modification involves the rerouting of the transmission line, at the request of the Town of West Lincoln, to avoid the Town of Smithville and areas proposed for future urban expansion. In the event that the amendment is not feasible in the required Project timeframe, the transmission line will follow the originally approved alignment.

The construction and installation activities for the transmission line will be completed in the same manner as described in the Construction Plan Report, submitted as part of the REA Application.

The proposed modification qualifies as a Project Design Change for the following reasons:

- Revises the boundary of the original Project Location.
- Minimal increase in the overall impact at the receptors.
- Requires undertaking Stage 2 Archaeological Assessment and NHA on lands not previously assessed.
- Requires reconfirmation of written comments from MTCS and MNRF.

B. Revised Footprint of Interconnect Station

This modification involves the expansion of the footprint for the Interconnect Station on Mountainview Road to accommodate additional equipment in response to Hydro One Networks Inc. (HONI) connection requirements determined during detailed design while avoiding archaeological resources.

The construction and installation activities for the interconnection station will be completed in the same manner as described in the Construction Plan Report, submitted as part of the REA Application. Additional equipment beyond what was described in the Project Description Report will be installed at this location, including a small building, fence and riser structures, however no transformer is required.

The proposed modification qualifies as a Project Design Change for the following reasons:

- Revises the boundary of the REA approved Project Location;
- Stage 2 Archaeological Assessment and NHA previously completed for REA;

- Requires notification to MTCS for change in project footprint, noting avoidance or archaeological sites;
- It will not require any additional NHA field work. Requires notification to MNRF for small increase in footprint and of any additional features in the ZOI; and
- There are not expected to be any changes to the previous recommendations or comments received from the MNRF and MTCS.

C. Alternate Access Road Between T12, T11 and T41

This modification involves adding a permanent alternative access road from T12 to T11 and from T11 to T41. The access roads would be located along the collector line route already approved in the REA. The approved access roads to these turbines are not being modified. The modification would enable the Project to potentially avoid delivery of components from Gore A Road, which has been identified by Haldimand County as a potential concern.

The proposed modification qualifies as a Project Design Change for the following reasons:

- Revises boundary of the REA approved Project Location;
- Stage 2 Archaeological Assessment previously completed for REA;
- Requires notification to MTCS for change in project footprint;
- Requires additional NHA field work and an update to the NHA to recognize changes to natural features;
- Requires reconfirmation of written comments from MNRF; and
- There are not expected to be any changes to the previous recommendations or comments received from the MNRF.

Technical Changes:

D. Adjust Footprint of North Substation

This modification involves the adjustment of the footprint for the North Substation (north of the Welland River) to accommodate reorientation of the substation during detailed design to avoid archaeological resources that would require a Stage 3 Archaeological Assessment. The footprint would be re-oriented into an area previously assessed as part of the construction laydown area. However, the location of the transformer remains consistent with the REA location as defined in the Noise Assessment Report (NAR) and REA Conditions of Approval.

The construction and installation activities for the North substation will be completed in the same manner as described in the Construction Plan Report, submitted as part of the REA Application.

The proposed modification qualifies as a Technical Design Change for the following reasons:

- No increase to the Project Location size;
- No increase in the overall impact at the receptors;

- Modification will not require additional archaeological or cultural heritage assessment. Assessment for the proposed new footprint area of the North substation has already been completed as part of the assessment of a construction lay down area. Therefore, there are not expected to be any changes to the previous recommendations or comments received from the Ministry of Tourism, Culture and Sport (MTCS) for further assessment; and
- Modification will not require any additional Natural Heritage Assessment (NHA). The NHA for the proposed new footprint area of the North substation was already been completed as part of the assessment of a construction lay down area. Therefore, there are not expected to be any changes to the previous recommendations or comments received from the Ministry of Natural Resources and Forestry (MNRF).

E. Relocation of Junction Boxes

This modification involves adding operational flexibility to install junction boxes within either the Municipal Right-of-Way, as proposed and approved in the REA, or on participating properties within previously assessed areas along the proposed collector line routes. Currently, the Project is approved to install junction boxes within the Right-of-Way. However, through continued consultation with area municipalities, a request to locate these junction boxes (where feasible) was received. This amendment would provide greater flexibility during the detailed design process to addresses Municipal comments while remaining within previously assessed areas.

The construction and installation activities for the junction boxes will be completed in the same manner as described in the Construction Plan Report, submitted as part of the REA Application.

The proposed modification qualifies as a Technical Design Change for the following reasons:

- No increase to the Project Location size;
- No increase in the overall impact at the receptors;
- Junction boxes will be constructed within previously assessed constructible area along proposed collector and fibre optic lines;
- Modification will not require additional archaeological or cultural heritage assessment. Assessment for the proposed relocation of junction boxes has already been completed as part of the assessment of the Project constructible area. Therefore, there are not expected to be any changes to the previous recommendation or comments received from the MTCS for further assessment; and
- Modification will not require any additional NHA. As above, the NHA for the proposed relocation of junction boxes has already been completed. Furthermore, no new potential effects are anticipated as a result of this modification. Therefore, there are not expected to be any changes to the previous recommendations or comments received from the MNRF.

F. Alternate Turbine Model

This modification involves changing 11 of the Project's 80 turbines to a customized ENERCON E101 (2.95MW) turbine on 124 m towers from a combination of different ENERCON models. Since the Project's inception and permitting, ENERCON has further reduced the sound characteristics of the E101 turbine through the following:

- limitation of power output to 2.9MW;
- adjusted power curve for the entire range of operational wind speeds; and
- updates to the generator design.

As a result, the Project no longer wishes to install ENERCON E-82 turbines and is proposing to reduce the tower height from 135 m to 124 m, such that all proposed turbines will be at the same height and the proposed layout will consist of only ENERCON E101 turbines – 69 E101 3.0 MW and 11 E101 2.9MW.

The number of turbines to be installed will remain the same at 77. However, the new turbine model would be physically lower than the REA approved turbines, specifically with a hub height of 124 m (rather than the previously approved hub height of 135 m) and rotor diameter of 101 m. While this reduction in tower height addresses a potential concern raised by Environment Canada during the review of the REA, the Project remains committed to completing the supplemental bird mortality monitoring outlined in the REA Conditions.

Specifications of the REA approved turbines and the new turbine model are summarized below in **Table 1.1**.

Table 1.1: Basic Wind Turbine Specifications

	REA Approved Turbine Models		New Turbine Model
Manufacturer	ENERCON	ENERCON	ENERCON
Model	E101	E82	E101
Name plate capacity (MW)	3.0 MW	2.3 MW	2.9 MW
Hub height above grade	124 m or 135 m	135 m	124 m
Blade length	48.6m	38.8 m	48.6 m
Rotor diameter	101 m	82 m	101 m
Blade sweep area	8,012 m^2	5,281 m^2	8,012 m^2
Rotational Speed	Variable, 4 – 14.5 rpm	Variable, 6 - 18 rpm	Variable, 4 – 14.1 rpm
Noise Level	104.8 dBA	103.3 dBA	102.9 dBA
Frequency spectrum	50 Hz or 60 Hz	50 Hz or 60 Hz	50 Hz or 60 Hz

The construction and installation activities for the turbines will be completed in the same manner as described in the Construction Plan Report, submitted as part of the REA Application.

The proposed modification qualifies as a Technical Design Change for the following reasons:

- No increase to the Project Location size, whereby a conservative approach for project footprint was included in the various REA documents and in calculating corresponding setbacks (ex. Waterbody Report, Property Line Setback Report, NHA);
- An updated Noise Assessment Report will be prepared to reflect the change in turbine model and tower height, with supporting documentation to be provided by the turbine supplier. It will demonstrate that there is no increase in the modelled noise levels at any of the noise receptors as presented in the NAR because the noise profile of the proposed turbines results in the same or lower sound levels at all receptors;
- Modification will not require additional archaeological or cultural heritage assessment. Assessment for the current 80 turbine sites has been completed, the modification does not involve the relocation of any turbine sites, and the turbines will be constructed within the previously assessed constructible area. Therefore, there are not expected to be any changes to the previous recommendation or comments received from the Ministry of Tourism, Culture and Sport (MTCS) for further assessment.
- Modification will not require any additional NHA. As above, the NHA for the current 77 turbine sites has been completed, the modification does not involves the relocation of any turbine sites, and the turbines will be constructed within the previously assessed constructible area. Furthermore, no new potential effects are anticipated as a resolve of this modification. Therefore, there are not expected to be any changes to the previous recommendations or comments received from the MNRF.

G. Alternate Transformer

The sound power level of the transformer selected for the Project is less than that modelled in the NAR as approved in the REA. As such, the reduced sound power level negates the need for sound barriers as identified in the approved NAR and REA Conditions.

The proposed modification qualifies as a Technical Design Change for the following reasons:

- No increase to the Project Location size;
- An updated Noise Assessment Report will be prepared to address the change in transformer noise for the Project, with supporting documentation to be provided by the transformer supplier. It will demonstrate that there is no increase in the modelled noise at the noise receptors near the Project Location because the noise profile of the transformer results in the same or lower sound levels at all receptors.
- Modification will not require additional archaeological or cultural heritage assessment. Therefore, there are not expected to be any changes to the previous recommendation or comments received from the Ministry of Tourism, Culture and Sport (MTCS) for further assessment.
- Modification will not require any additional NHA. Therefore, there are not expected to be any changes to the previous recommendations or comments received from the MNRF.

H. Revised Access Road Entrances

This modification involves adjustments to access road entrances, on private land owned by participating landowners, based on detailed design (engineering) and need for turning radius (driving surface) at nine entrance locations;

- Entrance 4 to T79 and T80
- Entrance 10 to T58
- Entrance 22 to T76,
- Entrance 27 to T09 and T51,
- Entrance 36 to T10 and T37,
- Entrance 42 to T82,
- Entrance 46 to T84,
- Entrance 49 to T99,
- Entrance 50 to T20.

The construction and installation activities for the access roads will be completed in the same manner as described in the Construction Plan Report, submitted as part of the REA Application.

The proposed modifications qualify as Technical Changes for the following reasons:

- No increase in the overall impact at the receptors
- Stage 2 AA field investigation are required at one of the proposed entrances (Entrance 36) where the relocated entrance is located outside of the area previously assessed in the REA. The location of the new entrance is along an existing driveway currently used by the landowner. An addendum to the approved Stage 2AA will be submitted to the MTCS for confirmation;
- Modification at the remaining entrances will not require additional archaeological or cultural heritage assessment. Assessment for the proposed shift to entrances has already been completed as part of the assessment of the area surrounding the access road entrances. Therefore, there are not expected to be any changes to the previous recommendation or comments received from the Ministry of Tourism, Culture and Sport (MTCS) for further assessment.
- Modification will not require any additional Natural Heritage Assessment (NHA) field work. Entrance 4 (T79 and 80) and 36 (T10 and T37) result in a small increase to the Zone of Investigation (ZOI) that was assessed in the NHA but features may or may not be described as being within the ZOI. MNRF would be notified of any additional features present within the ZOI. Reconfirmation from MNRF is not expected. There are not expected to be any changes to the previous recommendations or comments received from the MNRF.

Conclusion

The Project team is continually reviewing design features of the Project layout to consider efficiencies, address stakeholder comments, and further reduce potential environmental impacts. In our opinion, the proposed modifications described above are properly classified as Technical or Project Design Changes because they meet the factors set out in Chapter 10 of the Technical Guide to Renewable Energy Approvals.

We request confirmation from the MOECC that, if submitted as described above, the proposed modifications would be classified as indicated above. The modifications will be communicated by: filing a Notice of Proposed Change in the local newspapers; sending the Notice to stakeholders in the project study area; posting the Notice to the Project website; filing a Modification Report to the MOECC, local Municipalities, and Aboriginal Communities; and posting the Modification Report to the Project website.

If you have any questions or require any further information please do not hesitate to contact the undersigned at 416-389-8942 or Chris Powell at 519-780-8172.

Regards,

Adam Rosso P. Eng. M. Sc.
Director of Development, Boralex

cc: Chris Powell, Stantec Consulting Ltd.
Kerrie Skillen, Stantec Consulting Ltd.