



**EAPC**  
WIND ENERGY

**Addendum:  
Lindahl Wind Farm  
V100-2.0 80 m Hub Height  
Sound and Shadow Flicker Analysis  
Tioga, North Dakota**

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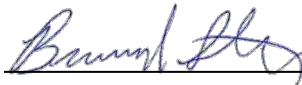
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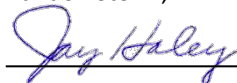
**2016**

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EAPC bears no responsibility to update this report for any changes occurring subsequent to the final issuance of this report.

### **Revision History**

Revision No.	Revision Purpose	Date	Revised By
0	Original	03/04/2016	B. Storm

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## ***Executive Summary***

This report is considered an addendum to the report previously filed with the North Dakota Public Service Commission (*Summary Report: Lindahl Wind Farm Sound and Shadow Flicker Analysis Tioga, North Dakota, October 5, 2015, issued by EAPC Wind Energy*).

EAPC was hired by TradeWind Energy, Inc. to provide a shadow flicker and sound analysis on residences within one mile of proposed turbines of the 150.0 MW wind farm near Tioga, ND. Coordinates of the proposed turbines were supplied to EAPC via TradeWind (A060 layout). Occupied residence locations were determined by TradeWind and EAPC through aerial images and site-visits. A map of the turbine locations and assumed occupied residences are shown in the Appendices.

At the time this report was issued, final turbine locations had been determined as well as the Vestas V100-2.0 turbine on an 80 m hub height as the final turbine generator (Table 1). The sound produced from the V100-2.0 is documented at 105.0 dB(A). The layout provided had 78 turbine locations. All 78 of the locations were included in each of the analyses, even though not all locations will ultimately be installed, as three of the locations are still considered alternate locations.

In summary, the A060 layout resulted in all occupied resident locations being under 50 dB(A) within 100 ft of the home under the worst case scenario (no ground attenuation) when modeling the V100-2.0 turbine layout (Appendix A). Therefore the V100-2.0 would be in compliance with state regulations. All non-participating residences have anticipated sound levels below 41.6 dB(A) assuming worst case scenario, and all participating residences have anticipated sound levels below 43.7 dB(A). No non-participating residences are anticipated to experience any shadow flicker above 1 hr/yr for realistic assumptions. All participating locations were below 26 hrs/yr of shadow flicker for realistic assumptions and some obstacles when modeling the V100-2.0 layout (Appendix C).

Table 1: Specifications of turbine evaluated within this report for the Lindahl wind farm.

Manufacturer	Model	Name plate capacity (kW)	Rotor diameter (m)	Hub height (m)	Sound level (dB(A))
Vestas	V100-2.0	2,000	100	80	105.0

## **Sound**

For preliminary screening purposes, a worst case sound scenario was analyzed using windPRO. The worst case scenario assumes that the wind turbines are operating at a wind speed that results in the loudest anticipated sound being emitted. According to information supplied by the client, the loudest normal operating noise level emitted from the turbines in consideration was 105.0 dB(A) for the Vestas V100-2.0. The sound emission level of 105.0 dB(A) occurs for hub height wind speeds of approximately 10 m/s for the Vestas V100-2.0 turbine.

The windPRO analysis used the ISO 9613-2 General noise calculation model with no ambient noise considered and two different possibilities: with no ground attenuation, and General attenuation (ground factor of 0.5). Noise levels were modeled 1.5 m above ground level (AGL) at the noted occupied residences and did not incorporate ambient noise. The worst case scenario (no ground attenuation) for the V100-2.0 layout resulted in no locations being above 50 dB(A) within 100 ft of a house (Table 2). The highest non-participating landowner had an anticipated sound level of 41.6 dB(A) for the worst case scenario. Results and maps depicting the worst case noise scenario results are shown in Appendix A and Appendix D.

Even though the worst case scenario resulted in all locations satisfying required sound standards, a more refined analysis was conducted for the V100 layout. The refined analyses included the General ground attenuation option (Appendix B and Appendix E). The more refined and realistic calculations resulted in all locations with a predicted noise level contributed from the proposed turbines even further below 50 dB(A) within 100 ft of an occupied residence (Table 2).

Considering the V100-2.0 turbine at the modeled locations, no mitigation options are anticipated to be necessary to satisfy North Dakota State regulations regarding acceptable sound levels of 50 dB(A) or below within 100 ft of an occupied residence.

Table 2: Noise estimates from windPRO assuming ground attenuation and no ground attenuation for V100-2.0 80m HH. Results presented for locations with no ground attenuation results above 35 dB(A) for V100. The sound levels are estimated at the center of the house. The distance required to travel from each receptor to reach the 50 dB(A) limit reported for the V100 no ground attenuation scenario (worst case). P indicates location is a participating landowner, NP denotes the location is a non-participating landowner.

Sensor	V100-2.0 General Ground Atten. (dB(A))	V100-2.0 No Ground Atten. (dB(A))	Distance to travel from receptor to reach 50 dB(A) for V100 No Grnd. Atten. (m / ft)
A-P	43.7	46.9	376 / 1234
B-P	42.9	46.2	409 / 1342
C-P	42.8	46.2	414 / 1358
D-P	41.1	44.4	424 / 1391
E-P	42.2	45.4	430 / 1411
F-P	43.4	46.7	435 / 1427
G-P	40.2	43.5	478 / 1568
H-P	41.5	44.9	520 / 1706
I-P	42.4	45.8	586 / 1923
J-P	42.4	45.8	591 / 1939
K-P	40.3	43.6	614 / 2014
L-P	40.0	43.4	649 / 2129
M-P	38.1	41.5	912 / 2992
N-NP	36.7	40.1	934 / 3064
O-P	37.4	40.8	930 / 3051
P-NP	38.1	41.6	949 / 3114
Q-NP	33.3	36.7	1322 / 4337
S-P	34.2	37.4	1485 / 4872
T-NP	35.0	38.5	1513 / 4964
U-NP	32.3	35.7	1601 / 5253
V-P	34.3	37.6	1620 / 5315
W-NP	32.0	35.3	1644 / 5394
X-NP	31.6	35.0	1738 / 5702
Y-NP	36.2	39.8	1731 / 5679
Z-NP	34.1	37.4	1750 / 5741
AA-P	32.8	36.0	1786 / 5203
BB-NP	34.4	37.7	1791 / 5072
CC-P	32.7	35.9	1905 / 5495
DD-NP	31.8	35.1	1950 / 5728
EE-NP	33.8	37.1	1971 / 5656

## **Shadow Flicker**

For preliminary screening purposes, an absolute worst case shadow flicker scenario was analyzed using windPRO for the V100-2.0 on an 80 m HH layout. The worst case scenario assumes that the wind turbines are always operating, perpendicular to the sun, no cloud cover, all shadows within 1.5 km are visible, and that the sensors are 1 m by 1 m “Greenhouses.” Greenhouse sensor mode indicates that a shadow cast from any direction will be accumulated in the results. In reality, individual rooms and windows would need to be modeled to determine the actual impact on a house (i.e., if there are no windows on the side of a house where a shadow is cast, it would not be accumulated).

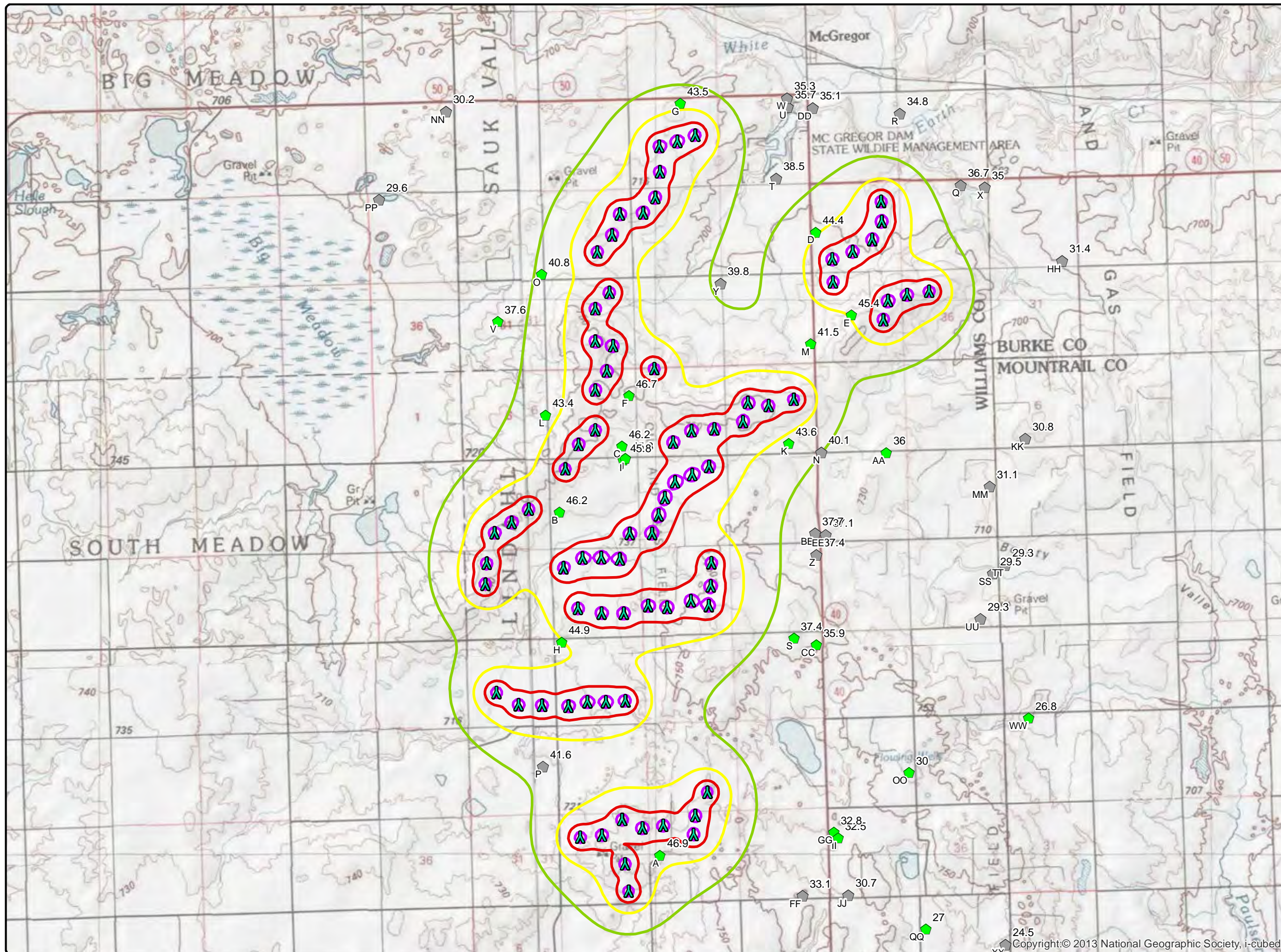
The worst case scenario for the V100 layout resulted in 10 locations, all participating in the project, being above 30 hours a year (an arbitrary value). A refined analysis was performed to determine if any turbines should be moved or if other forms of mitigation are warranted. This revised analysis included sunshine probabilities and operational statistics (Appendix F), but no obstacle blockage. The refined analysis for the V100 layout resulted in one home location having more than 30 hours a year of shadow flicker anticipated (Table 3).

To determine if the one participating location was of high concern and if turbines were justified to be moved or excluded from the layout, a detailed shadow flicker analysis taking into consideration local obstacles (i.e., tree breaks) was performed. When taking into consideration local obstacles, and using a conservative estimate of the tree heights, all locations were below the arbitrary value of 30 hours per year (Table 3). Details regarding the refined shadow flicker analysis including obstacles for location I-P, can be found in Appendix C and Appendix G.

Table 3: WindPRO estimated shadow flicker hours for realistic scenarios. Results presented for receptors listed in sound results. All locations with flicker reported are participating residences except for one. Results with obstacles modeled are presented for one select location.

Receptor	V100-2.0 Realistic Shadow No Obstacles / With Obstacles For Select Receptors (hrs/yr)
	A-P
B-P	24:36
C-P	21:36
D-P	15:52
E-P	22:45
F-P	22:04
G-P	0:00
H-P	5:11
I-P	32:04/19:58
J-P	27:54
K-P	17:31
L-P	25:14
M-P	2:05
N-NP	0:00
O-P	10:58
P-NP	0:00
Q-NP	1:00
S-P	0:00
T-NP	0:00
U-NP	0:00
V-P	0:00
W-NP	0:00
X-NP	0:00
Y-NP	0:00
Z-NP	0:00
AA-P	0:00
BB-NP	0:00
CC-P	0:00
DD-NP	0:00
EE-NP	0:00
FF-NP	0:00
GG-P	0:00
II-P	0:00

## **Appendix A: V100 No Ground Attenuation Sound Map**



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### Lindahl Wind Farm V100 Worst Case Sound

*Client*

TradeWind Energy, Inc.

*Project Description*

78 WTG locations (A060) designated as V100-2.0 on 80 m HH. Worst case noise map and data at receptors (dB(A)) within at least 1 mile of turbines. Assumes WTGs at rated noise of 105.0 dB(A). ISO-9613-2 General model. No ground attenuation. No ambient noise considered.

*Location: Tiooga, ND*

*Project #: 20132550*

*Issue Dates*

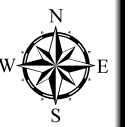
#	Description	Date
1	Original	2016.03.04

Drawn By: BS      Checked By: JH

*Legend*

- V100 80m HH
  - Non-Participating
  - Participating
- Sound level (dB(A))**
- 40
  - 45
  - 50
  - 55

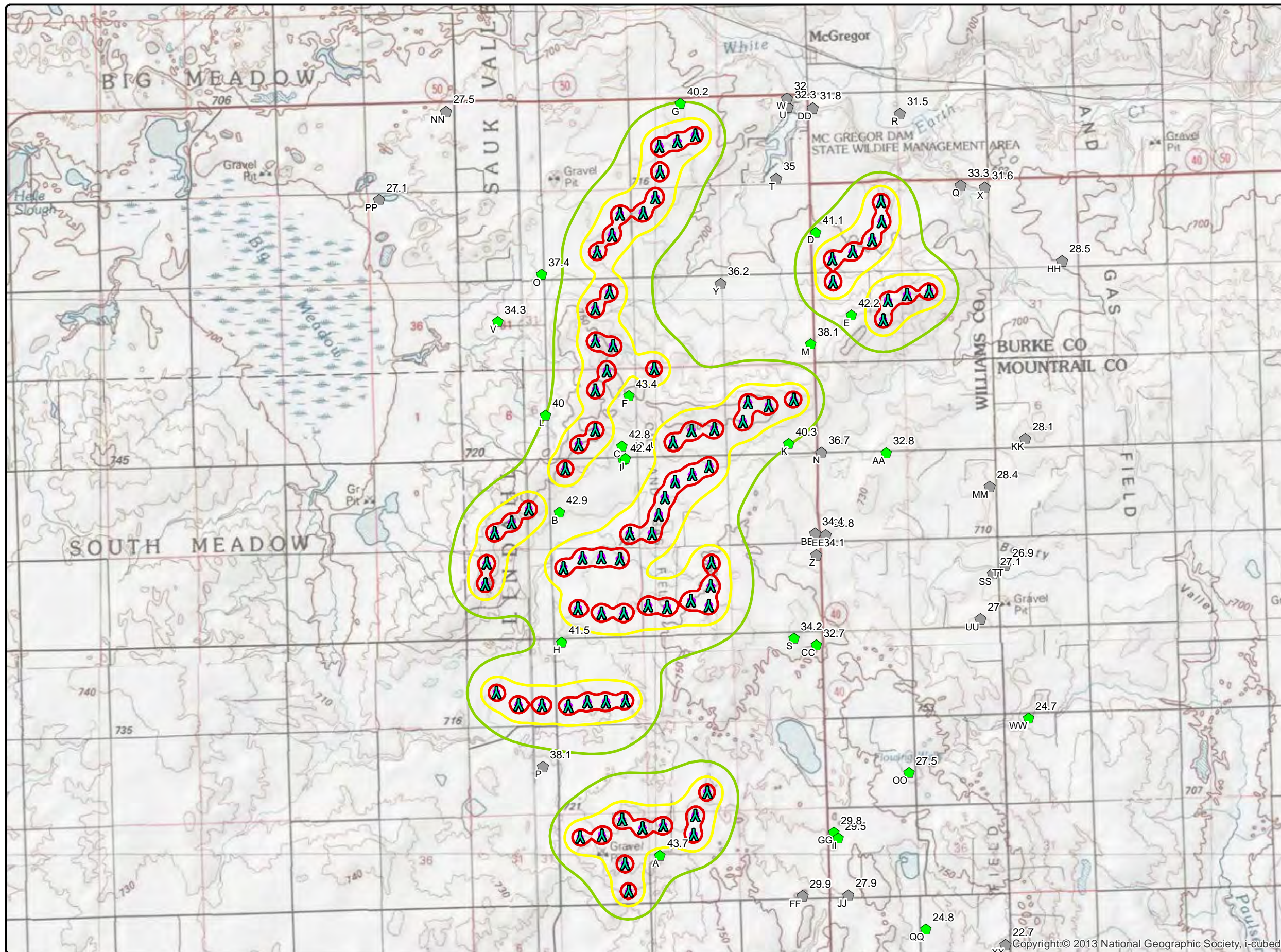
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0    0.5    1    2 Mile

## **Appendix B: V100 General Ground Attenuation Sound Map**



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### Lindahl Wind Farm V100 Realistic Case Sound

**Client**  
TradeWind Energy, Inc.

**Project Description**  
78 WTG locations (A060) designated as V100-2.0 on 80 m HH. Worst case noise map and data at receptors (dB(A)) within at least 1 mile of turbines. Assumes WTGs at rated noise of 105.0 dB(A). ISO-9613-2 General model. General ground attenuation (0.5) No ambient noise considered.

**Location:** Tiooga, ND  
**Project #:** 20132550

**Issue Dates**

#	Description	Date
1	Original	2016.03.04

Drawn By: BS      Checked By: JH

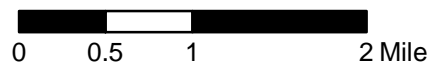
**Legend**

- V100 80m HH
- Non-Participating
- Participating

**Sound level (dB(A))**

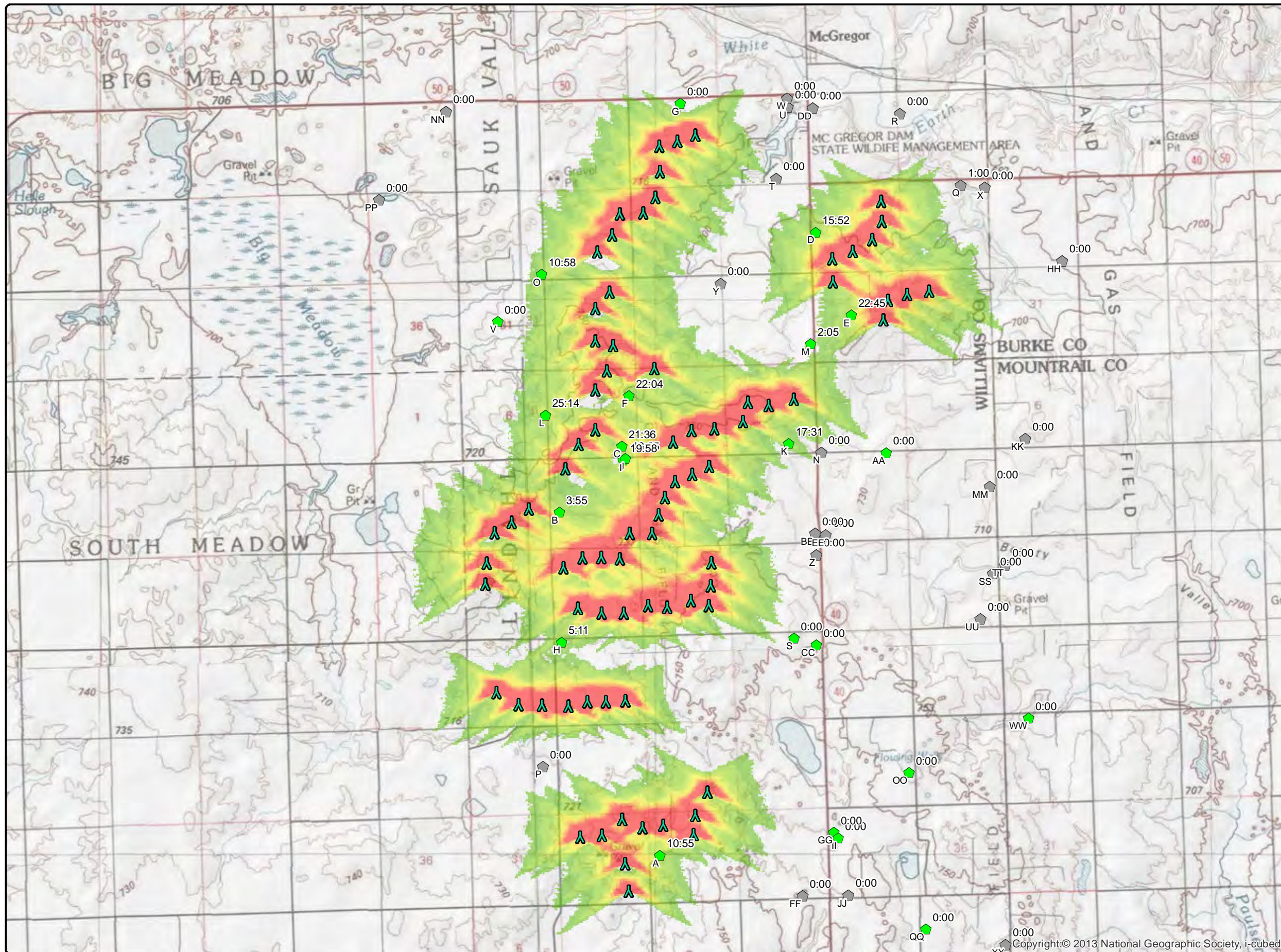
- 40
- 45
- 50
- 55

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## **Appendix C: V100 Realistic Shadow Flicker Map**



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### Lindahl Wind Farm V100 Realistic Shadow Flicker with Obstacles

**Client**  
TradeWind Energy, Inc.

**Project Description**  
78 WTG locations (A060) designated as V100-2.0 on 80 m HH. Realistic shadow flicker map and data at receptors (hrs/yr) within at least 1 mile of turbines. Assumes statistical reduction due to sunshine probability, turbine orientation and operation probability. Sensors in "greenhouse" mode. Obstacles assumed.

**Location:** Tioga, ND

**Project #:** 20132550

**Issue Dates**

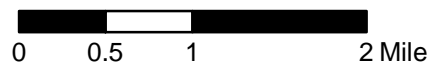
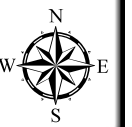
#	Description	Date
1	Original	2016.03.04

Drawn By: BS      Checked By: JH

#### Legend

- Status**
- ◻ Non-Participating
  - ◻ Participating
  - ▲ V100 80m HH
- Shadow Flicker (hrs/yr)**
- <5
  - 5 - 10
  - 10 - 20
  - 20 - 30
  - 30 - 40
  - 40 - 50
  - 50 - 60
  - 60 - 70
  - 70 - 80
  - >80

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## **Appendix D: windPRO V100 Sound Analysis with No Ground Attenuation**

Project:

**20132550- Lindahl Wind Farm**

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 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
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 3/4/2016 10:38 AM/2.9.285

**DECIBEL - Main Result**

**Calculation:** A060 V100 2.0 80m HH No Grnd Atten. Generic Octave

**Noise calculation model:**

ISO 9613-2 General

**Wind speed:**

95% rated power

**Ground attenuation:**

None

**Meteorological coefficient, C0:**

0.0 dB

**Type of demand in calculation:**

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

**Noise values in calculation:**

All noise values are mean values (Lwa) (Normal)

**Pure tones:**

Pure and Impulse tone penalty are added to WTG source noise

**Height above ground level, when no value in NSA object:**

1.5 m Don't allow override of model height with height from NSA object

**Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:**

0.0 dB(A)



Scale 1:400,000  
 New WTG Noise sensitive area

**WTGs**

UTM NAD83 Zone: 13			Row data/Description	WTG type			Noise data				Wind speed [m/s]	Status	Lwa,ref [dB(A)]	Pure tones
East	North	Z [m]		Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Creator				
5	646,913	5,375,455	745.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
6	646,888	5,375,080	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
12	648,327	5,377,151	750.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
13	648,570	5,377,592	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
14	648,872	5,378,572	753.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
15	648,872	5,377,853	752.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
18	649,189	5,379,368	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
20	648,867	5,380,033	744.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
22	649,124	5,380,328	729.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
24	651,007	5,377,868	749.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
26	651,525	5,378,000	751.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
27	651,616	5,378,348	758.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
28	651,987	5,378,290	755.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
29	652,436	5,378,405	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
34	654,047	5,379,834	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
35	654,478	5,380,290	740.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
36	654,876	5,380,346	731.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
37	649,468	5,369,552	735.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
38	649,403	5,370,690	746.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
39	648,989	5,370,563	740.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
40	649,348	5,370,846	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
41	649,714	5,370,690	746.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
42	650,635	5,370,574	746.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
43	650,667	5,370,918	744.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
45	650,882	5,371,340	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
66	649,309	5,375,532	733.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
67	649,484	5,375,990	732.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
68	649,889	5,375,994	741.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
69	650,008	5,376,321	740.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
70	650,956	5,375,465	751.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
84	648,982	5,374,557	737.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
85	648,553	5,374,643	733.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
98	648,903	5,381,054	722.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
99	649,170	5,381,363	721.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
100	649,950	5,382,038	713.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
101	650,030	5,382,496	712.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
104	650,119	5,376,639	740.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
105	650,267	5,377,632	746.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
150	650,663	5,383,159	707.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h

To be continued on next page...

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:

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3/4/2016 10:38 AM/2.9.285

## DECIBEL - Main Result

Calculation: A060 V100 2.0 80m HH No Grnd Atten. Generic Octave

...continued from previous page

UTM NAD83 Zone: 13				WGTg type			Noise data								
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Creator	Name	Wind speed [m/s]	Status	LwA,ref [dB(A)]	Pure tones
151	650,947	5,375,049	753.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
152	650,911	5,374,694	758.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
154	650,163	5,374,664	746.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
155	649,378	5,374,555	741.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
156	649,818	5,374,694	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
158	650,613	5,377,049	737.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
164	649,406	5,372,982	725.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
165	647,909	5,372,903	716.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
166	647,487	5,372,910	715.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
171	647,671	5,376,427	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
173	647,364	5,376,192	740.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
174	647,056	5,376,002	741.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
175	653,143	5,380,511	713.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
176	653,130	5,380,927	710.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
177	653,497	5,381,062	704.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
178	653,850	5,381,276	700.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
179	654,022	5,381,604	696.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
180	654,011	5,381,966	694.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
183	649,728	5,381,758	721.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
184	650,599	5,377,842	746.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
205	648,594	5,370,523	731.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
206	650,092	5,370,737	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
300	654,134	5,380,179	734.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
302	648,870	5,379,451	759.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
303	649,079	5,378,913	759.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
304	649,308	5,381,738	716.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
305	650,346	5,383,045	709.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
306	650,021	5,382,956	710.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
307	647,090	5,373,129	713.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
308	649,061	5,372,960	722.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
309	648,724	5,372,961	720.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
310	648,383	5,372,885	719.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
311	648,975	5,375,560	734.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
312	648,641	5,375,554	726.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
313	648,297	5,375,376	728.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
314	649,928	5,378,956	741.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
315	650,591	5,374,779	748.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
316	650,301	5,376,922	735.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
317	650,917	5,377,197	740.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h

h) Generic octave distribution used

## Calculation Results

### Sound Level

Noise sensitive area				UTM NAD83 Zone: 13			Demands		Sound Level		Demands fulfilled ?	
No.	Name	East	North	Z [m]	Imission height [m]	Noise [dB(A)]	From WTGs [dB(A)]	Distance to noise demand [m]	Noise			
A	Participating	650,034	5,370,204	742.6	1.5	50.0	46.9	257	Yes			
B	Participating	648,222	5,376,376	731.5	1.5	50.0	46.2	322	Yes			
C	Participating	649,350	5,377,570	737.6	1.5	50.0	46.2	321	Yes			
D	Participating	652,833	5,381,417	705.0	1.5	50.0	44.4	340	Yes			
E	Participating	653,476	5,379,925	741.5	1.5	50.0	45.4	339	Yes			
F	Participating	649,476	5,378,474	747.0	1.5	50.0	46.7	316	Yes			
G	Participating	650,400	5,383,729	711.5	1.5	50.0	43.5	387	Yes			
H	Participating	648,263	5,374,042	728.5	1.5	50.0	44.9	432	Yes			
I	Participating	649,372	5,377,319	734.6	1.5	50.0	45.8	490	Yes			
J	Participating	649,411	5,377,350	734.6	1.5	50.0	45.8	498	Yes			
K	Participating	652,350	5,377,616	735.4	1.5	50.0	43.6	514	Yes			
L	Participating	647,974	5,378,125	736.6	1.5	50.0	43.4	559	Yes			
M	Participating	652,746	5,379,403	722.4	1.5	50.0	41.5	839	Yes			

To be continued on next page...

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:

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3/4/2016 10:38 AM/2.9.285

## DECIBEL - Main Result

Calculation: A060 V100 2.0 80m HH No Grnd Atten. Generic Octave

...continued from previous page

Noise sensitive area		UTM NAD83 Zone: 13			Demands			Sound Level		Demands fulfilled ?	
No.	Name	East	North	Z	Imission height	Noise	From WTGs	Distance to noise demand	Noise		
				[m]	[m]	[dB(A)]	[dB(A)]	[m]			
	N Non-Participating	652,934	5,377,454	728.5	1.5	50.0	40.1		861	Yes	
	O Participating	647,905	5,380,657	723.4	1.5	50.0	40.8		854	Yes	
	P Non-Participating	647,929	5,371,803	716.8	1.5	50.0	41.6		854	Yes	
	Q Non-Participating	655,444	5,382,262	682.8	1.5	50.0	36.7		1,242	Yes	
	R Non-Participating	654,346	5,383,551	675.6	1.5	50.0	34.8		1,412	Yes	
	S Participating	652,445	5,374,111	759.0	1.5	50.0	37.4		1,394	Yes	
	T Non-Participating	652,124	5,382,382	698.0	1.5	50.0	38.5		1,438	Yes	
	U Non-Participating	652,329	5,383,668	691.9	1.5	50.0	35.7		1,531	Yes	
	V Participating	647,113	5,379,805	712.6	1.5	50.0	37.6		1,534	Yes	
	W Non-Participating	652,318	5,383,827	691.2	1.5	50.0	35.3		1,574	Yes	
	X Non-Participating	655,873	5,382,222	689.2	1.5	50.0	35.0		1,656	Yes	
	Y Non-Participating	651,119	5,380,491	705.0	1.5	50.0	39.8		1,634	Yes	
	Z Non-Participating	652,848	5,375,611	736.1	1.5	50.0	37.4		1,662	Yes	
	AA Participating	654,105	5,377,449	726.3	1.5	50.0	36.0		1,715	Yes	
	BB Non-Participating	652,820	5,375,995	733.4	1.5	50.0	37.7		1,706	Yes	
	CC Participating	652,849	5,373,992	753.0	1.5	50.0	35.9		1,814	Yes	
	DD Non-Participating	652,780	5,383,651	684.1	1.5	50.0	35.1		1,876	Yes	
	EE Non-Participating	653,014	5,375,966	734.6	1.5	50.0	37.1		1,885	Yes	
	FF Non-Participating	652,597	5,369,477	749.8	1.5	50.0	33.1		2,022	Yes	
	GG Participating	653,163	5,370,620	746.2	1.5	50.0	32.8		2,179	Yes	
	HH Non-Participating	657,270	5,380,900	701.0	1.5	50.0	31.4		2,248	Yes	
	II Participating	653,237	5,370,521	746.8	1.5	50.0	32.5		2,280	Yes	
	JJ Non-Participating	653,421	5,369,486	746.6	1.5	50.0	30.7		2,762	Yes	
	KK Non-Participating	656,603	5,377,699	728.9	1.5	50.0	30.8		2,949	Yes	
	LL Non-Participating	652,987	5,368,263	755.9	1.5	50.0	29.6		3,075	Yes	
	MM Non-Participating	655,962	5,376,837	710.2	1.5	50.0	31.1		3,340	Yes	
	NN Non-Participating	646,183	5,383,581	712.5	1.5	50.0	30.2		3,388	Yes	
	OO Participating	654,514	5,371,692	765.0	1.5	50.0	30.0		3,442	Yes	
	PP Non-Participating	644,980	5,381,994	704.1	1.5	50.0	29.6		3,811	Yes	
	QQ Participating	654,816	5,368,880	743.7	1.5	50.0	27.0		4,282	Yes	
	RR Non-Participating	654,290	5,367,724	742.3	1.5	50.0	26.4		4,410	Yes	
	SS Non-Participating	656,021	5,375,274	710.2	1.5	50.0	29.5		4,552	Yes	
	TT Non-Participating	656,242	5,375,429	710.2	1.5	50.0	29.3		4,623	Yes	
	UU Non-Participating	655,800	5,374,456	722.8	1.5	50.0	29.3		4,622	Yes	
	VV Non-Participating	655,758	5,368,066	719.3	1.5	50.0	24.6		5,476	Yes	
	WW Participating	656,662	5,372,675	722.4	1.5	50.0	26.8		5,727	Yes	
	XX Non-Participating	656,251	5,368,598	741.7	1.5	50.0	24.5		5,723	Yes	
	YY Non-Participating	656,161	5,367,989	720.8	1.5	50.0	24.0		5,873	Yes	
	ZZ Non-Participating	656,215	5,367,523	716.3	1.5	50.0	23.5		6,134	Yes	

### Distances (m)

WTG	X	HH	T	D	DD	NN	PP	G	Y	O	V	L	F	M	E	KK	K	I	B	N	AA	MM
5	11229	11701	8668	8402	10080	8159	6819	8979	6562	5296	4355	2873	3960	7044	7941	9947	5851	3086	1601	6344	7464	9154
6	11478	11902	8986	8689	10401	8530	7173	9335	6869	5669	4731	3233	4268	7281	8178	10062	6022	3344	1860	6496	7596	9243
12	9092	9697	6464	6205	7879	6778	5887	6897	4353	3531	2919	1036	1752	4960	5849	8294	4050	1058	782	4617	5786	7642
13	8647	9308	5965	5728	7378	6447	5680	6404	3860	3136	2650	800	1264	4552	5433	8034	3780	847	1265	4366	5537	7431
14	7896	8715	5009	4877	6409	5685	5183	5379	2955	2298	2148	1003	612	3962	4799	7780	3607	1349	2290	4213	5352	7299
15	8253	8934	5576	5329	6992	6328	5683	6072	3465	2966	2628	938	866	4173	5049	7733	3486	732	1614	4082	5249	7163
18	7268	8225	4207	4181	5589	5176	4961	4526	2233	1819	2122	1738	939	3557	4323	7600	3614	2057	3144	4206	5277	7231
20	7340	8448	4016	4201	5329	4449	4354	4001	2298	1147	1769	2107	1674	3930	4610	8081	4240	2761	3714	4816	5841	7782
22	7010	8166	3636	3866	4941	4386	4466	3633	2002	1263	2078	2485	1887	3738	4371	7928	4215	3019	4054	4773	5753	7678
24	6530	6959	4650	3991	6049	7477	7304	5893	2625	4172	4349	3044	1647	2320	3214	5599	1366	1725	3160	1971	3126	5061
26	6061	6436	4423	3659	5789	7726	7668	5839	2524	4491	4767	3553	2103	1860	2741	5087	910	2258	3681	1511	2638	4587
27	5756	6203	4066	3302	5429	7544	7572	5517	2200	4371	4733	3649	2144	1546	2439	5029	1037	2469	3925	1593	2646	4601
28	5528	5893	4094	3240	5420	7854	7926	5666	2366	4719	5104	4017	2518	1347	2211	4654	766	2790	4224	1263	2279	4232

To be continued on next page...

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
 Lenexa, KS, 66219

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## DECIBEL - Main Result

Calculation: A060 V100 2.0 80m HH No Grnd Atten. Generic Octave

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WTG	X	HH	T	D	DD	NN	PP	G	Y	O	V	L	F	M	E	KK	K	I	B	N	AA	MM
29	5137	5440	3989	3038	5257	8118	8275	5700	2467	5060	5504	4471	2961	1045	1842	4227	794	3251	4677	1074	1923	3859
34	3006	3395	3192	1995	4022	8711	9321	5336	3001	6197	6934	6309	4769	1371	578	3330	2793	5309	6774	2627	2386	3557
35	2383	2858	3149	1994	3766	8924	9650	5335	3365	6583	7381	6855	5322	1946	1066	3351	3417	5908	7380	3229	2865	3758
36	2125	2457	3423	2307	3914	9276	10033	5611	3760	6978	7782	7251	5715	2329	1462	3161	3719	6282	7749	3484	2998	3673
37	14197	13772	13102	12333	14483	14409	13227	14208	11063	11215	10520	8702	8922	10382	11121	10830	8564	7768	6937	8629	9158	9760
38	13789	13406	12633	11877	14018	13913	12741	13720	10585	10717	10024	8205	8429	9937	10686	10508	8124	7273	6439	8207	8770	9442
39	13540	13245	12228	11515	13626	13317	12114	13242	10154	10152	9431	7630	7926	9606	10382	10436	7813	6767	5864	7941	8579	9380
40	13115	12800	11866	11131	13257	13123	11974	12926	9807	9917	9234	7408	7629	9207	9974	9980	7406	6473	5644	7519	8138	8924
41	13074	12702	11938	11172	13319	13366	12256	13057	9902	10130	9479	7636	7788	9226	9972	9828	7411	6638	5879	7492	8060	8765
42	12772	12274	11902	11064	13252	13748	12744	13158	9929	10446	9880	8006	7985	9078	9773	9295	7248	6862	6284	7254	7701	8222
43	12446	11969	11557	10720	12908	13434	12451	12814	9584	10123	9572	7694	7650	8736	9435	9012	6906	6531	5981	6918	7381	7942
45	11972	11498	11112	10264	12457	13112	12180	12399	9154	9781	9266	7382	7271	8276	8969	8554	6446	6167	5696	6449	6907	7485
66	9373	9602	7406	6860	8830	8635	7778	8270	5279	5314	4804	2917	2947	5177	6055	7609	3687	1788	1376	4103	5165	6780
67	8925	9205	6916	6377	8340	8278	7506	7793	4789	4927	4492	2615	2484	4721	5606	7321	3295	1334	1320	3748	4846	6533
68	8637	8863	6768	6171	8185	8444	7753	7752	4662	5068	4715	2865	2514	4448	5322	6927	2948	1422	1710	3377	4460	6131
69	8320	8585	6420	5827	7837	8206	7581	7419	4316	4819	4530	2719	2218	4123	5002	6738	2676	1183	1787	3138	4250	5976
70	8357	8331	7015	6241	8387	9416	8851	8283	5029	6022	5797	3996	3353	4326	5123	6073	2563	2439	2882	2805	3722	5191
84	10308	10437	8433	7867	9856	9448	8446	9281	6307	6195	5571	3708	3948	6136	7001	8244	4550	2790	1971	4900	5883	7343
85	10537	10730	8523	8013	9951	9247	8174	9272	6386	6049	5359	3530	3941	6344	7221	8611	4823	2799	1764	5205	6221	7727
98	7067	8369	3484	3947	4667	3713	4034	3066	2286	1074	2183	3033	2643	4183	4710	8399	4869	3764	4727	5405	6329	8223
99	6758	8113	3125	3664	4274	3721	4237	2667	2135	1449	2580	3452	2905	4078	4540	8287	4915	4049	5076	5427	6299	8162
100	5926	7408	2201	2949	3258	4071	4970	1750	1939	2468	3610	4384	3595	3842	4111	7943	5031	4754	5920	5470	6191	7950
101	5850	7414	2097	3004	2983	3997	5075	1287	2282	2810	3969	4831	4060	4116	4300	8138	5404	5219	6382	5819	6487	8199
104	8018	8324	6083	5495	7500	7980	7422	7096	3980	4588	4366	2610	1944	3813	4698	6570	2436	1010	1915	2931	4068	5847
105	7246	7728	5100	4573	6523	7216	6854	6099	2983	3838	3830	2345	1155	3047	3944	6337	2083	948	2400	2673	3842	5750
150	5294	6983	1655	2783	2173	4500	5801	628	2707	3724	4884	5707	4833	4295	4286	8068	5794	5981	7209	6141	6667	8249
151	8702	8615	7427	6642	8795	9772	9157	8697	5445	6380	6109	4278	3728	4711	5493	6246	2925	2763	3031	3120	3967	5324
152	9017	8886	7783	6993	9150	10067	9406	9050	5801	6678	6368	4517	4043	5054	5826	6437	3257	3043	3172	3422	4218	5487
154	9473	9455	7963	7262	9361	9765	8978	9068	5905	6404	5978	4095	3872	5397	6217	7120	3674	2770	2588	3932	4827	6193
155	10049	10127	8295	7683	9712	9575	8642	9231	6186	6277	5718	3836	3920	5903	6755	7880	4267	2764	2157	4588	5543	6968
156	9661	9698	8027	7368	9434	9602	8758	9054	5941	6263	5783	3895	3796	5545	6383	7421	3867	2663	2319	4163	5096	6507
158	7378	7691	5543	4900	6949	7893	7496	6684	3479	4511	4455	2850	1823	3177	4058	6025	1827	1270	2484	2356	3515	5353
164	11279	11160	9785	9105	11190	11079	10041	10793	7702	7821	7198	5339	5493	7238	8048	8605	5490	4337	3595	5696	6484	7606
165	12259	12312	10374	9836	11801	10817	9551	11109	8239	7754	6948	5223	5787	8103	8961	9929	6476	4652	3487	6780	7685	8963
166	12532	12632	10546	10048	11975	10751	9424	11205	8406	7759	6905	5238	5909	8356	9224	10298	6767	4795	3543	7094	8025	9341
171	10043	10590	7436	7180	8848	7307	6183	7796	5330	4237	3424	1725	2729	5883	6778	9022	4828	1921	553	5362	6515	8301
173	10429	10968	7809	7564	9218	7483	6273	8126	5708	4498	3622	2027	3109	6267	7162	9361	5186	2303	878	5711	6857	8622
174	10791	11328	8148	7918	9554	7629	6342	8420	6055	4732	3804	2313	3459	6629	7524	9697	5535	2664	1225	6055	7196	8945
175	3222	4145	2131	958	3161	7607	8297	4229	2024	5240	6071	5693	4195	1177	674	4459	3002	4941	6428	3064	3210	4631
176	3033	4140	1769	573	2746	7437	8220	3912	2058	5232	6121	5868	4401	1572	1060	4742	3402	5210	6693	3479	3612	4975
177	2644	3777	1905	753	2687	7736	8568	4087	2446	5607	6507	6256	4782	1821	1137	4578	3632	5570	7056	3652	3664	4892
178	2233	3441	2050	1027	2605	8006	8899	4233	2842	5977	6896	6668	5195	2174	1402	4514	3956	5976	7462	3930	3836	4916
179	1952	3324	2051	1204	2394	8085	9051	4199	3109	6190	7140	6977	5519	2544	1766	4681	4324	6323	7809	4290	4156	5147
180	1880	3429	1932	1300	2087	7993	9031	4019	3247	6245	7229	7156	5724	2858	2110	4993	4656	6566	8048	4639	4518	5488
183	6163	7591	2476	3124	3592	3986	4754	2082	1882	2130	3264	4034	3294	3828	4172	7984	4902	4453	5589	5367	6142	7942
184	6856	7339	4789	4216	6205	7242	6987	5891	2700	3897	4001	2640	1289	2655	3552	6006	1766	1334	2793	2367	3528	5457
205	13779	13527	12374	11690	13780	13279	12027	13329	10283	10158	9400	7627	8000	9803	10594	10754	8026	6841	5865	8178	8851	9704
206	12858	12443	11821	11026	13191	13426	12364	12996	9808	10159	9545	7686	7762	9064	9792	9532	7240	6621	5941	7294	7820	8466
300	2683	3218	2982	1796	3727	8648	9332	5152	3031	6247	7031	6494	4960	1590	705	3500	3123	5555	7030	2978	2730	3809
302	7532	8524	4380	4424	5738	4927	4648	4544	2478	1545	1792	1600	1150	3876	4630	7929	3934	2190	3143	4528	5605	7559
303	7557	8429	4616	4513	6012	5494	5128	4994	2579	2102	2159	1357	592	3700	4512	7622	3519	1621	2678	4122	5235	7189
304	6583	8006	2889	3540	3964	3628	4336	2271	2199	1771	2925	3851	3268	4156	4545	8339	5123	4420	5471	5613	6435	8264
305	5588	7249	1898	2973	2508	4197	5468	686	2668	3415	4577	5462	4653	4362	4420	8230	5787	5808	6999	6161	6741	8372
306	5898	7535	2180	3206	2845	388																

Project:  
**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
 Lenexa, KS, 66219

Description:  
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 wind@eapc.net  
 Calculated:  
 3/4/2016 10:38 AM/2.9.285

**DECIBEL - Main Result**

**Calculation:** A060 V100 2.0 80m HH No Grnd Atten. Generic Octave

...continued from previous page

WTG	X	HH	T	D	DD	NN	PP	G	Y	O	V	L	F	M	E	KK	K	I	B	N	AA	MM
316	7690	8025	5756	5159	7171	7830	7351	6808	3662	4438	4298	2620	1758	3483	4370	6350	2163	1010	2150	2686	3840	5662
317	7058	7354	5324	4635	6718	7948	7633	6553	3300	4587	4612	3086	1925	2866	3741	5708	1493	1550	2817	2033	3198	5058
WTG	TT	SS	EE	BB	H	Z	S	A	OO	WW	FF	LL	JJ	GG	II	YY	VV	ZZ	QQ	C	R	J
5	9329	9110	6123	5932	1954	5937	5693	6109	8482	10138	8249	9414	8831	7902	8021	11886	11526	12225	10281	3227	10991	3136
6	9361	9135	6190	6002	1723	5984	5641	5803	8345	10066	7999	9147	8601	7699	7817	11674	11308	12005	10065	3502	11287	3394
12	8100	7920	4835	4639	3110	4776	5119	7154	8251	9461	8782	10036	9204	8127	8250	12055	11737	12447	10513	1106	8786	1102
13	7971	7803	4732	4540	3563	4715	5209	7532	8375	9469	9059	10322	9447	8349	8473	12241	11934	12643	10720	780	8299	875
14	8012	7873	4894	4715	4571	4958	5716	8449	8898	9771	9829	11100	10161	9036	9158	12851	12562	13267	11370	1110	7400	1336
15	7759	7600	4552	4363	3859	4565	5174	7737	8354	9354	9167	10436	9524	8410	8533	12265	11967	12674	10763	555	7902	737
18	8079	7965	5119	4956	5406	5245	6184	9203	9342	10032	10462	11737	10750	9609	9729	13345	13073	13772	11902	1805	6640	2030
20	8694	8593	5809	5651	6022	5950	6919	9898	10073	10720	11196	12471	11488	10347	10468	14081	13810	14509	12641	2510	6511	2738
22	8641	8551	5845	5695	6345	6010	7049	10165	10180	10742	11394	12669	11663	10515	10635	14205	13942	14638	12785	2767	6137	2992
24	5775	5645	2765	2607	4708	2913	4023	7726	7102	7678	8541	9807	8723	7562	7678	11143	10893	11582	9762	1684	6592	1678
26	5372	5258	2521	2387	5129	2731	3996	7938	6981	7399	8590	9846	8723	7560	7673	11033	10799	11479	9696	2217	6227	2212
27	5470	5372	2762	2643	5458	3002	4317	8296	7260	7593	8925	10178	9044	7882	7993	11313	11085	11762	9994	2396	5876	2420
28	5128	5037	2541	2442	5649	2814	4204	8319	7066	7307	8834	10077	8920	7760	7869	11115	10898	11568	9826	2734	5766	2742
29	4832	4760	2507	2440	6038	2824	4294	8546	7027	7120	8930	10157	8973	7819	7925	11062	10860	11520	9818	3197	5489	3204
34	4922	4969	4004	4030	8186	4390	5943	10433	8156	7622	10458	11620	10367	9257	9348	12033	11892	12501	10981	5214	3729	5260
35	5171	5248	4565	4604	8813	4955	6505	11022	8598	7922	10976	12119	10856	9759	9848	12416	12291	12885	11415	5805	3264	5858
36	5103	5200	4759	4812	9137	5151	6692	11239	8662	7876	11106	12230	10957	9876	9961	12424	12312	12893	11466	6184	3249	6233
37	8968	8700	7329	7263	4649	6938	5445	863	5481	7843	3130	3748	3954	3846	3892	6873	6463	7046	5390	8019	14825	7798
38	8704	8434	6935	6861	4156	6545	5077	651	5370	7721	3244	4003	4057	3804	3863	7064	6656	7264	5537	7524	14382	7304
39	8734	8464	6738	6647	3554	6354	4953	1105	5639	7959	3768	4613	4561	4175	4248	7620	7215	7840	6065	7017	14050	6800
40	8279	8009	6297	6210	3375	5912	4500	940	5235	7539	3526	4463	4294	3822	3903	7388	6987	7629	5811	6724	13653	6505
41	8067	7797	6223	6148	3653	5834	4378	582	4904	7226	3128	4075	3898	3450	3527	6990	6589	7232	5414	6890	13670	6667
42	7417	7149	5894	5845	4202	5502	3973	706	4037	6383	2248	3297	2991	2528	2603	6101	5704	6360	4511	7113	13498	6886
43	7172	6902	5567	5515	3942	5175	3655	954	3924	6247	2409	3526	3104	2514	2601	6226	5836	6505	4623	6781	13158	6554
45	6742	6472	5094	5042	3763	4702	3182	1418	3649	5932	2532	3728	3144	2392	2493	6253	5873	6558	4640	6416	12693	6188
66	6934	6717	3730	3542	1821	3540	3443	5377	6468	7889	6890	8147	7312	6244	6367	10191	9866	10576	8636	2038	9470	1821
67	6781	6576	3530	3336	2299	3385	3507	5812	6616	7907	7219	8484	7603	6510	6633	10421	10107	10817	8887	1586	8990	1362
68	6378	6174	3125	2931	2541	2984	3175	5792	6317	7543	7057	8329	7405	6293	6416	10170	9864	10573	8654	1666	8774	1438
69	6298	6104	3027	2831	2870	2927	3290	6117	6460	7588	7318	8591	7640	6516	6638	10358	10060	10767	8859	1412	8432	1190
70	5286	5069	2118	1938	3046	1898	2013	5341	5186	6352	6209	7483	6467	5324	5445	9110	8821	9526	7633	2648	8768	2437
84	7312	7076	4271	4099	884	4007	3492	4478	6230	7907	6235	7460	6740	5743	5865	9730	9384	10090	8140	3035	10472	2826
85	7729	7495	4653	4476	667	4403	3928	4680	6652	8345	6561	7770	7092	6119	6240	10108	9756	10460	8511	3034	10626	2840
98	9247	9169	6541	6398	7041	6722	7795	10909	10915	11420	12152	13428	12419	11270	11390	14946	14686	15381	13534	3513	5989	3739
99	9232	9166	6626	6492	7377	6828	7957	11193	11050	11473	12371	13645	12615	11461	11580	15091	14840	15530	13701	3797	5620	4020
100	9125	9089	6801	6690	8172	7050	8311	11835	11308	11521	12837	14106	13023	11862	11977	15361	15132	15810	14029	4508	4649	4719
101	9409	9384	7180	7075	8637	7440	8726	12292	11698	11851	13270	14537	13445	12283	12397	15750	15526	16201	14433	4973	4443	5183
104	6242	6058	2972	2777	3192	2916	3435	6436	6617	7650	7579	8854	7879	6745	6867	10552	10262	10967	9070	1208	8102	1003
105	6368	6219	3213	3033	4112	3278	4140	7432	7302	8091	8482	9756	8736	7587	7707	11302	11030	11729	9864	919	7189	901
150	9533	9533	7568	7482	9428	7858	9222	12971	12097	12079	13818	15077	13949	12786	12898	16136	15930	16593	14871	5741	3704	5943
151	5309	5079	2261	2098	2867	1982	1767	4930	4898	6189	5811	7086	6088	4953	5074	8777	8480	9187	7282	2984	9157	2767
152	5382	5143	2458	2310	2727	2143	1641	4575	4690	6095	5483	6758	5781	4655	4778	8516	8211	8920	7004	3272	9500	3050
154	6127	5890	3134	2972	1999	2847	2348	4462	5269	6797	5730	6996	6118	5035	5159	8974	8651	9361	7423	3018	9823	2789
155	6920	6682	3900	3731	1227	3627	3099	4400	5880	7523	6012	7254	6484	5460	5583	9441	9100	9808	7860	3015	10277	2795
156	6466	6230	3440	3272	1686	3166	2691	4495	5574	7136	5911	7170	6333	5271	5395	9230	8900	9610	7667	2914	9948	2687
158	5858	5692	2634	2446	3816	2658	3462	6870	6627	7465	7828	9101	8068	6916	7036	10624	10352	11051	9187	1366	7498	1239
164	7261	7001	4682	4554	1559	4331	3242	2848	5269	7263	4740	5924	5324	4438	4553	8400	8032	8727	6789	4588	11667	4368
165	8708	8452	5954	5803	1193	5633	4694	3435	6715	8756	5807	6879	6485	5729	5836	9605	9220	9896	7993	4885	12443	4694
166	9110	8856	6316	6161	1372	6003	5102	3716	7132	9178	6156	7201	6851	6121	6227	9973	9585	10257	8364	5019	12660	4839
171	8629	8429	5363	5167	2457	5241	5306	6657	8322	9743	8519	9742	9014	7993	8116	11970	11632	12341	10393	2031	9763	1970
173	8911	8706	5655	5460	2330	5515	5491	6556	8448	9941	8513	9721	9037	8042	8164	12028	11683	12390	10440	2417	10144	2352
174	9204	8995	5958	5764	2302	5805	5711	6518	8614													

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
 Lenexa, KS, 66219

Description:

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 wind@eapc.net  
 Calculated:  
 3/4/2016 10:38 AM/2.9.285

**DECIBEL - Main Result**

Calculation: A060 V100 2.0 80m HH No Grnd Atten. Generic Octave

...continued from previous page

WTG	TT	SS	EE	BB	H	Z	S	A	OO	WW	FF	LL	JJ	GG	II	YY	VV	ZZ	QQ	C	R	J
183	9083	9036	6659	6540	7854	6894	8116	11558	11146	11428	12612	13883	12816	11656	11772	15198	14961	15644	13847	4205	4954	4419
184	6137	6000	3058	2889	4461	3168	4163	7659	7291	7966	8601	9872	8820	7664	7782	11315	11054	11749	9905	1278	6829	1286
205	9087	8817	7012	6914	3535	6632	5264	1475	6034	8350	4138	4940	4937	4570	4643	7980	7574	8190	6435	7088	14242	6876
206	7736	7466	5990	5924	3777	5599	4114	536	4524	6850	2804	3808	3556	3073	3152	6662	6264	6915	5076	6873	13502	6648
300	5197	5256	4359	4386	8493	4746	6299	10785	8496	7919	10812	11971	10717	9608	9700	12358	12222	12826	11320	5449	3379	5506
302	8398	8282	5415	5249	5443	5529	6426	9320	9595	10326	10648	11922	10955	9819	9941	13585	13307	14008	12129	1941	6841	2170
303	7966	7838	4916	4745	4939	5011	5864	8761	9038	9819	10071	11345	10379	9244	9366	13019	12739	13441	11558	1370	7018	1598
304	9375	9319	6860	6732	7767	7076	8247	11557	11315	11672	12695	13969	12924	11768	11886	15363	15118	15805	13988	4168	5354	4389
305	9632	9623	7565	7472	9241	7844	9178	12845	12094	12142	13754	15016	13904	12741	12854	16140	15927	16595	14854	5565	4032	5771
306	9765	9748	7604	7503	9086	7870	9171	12752	12127	12240	13723	14990	13893	12730	12844	16178	15957	16630	14871	5428	4366	5639
307	9437	9185	6568	6407	1486	6270	5444	4150	7562	9583	6608	7646	7305	6571	6678	10426	10039	10710	8818	4983	12700	4817
308	7594	7335	4966	4831	1344	4623	3574	2923	5599	7607	4963	6122	5575	4723	4836	8667	8295	8986	7055	4619	11837	4404
309	7913	7655	5238	5097	1175	4902	3895	3052	5928	7943	5210	6344	5843	5019	5131	8946	8570	9257	7333	4651	11990	4443
310	8261	8003	5562	5419	1163	5232	4243	3149	6246	8282	5420	6524	6078	5290	5399	9191	8810	9492	7578	4784	12220	4582
311	7268	7052	4059	3870	1677	3873	3760	5460	6756	8211	7080	8327	7528	6477	6600	10439	10108	10817	8874	2045	9629	1842
312	7602	7386	4392	4202	1559	4208	4069	5529	7029	8522	7251	8488	7725	6693	6816	10667	10331	11039	9093	2137	9824	1954
313	7945	7725	4754	4565	1334	4557	4337	5456	7227	8791	7300	8520	7807	6804	6927	10790	10446	11152	9203	2434	10170	2267
314	7233	7119	4297	4139	5189	4440	5460	8753	8591	9209	9848	11122	10094	8942	9061	12615	12353	13048	11199	1502	6375	1687
315	5688	5453	2698	2539	2442	2406	1971	4609	4992	6425	5669	6943	6002	4890	5013	8783	8471	9181	7256	3055	9542	2829
316	6126	5953	2877	2684	3528	2865	3535	6723	6716	7649	7791	9066	8064	6922	7042	10684	10403	11105	9223	1151	7766	988
317	5611	5454	2432	2251	4123	2499	3444	7049	6576	7311	7901	9171	8108	6950	7068	10597	10335	11030	9186	1611	7220	1514

WTG	P	UU	CC	XX	RR	Q	W	U
5	3791	8943	6114	11586	10686	10914	9965	9838
6	3438	8934	6060	11388	10436	11171	10296	10167
12	5363	7944	5516	11660	11155	8762	7778	7648
13	5825	7881	5592	11828	11406	8311	7275	7145
14	6835	8059	6066	12407	12126	7537	6284	6158
15	6123	7716	5543	11837	11487	7914	6897	6765
18	7669	8236	6504	12879	12713	6892	5447	5325
20	8284	8898	7236	13612	13451	6945	5129	5020
22	8609	8891	7350	13726	13622	6609	4738	4629
24	6802	5884	4292	10651	10662	6245	6102	5949
26	7165	5553	4221	10523	10642	5790	5881	5725
27	7512	5714	4527	10796	10956	5475	5524	5368
28	7652	5407	4384	10589	10814	5266	5547	5389
29	7994	5188	4432	10523	10841	4891	5423	5264
34	10096	5657	5964	11450	12113	2801	4351	4201
35	10720	5982	6505	11826	12568	2196	4145	4004
36	11011	5962	6670	11829	12636	1998	4320	4186
37	2727	8009	5581	6850	5157	14045	14557	14403
38	2293	7770	5239	7000	5411	13628	14086	13933
39	1631	7845	5163	7523	6014	13362	13676	13524
40	1712	7393	4707	7260	5846	12942	13317	13164
41	2104	7157	4553	6864	5453	12913	13393	13239
42	2972	6461	4073	5954	4635	12639	13360	13204
43	2878	6234	3770	6047	4830	12309	13015	12858
45	2989	5822	3302	6029	4969	11837	12570	12413
66	3976	6580	3861	9812	9262	9107	8824	8679
67	4467	6500	3914	10022	9562	8652	8334	8188
68	4627	6108	3574	9756	9368	8376	8201	8053
69	4974	6085	3674	9931	9605	8053	7854	7705
70	4751	4948	2399	8672	8429	8145	8472	8317
84	2949	6819	3908	9400	8653	10056	9852	9707
85	2908	7250	4345	9788	8988	10273	9926	9783
98	9302	9545	8090	14462	14378	6652	4399	4309
99	9640	9574	8238	14598	14569	6338	3998	3911
100	10433	9577	8553	14844	14958	5499	2968	2884
101	10898	9896	8959	15227	15374	5419	2647	2581

To be continued on next page...

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
 Lenexa, KS, 66219

Description:

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 wind@eapc.net  
 Calculated:  
 3/4/2016 10:38 AM/2.9.285

**DECIBEL - Main Result**

**Calculation:** A060 V100 2.0 80m HH No Grnd Atten. Generic Octave

...continued from previous page

WTG	P	UU	CC	XX	RR	Q	W	U
104	5309	6086	3803	10113	9843	7745	7517	7368
105	6281	6380	4463	10836	10694	6946	6526	6379
150	11681	10106	9424	15597	15856	4865	1785	1742
151	4432	4889	2176	8352	8052	8500	8885	8729
152	4153	4895	2061	8104	7746	8822	9241	9086
154	3630	5641	2769	8594	8075	9253	9413	9261
155	3110	6423	3516	9096	8414	9808	9727	9579
156	3454	5987	3111	8863	8282	9430	9469	9319
158	5893	5799	3788	10159	10024	7108	6989	6838
164	1890	6562	3588	8129	7177	11072	11229	11079
165	1100	8043	5059	9388	8218	12016	11781	11637
166	1192	8456	5470	9768	8555	12279	11939	11798
171	4631	8365	5722	11615	10934	9720	8738	8610
173	4425	8613	5910	11690	10940	10106	9102	8975
174	4289	8880	6132	11806	10994	10467	9430	9305
175	10150	6612	6526	12312	12839	2892	3417	3260
176	10503	7000	6941	12718	13254	2672	3012	2856
177	10805	6996	7100	12765	13362	2287	3006	2856
178	11172	7093	7353	12904	13560	1874	2976	2835
179	11541	7366	7702	13196	13883	1567	2801	2670
180	11844	7720	8058	13555	14245	1463	2516	2393
183	10117	9497	8370	14688	14757	5738	3315	3227
184	6603	6206	4459	10835	10771	6558	6227	6078
205	1442	8210	5490	7895	6347	13592	13816	13666
206	2411	6813	4266	6520	5167	12707	13278	13123
300	10424	5961	6319	11773	12456	2461	4075	3928
302	7706	8543	6755	13125	12919	7150	5571	5454
303	7203	8065	6199	12564	12343	7193	5886	5760
304	10031	9756	8517	14862	14874	6159	3664	3585
305	11499	10175	9393	15608	15821	5158	2121	2079
306	11348	10279	9400	15652	15819	5467	2457	2415
307	1569	8811	5823	10221	9003	12378	11907	11770
308	1619	6903	3926	8410	7400	11282	11345	11196
309	1405	7232	4252	8700	7643	11475	11445	11298
310	1173	7582	4601	8960	7844	11739	11628	11483
311	3900	6914	4179	10071	9469	9315	8918	8775
312	3818	7243	4489	10310	9655	9554	9054	8913
313	3592	7559	4758	10451	9720	9925	9359	9221
314	7427	7398	5760	12136	12050	6431	5426	5289
315	3993	5219	2391	8381	7966	8919	9212	9058
316	5642	6027	3883	10232	10026	7414	7194	7044
317	6166	5600	3742	10119	10056	6793	6777	6623

## **Appendix E: windPRO V100 Sound Analysis with General Ground Attenuation**

Project:

20132550- Lindahl Wind Farm

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:

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Calculated:  
3/4/2016 10:58 AM/2.9.285

## DECIBEL - Main Result

Calculation: A060 V100 2.0 80m HH Gen Grnd Atten. 0.5 Generic Octave

Noise calculation model:

ISO 9613-2 General

Wind speed:

95% rated power

Ground attenuation:

General, Ground factor: 0.5

Meteorological coefficient, C0:

0.0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Pure and Impulse tone penalty are added to WTG source noise

Height above ground level, when no value in NSA object:

1.5 m Don't allow override of model height with height from NSA object

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0.0 dB(A)



Scale 1:400,000

▲ New WTG

▨ Noise sensitive area

### WTGs

UTM NAD83 Zone: 13			Row data/Description	WTG type			Noise data				Wind speed [m/s]	Status	Lwa,ref [dB(A)]	Pure tones
East	North	Z [m]		Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Creator				
5	646,913	5,375,455	745.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
6	646,888	5,375,080	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
12	648,327	5,377,151	750.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
13	648,570	5,377,592	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
14	648,872	5,378,572	753.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
15	648,872	5,377,853	752.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
18	649,189	5,379,368	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
20	648,867	5,380,033	744.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
22	649,124	5,380,328	729.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
24	651,007	5,377,868	749.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
26	651,525	5,378,000	751.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
27	651,616	5,378,348	758.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
28	651,987	5,378,290	755.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
29	652,436	5,378,405	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
34	654,047	5,379,834	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
35	654,478	5,380,290	745.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
36	654,876	5,380,346	731.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
37	649,468	5,369,552	735.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
38	649,403	5,370,690	742.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
39	648,989	5,370,563	740.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
40	649,348	5,370,846	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
41	649,714	5,370,690	746.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
42	650,635	5,370,574	746.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
43	650,667	5,370,918	744.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
45	650,882	5,371,340	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
66	649,309	5,375,532	733.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
67	649,484	5,375,990	732.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
68	649,889	5,375,994	741.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
69	650,008	5,376,321	740.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
70	650,956	5,375,465	751.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
84	648,982	5,374,557	737.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
85	648,553	5,374,643	733.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
98	648,903	5,381,054	722.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
99	649,170	5,381,363	721.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
100	649,950	5,382,038	713.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
101	650,030	5,382,496	712.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
104	650,119	5,376,639	740.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
105	650,267	5,377,632	746.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h
150	650,663	5,383,159	707.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB (95%)	User value	105.0	0 dB h

To be continued on next page...

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:

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3/4/2016 10:58 AM/2.9.285

## DECIBEL - Main Result

Calculation: A060 V100 2.0 80m HH Gen Grnd Atten. 0.5 Generic Octave

...continued from previous page

Row data/Description	UTM NAD83 Zone: 13			WGTg type			Noise data						Wind speed [m/s]	Status	LwA,ref [dB(A)]	Pure tones
	East	North	Z	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Creator	Name					
151	650,947	5,375,049	753.4	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
152	650,911	5,374,694	758.8	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
154	650,163	5,374,664	746.8	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
155	649,378	5,374,555	741.3	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
156	649,818	5,374,694	743.7	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
158	650,613	5,377,049	737.8	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
164	649,406	5,372,982	725.6	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
165	647,909	5,372,903	716.3	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
166	647,487	5,372,910	715.6	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
171	647,671	5,376,427	743.7	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
173	647,364	5,376,192	740.7	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
174	647,056	5,376,002	741.8	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
175	653,143	5,380,511	713.2	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
176	653,130	5,380,927	710.2	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
177	653,497	5,381,062	704.1	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
178	653,850	5,381,276	700.7	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
179	654,022	5,381,604	696.2	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
180	654,011	5,381,966	694.9	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
183	649,728	5,381,758	721.2	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
184	650,599	5,377,842	746.4	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
205	648,594	5,370,523	731.5	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
206	650,092	5,370,737	743.7	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
300	654,134	5,380,179	734.1	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
302	648,870	5,379,451	759.0	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
303	649,079	5,378,913	759.0	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
304	649,308	5,381,738	716.8	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
305	650,346	5,383,045	709.5	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
306	650,021	5,382,956	710.0	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
307	647,090	5,373,129	713.2	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
308	649,061	5,372,960	722.4	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
309	648,724	5,372,961	720.3	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
310	648,383	5,372,885	719.3	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
311	648,975	5,375,560	734.6	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
312	648,641	5,375,554	726.9	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
313	648,297	5,375,376	728.5	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
314	649,928	5,378,956	741.0	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
315	650,591	5,374,779	748.6	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
316	650,301	5,376,922	735.0	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h
317	650,917	5,377,197	740.0	V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	USER	95% Rated 105dB	(95%)	User value	105.0	0 dB h

h) Generic octave distribution used

## Calculation Results

### Sound Level

Noise sensitive area No.	Name	UTM NAD83 Zone: 13			Imission height [m]	Demands Noise [dB(A)]	Sound Level From WGTs [dB(A)]	Distance to noise demand [m]	Demands fulfilled ? Noise
		East	North	Z [m]					
A	Participating	650,034	5,370,204	742.6	1.5	50.0	43.7	376	Yes
B	Participating	648,222	5,376,376	731.5	1.5	50.0	42.9	409	Yes
C	Participating	649,350	5,377,570	737.6	1.5	50.0	42.8	414	Yes
D	Participating	652,833	5,381,417	705.0	1.5	50.0	41.1	424	Yes
E	Participating	653,476	5,379,925	741.5	1.5	50.0	42.2	430	Yes
F	Participating	649,476	5,378,474	747.0	1.5	50.0	43.4	435	Yes
G	Participating	650,400	5,383,729	711.5	1.5	50.0	40.2	478	Yes
H	Participating	648,263	5,374,042	728.5	1.5	50.0	41.5	520	Yes
I	Participating	649,372	5,377,319	734.6	1.5	50.0	42.4	586	Yes
J	Participating	649,411	5,377,350	734.6	1.5	50.0	42.4	591	Yes
K	Participating	652,350	5,377,616	735.4	1.5	50.0	40.3	614	Yes
L	Participating	647,974	5,378,125	736.6	1.5	50.0	40.0	649	Yes
M	Participating	652,746	5,379,403	722.4	1.5	50.0	38.1	912	Yes

To be continued on next page...

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
 Lenexa, KS, 66219

Description:

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 3/4/2016 10:58 AM/2.9.285

**DECIBEL - Main Result**

**Calculation:** A060 V100 2.0 80m HH Gen Grnd Atten. 0.5 Generic Octave

...continued from previous page

Noise sensitive area		UTM NAD83 Zone: 13			Demands			Sound Level		Demands fulfilled ?	
No.	Name	East	North	Z	Imission height	Noise	From WTGs	Distance to noise demand	Noise		
				[m]	[m]	[dB(A)]	[dB(A)]	[m]			
	N Non-Participating	652,934	5,377,454	728.5	1.5	50.0	36.7	934	Yes		
	O Participating	647,905	5,380,657	723.4	1.5	50.0	37.4	930	Yes		
	P Non-Participating	647,929	5,371,803	716.8	1.5	50.0	38.1	949	Yes		
	Q Non-Participating	655,444	5,382,262	682.8	1.5	50.0	33.3	1,322	Yes		
	R Non-Participating	654,346	5,383,551	675.6	1.5	50.0	31.5	1,483	Yes		
	S Participating	652,445	5,374,111	759.0	1.5	50.0	34.2	1,485	Yes		
	T Non-Participating	652,124	5,382,382	698.0	1.5	50.0	35.0	1,513	Yes		
	U Non-Participating	652,329	5,383,668	691.9	1.5	50.0	32.3	1,601	Yes		
	V Participating	647,113	5,379,805	712.6	1.5	50.0	34.3	1,620	Yes		
	W Non-Participating	652,318	5,383,827	691.2	1.5	50.0	32.0	1,644	Yes		
	X Non-Participating	655,873	5,382,222	689.2	1.5	50.0	31.6	1,738	Yes		
	Y Non-Participating	651,119	5,380,491	705.0	1.5	50.0	36.2	1,731	Yes		
	Z Non-Participating	652,848	5,375,611	736.1	1.5	50.0	34.1	1,750	Yes		
	AA Participating	654,105	5,377,449	726.3	1.5	50.0	32.8	1,786	Yes		
	BB Non-Participating	652,820	5,375,995	733.4	1.5	50.0	34.4	1,791	Yes		
	CC Participating	652,849	5,373,992	753.0	1.5	50.0	32.7	1,905	Yes		
	DD Non-Participating	652,780	5,383,651	684.1	1.5	50.0	31.8	1,950	Yes		
	EE Non-Participating	653,014	5,375,966	734.6	1.5	50.0	33.8	1,971	Yes		
	FF Non-Participating	652,597	5,369,477	749.8	1.5	50.0	29.9	2,101	Yes		
	GG Participating	653,163	5,370,620	746.2	1.5	50.0	29.8	2,253	Yes		
	HH Non-Participating	657,270	5,380,900	701.0	1.5	50.0	28.5	2,320	Yes		
	II Participating	653,237	5,370,521	746.8	1.5	50.0	29.5	2,355	Yes		
	JJ Non-Participating	653,421	5,369,486	746.6	1.5	50.0	27.9	2,843	Yes		
	KK Non-Participating	656,603	5,377,699	728.9	1.5	50.0	28.1	3,020	Yes		
	LL Non-Participating	652,987	5,368,263	755.9	1.5	50.0	26.9	3,153	Yes		
	MM Non-Participating	655,962	5,376,837	710.2	1.5	50.0	28.4	3,418	Yes		
	NN Non-Participating	646,183	5,383,581	712.5	1.5	50.0	27.5	3,476	Yes		
	OO Participating	654,514	5,371,692	765.0	1.5	50.0	27.5	3,513	Yes		
	PP Non-Participating	644,980	5,381,994	704.1	1.5	50.0	27.1	3,890	Yes		
	QQ Participating	654,816	5,368,880	743.7	1.5	50.0	24.8	4,364	Yes		
	RR Non-Participating	654,290	5,367,724	742.3	1.5	50.0	24.2	4,489	Yes		
	SS Non-Participating	656,021	5,375,274	710.2	1.5	50.0	27.1	4,624	Yes		
	TT Non-Participating	656,242	5,375,429	710.2	1.5	50.0	26.9	4,695	Yes		
	UU Non-Participating	655,800	5,374,456	722.8	1.5	50.0	27.0	4,728	Yes		
	VV Non-Participating	655,758	5,368,066	719.3	1.5	50.0	22.8	5,557	Yes		
	WW Participating	656,662	5,372,675	722.4	1.5	50.0	24.7	5,798	Yes		
	XX Non-Participating	656,251	5,368,598	741.7	1.5	50.0	22.7	5,805	Yes		
	YY Non-Participating	656,161	5,367,989	720.8	1.5	50.0	22.3	5,954	Yes		
	ZZ Non-Participating	656,215	5,367,523	716.3	1.5	50.0	21.8	6,212	Yes		

**Distances (m)**

WTG	X	HH	T	D	DD	NN	PP	G	Y	O	V	L	F	M	E	KK	K	I	B	N	AA	MM
5	11229	11701	8668	8402	10080	8159	6819	8979	6562	5296	4355	2873	3960	7044	7941	9947	5851	3086	1601	6344	7464	9154
6	11478	11902	8986	8689	10401	8530	7173	9335	6869	5669	4731	3233	4268	7281	8178	10062	6022	3344	1860	6496	7596	9243
12	9092	9697	6464	6205	7879	6778	5887	6897	4353	3531	2919	1036	1752	4960	5849	8294	4050	1058	782	4617	5786	7642
13	8647	9308	5965	5728	7378	6447	5680	6404	3860	3136	2650	800	1264	4552	5433	8034	3780	847	1265	4366	5537	7431
14	7896	8715	5009	4877	6409	5685	5183	5379	2955	2298	2148	1003	612	3962	4799	7780	3607	1349	2290	4213	5352	7299
15	8253	8934	5576	5329	6992	6328	5683	6072	3465	2966	2628	938	866	4173	5049	7733	3486	732	1614	4082	5249	7163
18	7268	8225	4207	4181	5589	5176	4961	4526	2233	1819	2122	1738	939	3557	4323	7600	3614	2057	3144	4206	5277	7231
20	7340	8448	4016	4201	5329	4449	4354	4001	2298	1147	1769	2107	1674	3930	4610	8081	4240	2761	3714	4816	5841	7782
22	7010	8166	3636	3866	4941	4386	4466	3633	2002	1263	2078	2485	1887	3738	4371	7928	4215	3019	4054	4773	5753	7678
24	6530	6959	4650	3991	6049	7477	7304	5893	2625	4172	4349	3044	1647	2320	3214	5599	1366	1725	3160	1971	3126	5061
26	6061	6436	4423	3659	5789	7726	7668	5839	2524	4491	4767	3553	2103	1860	2741	5087	910	2258	3681	1511	2638	4587
27	5756	6203	4066	3302	5429	7544	7572	5517	2200	4371	4733	3649	2144	1546	2439	5029	1037	2469	3925	1593	2646	4601
28	5528	5893	4094	3240	5420	7854	7926	5666	2366	4719	5104	4017	2518	1347	2211	4654	766	2790	4224	1263	2279	4232

To be continued on next page...

Project:

20132550- Lindahl Wind Farm

TradeWind Energy, Inc.
Kevin Walter
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Lenexa, KS, 66219

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DECIBEL - Main Result

Calculation: A060 V100 2.0 80m HH Gen Grnd Atten. 0.5 Generic Octave

...continued from previous page

Table with 20 columns (WTG, X, HH, T, D, DD, NN, PP, G, Y, O, V, L, F, M, E, KK, K, I, B, N, AA, MM) and 31 rows of numerical data representing wind farm results.

To be continued on next page...

Project: 20132550- Lindahl Wind Farm

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DECIBEL - Main Result

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...continued from previous page

Table with columns WTG, X, HH, T, D, DD, NN, PP, G, Y, O, V, L, F, M, E, KK, K, I, B, N, AA, MM and rows of numerical data representing wind speed measurements at various points.

To be continued on next page...

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.

Kevin Walter

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**DECIBEL - Main Result**

Calculation: A060 V100 2.0 80m HH Gen Grnd Atten. 0.5 Generic Octave

...continued from previous page

WTG	TT	SS	EE	BB	H	Z	S	A	OO	WW	FF	LL	JJ	GG	II	YY	VV	ZZ	QQ	C	R	J
183	9083	9036	6659	6540	7854	6894	8116	11558	11146	11428	12612	13883	12816	11656	11772	15198	14961	15644	13847	4205	4954	4419
184	6137	6000	3058	2889	4461	3168	4163	7659	7291	7966	8601	9872	8820	7664	7782	11315	11054	11749	9905	1278	6829	1286
205	9087	8817	7012	6914	3535	6632	5264	1475	6034	8350	4138	4940	4937	4570	4643	7980	7574	8190	6435	7088	14242	6876
206	7736	7466	5990	5924	3777	5599	4114	536	4524	6850	2804	3808	3556	3073	3152	6662	6264	6915	5076	6873	13502	6648
300	5197	5256	4359	4386	8493	4746	6299	10785	8496	7919	10812	11971	10717	9608	9700	12358	12222	12826	11320	5449	3379	5506
302	8398	8282	5415	5249	5443	5529	6426	9320	9595	10326	10648	11922	10955	9819	9941	13585	13307	14008	12129	1941	6841	2170
303	7966	7838	4916	4745	4939	5011	5864	8761	9038	9819	10071	11345	10379	9244	9366	13019	12739	13441	11558	1370	7018	1598
304	9375	9319	6860	6732	7767	7076	8247	11557	11315	11672	12695	13969	12924	11768	11886	15363	15118	15805	13988	4168	5354	4389
305	9632	9623	7565	7472	9241	7844	9178	12845	12094	12142	13754	15016	13904	12741	12854	16140	15927	16595	14854	5565	4032	5771
306	9765	9748	7604	7503	9086	7870	9171	12752	12127	12240	13723	14990	13893	12730	12844	16178	15957	16630	14871	5428	4366	5639
307	9437	9185	6568	6407	1486	6270	5444	4150	7562	9583	6608	7646	7305	6571	6678	10426	10039	10710	8818	4983	12700	4817
308	7594	7335	4966	4831	1344	4623	3574	2923	5599	7607	4963	6122	5575	4723	4836	8667	8295	8986	7055	4619	11837	4404
309	7913	7655	5238	5097	1175	4902	3895	3052	5928	7943	5210	6344	5843	5019	5131	8946	8570	9257	7333	4651	11990	4443
310	8261	8003	5562	5419	1163	5232	4243	3149	6246	8282	5420	6524	6078	5290	5399	9191	8810	9492	7578	4784	12220	4582
311	7268	7052	4059	3870	1677	3873	3760	5460	6756	8211	7080	8327	7528	6477	6600	10439	10108	10817	8874	2045	9629	1842
312	7602	7386	4392	4202	1559	4208	4069	5529	7029	8522	7251	8488	7725	6693	6816	10667	10331	11039	9093	2137	9824	1954
313	7945	7725	4754	4565	1334	4557	4337	5456	7227	8791	7300	8520	7807	6804	6927	10790	10446	11152	9203	2434	10170	2267
314	7233	7119	4297	4139	5189	4440	5460	8753	8591	9209	9848	11122	10094	8942	9061	12615	12353	13048	11199	1502	6375	1687
315	5688	5453	2698	2539	2442	2406	1971	4609	4992	6425	5669	6943	6002	4890	5013	8783	8471	9181	7256	3055	9542	2829
316	6126	5953	2877	2684	3528	2865	3535	6723	6716	7649	7791	9066	8064	6922	7042	10684	10403	11105	9223	1151	7766	988
317	5611	5454	2432	2251	4123	2499	3444	7049	6576	7311	7901	9171	8108	6950	7068	10597	10335	11030	9186	1611	7220	1514

WTG	P	UU	CC	XX	RR	Q	W	U
5	3791	8943	6114	11586	10686	10914	9965	9838
6	3438	8934	6060	11388	10436	11171	10296	10167
12	5363	7944	5516	11660	11155	8762	7778	7648
13	5825	7881	5592	11828	11406	8311	7275	7145
14	6835	8059	6066	12407	12126	7537	6284	6158
15	6123	7716	5543	11837	11487	7914	6897	6765
18	7669	8236	6504	12879	12713	6892	5447	5325
20	8284	8898	7236	13612	13451	6945	5129	5020
22	8609	8891	7350	13726	13622	6609	4738	4629
24	6802	5884	4292	10651	10662	6245	6102	5949
26	7165	5553	4221	10523	10642	5790	5881	5725
27	7512	5714	4527	10796	10956	5475	5524	5368
28	7652	5407	4384	10589	10814	5266	5547	5389
29	7994	5188	4432	10523	10841	4891	5423	5264
34	10096	5657	5964	11450	12113	2801	4351	4201
35	10720	5982	6505	11826	12568	2196	4145	4004
36	11011	5962	6670	11829	12636	1998	4320	4186
37	2727	8009	5581	6850	5157	14045	14557	14403
38	2293	7770	5239	7000	5411	13628	14086	13933
39	1631	7845	5163	7523	6014	13362	13676	13524
40	1712	7393	4707	7260	5846	12942	13317	13164
41	2104	7157	4553	6864	5453	12913	13393	13239
42	2972	6461	4073	5954	4635	12639	13360	13204
43	2878	6234	3770	6047	4830	12309	13015	12858
45	2989	5822	3302	6029	4969	11837	12570	12413
66	3976	6580	3861	9812	9262	9107	8824	8679
67	4467	6500	3914	10022	9562	8652	8334	8188
68	4627	6108	3574	9756	9368	8376	8201	8053
69	4974	6085	3674	9931	9605	8053	7854	7705
70	4751	4948	2399	8672	8429	8145	8472	8317
84	2949	6819	3908	9400	8653	10056	9852	9707
85	2908	7250	4345	9788	8988	10273	9926	9783
98	9302	9545	8090	14462	14378	6652	4399	4309
99	9640	9574	8238	14598	14569	6338	3998	3911
100	10433	9577	8553	14844	14958	5499	2968	2884
101	10898	9896	8959	15227	15374	5419	2647	2581

To be continued on next page...

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
 Lenexa, KS, 66219

Description:

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 +1 701 775 3000

wind@eapc.net

Calculated:

3/4/2016 10:58 AM/2.9.285

**DECIBEL - Main Result**

**Calculation:** A060 V100 2.0 80m HH Gen Grnd Atten. 0.5 Generic Octave

...continued from previous page

WTG	P	UU	CC	XX	RR	Q	W	U
104	5309	6086	3803	10113	9843	7745	7517	7368
105	6281	6380	4463	10836	10694	6946	6526	6379
150	11681	10106	9424	15597	15856	4865	1785	1742
151	4432	4889	2176	8352	8052	8500	8885	8729
152	4153	4895	2061	8104	7746	8822	9241	9086
154	3630	5641	2769	8594	8075	9253	9413	9261
155	3110	6423	3516	9096	8414	9808	9727	9579
156	3454	5987	3111	8863	8282	9430	9469	9319
158	5893	5799	3788	10159	10024	7108	6989	6838
164	1890	6562	3588	8129	7177	11072	11229	11079
165	1100	8043	5059	9388	8218	12016	11781	11637
166	1192	8456	5470	9768	8555	12279	11939	11798
171	4631	8365	5722	11615	10934	9720	8738	8610
173	4425	8613	5910	11690	10940	10106	9102	8975
174	4289	8880	6132	11806	10994	10467	9430	9305
175	10150	6612	6526	12312	12839	2892	3417	3260
176	10503	7000	6941	12718	13254	2672	3012	2856
177	10805	6996	7100	12765	13362	2287	3006	2856
178	11172	7093	7353	12904	13560	1874	2976	2835
179	11541	7366	7702	13196	13883	1567	2801	2670
180	11844	7720	8058	13555	14245	1463	2516	2393
183	10117	9497	8370	14688	14757	5738	3315	3227
184	6603	6206	4459	10835	10771	6558	6227	6078
205	1442	8210	5490	7895	6347	13592	13816	13666
206	2411	6813	4266	6520	5167	12707	13278	13123
300	10424	5961	6319	11773	12456	2461	4075	3928
302	7706	8543	6755	13125	12919	7150	5571	5454
303	7203	8065	6199	12564	12343	7193	5886	5760
304	10031	9756	8517	14862	14874	6159	3664	3585
305	11499	10175	9393	15608	15821	5158	2121	2079
306	11348	10279	9400	15652	15819	5467	2457	2415
307	1569	8811	5823	10221	9003	12378	11907	11770
308	1619	6903	3926	8410	7400	11282	11345	11196
309	1405	7232	4252	8700	7643	11475	11445	11298
310	1173	7582	4601	8960	7844	11739	11628	11483
311	3900	6914	4179	10071	9469	9315	8918	8775
312	3818	7243	4489	10310	9655	9554	9054	8913
313	3592	7559	4758	10451	9720	9925	9359	9221
314	7427	7398	5760	12136	12050	6431	5426	5289
315	3993	5219	2391	8381	7966	8919	9212	9058
316	5642	6027	3883	10232	10026	7414	7194	7044
317	6166	5600	3742	10119	10056	6793	6777	6623

## **Appendix F: windPRO V100 Shadow Flicker Report, No Obstacles**

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
 Lenexa, KS, 66219

Description:

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 Calculated:  
 3/4/2016 9:45 AM/2.9.285

**SHADOW - Main Result**

**Calculation:** A060 V100 Realistic Flicker w/Out Obstacles DNV Tab

**Assumptions for shadow calculations**

Maximum distance for influence 1,500 m  
 Minimum sun height over horizon for influence 3 °  
 Day step for calculation 1 days  
 Time step for calculation 1 minutes

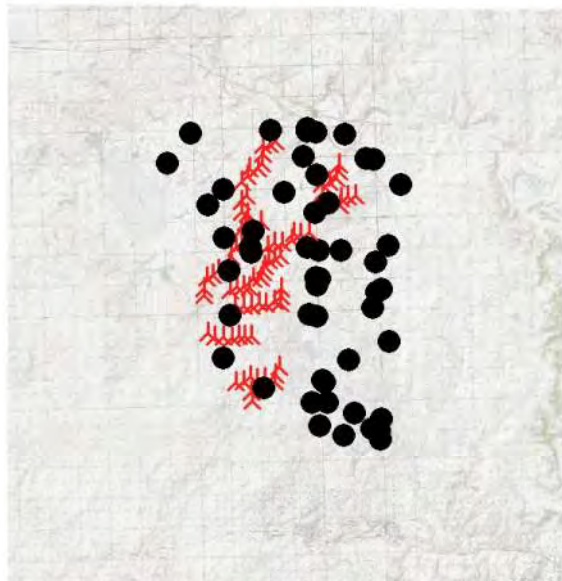
Sunshine probability S (Average daily sunshine hours) [BISMARCK]  
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 4.92 5.13 7.45 8.03 10.20 11.21 11.69 10.35 8.68 5.69 4.02 3.69

Operational hours are calculated from WTGs in calculation and wind distribution:

DNV Shadow

Operational time  
 N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 660 333 352 411 608 961 789 574 695 904 1,116 1,191 8,594  
 Idle start wind speed: Cut in wind speed from power curve

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:  
 Height contours used: Height Contours: 20100616\_Lindahl\_10ft\_HCL.wpo (1)  
 Obstacles not used in calculation  
 Eye height: 1.5 m  
 Grid resolution: 10.0 m



⤴ New WTG

Scale 1:400,000  
 🗺 Shadow receptor

**WTGs**

UTM NAD83 Zone: 13			WTG type									
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	RPM		
		[m]					[kW]	[m]	[m]	[RPM]		
5	646,913	5,375,455	745.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
6	646,888	5,375,080	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
12	648,327	5,377,151	750.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
13	648,570	5,377,592	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
14	648,872	5,378,572	753.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
15	648,872	5,377,853	752.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
18	649,189	5,379,368	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
20	648,867	5,380,033	744.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
22	649,124	5,380,328	729.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
24	651,007	5,377,868	749.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
26	651,525	5,378,000	751.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
27	651,616	5,378,348	758.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
28	651,987	5,378,290	755.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
29	652,436	5,378,405	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
34	654,047	5,379,834	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
35	654,478	5,380,290	740.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
36	654,876	5,380,346	731.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
37	649,468	5,369,552	735.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
38	649,403	5,370,046	745.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
39	648,989	5,370,563	740.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
40	649,348	5,370,846	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
41	649,714	5,370,690	746.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
42	650,635	5,370,574	746.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
43	650,667	5,370,918	744.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
45	650,882	5,371,340	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
66	649,309	5,375,532	733.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
67	649,484	5,375,990	732.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		

To be continued on next page...

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
 Lenexa, KS, 66219

Description:

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 Calculated:  
 3/4/2016 9:45 AM/2.9.285

**SHADOW - Main Result**

**Calculation:** A060 V100 Realistic Flicker w/Out Obstacles DNV Tab

...continued from previous page

UTM NAD83 Zone: 13				WTG type										
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	RPM				
			[m]								[kW]	[m]	[m]	[RPM]
68	649,889	5,375,994	741.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
69	650,008	5,376,321	740.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
70	650,956	5,375,465	751.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
84	648,982	5,374,557	737.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
85	648,553	5,374,643	733.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
98	648,903	5,381,054	722.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
99	649,170	5,381,363	721.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
100	649,950	5,382,038	713.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
101	650,030	5,382,496	712.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
104	650,119	5,376,639	740.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
105	650,267	5,377,632	746.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
150	650,663	5,383,159	707.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
151	650,947	5,375,049	753.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
152	650,911	5,374,694	758.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
154	650,163	5,374,664	746.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
155	649,378	5,374,555	741.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
156	649,818	5,374,694	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
158	650,613	5,377,049	737.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
164	649,406	5,372,982	725.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
165	647,909	5,372,903	716.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
166	647,487	5,372,910	715.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
171	647,671	5,376,427	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
173	647,364	5,376,192	740.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
174	647,056	5,376,002	741.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
175	653,143	5,380,511	713.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
176	653,130	5,380,927	710.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
177	653,497	5,381,062	704.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
178	653,850	5,381,276	700.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
179	654,022	5,381,604	696.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
180	654,011	5,381,966	694.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
183	649,728	5,381,758	721.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
184	650,599	5,377,842	746.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
205	648,594	5,370,523	731.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
206	650,092	5,370,737	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
300	654,134	5,380,179	734.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
302	648,870	5,379,451	759.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
303	649,079	5,378,913	759.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
304	649,308	5,381,738	716.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
305	650,346	5,383,045	709.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
306	650,021	5,382,956	710.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
307	647,090	5,373,129	713.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
308	649,061	5,372,960	722.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
309	648,724	5,372,961	720.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
310	648,383	5,372,885	719.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
311	648,975	5,375,560	734.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
312	648,641	5,375,554	726.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
313	648,297	5,375,376	728.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
314	649,928	5,378,956	741.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
315	650,591	5,374,779	748.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
316	650,301	5,376,922	735.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
317	650,917	5,377,197	740.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				

Project:

**20132550- Lindahl Wind Farm**

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 Kevin Walter  
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 Calculated:  
 3/4/2016 9:45 AM/2.9.285

**SHADOW - Main Result**

**Calculation:** A060 V100 Realistic Flicker w/Out Obstacles DNV Tab

**Shadow receptor-Input**

UTM NAD83 Zone: 13

No.	Name	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
				[m]	[m]	[m]	[m]	[°]	[°]	
A	Participating	650,034	5,370,204	742.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
B	Participating	648,222	5,376,376	731.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
C	Participating	649,350	5,377,570	737.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
D	Participating	652,833	5,381,417	705.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
E	Participating	653,476	5,379,925	741.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
F	Participating	649,476	5,378,474	747.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
G	Participating	650,400	5,383,729	711.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
H	Participating	648,263	5,374,042	728.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
I	Participating	649,372	5,377,319	734.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
J	Participating	649,411	5,377,350	734.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
K	Participating	652,350	5,377,616	735.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
L	Participating	647,974	5,378,125	736.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
M	Participating	652,746	5,379,403	722.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
N	Non-Participating	652,934	5,377,454	728.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
O	Participating	647,905	5,380,657	723.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
P	Non-Participating	647,929	5,371,803	716.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
Q	Non-Participating	655,444	5,382,262	682.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
R	Non-Participating	654,346	5,383,551	675.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
S	Participating	652,445	5,374,111	759.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
T	Non-Participating	652,124	5,382,382	698.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
U	Non-Participating	652,329	5,383,668	691.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
V	Participating	647,113	5,379,805	712.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
W	Non-Participating	652,318	5,383,827	691.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
X	Non-Participating	655,873	5,382,222	689.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
Y	Non-Participating	651,119	5,380,491	705.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
Z	Non-Participating	652,848	5,375,611	736.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AA	Participating	654,105	5,377,449	726.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BB	Non-Participating	652,820	5,375,995	733.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
CC	Participating	652,849	5,373,992	753.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
DD	Non-Participating	652,780	5,383,651	684.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
EE	Non-Participating	653,014	5,375,966	734.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
FF	Non-Participating	652,597	5,369,477	749.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
GG	Participating	653,163	5,370,620	746.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
HH	Non-Participating	657,270	5,380,900	701.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
II	Participating	653,237	5,370,521	746.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
JJ	Non-Participating	653,421	5,369,486	746.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
KK	Non-Participating	656,603	5,377,699	728.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
LL	Non-Participating	652,987	5,368,263	755.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
MM	Non-Participating	655,962	5,376,837	710.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
NN	Non-Participating	646,183	5,383,581	712.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
OO	Participating	654,514	5,371,692	765.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
PP	Non-Participating	644,980	5,381,994	704.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
QQ	Participating	654,816	5,368,880	743.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
RR	Non-Participating	654,290	5,367,724	742.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
SS	Non-Participating	656,021	5,375,274	710.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
TT	Non-Participating	656,242	5,375,429	710.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
UU	Non-Participating	655,800	5,374,456	722.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
VV	Non-Participating	655,758	5,368,066	719.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
WW	Participating	656,662	5,372,675	722.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
XX	Non-Participating	656,251	5,368,598	741.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
YY	Non-Participating	656,161	5,367,989	720.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
ZZ	Non-Participating	656,215	5,367,523	716.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.

Kevin Walter

Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:

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Calculated:

3/4/2016 9:45 AM/2.9.285

**SHADOW - Main Result****Calculation:** A060 V100 Realistic Flicker w/Out Obstacles DNV Tab**Calculation Results**

Shadow receptor

No.	Name	Shadow, worst case		Max shadow hours per day [h/day]	Shadow, expected values
		Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]
A	Participating	70:39	197	0:36	26:25
B	Participating	60:29	179	0:42	24:36
C	Participating	54:04	156	0:55	21:36
D	Participating	43:30	159	0:32	15:52
E	Participating	53:33	128	0:40	22:45
F	Participating	64:21	148	0:39	22:04
G	Participating	0:00	0	0:00	0:00
H	Participating	13:27	85	0:20	5:11
I	Participating	79:04	208	1:03	32:04
J	Participating	69:50	178	1:04	27:54
K	Participating	36:13	115	0:28	17:31
L	Participating	67:32	195	0:31	25:14
M	Participating	5:13	27	0:17	2:05
N	Non-Participating	0:00	0	0:00	0:00
O	Participating	28:12	133	0:22	10:58
P	Non-Participating	0:00	0	0:00	0:00
Q	Non-Participating	2:43	18	0:14	1:00
R	Non-Participating	0:00	0	0:00	0:00
S	Participating	0:00	0	0:00	0:00
T	Non-Participating	0:00	0	0:00	0:00
U	Non-Participating	0:00	0	0:00	0:00
V	Participating	0:00	0	0:00	0:00
W	Non-Participating	0:00	0	0:00	0:00
X	Non-Participating	0:00	0	0:00	0:00
Y	Non-Participating	0:00	0	0:00	0:00
Z	Non-Participating	0:00	0	0:00	0:00
AA	Participating	0:00	0	0:00	0:00
BB	Non-Participating	0:00	0	0:00	0:00
CC	Participating	0:00	0	0:00	0:00
DD	Non-Participating	0:00	0	0:00	0:00
EE	Non-Participating	0:00	0	0:00	0:00
FF	Non-Participating	0:00	0	0:00	0:00
GG	Participating	0:00	0	0:00	0:00
HH	Non-Participating	0:00	0	0:00	0:00
II	Participating	0:00	0	0:00	0:00
JJ	Non-Participating	0:00	0	0:00	0:00
KK	Non-Participating	0:00	0	0:00	0:00
LL	Non-Participating	0:00	0	0:00	0:00
MM	Non-Participating	0:00	0	0:00	0:00
NN	Non-Participating	0:00	0	0:00	0:00
OO	Participating	0:00	0	0:00	0:00
PP	Non-Participating	0:00	0	0:00	0:00
QQ	Participating	0:00	0	0:00	0:00
RR	Non-Participating	0:00	0	0:00	0:00
SS	Non-Participating	0:00	0	0:00	0:00
TT	Non-Participating	0:00	0	0:00	0:00
UU	Non-Participating	0:00	0	0:00	0:00
VV	Non-Participating	0:00	0	0:00	0:00
WW	Participating	0:00	0	0:00	0:00
XX	Non-Participating	0:00	0	0:00	0:00
YY	Non-Participating	0:00	0	0:00	0:00
ZZ	Non-Participating	0:00	0	0:00	0:00

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
 Lenexa, KS, 66219

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**SHADOW - Main Result**

**Calculation:** A060 V100 Realistic Flicker w/Out Obstacles DNV Tab

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
5	V100	0:00	0:00
6	V100	0:00	0:00
12	V100	15:51	5:45
13	V100	91:03	34:12
14	V100	50:30	22:08
15	V100	43:21	13:27
18	V100	0:00	0:00
20	V100	9:54	3:25
22	V100	4:12	1:34
24	V100	4:03	1:48
26	V100	29:58	15:00
27	V100	0:00	0:00
28	V100	0:00	0:00
29	V100	0:00	0:00
34	V100	31:27	13:26
35	V100	8:24	3:26
36	V100	2:01	0:47
37	V100	13:41	3:23
38	V100	20:42	7:43
39	V100	7:50	3:47
40	V100	0:00	0:00
41	V100	0:00	0:00
42	V100	26:45	10:55
43	V100	0:00	0:00
45	V100	0:00	0:00
66	V100	7:42	2:40
67	V100	3:29	1:11
68	V100	0:00	0:00
69	V100	0:00	0:00
70	V100	0:00	0:00
84	V100	2:29	0:58
85	V100	0:00	0:00
98	V100	8:48	3:38
99	V100	5:18	2:11
100	V100	0:00	0:00
101	V100	0:00	0:00
104	V100	25:52	8:27
105	V100	27:19	11:41
150	V100	0:00	0:00
151	V100	0:00	0:00
152	V100	0:00	0:00
154	V100	0:00	0:00
155	V100	8:36	3:34
156	V100	0:00	0:00
158	V100	9:15	3:27
164	V100	0:00	0:00
165	V100	0:00	0:00
166	V100	0:00	0:00
171	V100	33:35	14:54
173	V100	10:57	4:11
174	V100	4:46	1:38
175	V100	0:00	0:00
176	V100	10:27	3:14
177	V100	18:16	6:22
178	V100	6:23	2:42
179	V100	3:52	1:34

To be continued on next page...

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.

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**SHADOW - Main Result****Calculation:** A060 V100 Realistic Flicker w/Out Obstacles DNV Tab

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
180	V100	7:15	2:53
183	V100	0:00	0:00
184	V100	16:37	6:44
205	V100	1:41	0:45
206	V100	0:00	0:00
300	V100	25:48	10:43
302	V100	0:00	0:00
303	V100	1:11	0:28
304	V100	0:00	0:00
305	V100	0:00	0:00
306	V100	0:00	0:00
307	V100	2:22	0:38
308	V100	0:00	0:00
309	V100	0:00	0:00
310	V100	0:00	0:00
311	V100	0:00	0:00
312	V100	0:00	0:00
313	V100	0:00	0:00
314	V100	0:00	0:00
315	V100	0:00	0:00
316	V100	21:18	7:31
317	V100	2:12	0:44

Project:

**20132550- Lindahl Wind Farm**

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3/4/2016 9:45 AM/2.9.285

**SHADOW - Calendar**

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: A - Participating**

**Assumptions for shadow calculations**

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June									
1	08:44	15:55 (37)	08:22	07:35		06:34	20:31 (39)	05:56	06:21 (42)						
	17:08	23	16:18 (37)	17:50		21:04	8	20:39 (39)	21:44	25	06:46 (42)				
2	08:44	15:56 (37)	08:21	07:33	18:04 (38)	07:30	06:32	20:30 (39)	05:55	06:21 (42)					
	17:09	22	16:18 (37)	17:52	18:35	8	21:06	10	20:40 (39)	21:45	26	06:47 (42)			
3	08:44	15:57 (37)	08:20	07:31	18:00 (38)	07:28	06:31	20:30 (39)	05:54	06:20 (42)					
	17:10	21	16:18 (37)	17:54	18:37	14	21:07	12	20:42 (39)	21:46	27	06:47 (42)			
4	08:44	15:58 (37)	08:18	07:29	17:57 (38)	07:26	06:29	20:29 (39)	05:54	06:20 (42)					
	17:11	19	16:17 (37)	17:55	18:38	19	21:09	14	20:43 (39)	21:47	28	06:48 (42)			
5	08:44	15:59 (37)	08:17	07:27	17:55 (38)	07:24	06:28	20:29 (39)	05:53	06:19 (42)					
	17:12	19	16:18 (37)	17:57	18:40	23	21:10	16	20:45 (39)	21:48	29	06:48 (42)			
6	08:44	16:00 (37)	08:15	07:25	17:53 (38)	07:22	06:26	20:29 (39)	05:53	06:19 (42)					
	17:13	18	16:18 (37)	17:58	18:42	25	21:12	17	20:46 (39)	21:49	30	06:49 (42)			
7	08:43	16:01 (37)	08:14	07:23	17:51 (38)	07:20	06:24	20:29 (39)	05:52	06:19 (42)					
	17:14	16	16:17 (37)	18:00	18:43	29	21:13	18	20:47 (39)	21:50	31	06:50 (42)			
8	08:43	16:03 (37)	08:12	07:21	18:50 (38)	07:17	06:23	20:29 (39)	05:52	06:18 (42)					
	17:15	14	16:17 (37)	18:00	18:45	31	21:14	19	20:48 (39)	21:51	32	06:50 (42)			
9	08:43	16:04 (37)	08:11	07:19	18:49 (38)	07:15	06:21	20:29 (39)	05:51	06:18 (42)					
	17:16	11	16:15 (37)	18:02	19:46	33	21:16	21	20:50 (39)	21:51	32	06:50 (42)			
10	08:42	16:07 (37)	08:09	07:17	18:49 (38)	07:13	06:20	20:30 (39)	05:51	06:18 (42)					
	17:18	7	16:14 (37)	18:03	19:48	34	21:17	20	20:50 (39)	21:52	33	06:51 (42)			
11	08:42	16:08 (37)	08:08	07:15	18:48 (38)	07:11	06:18	20:30 (39)	05:51	06:17 (42)					
	17:19		18:05	19:49	35	19:23 (38)	21:19	18	20:48 (39)	21:53	34	06:51 (42)			
12	08:41	16:09 (37)	08:06	07:13	18:48 (38)	07:09	06:17	20:31 (39)	05:51	06:18 (42)					
	17:20		18:07	19:51	35	19:23 (38)	21:20	17	20:48 (39)	21:53	33	06:51 (42)			
13	08:41	16:10 (37)	08:04	07:11	18:47 (38)	07:07	06:16	20:33 (39)	05:50	06:18 (42)					
	17:22		18:08	19:52	36	19:23 (38)	21:21	14	20:47 (39)	21:54	33	06:51 (42)			
14	08:40	16:11 (37)	08:03	07:09	18:47 (38)	07:05	06:14	20:33 (39)	05:50	06:18 (42)					
	17:23		18:10	19:54	36	19:23 (38)	21:23	12	20:45 (39)	21:55	34	06:52 (42)			
15	08:40	16:12 (37)	08:01	07:07	18:47 (38)	07:04	06:13	20:35 (39)	05:50	06:18 (42)					
	17:24		18:11	19:55	35	19:22 (38)	21:24	9	20:44 (39)	21:55	34	06:52 (42)			
16	08:39	16:13 (37)	08:00	07:05	18:48 (38)	07:02	06:12	20:36 (39)	05:50	06:19 (42)					
	17:26		18:13	19:57	34	19:22 (38)	21:25		21:56	33	06:52 (42)				
17	08:38	16:14 (37)	08:00	07:03	18:48 (38)	07:00	06:10	20:19 (205)	06:10	05:50	06:19 (42)				
	17:27		18:15	19:58	33	19:21 (38)	21:27	1	20:20 (205)	21:27	21:56	34	06:53 (42)		
18	08:37	16:15 (37)	08:00	07:01	18:48 (38)	06:58	06:09	20:19 (205)	06:09	05:50	06:19 (42)				
	17:29		18:16	20:00	32	19:20 (38)	21:28	3	20:22 (205)	21:28	21:56	34	06:53 (42)		
19	08:37	16:16 (37)	07:59	06:56	18:49 (38)	06:56	06:08	20:18 (205)	06:08	05:50	06:19 (42)				
	17:30		18:18	20:01	30	19:19 (38)	21:29	5	20:23 (205)	21:29	21:57	34	06:53 (42)		
20	08:36	16:17 (37)	07:57	06:54	18:49 (38)	06:54	06:07	20:18 (205)	06:07	05:50	06:19 (42)				
	17:32		18:20	20:03	28	19:17 (38)	21:31	6	20:24 (205)	21:31	21:57	34	06:53 (42)		
21	08:35	16:18 (37)	07:55	06:52	18:50 (38)	06:52	06:06	20:18 (205)	06:06	05:50	06:19 (42)				
	17:33		18:21	20:04	25	19:15 (38)	21:32	7	20:25 (205)	21:32	21:57	34	06:53 (42)		
22	08:34	16:19 (37)	07:53	06:50	18:52 (38)	06:50	06:04	20:18 (205)	06:04	05:51	06:20 (42)				
	17:35		18:23	20:06	21	19:13 (38)	21:33	9	20:27 (205)	21:33	21:58	34	06:54 (42)		
23	08:33	16:20 (37)	07:50	06:48	18:54 (38)	06:48	06:03	20:20 (205)	06:03	05:51	06:20 (42)				
	17:36		18:24	20:07	16	19:10 (38)	21:34	5	06:34 (42)	21:58	34	06:54 (42)			
24	08:32	16:21 (37)	07:48	06:46	18:58 (38)	06:46	06:02	20:21 (205)	06:02	05:51	06:20 (42)				
	17:38		18:26	20:09	8	19:06 (38)	21:35	8	20:29 (205)	21:35	10	06:37 (42)	21:58	34	06:54 (42)
25	08:31	16:22 (37)	07:46	06:45	18:59 (38)	06:45	06:01	20:22 (205)	06:01	05:51	06:21 (42)				
	17:39		18:28	20:10		20:56	21:37	13	06:40 (42)	21:58	34	06:55 (42)			
26	08:30	16:23 (37)	07:44	06:43	19:02 (38)	06:43	06:00	20:24 (205)	06:00	05:52	06:21 (42)				
	17:41		18:29	20:12		20:57	21:38	15	06:41 (42)	21:58	34	06:55 (42)			
27	08:29	16:24 (37)	07:42	06:41	19:04 (38)	06:41	06:00	20:26 (205)	06:00	05:52	06:20 (42)				
	17:42		18:31	20:13		20:59	21:39	17	06:42 (42)	21:58	34	06:54 (42)			
28	08:27	16:25 (37)	07:40	06:39	19:06 (38)	06:39	05:59	20:24 (205)	05:59	05:53	06:21 (42)				
	17:44		18:32	20:15		21:00	21:40	19	06:43 (42)	21:58	34	06:55 (42)			
29	08:26	16:26 (37)	07:38	06:38	19:08 (38)	06:38	05:58	20:33 (39)	05:58	05:53	06:21 (42)				
	17:45		18:34	20:16		21:02	3	20:36 (39)	21:41	21	06:44 (42)	21:58	34	06:55 (42)	
30	08:25	16:27 (37)	07:36	06:36	19:10 (38)	06:36	05:57	20:32 (39)	05:57	05:54	06:22 (42)				
	17:47		18:36	20:18		21:03	6	20:38 (39)	21:42	22	06:45 (42)	21:58	33	06:55 (42)	
31	08:24	16:28 (37)	07:34	06:34	19:12 (38)	06:34	05:56	20:34 (39)	05:56	05:54	06:22 (42)				
	17:49		18:38	20:19		21:04	21:43	24	06:46 (42)						
Potential sun hours	274	285	368	409	471	481									
Total, worst case	170			620	57	371								969	
Sun reduction	0.56			0.63	0.59	0.67								0.70	
Oper. time red.	0.98			0.98	0.98	0.98								0.98	
Wind dir. red.	0.54			0.62	0.70	0.66								0.59	
Total reduction	0.30			0.38	0.40	0.43								0.40	
Total, real	50			234	23	160								387	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
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Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:

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wind@eapc.net  
Calculated:  
3/4/2016 9:45 AM/2.9.285

**SHADOW - Calendar**

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: A - Participating**

**Assumptions for shadow calculations**

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December	
1	05:54	06:22 (42)   06:26	20:41 (39)   07:09	07:51	18:27 (38)   07:37	08:22	
	21:58	33   06:55 (42)   21:32	18   20:59 (39)   20:37	19:35	36   19:03 (38)   17:34	17:00	
2	05:55	06:22 (42)   06:27	20:40 (39)   07:10	07:52	18:27 (38)   07:39	08:23	
	21:58	33   06:55 (42)   21:31	19   20:59 (39)   20:35	19:33	35   19:02 (38)   17:32	17:00	
3	05:56	06:23 (42)   06:29	20:39 (39)   07:12	07:54	18:26 (38)   07:41	08:25	
	21:57	33   06:56 (42)   21:29	20   20:59 (39)   20:33	19:31	35   19:01 (38)   17:31	16:59	
4	05:56	06:23 (42)   06:30	20:40 (39)   07:13	07:55	18:27 (38)   07:42	08:26	
	21:57	32   06:55 (42)   21:28	20   21:00 (39)   20:31	19:29	33   19:00 (38)   17:29	16:59	
5	05:57	06:24 (42)   06:31	20:39 (39)   07:14	07:57	18:27 (38)   07:44	08:27	
	21:57	31   06:55 (42)   21:26	19   20:58 (39)   20:29	19:27	32   18:59 (38)   17:28	16:58	
6	05:58	06:25 (42)   06:33	20:39 (39)   07:16	07:58	18:28 (38)   07:45	08:28	
	21:56	31   06:56 (42)   21:25	17   20:56 (39)   20:27	19:25	30   18:58 (38)   17:26	16:58	
7	05:59	06:26 (42)   06:34	20:38 (39)   07:17	07:59	18:28 (38)   07:47	08:29	
	21:56	30   06:56 (42)   21:23	17   20:55 (39)   20:25	19:23	27   18:55 (38)   17:25	16:58	
8	05:59	06:26 (42)   06:35	20:39 (39)   07:18	08:01	18:29 (38)   07:48	08:30	
	21:55	29   06:55 (42)   21:21	15   20:54 (39)   20:23	19:20	24   18:53 (38)   17:23	16:58	
9	06:00	06:27 (42)   06:37	20:39 (39)   07:20	08:02	18:30 (38)   07:50	08:32	
	21:55	28   06:55 (42)   21:20	13   20:52 (39)   20:21	19:18	21   18:51 (38)   17:22	16:57	
10	06:01	06:28 (42)   06:38	20:38 (39)   07:21	08:04	18:32 (38)   07:52	08:33	
	21:54	27   06:55 (42)   21:18	12   20:50 (39)   20:19	19:16	17   18:49 (38)   17:20	16:57	
11	06:02	06:29 (42)   06:40	20:40 (39)   07:23	08:05	18:35 (38)   07:53	08:34	
	21:54	26   06:55 (42)   21:17	9   20:49 (39)   20:17	19:14	12   18:47 (38)   17:19	16:57	
12	06:03	06:30 (42)   06:41	20:40 (39)   07:24	08:07	18:36 (38)   07:55	08:34	
	21:53	24   06:54 (42)   21:15	7   20:47 (39)   20:15	19:12	17:18	16:57	
13	06:04	06:31 (42)   06:42	20:40 (39)   07:25	08:08	18:37 (38)   07:56	08:35	
	21:52	23   06:54 (42)   21:13	5   20:45 (39)   20:13	19:10	17:17	16:57	
14	06:05	06:32 (42)   06:44	20:41 (39)   07:27	08:10	18:38 (38)   07:58	08:36	
	21:52	22   06:54 (42)   21:11	2   20:43 (39)   20:11	19:08	17:15	16:57	
15	06:06	06:33 (42)   06:45	07:28	08:11	18:39 (38)   07:59	08:37	
	21:51	20   06:53 (42)   21:10	20:09	19:06	17:14	16:57	
16	06:07	06:34 (42)   06:46	07:30	08:13	18:40 (38)   08:01	08:38	
	21:50	18   06:52 (42)   21:08	20:06	19:05	17:13	16:58	
17	06:08	06:35 (42)   06:48	07:31	08:14	18:41 (38)   08:02	08:39	
	21:49	16   06:51 (42)   21:06	20:04	19:03	17:12	16:58	
18	06:09	06:36 (42)   06:49	20:29 (205)   07:32	08:16	18:42 (38)   08:04	08:39	
	21:48	14   06:50 (42)   21:04	4   20:33 (205)   20:02	19:01	17:11	16:58	
19	06:10	06:37 (42)   06:51	20:26 (205)   07:34	18:48 (38)   08:17	18:43 (38)   08:05	08:40	
	21:47	12   06:49 (42)   21:02	9   20:35 (205)   20:00	3   18:51 (38)   18:57	17:10	16:59	
20	06:11	06:38 (42)   06:52	20:24 (205)   07:35	18:42 (38)   08:19	18:44 (38)   08:07	08:41	
	21:46	8   06:46 (42)   21:01	9   20:33 (205)   19:58	14   18:56 (38)   18:55	17:09	16:59	
21	06:12	06:53	20:24 (205)   07:37	18:38 (38)   08:20	18:45 (38)   08:08	08:41	
	21:45	20:59	8   20:32 (205)   19:56	20   18:58 (38)   18:53	17:08	16:59	
22	06:14	06:55	20:22 (205)   07:38	18:36 (38)   08:22	18:46 (38)   08:10	08:42	
	21:44	20:57	8   20:30 (205)   19:54	24   19:00 (38)   18:51	17:07	17:00	
23	06:15	06:56	20:22 (205)   07:39	18:34 (38)   08:23	18:47 (38)   08:11	08:42	
	21:43	20:55	6   20:28 (205)   19:52	27   19:01 (38)   18:49	17:06	17:00	
24	06:16	06:58	20:22 (205)   07:41	18:33 (38)   08:25	18:48 (38)   08:13	08:43	
	21:42	20:53	5   20:27 (205)   19:50	29   19:02 (38)   18:48	17:05	17:01	
25	06:17	06:59	20:21 (205)   07:42	18:31 (38)   08:27	18:49 (38)   08:14	08:43	
	21:41	20:51	3   20:24 (205)   19:47	31   19:02 (38)   18:46	17:04	17:02	
26	06:18	07:00	20:21 (205)   07:44	18:30 (38)   08:28	18:50 (38)   08:15	08:43	
	21:40	20:49	1   20:22 (205)   19:45	32   19:02 (38)   18:44	17:03	17:02	
27	06:20	07:02	07:45	18:29 (38)   08:30	18:51 (38)   08:17	08:44	
	21:39	20:47	19:43	34   19:03 (38)   18:42	17:03	17:03	
28	06:21	20:48 (39)   07:03	07:47	18:28 (38)   08:31	18:52 (38)   08:18	08:44	
	21:37	5   20:53 (39)   20:45	19:41	35   19:03 (38)   18:41	17:02	17:04	
29	06:22	20:45 (39)   07:05	07:48	18:28 (38)   08:33	18:53 (38)   08:20	08:44	
	21:36	10   20:55 (39)   20:43	19:39	35   19:03 (38)   18:39	17:01	17:05	
30	06:23	20:43 (39)   07:06	07:49	18:27 (38)   08:34	18:54 (38)   08:21	08:44	
	21:35	13   20:56 (39)   20:41	19:37	36   19:03 (38)   18:37	17:01	17:05	
31	06:25	20:43 (39)   07:07	19:37	36   19:03 (38)   18:37	17:01	17:05	
	21:33	15   20:58 (39)   20:39	19:37	36   19:03 (38)   18:37	17:01	17:05	
Potential sun hours	486	445	379	337	278	260	651
Total, worst case	533	246	320	302	278	260	651
Sun reduction	0.75	0.72	0.69	0.52	0.52	0.52	0.44
Oper. time red.	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Wind dir. red.	0.60	0.70	0.62	0.62	0.62	0.62	0.54
Total reduction	0.43	0.50	0.41	0.31	0.31	0.31	0.23
Total, real	231	122	132	95	95	95	152

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:

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Calculated:  
3/4/2016 9:45 AM/2.9.285

## SHADOW - Calendar

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: B - Participating**

### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	08:45 17:07	09:12 (66)   08:23 09:16 (66)   17:50	07:35 18:34	08:05 (67)   07:32 18:11 (174)   20:21	06:34 21:05	19:30 (171)   05:55 19:59 (171)   21:45
2	08:45 17:08	09:12 (66)   08:21 09:17 (66)   17:52	07:33 18:35	17:55 (174)   07:30 18:12 (174)   20:22	06:32 21:06	19:31 (171)   05:55 19:57 (171)   21:46
3	08:45 17:09	09:12 (66)   08:20 09:18 (66)   17:53	07:31 18:37	17:55 (174)   07:28 18:13 (174)   20:24	06:31 21:08	19:33 (171)   05:54 19:56 (171)   21:47
4	08:44 17:10	09:12 (66)   08:18 09:19 (66)   17:55	07:29 18:39	17:56 (174)   07:26 18:12 (174)   20:25	06:29 21:09	19:34 (171)   05:54 19:54 (171)   21:47
5	08:44 17:12	09:11 (66)   08:17 09:19 (66)   17:57	07:28 18:40	17:56 (174)   07:24 18:11 (174)   20:27	06:27 21:10	19:37 (171)   05:53 19:52 (171)   21:48
6	08:44 17:13	09:11 (66)   08:16 09:20 (66)   17:58	07:26 18:42	17:58 (174)   07:22 18:19 (173)   20:28	19:44 (171)   06:26 19:55 (171)   21:12	19:41 (171)   05:52 19:46 (171)   21:49
7	08:44 17:14	09:11 (66)   08:14 09:20 (66)   18:00	07:24 18:43	18:01 (174)   07:20 18:21 (173)   20:30	19:40 (171)   06:24 19:58 (171)   21:13	05:52 21:50
8	08:43 17:15	09:10 (66)   08:13 09:20 (66)   18:00	08:21 18:45	19:07 (173)   07:17 19:22 (173)   20:31	19:37 (171)   06:23 20:01 (171)   21:15	05:52 21:51
9	08:43 17:16	09:10 (66)   08:11 09:21 (66)   18:02	08:19 19:46	19:05 (173)   07:15 19:24 (173)   20:33	19:35 (171)   06:21 20:02 (171)   21:16	05:51 21:52
10	08:43 17:17	09:09 (66)   08:09 09:21 (66)   18:03	08:17 19:48	19:03 (173)   07:13 19:25 (173)   20:34	19:33 (171)   06:20 20:04 (171)   21:18	05:51 21:52
11	08:42 17:19	09:09 (66)   08:08 09:22 (66)   18:05	08:15 19:49	19:02 (173)   07:11 19:26 (173)   20:35	19:31 (171)   06:18 20:05 (171)   21:19	05:51 21:53
12	08:42 17:20	09:08 (66)   08:06 09:22 (66)   18:07	08:13 19:51	19:02 (173)   07:09 19:28 (173)   20:37	19:30 (171)   06:17 20:05 (171)   21:20	05:50 21:54
13	08:41 17:21	09:07 (66)   08:04 09:22 (66)   18:08	08:11 19:52	19:01 (173)   07:07 19:28 (173)   20:38	19:29 (171)   06:16 20:06 (171)   21:22	05:50 21:54
14	08:41 17:23	09:07 (66)   08:03 09:23 (66)   18:10	08:09 19:54	19:01 (173)   07:05 19:28 (173)   20:40	19:28 (171)   06:14 20:06 (171)   21:23	05:50 21:55
15	08:40 17:24	09:06 (66)   08:01 09:23 (66)   18:11	08:07 19:55	19:01 (173)   07:04 19:27 (173)   20:41	19:27 (171)   06:13 20:07 (171)   21:24	05:50 21:55
16	08:39 17:26	09:07 (66)   07:59 09:22 (66)   18:13	08:05 19:57	19:01 (173)   07:02 19:27 (173)   20:43	19:27 (171)   06:12 20:08 (171)   21:26	05:50 21:56
17	08:38 17:27	09:08 (66)   07:58 09:22 (66)   18:15	08:03 19:58	19:02 (173)   07:00 19:26 (173)   20:44	19:26 (171)   06:10 20:08 (171)   21:27	05:50 21:56
18	08:38 17:28	09:09 (66)   07:56 09:21 (66)   18:16	08:01 20:00	19:03 (173)   06:58 19:25 (173)   20:46	19:26 (171)   06:09 20:08 (171)   21:28	05:50 21:57
19	08:37 17:30	09:10 (66)   07:54 09:20 (66)   18:18	07:59 20:01	19:04 (173)   06:56 19:23 (173)   20:47	19:25 (171)   06:08 20:07 (171)   21:30	05:50 21:57
20	08:36 17:31	09:12 (66)   07:52 09:19 (66)   18:20	08:15 (67)   07:57 08:17 (67)   20:03	19:05 (173)   06:54 19:22 (173)   20:49	19:25 (171)   06:07 20:07 (171)   21:31	05:50 21:58
21	08:35 17:33	07:50 18:21	08:13 (67)   07:55 08:18 (67)   20:04	19:06 (173)   06:52 19:18 (173)   20:50	19:25 (171)   06:05 20:06 (171)   21:32	05:50 21:58
22	08:34 17:34	07:49 18:23	08:11 (67)   07:53 08:19 (67)   20:06	06:50 20:52	19:24 (171)   06:04 20:06 (171)   21:33	05:50 21:58
23	08:33 17:36	07:47 18:24	08:09 (67)   07:51 08:19 (67)   20:07	06:48 20:53	19:25 (171)   06:03 20:06 (171)   21:35	05:51 21:58
24	08:32 17:37	07:45 18:26	08:08 (67)   07:48 18:03 (174)   20:09	06:46 20:55	19:25 (171)   06:02 20:06 (171)   21:36	05:51 21:58
25	08:31 17:39	07:43 18:28	08:06 (67)   07:46 18:04 (174)   20:10	06:45 20:56	19:25 (171)   06:01 20:05 (171)   21:37	05:51 21:59
26	08:30 17:41	07:41 18:29	08:04 (67)   07:44 18:06 (174)   20:12	06:43 20:57	19:25 (171)   06:00 20:04 (171)   21:38	05:52 21:59
27	08:29 17:42	07:39 18:31	08:03 (67)   07:42 18:08 (174)   20:13	06:41 20:59	19:27 (171)   05:59 20:04 (171)   21:39	05:52 21:59
28	08:28 17:44	07:37 18:32	08:04 (67)   07:40 18:09 (174)   20:15	06:39 21:00	19:27 (171)   05:59 20:02 (171)   21:40	05:53 21:59
29	08:26 17:45	07:36 18:32	07:38 20:16	06:38 21:02	19:27 (171)   05:58 20:01 (171)   21:41	05:53 21:58
30	08:25 17:47	07:35 18:32	07:36 20:18	06:36 21:03	19:29 (171)   05:57 20:01 (171)   21:43	05:54 21:58
31	08:24 17:49	07:34 18:32	07:34 20:19	07:34 21:03	05:56 21:44	
Potential sun hours	273	285	368	410	471	481
Total, worst case	214	138	433	886	118	
Sun reduction	0.56	0.50	0.63	0.59	0.67	
Oper. time red.	0.98	0.98	0.98	0.98	0.98	
Wind dir. red.	0.72	0.67	0.62	0.69	0.69	
Total reduction	0.39	0.33	0.38	0.40	0.45	
Total, real	84	46	167	352	53	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:

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Calculated:  
3/4/2016 9:45 AM/2.9.285

**SHADOW - Calendar**

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: B - Participating**

**Assumptions for shadow calculations**

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December	
1	05:54   06:26		07:09	19:30 (171)   07:51	18:41 (173)   07:38	08:22   08:51 (66)	
	21:58   21:32		20:38	34 20:04 (171)   19:35	27 19:08 (173)   17:34	17:00   13 09:04 (66)	
2	05:55   06:27		07:10	19:32 (171)   07:52	18:41 (173)   07:39	08:24   08:52 (66)	
	21:58   21:31		20:36	31 20:03 (171)   19:33	25 19:06 (173)   17:32	16:59   12 09:04 (66)	
3	05:55   06:29		07:12	19:33 (171)   07:54	18:42 (173)   07:41	08:25   08:53 (66)	
	21:58   21:29		20:34	27 20:00 (171)   19:31	22 19:04 (173)   17:31	16:59   11 09:04 (66)	
4	05:56   06:30		07:13	19:34 (171)   07:55	18:42 (173)   07:42	08:26   08:55 (66)	
	21:57   21:28		20:32	24 19:58 (171)   19:29	20 19:02 (173)   17:29	16:59   10 09:05 (66)	
5	05:57   06:31		07:14	19:37 (171)   07:57	18:43 (173)   07:44	08:27   08:56 (66)	
	21:57   21:26		20:29	19 19:56 (171)   19:27	17 19:00 (173)   17:28	16:58   10 09:06 (66)	
6	05:58   06:33		07:16	19:40 (171)   07:58	18:44 (173)   07:46	08:29   08:57 (66)	
	21:57   21:25		20:27	11 19:51 (171)   19:25	13 18:57 (173)   17:26	16:58   9 09:06 (66)	
7	05:58   06:34		19:49 (171)   07:17	08:00	18:35 (174)   07:47	08:30   08:58 (66)	
	21:56   21:23	9	19:58 (171)   20:25	19:23	19 18:56 (173)   17:25	16:58   8 09:06 (66)	
8	05:59   06:35		19:46 (171)   07:19	08:01	18:32 (174)   07:49	08:31   08:59 (66)	
	21:56   21:22	16	20:02 (171)   20:23	19:21	17 18:53 (173)   17:23	16:57   7 09:06 (66)	
9	06:00   06:37		19:43 (171)   07:20	08:03	18:31 (174)   07:50	08:32   09:00 (66)	
	21:55   21:20	21	20:04 (171)   20:21	19:18	16 18:47 (174)   17:22	16:57   6 09:06 (66)	
10	06:01   06:38		19:41 (171)   07:21	08:04	18:29 (174)   07:52	08:33   09:02 (66)	
	21:55   21:18	24	20:05 (171)   20:19	19:16	18 18:47 (174)   17:20	16:57   5 09:07 (66)	
11	06:02   06:39		19:40 (171)   07:23	08:05	18:29 (174)   07:53	08:34   09:03 (66)	
	21:54   21:17	27	20:07 (171)   20:17	19:14	18 18:47 (174)   17:19	16:57   5 09:08 (66)	
12	06:03   06:41		19:38 (171)   07:24	08:07	08:40 (67)   07:55	08:35   09:03 (66)	
	21:53   21:15	30	20:08 (171)   20:15	19:12	23 18:45 (174)   17:18	16:57   4 09:07 (66)	
13	06:04   06:42		19:36 (171)   07:25	08:08	08:38 (67)   07:56	08:36   09:04 (66)	
	21:53   21:13	33	20:09 (171)   20:13	19:10	26 18:43 (174)   17:16	16:57   3 09:07 (66)	
14	06:05   06:44		19:35 (171)   07:27	08:10	08:35 (67)   07:58	08:37   09:05 (66)	
	21:52   21:12	34	20:09 (171)   20:11	19:08	27 18:41 (174)   17:15	16:57   3 09:08 (66)	
15	06:06   06:45		19:34 (171)   07:28	08:11	08:35 (67)   08:00	08:37   09:06 (66)	
	21:51   21:10	36	20:10 (171)   20:09	19:07	27 18:39 (174)   17:14	16:57   2 09:08 (66)	
16	06:07   06:46		19:33 (171)   07:30	08:13	08:36 (67)   08:01	08:38   09:07 (66)	
	21:50   21:08	37	20:10 (171)   20:07	19:05	22 18:37 (174)   17:13	16:58   2 09:09 (66)	
17	06:08   06:48		19:32 (171)   07:31	08:14	08:38 (67)   08:03	08:39   09:08 (66)	
	21:50   21:06	39	20:11 (171)   20:04	19:03	18 18:35 (174)   17:12	16:58   1 09:09 (66)	
18	06:09   06:49		19:32 (171)   07:32	08:16	08:40 (67)   08:04	08:40   09:08 (66)	
	21:49   21:05	39	20:11 (171)   20:02	19:01	12 18:33 (174)   17:11	16:58   1 09:09 (66)	
19	06:10   06:51		19:31 (171)   07:34	08:17	08:41 (67)   08:06	08:40   09:09 (66)	
	21:48   21:03	40	20:11 (171)   20:00	18:57	9 08:50 (67)   17:09	16:58   1 09:10 (66)	
20	06:11   06:52		19:30 (171)   07:35	08:19	08:43 (67)   08:07	08:41   09:10 (66)	
	21:47   21:01	41	20:11 (171)   19:58	18:55	7 08:50 (67)   17:08	16:59   09:10 (66)	
21	06:12   06:53		19:30 (171)   07:37	08:21	08:44 (67)   08:09	08:41   09:10 (66)	
	21:46   20:59	42	20:12 (171)   19:56	18:53	4 08:48 (67)   17:07	16:59   09:10 (66)	
22	06:13   06:55		19:29 (171)   07:38	18:53 (173)   08:22	08:46 (67)   08:10	08:42   09:11 (66)	
	21:45   20:57	42	20:11 (171)   19:54	10 19:03 (173)   18:51	1 08:47 (67)   17:07	7 08:55 (66)   17:00	
23	06:15   06:56		19:29 (171)   07:40	18:49 (173)   08:24	08:12	08:47 (66)   08:42	
	21:44   20:55	42	20:11 (171)   19:52	16 19:05 (173)   18:49	17:06	10 08:57 (66)   17:00	
24	06:16   06:58		19:29 (171)   07:41	18:48 (173)   08:25	08:13	08:47 (66)   08:43	
	21:42   20:53	42	20:11 (171)   19:50	19 19:07 (173)   18:48	17:05	12 08:59 (66)   17:01	
25	06:17   06:59		19:29 (171)   07:42	18:45 (173)   08:27	08:14	08:46 (66)   08:43	
	21:41   20:51	41	20:10 (171)   19:48	22 19:07 (173)   18:46	17:04	14 09:00 (66)   17:01	
26	06:18   07:00		19:28 (171)   07:44	18:45 (173)   08:28	08:16	08:46 (66)   08:44	
	21:40   20:49	41	20:09 (171)   19:45	23 19:08 (173)   18:44	17:03	15 09:01 (66)   17:02	
27	06:20   07:02		19:29 (171)   07:45	18:43 (173)   08:30	08:17	08:45 (66)   08:44	
	21:39   20:48	40	20:09 (171)   19:43	25 19:08 (173)   18:42	17:02	17 09:02 (66)   17:03	
28	06:21   07:03		19:29 (171)   07:47	18:42 (173)   08:31	08:19	08:47 (66)   08:44	
	21:38   20:46	39	20:08 (171)   19:41	26 19:08 (173)   18:41	17:02	16 09:03 (66)   17:04	
29	06:22   07:05		19:29 (171)   07:48	18:42 (173)   08:33	08:20	08:48 (66)   08:44	
	21:36   20:44	38	20:07 (171)   19:39	26 19:08 (173)   18:39	17:01	15 09:03 (66)   17:04	
30	06:23   07:06		19:30 (171)   07:49	18:41 (173)   08:35	08:21	08:49 (66)   08:45	
	21:35   20:42	37	20:07 (171)   19:37	26 19:07 (173)   18:37	17:00	14 09:03 (66)   17:05	
31	06:25   07:07		19:30 (171)   07:50	08:36		08:45   09:12 (66)	
	21:34   20:40	35	20:05 (171)   19:36	18:36		17:06   4 09:16 (66)	
Potential sun hours	486	445	379	336	277	260	
Total, worst case		865	339	388	120	128	
Sun reduction		0.72	0.69	0.52	0.43	0.44	
Oper. time red.		0.98	0.98	0.98	0.98	0.98	
Wind dir. red.		0.69	0.65	0.64	0.72	0.72	
Total reduction		0.49	0.44	0.33	0.31	0.31	
Total, real		421	149	128	37	40	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker
			(WTG causing flicker last time)

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:

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Calculated:  
3/4/2016 9:45 AM/2.9.285

### SHADOW - Calendar

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: C - Participating**

#### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

#### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	08:45	08:23	07:35	17:44 (12)	07:32	07:53 (105)
2	08:45	08:21	07:33	17:54 (12)	07:30	07:51 (105)
3	08:45	08:20	07:31		07:28	07:50 (105)
4	08:44	08:18	07:29		07:26	07:49 (105)
5	08:44	08:17	07:27		07:24	07:49 (105)
6	08:44	08:15	07:25		07:21	07:49 (105)
7	08:44	08:14	07:23		07:19	07:49 (105)
8	08:43	08:12	08:21		07:17	07:50 (105)
9	08:43	08:11	08:19		07:15	07:51 (105)
10	08:43	08:09	08:17		07:13	07:52 (105)
11	08:42	08:08	08:15		07:11	07:33 (184)
12	08:42	08:06	08:13		07:09	07:31 (184)
13	08:41	08:04	08:11		07:07	07:29 (184)
14	08:41	08:03	08:09		07:05	07:27 (184)
15	08:40	08:01	08:07		07:03	07:25 (184)
16	08:39	07:59	08:05		07:01	07:23 (184)
17	08:38	07:58	08:03		07:00	07:22 (184)
18	08:38	07:56	08:01		06:58	07:20 (184)
19	08:37	07:54	07:59		06:56	07:21 (184)
20	08:36	07:52	07:57		06:54	07:21 (184)
21	08:35	07:50	07:55		06:52	07:22 (184)
22	08:34	07:49	07:53		06:50	07:23 (184)
23	08:33	07:47	07:51		06:48	07:23 (184)
24	08:32	07:45	07:48		06:46	07:24 (184)
25	08:31	07:43	07:46		06:45	07:24 (184)
26	08:30	07:41	07:44		06:43	07:25 (184)
27	08:29	07:39	07:42	08:04 (105)	06:41	07:25 (184)
28	08:28	07:37	07:40	08:02 (105)	06:39	07:26 (184)
29	08:26	07:35	07:38	08:00 (105)	06:37	07:27 (184)
30	08:25	07:33	07:36	07:58 (105)	06:36	07:28 (184)
31	08:24	07:31	07:34	07:56 (105)	06:34	07:29 (184)
Potential sun hours	273	285	368	410	471	481
Total, worst case	244	295	106	813		305
Sun reduction	0.56	0.50	0.63	0.59		0.70
Oper. time red.	0.98	0.98	0.98	0.98		0.98
Wind dir. red.	0.72	0.64	0.66	0.67		0.72
Total reduction	0.39	0.32	0.41	0.38		0.49
Total, real	96	94	43	312		151

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

20132550- Lindahl Wind Farm

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:

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Calculated:  
3/4/2016 9:45 AM/2.9.285

### SHADOW - Calendar

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: C - Participating**

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

#### Assumptions for shadow calculations

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:54 21:05 (15)	06:26 21:14 (15)	07:09 21:32	07:32 (184) 19:57 (13)	07:51 19:35	07:38 08:03 (158)
2	05:55 21:08 (15)	06:27 21:31	07:10 21:31	07:10 19:58 (13)	07:52 19:33	08:04 (158) 17:00
3	05:55 21:08 (15)	06:29 21:31	07:11 21:31	07:11 19:58 (13)	07:54 19:33	07:41 16:59
4	05:56 21:08 (15)	06:30 21:31	07:13 21:31	07:13 19:58 (13)	07:55 19:31	07:42 16:59
5	05:57 21:08 (15)	06:31 21:31	07:14 21:31	07:14 19:58 (13)	07:57 19:29	07:44 16:58
6	05:57 21:08 (15)	06:33 21:31	07:16 21:31	07:16 19:58 (13)	07:58 19:27	07:45 16:58
7	05:58 21:08 (15)	06:34 21:31	07:17 21:31	07:17 19:58 (13)	08:00 19:25	07:47 16:58
8	05:59 21:08 (15)	06:35 21:31	07:18 21:31	07:18 19:58 (13)	08:01 19:22	07:49 16:58
9	06:00 21:08 (15)	06:37 21:31	07:20 21:31	07:20 19:58 (13)	08:02 19:20	07:50 16:57
10	06:01 21:08 (15)	06:38 21:31	07:21 21:31	07:21 19:58 (13)	08:04 19:18	07:52 16:57
11	06:02 21:08 (15)	06:39 21:31	07:23 21:31	07:23 19:58 (13)	08:05 19:16	07:53 16:57
12	06:03 21:08 (15)	06:41 21:31	07:24 21:31	07:24 19:58 (13)	08:07 19:14	08:34 (316) 08:42 (316)
13	06:04 21:08 (15)	06:42 21:31	07:25 21:31	07:25 19:58 (13)	08:08 19:12	08:32 (316) 08:35 (316)
14	06:05 21:08 (15)	06:44 21:31	07:27 21:31	07:27 19:58 (13)	08:10 19:10	08:31 (316) 16:57
15	06:06 21:08 (15)	06:45 21:31	07:28 21:31	07:28 19:58 (13)	08:11 19:08	08:30 (316) 16:57
16	06:07 21:08 (15)	06:46 21:31	07:30 21:31	07:30 19:58 (13)	08:13 19:06	08:30 (316) 16:57
17	06:08 21:08 (15)	06:48 21:31	07:31 21:31	07:31 19:58 (13)	08:14 19:04	08:30 (316) 16:57
18	06:09 21:08 (15)	06:49 21:31	07:32 21:31	07:32 19:58 (13)	08:16 19:03	08:29 (316) 16:58
19	06:10 21:08 (15)	06:50 21:31	07:34 21:31	07:34 19:58 (13)	08:17 19:02	08:29 (316) 16:58
20	06:11 21:08 (15)	06:52 21:31	07:35 21:31	07:35 19:58 (13)	08:19 19:01	08:29 (316) 16:58
21	06:12 21:08 (15)	06:53 21:31	07:37 21:31	07:37 19:58 (13)	08:20 19:00	08:29 (316) 16:58
22	06:13 21:08 (15)	06:55 21:31	07:38 21:31	07:38 19:58 (13)	08:22 18:59	08:29 (316) 16:58
23	06:15 21:08 (15)	06:56 21:31	07:39 21:31	07:39 19:58 (13)	08:24 18:58	08:29 (316) 16:58
24	06:16 21:08 (15)	06:57 21:31	07:41 21:31	07:41 19:58 (13)	08:25 18:57	08:29 (316) 16:58
25	06:17 21:08 (15)	06:59 21:31	07:42 21:31	07:42 19:58 (13)	08:27 18:56	08:29 (316) 16:58
26	06:18 21:08 (15)	07:00 21:31	07:44 21:31	07:44 19:58 (13)	08:28 18:55	08:29 (316) 16:58
27	06:19 21:08 (15)	07:02 21:31	07:45 21:31	07:45 19:58 (13)	08:30 18:54	08:29 (316) 16:58
28	06:21 21:08 (15)	07:03 21:31	07:47 21:31	07:47 19:58 (13)	08:31 18:53	08:29 (316) 16:58
29	06:22 21:08 (15)	07:04 21:31	07:48 21:31	07:48 19:58 (13)	08:33 18:52	08:29 (316) 16:58
30	06:23 21:08 (15)	07:06 21:31	07:49 21:31	07:49 19:58 (13)	08:34 18:51	08:29 (316) 16:58
31	06:25 21:34	07:07 20:40	07:31 (184) 19:57 (13)	18:37 18:35	09:05 (158) 09:05 (158)	17:00 17:06
Potential sun hours	486	445	379	336	277	260
Total, worst case	13	266	651	306	245	
Sun reduction	0.75	0.72	0.69	0.52	0.43	
Oper. time red.	0.98	0.98	0.98	0.98	0.98	
Wind dir. red.	0.72	0.65	0.67	0.64	0.72	
Total reduction	0.53	0.46	0.45	0.33	0.31	
Total, real	7	123	295	101	75	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:

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wind@eapc.net  
Calculated:  
3/4/2016 9:45 AM/2.9.285

## SHADOW - Calendar

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: D - Participating**

### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	08:45 17:07	10:30 (176) 17:50	08:22 08:47 (177)	07:35 18:34	07:32 20:21	06:34 21:45
2	08:45 17:08	10:31 (176) 17:51	08:21 09:04 (177)	07:33 18:35	07:29 20:22	21:05 21:46
3	08:45 17:09	10:33 (176) 17:53	08:20 09:06 (177)	07:31 18:37	07:27 20:23	21:06 21:46
4	08:44 17:10	10:35 (176) 17:55	08:18 09:06 (177)	07:29 18:38	07:25 20:25	06:29 21:47
5	08:44 17:11	10:36 (176) 17:56	08:17 09:07 (177)	07:27 18:40	07:23 20:26	06:29 21:48
6	08:44 17:12	10:45 (176) 17:56	08:15 09:07 (177)	07:25 18:41	07:21 20:28	06:29 21:49
7	08:44 17:13	10:49 (176) 18:00	08:14 09:08 (177)	07:23 18:43	07:19 20:29	06:24 21:50
8	08:43 17:15	10:49 (176) 18:00	08:12 09:08 (177)	07:21 18:44	07:17 20:31	06:22 21:51
9	08:43 17:16	10:49 (176) 18:01	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
10	08:43 17:17	10:49 (176) 18:01	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
11	08:42 17:18	10:49 (176) 18:01	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
12	08:42 17:20	10:49 (176) 18:06	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
13	08:41 17:21	10:49 (176) 18:06	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
14	08:40 17:22	10:49 (176) 18:03	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
15	08:40 17:24	10:49 (176) 18:03	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
16	08:39 17:25	10:49 (176) 18:03	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
17	08:38 17:27	10:49 (176) 18:04	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
18	08:38 17:28	10:49 (176) 18:04	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
19	08:37 17:30	10:49 (176) 18:04	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
20	08:36 17:31	10:49 (176) 18:04	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
21	08:35 17:32	10:49 (176) 18:04	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
22	08:34 17:34	10:49 (176) 18:04	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
23	08:33 17:36	10:49 (176) 18:04	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
24	08:32 17:37	10:49 (176) 18:04	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
25	08:31 17:39	10:49 (176) 18:04	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
26	08:30 17:40	10:49 (176) 18:04	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
27	08:29 17:42	10:49 (176) 18:04	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
28	08:28 17:43	10:49 (176) 18:04	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
29	08:26 17:45	10:49 (176) 18:04	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
30	08:25 17:47	10:49 (176) 18:04	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
31	08:24 17:48	10:49 (176) 18:04	08:11 09:08 (177)	07:19 18:45	07:15 20:32	06:21 21:52
Potential sun hours	273	284	368	410	472	482
Total, worst case	106	512	189	115	137	
Sun reduction	0.56	0.50	0.63	0.59	0.67	
Oper. time red.	0.98	0.98	0.98	0.98	0.98	
Wind dir. red.	0.70	0.72	0.69	0.64	0.60	
Total reduction	0.39	0.36	0.43	0.37	0.40	
Total, real	41	184	81	43	55	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:

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Calculated:

3/4/2016 9:45 AM/2.9.285

### SHADOW - Calendar

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: D - Participating**

#### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

#### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December					
1	05:54	06:26	06:51 (180)	07:08	07:32 (179)	07:51	08:13 (178)	07:37	08:06 (177)	08:22	
	21:58	21:32	11 07:02 (180)	20:37	15 07:47 (179)	19:35	18 08:31 (178)	17:34	32 08:38 (177)	16:59	
2	05:54	06:27	06:53 (180)	07:10	07:33 (179)	07:52	08:15 (178)	07:39	08:06 (177)	08:24	
	21:58	21:31	10 07:03 (180)	20:35	14 07:47 (179)	19:33	16 08:31 (178)	17:32	32 08:38 (177)	16:59	
3	05:55	06:28	06:54 (180)	07:11	07:35 (179)	07:54	08:16 (178)	07:41	08:07 (177)	08:25	
	21:58	21:29	9 07:03 (180)	20:33	12 07:47 (179)	19:31	14 08:30 (178)	17:30	31 08:38 (177)	16:59	
4	05:56	06:30	06:55 (180)	07:13	07:36 (179)	07:55	08:18 (178)	07:42	08:07 (177)	08:26	
	21:57	21:28	8 07:03 (180)	20:31	11 07:47 (179)	19:28	11 08:29 (178)	17:29	30 08:37 (177)	16:58	
5	05:56	06:31	06:56 (180)	07:14	07:37 (179)	07:56	08:19 (178)	07:44	08:09 (177)	08:27	
	21:57	21:26	6 07:02 (180)	20:29	9 07:46 (179)	19:26	9 08:28 (178)	17:27	28 08:37 (177)	16:58	
6	05:57	06:32	06:58 (180)	07:15	07:39 (179)	07:58	08:21 (178)	07:45	08:11 (177)	08:28	
	21:57	21:25	4 07:02 (180)	20:27	7 07:46 (179)	19:24	6 08:27 (178)	17:26	26 08:37 (177)	16:57	
7	05:58	06:34	06:59 (180)	07:17	07:40 (179)	07:59	08:22 (178)	07:47	08:13 (177)	08:30	10:24 (176)
	21:56	21:23	2 07:01 (180)	20:25	4 07:44 (179)	19:22	2 08:24 (178)	17:24	24 08:37 (177)	16:57	8 10:32 (176)
8	05:59	06:35	07:18	20:25	07:41 (179)	08:01	07:49	08:14 (177)	08:31	10:22 (176)	
	21:56	21:22	20:23	1 07:42 (179)	19:20	17:23	21 08:35 (177)	16:57	12 10:34 (176)		
9	06:00	06:36	07:20	08:02	07:50	08:16 (177)	08:32	10:21 (176)			
	21:55	21:20	20:21	19:18	17:21	19 08:35 (177)	16:57	15 10:36 (176)			
10	06:00	06:38	07:21	08:04	07:52	08:18 (177)	08:33	10:20 (176)			
	21:55	21:18	20:19	19:16	17:20	16 08:34 (177)	16:57	18 10:38 (176)			
11	06:01	06:39	07:22	08:05	07:53	08:19 (177)	08:34	10:20 (176)			
	21:54	21:17	20:17	19:14	17:19	13 08:32 (177)	16:57	19 10:39 (176)			
12	06:02	06:40	07:24	08:07	07:55	08:21 (177)	08:35	10:20 (176)			
	21:53	21:15	20:15	19:12	17:17	10 08:31 (177)	16:57	20 10:40 (176)			
13	06:03	06:42	07:25	08:08	07:56	08:23 (177)	08:36	10:20 (176)			
	21:53	21:13	20:13	19:10	17:16	7 08:30 (177)	16:57	21 10:41 (176)			
14	06:04	06:43	07:27	08:10	07:58	08:24 (177)	08:37	10:20 (176)			
	21:52	21:12	20:11	19:08	17:15	1 08:25 (177)	16:57	22 10:42 (176)			
15	06:05	06:45	07:28	08:11	07:59	08:25 (177)	08:37	10:20 (176)			
	21:51	21:10	20:08	19:06	17:14	16:57	23 10:43 (176)				
16	06:06	06:46	07:29	08:13	08:01	08:38	10:20 (176)				
	21:50	21:08	20:06	19:04	17:12	16:57	24 10:44 (176)				
17	06:07	06:47	07:31	08:14	08:02	08:39	10:21 (176)				
	21:50	21:06	20:04	19:02	17:11	16:57	25 10:46 (176)				
18	06:08	06:49	07:32	08:16	08:04	08:40	10:20 (176)				
	21:49	21:04	20:02	19:00	17:10	16:58	26 10:46 (176)				
19	06:10	06:50	07:34	08:17	08:06	08:40	10:21 (176)				
	21:48	21:03	20:00	18:57	17:09	16:58	26 10:47 (176)				
20	06:11	06:52	07:35	08:19	08:07	08:41	10:21 (176)				
	21:47	21:01	19:58	18:55	17:08	16:58	26 10:47 (176)				
21	06:12	06:53	07:36	08:20	08:20	09:20 (177)	08:08	08:41	10:22 (176)		
	21:46	20:59	19:56	18:53	6 09:26 (177)	17:07	16:59	26 10:48 (176)			
22	06:13	06:54	07:38	08:22	08:22	09:16 (177)	08:10	08:42	10:22 (176)		
	21:45	20:57	19:54	18:51	14 09:30 (177)	17:06	16:59	26 10:48 (176)			
23	06:14	06:56	07:39	08:23	08:23	09:13 (177)	08:11	08:42	10:23 (176)		
	21:43	20:55	19:52	18:49	19 09:32 (177)	17:05	17:00	26 10:49 (176)			
24	06:15	06:57	07:41	08:18 (178)	08:25	09:11 (177)	08:13	08:43	10:23 (176)		
	21:42	20:53	19:49	8 08:26 (178)	18:47	22 09:33 (177)	17:04	17:00	26 10:49 (176)		
25	06:17	06:50 (180)	06:59	07:42	08:16 (178)	08:27	09:10 (177)	08:14	08:43	10:24 (176)	
	21:41	7 06:57 (180)	20:51	19:47	13 08:29 (178)	18:46	25 09:35 (177)	17:04	17:01	26 10:50 (176)	
26	06:18	06:48 (180)	07:00	07:43	08:13 (178)	08:28	09:09 (177)	08:16	08:44	10:25 (176)	
	21:40	11 06:59 (180)	20:49	19:45	17 08:30 (178)	18:44	26 09:35 (177)	17:03	17:02	25 10:50 (176)	
27	06:19	06:47 (180)	07:01	07:45	08:12 (178)	08:30	09:08 (177)	08:17	08:44	10:25 (176)	
	21:39	13 07:00 (180)	20:47	19:43	19 08:31 (178)	18:42	28 09:36 (177)	17:02	17:02	25 10:50 (176)	
28	06:20	06:46 (180)	07:03	07:38 (179)	07:46	08:11 (178)	08:31	09:08 (177)	08:18	08:44	10:26 (176)
	21:38	15 07:01 (180)	20:45	4 07:42 (179)	19:41	20 08:31 (178)	18:40	29 09:37 (177)	17:01	17:03	23 10:49 (176)
29	06:22	06:48 (180)	07:04	07:34 (179)	07:48	08:11 (178)	08:33	09:07 (177)	08:20	08:44	10:26 (176)
	21:36	14 07:02 (180)	20:43	10 07:44 (179)	19:39	21 08:32 (178)	18:39	30 09:37 (177)	17:01	17:04	23 10:49 (176)
30	06:23	06:49 (180)	07:06	07:31 (179)	07:49	08:12 (178)	08:34	09:07 (177)	08:21	08:44	10:27 (176)
	21:35	13 07:02 (180)	20:41	14 07:45 (179)	19:37	20 08:32 (178)	18:37	31 09:38 (177)	17:00	17:05	22 10:49 (176)
31	06:24	06:50 (180)	07:07	07:31 (179)	07:49	08:36	09:07 (177)	08:45	10:28 (176)		
	21:34	12 07:02 (180)	20:39	16 07:47 (179)	18:35	31 09:38 (177)	17:06	21 10:49 (176)			
Potential sun hours	486	445	379	336	277	290	260	554			
Total, worst case	85	94	191	337	290	554					
Sun reduction	0.75	0.72	0.69	0.52	0.44	0.44					
Oper. time red.	0.98	0.98	0.98	0.98	0.98	0.98					
Wind dir. red.	0.60	0.62	0.67	0.71	0.72	0.69					
Total reduction	0.44	0.44	0.46	0.37	0.31	0.30					
Total, real	38	42	87	125	90	168					

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
 Lenexa, KS, 66219

Description:

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 Calculated:  
 3/4/2016 9:45 AM/2.9.285

**SHADOW - Calendar**

**Calculation:** A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor:** E - Participating

**Assumptions for shadow calculations**

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	08:45	08:22	07:35	07:32	06:34	06:57 (300)   05:55
	17:07	17:50	18:34	20:20	21:05	22 07:19 (300)   21:44
2	08:44	08:21	07:33	07:29	06:32	06:55 (300)   05:54
	17:08	17:51	18:35	20:22	21:06	24 07:19 (300)   21:45
3	08:44	08:20	07:31	07:27	06:30	06:53 (300)   05:54
	17:09	17:53	18:37	20:23	21:07	26 07:19 (300)   21:46
4	08:44	08:18	07:29	07:25	06:29	06:52 (300)   05:53
	17:10	17:55	18:38	20:25	21:09	28 07:20 (300)   21:47
5	08:44	08:17	07:27	07:23	06:27	06:50 (300)   05:53
	17:11	17:56	18:40	20:26	21:10	30 07:20 (300)   21:48
6	08:44	08:15	07:25	07:49 (34)   07:21	06:26	06:49 (300)   05:52
	17:12	17:58	18:41	13 08:02 (34)   20:28	21:12	31 07:20 (300)   21:49
7	08:44	08:14	07:23	07:45 (34)   07:19	06:24	06:47 (300)   05:52
	17:13	18:00	18:43	20 08:05 (34)   20:29	21:13	33 07:20 (300)   21:50
8	08:43	08:12	08:21	08:43 (34)   07:17	06:22	06:46 (300)   05:51
	17:15	18:00	18:44	24 09:07 (34)   20:31	21:15	34 07:20 (300)   21:51
9	08:43	08:11	08:19	08:41 (34)   07:15	06:21	06:46 (300)   05:51
	17:16	18:01	19:46	28 09:09 (34)   20:32	21:16	35 07:21 (300)   21:52
10	08:43	08:09	08:17	08:39 (34)   07:13	06:19	06:46 (300)   05:50
	17:17	18:03	19:48	31 09:10 (34)   20:34	21:17	34 07:20 (300)   21:52
11	08:42	08:08	08:15	08:38 (34)   07:11	06:18	06:46 (300)   05:50
	17:18	18:05	19:49	33 09:11 (34)   20:35	21:19	34 07:20 (300)   21:53
12	08:42	08:06	08:13	08:37 (34)   07:09	06:17	06:46 (300)   05:50
	17:20	18:06	19:51	35 09:12 (34)   20:37	21:20	33 07:19 (300)   21:54
13	08:41	08:04	08:11	08:36 (34)   07:07	06:15	06:46 (300)   05:50
	17:21	18:08	19:52	36 09:12 (34)   20:38	21:21	33 07:19 (300)   21:54
14	08:40	08:03	08:09	08:35 (34)   07:05	06:14	06:47 (300)   05:50
	17:22	18:09	19:54	38 09:13 (34)   20:40	21:23	32 07:19 (300)   21:55
15	08:40	08:01	08:07	08:34 (34)   07:03	06:12	06:48 (300)   05:49
	17:24	18:11	19:55	39 09:13 (34)   20:41	21:24	31 07:19 (300)   21:55
16	08:39	07:59	08:05	08:34 (34)   07:01	06:11	06:47 (300)   05:49
	17:25	18:13	19:57	39 09:13 (34)   20:43	21:26	31 07:18 (300)   21:56
17	08:38	07:57	08:03	08:34 (34)   06:59	06:10	06:48 (300)   05:49
	17:27	18:14	19:58	39 09:13 (34)   20:44	21:27	29 07:17 (300)   21:56
18	08:38	07:56	08:01	08:32 (34)   06:57	06:09	06:49 (300)   05:49
	17:28	18:16	20:00	40 09:12 (34)   20:46	21:28	28 07:17 (300)   21:57
19	08:37	07:54	07:59	08:32 (34)   06:55	07:18 (36)   06:07	06:50 (300)   05:50
	17:30	18:18	20:01	40 09:12 (34)   20:47	1 07:19 (36)   21:29	26 07:16 (300)   21:57
20	08:36	07:52	07:57	08:32 (34)   06:54	07:16 (36)   06:06	06:51 (300)   05:50
	17:31	18:19	20:03	39 09:11 (34)   20:48	3 07:19 (36)   21:31	25 07:16 (300)   21:57
21	08:35	07:50	07:54	08:32 (34)   06:52	07:14 (36)   06:05	06:52 (300)   05:50
	17:33	18:21	20:04	39 09:11 (34)   20:50	5 07:19 (36)   21:32	23 07:15 (300)   21:58
22	08:34	07:48	07:52	08:33 (34)   06:50	07:12 (36)   06:04	06:53 (300)   05:50
	17:34	18:22	20:06	37 09:10 (34)   20:51	7 07:19 (36)   21:33	21 07:14 (300)   21:58
23	08:33	07:47	07:50	08:33 (34)   06:48	07:10 (36)   06:03	06:54 (300)   05:50
	17:36	18:24	20:07	36 09:09 (34)   20:53	8 07:18 (36)   21:34	19 07:13 (300)   21:58
24	08:32	07:45	07:48	08:34 (34)   06:46	07:09 (35)   06:02	06:55 (300)   05:51
	17:37	18:26	20:09	34 09:08 (34)   20:54	9 07:18 (36)   21:36	16 07:11 (300)   21:58
25	08:31	07:43	07:46	08:34 (34)   06:44	07:07 (300)   06:01	06:57 (300)   05:51
	17:39	18:27	20:10	33 09:07 (34)   20:56	10 07:17 (36)   21:37	13 07:10 (300)   21:58
26	08:30	07:41	07:44	08:35 (34)   06:42	07:05 (300)   06:00	06:59 (300)   05:51
	17:40	18:29	20:12	30 09:05 (34)   20:57	10 07:15 (36)   21:38	9 07:08 (300)   21:58
27	08:29	07:39	07:42	08:37 (34)   06:41	07:03 (300)   05:59	05:52
	17:42	18:30	20:13	26 09:03 (34)   20:59	11 07:14 (300)   21:39	21:58
28	08:27	07:37	07:40	08:38 (34)   06:39	07:02 (300)   05:58	05:52
	17:43	18:32	20:15	23 09:01 (34)   21:00	14 07:16 (300)   21:40	21:58
29	08:26		07:38	08:39 (34)   06:37	07:00 (300)   05:57	05:53
	17:45		20:16	19 08:58 (34)   21:02	17 07:17 (300)   21:41	21:58
30	08:25		07:36	08:43 (34)   06:35	06:58 (300)   05:56	05:53
	17:47		20:18	11 08:54 (34)   21:03	19 07:17 (300)   21:42	21:58
31	08:24		07:34		05:56	
	17:48		20:19		21:43	
Potential sun hours	273	284	368	410	472	481
Total, worst case			782	114	700	
Sun reduction			0.63	0.59	0.67	
Oper. time red.			0.98	0.98	0.98	
Wind dir. red.			0.69	0.61	0.61	
Total reduction			0.43	0.35	0.40	
Total, real			335	40	281	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

20132550- Lindahl Wind Farm

TradeWind Energy, Inc.
Kevin Walter
Southlake Technology Park, 16105 W 113th St, Ste 1
Lenexa, KS, 66219

Description:

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SHADOW - Calendar

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab Shadow receptor: E - Participating

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Table with 12 columns (Jan-Dec) and 1 row of values: 4.92, 5.13, 7.45, 8.03, 10.20, 11.21, 11.69, 10.35, 8.68, 5.69, 4.02, 3.69

Operational time

Table with 13 columns (N, NNE, ENE, E, ESE, SSE, S, SSW, WSW, W, WNW, NNW, Sum) and 1 row of values: 660, 333, 352, 411, 608, 961, 789, 574, 695, 904, 1,116, 1,191, 8,594

Idle start wind speed: Cut in wind speed from power curve

Main shadow calculation table with columns for months (July-December) and rows for each hour of the day (05:54-21:58). Includes summary rows for Potential sun hours, Total, worst case, Sun reduction, Oper. time red., Wind dir. red., Total reduction, and Total, real.

Table layout: For each day in each month the following matrix apply

Matrix layout table with columns: Day in month, Sun rise (hh:mm), Sun set (hh:mm), Minutes with flicker, First time (hh:mm) with flicker, Last time (hh:mm) with flicker, (WTG causing flicker first time), (WTG causing flicker last time)

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:

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### SHADOW - Calendar

**Calculation:** A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor:** F - Participating

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

### Assumptions for shadow calculations

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1   08:45	16:02 (15)   08:23	08:47 (184)   07:35	07:32		06:34	19:42 (14)   05:55
17:07	33   16:35 (13)   17:50	13   09:00 (184)   18:34	20:21		21:05	35   20:17 (14)   21:45
2   08:45	16:03 (15)   08:21	08:45 (184)   07:33	07:30		06:32	19:43 (14)   05:55
17:08	34   16:37 (13)   17:52	14   08:59 (184)   18:35	20:22		21:06	33   20:16 (14)   21:46
3   08:45	16:03 (15)   08:20	08:44 (184)   07:31	07:28		06:31	19:44 (14)   05:54
17:09	34   16:37 (13)   17:53	15   08:59 (184)   18:37	20:24		21:08	32   20:16 (14)   21:47
4   08:44	16:04 (15)   08:18	08:42 (184)   07:29	07:26		06:29	19:44 (14)   05:53
17:10	34   16:38 (13)   17:55	17   08:59 (184)   18:38	20:25		21:09	30   20:14 (14)   21:48
5   08:44	16:05 (15)   08:17	08:43 (184)   07:27	07:24		06:27	19:46 (14)   05:53
17:11	33   16:38 (13)   17:57	16   08:59 (184)   18:40	20:27		21:10	27   20:13 (14)   21:48
6   08:44	16:04 (15)   08:16	08:43 (184)   07:25	07:21		06:26	19:46 (14)   05:52
17:13	34   16:38 (13)   17:58	14   08:57 (184)   18:42	20:28		21:12	26   20:12 (14)   21:49
7   08:44	16:05 (15)   08:14	08:45 (184)   07:23	07:19		06:24	19:48 (14)   05:52
17:14	33   16:38 (13)   18:00	12   08:57 (184)   18:43	20:30		21:13	23   20:11 (14)   21:50
8   08:43	16:05 (15)   08:12	08:47 (184)   08:21	07:17		06:23	19:49 (14)   05:51
17:15	33   16:38 (13)   18:00	7   08:54 (184)   18:45	20:31		21:15	19   20:08 (14)   21:51
9   08:43	16:06 (15)   08:11	08:19	07:15		06:21	19:52 (14)   05:51
17:16	32   16:38 (13)   18:02	19:46	20:32		21:16	15   20:07 (14)   21:52
10   08:43	16:06 (15)   08:09	08:17	07:13		06:20	19:55 (14)   05:51
17:17	31   16:37 (13)   18:03	19:48	20:34		21:18	7   20:02 (14)   21:52
11   08:42	16:08 (15)   08:08	08:15	07:11		06:18	19:50 (14)   05:50
17:19	30   16:38 (13)   18:05	19:49	20:35		21:19	21:53
12   08:42	16:08 (15)   08:06	08:13	07:09	19:56 (14)	06:17	19:50 (14)   05:50
17:20	29   16:37 (13)   18:06	19:51	20:37	14   20:10 (14)	21:20	21:54
13   08:41	16:08 (15)   08:04	08:11	07:07	19:53 (14)	06:15	19:50 (14)   05:50
17:21	27   16:35 (13)   18:08	19:52	20:38	20   20:13 (14)	21:22	21:54
14   08:41	16:10 (15)   08:03	08:09	07:05	19:51 (14)	06:14	19:50 (14)   05:50
17:23	25   16:35 (15)   18:10	19:54	20:40	24   20:15 (14)	21:23	21:55
15   08:40	16:10 (15)   08:01	08:07	07:03	19:49 (14)	06:13	19:50 (14)   05:50
17:24	25   16:35 (15)   18:11	19:55	20:41	27   20:16 (14)	21:24	21:55
16   08:39	16:11 (15)   07:59	08:05	07:01	19:47 (14)	06:11	19:50 (14)   05:50
17:25	24   16:35 (15)   18:13	19:57	20:43	30   20:17 (14)	21:26	21:56
17   08:38	16:12 (15)   07:58	08:03	07:00	19:47 (14)	06:10	19:50 (14)   05:50
17:27	22   16:34 (15)   18:15	19:58	20:44	32   20:19 (14)	21:27	21:56
18   08:38	16:13 (15)   07:56	08:01	06:58	19:45 (14)	06:09	19:50 (14)   05:50
17:28	21   16:34 (15)   18:16	20:00	20:46	34   20:19 (14)	21:28	21:57
19   08:37	16:14 (15)   07:54	07:59	06:56	19:44 (14)	06:08	19:50 (14)   05:50
17:30	19   16:33 (15)   18:18	20:01	20:47	35   20:19 (14)	21:30	21:57
20   08:36	16:15 (15)   07:52	07:57	06:54	19:43 (14)	06:06	19:50 (14)   05:50
17:31	17   16:32 (15)   18:19	20:03	20:49	37   20:20 (14)	21:31	21:58
21   08:35	16:17 (15)   07:50	07:55	06:52	19:42 (14)	06:05	19:50 (14)   05:50
17:33	14   16:31 (15)   18:21	20:04	20:50	38   20:20 (14)	21:32	21:58
22   08:34	16:20 (15)   07:49	07:53	06:50	19:42 (14)	06:04	19:50 (14)   05:50
17:34	9   16:29 (15)   18:23	20:06	20:52	38   20:20 (14)	21:33	21:58
23   08:33	16:20 (15)   07:47	07:50	06:48	19:42 (14)	06:03	19:50 (14)   05:51
17:36	18:24	20:07	20:53	38   20:20 (14)	21:35	21:58
24   08:32	16:18 (15)   07:45	07:48	06:46	19:42 (14)	06:02	19:50 (14)   05:51
17:37	18:26	20:09	20:55	38   20:20 (14)	21:36	21:58
25   08:31	16:19 (15)   07:43	07:46	06:45	19:41 (14)	06:01	19:50 (14)   05:51
17:39	18:27	20:10	20:56	39   20:20 (14)	21:37	21:59
26   08:30	16:20 (15)   07:41	07:44	06:43	19:41 (14)	06:00	19:50 (14)   05:52
17:40	18:29	20:12	20:57	38   20:19 (14)	21:38	21:59
27   08:29	08:53 (184)   07:39	07:42	06:41	19:42 (14)	05:59	19:50 (14)   05:52
17:42	3   08:56 (184)   18:31	20:13	20:59	38   20:20 (14)	21:39	21:59
28   08:28	08:52 (184)   07:37	07:40	06:39	19:41 (14)	05:58	19:50 (14)   05:52
17:44	5   08:57 (184)   18:32	20:15	21:00	38   20:19 (14)	21:40	21:59
29   08:26	08:51 (184)	07:38	06:37	19:41 (14)	05:58	19:50 (14)   05:53
17:45	7   08:58 (184)	20:16	21:02	37   20:18 (14)	21:41	21:59
30   08:25	08:50 (184)	07:36	06:36	19:42 (14)	05:57	19:50 (14)   05:53
17:47	9   08:59 (184)	20:18	21:03	36   20:18 (14)	21:43	21:58
31   08:24	08:48 (184)	07:34	06:34	19:41 (14)	05:56	19:50 (14)   05:53
17:48	11   08:59 (184)	20:19	21:04	36   20:18 (14)	21:44	21:58
Potential sun hours	273	284	368	410	471	481
Total, worst case	628	108	631	247		
Sun reduction	0.56	0.50	0.59	0.67		
Oper. time red.	0.98	0.98	0.98	0.98		
Wind dir. red.	0.54	0.72	0.69	0.69		
Total reduction	0.29	0.35	0.39	0.45		
Total, real	184	38	248	111		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

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### SHADOW - Calendar

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: F - Participating**

#### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [BISMARCK]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4.92 5.13 7.45 8.03 10.20 11.21 11.69 10.35 8.68 5.69 4.02 3.69

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
660 333 352 411 608 961 789 574 695 904 1,116 1,191 8,594  
Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:54	06:26	07:09	07:51	07:38	08:22
	21:58	21:32	20:38	19:35	17:34	17:00
2	05:55	06:27	07:10	07:52	07:39	08:24
	21:58	21:31	20:36	19:33	17:32	16:59
3	05:55	06:29	20:04 (14)	07:11	07:54	08:25
	21:58	21:29	20:14 (14)	20:34	19:31	17:31
4	05:56	06:30	20:01 (14)	07:13	07:55	07:42
	21:57	21:28	20:17 (14)	20:31	19:29	17:29
5	05:57	06:31	19:59 (14)	07:14	07:57	07:44
	21:57	21:26	20:20 (14)	20:29	19:27	17:28
6	05:57	06:33	19:57 (14)	07:16	07:58	07:45
	21:57	21:25	20:21 (14)	20:27	19:25	17:26
7	05:58	06:34	19:56 (14)	07:17	08:00	07:47
	21:56	21:23	20:22 (14)	20:25	19:22	17:25
8	05:59	06:35	19:55 (14)	07:18	08:01	07:49
	21:56	21:22	20:23 (14)	20:23	19:20	17:23
9	06:00	06:37	19:54 (14)	07:20	08:02	07:50
	21:55	21:20	20:24 (14)	20:21	19:18	17:22
10	06:01	06:38	19:52 (14)	07:21	08:04	07:52
	21:55	21:18	20:24 (14)	20:19	19:16	17:20
11	06:02	06:39	19:51 (14)	07:23	08:05	07:53
	21:54	21:17	20:25 (14)	20:17	19:14	17:19
12	06:03	06:41	19:51 (14)	07:24	08:07	07:55
	21:53	21:15	20:26 (14)	20:15	19:12	17:18
13	06:04	06:42	19:50 (14)	07:25	08:08	07:56
	21:53	21:13	20:26 (14)	20:13	19:10	17:16
14	06:05	06:44	19:49 (14)	07:27	08:10	07:58
	21:52	21:12	20:26 (14)	20:11	19:08	17:15
15	06:06	06:45	19:49 (14)	07:28	08:11	08:00
	21:51	21:10	20:27 (14)	20:09	19:06	17:14
16	06:07	06:46	19:48 (14)	07:30	08:13	08:01
	21:50	21:08	20:26 (14)	20:06	19:04	17:13
17	06:08	06:48	19:48 (14)	07:31	08:14	08:03
	21:50	21:06	20:26 (14)	20:04	19:03	17:12
18	06:09	06:49	19:48 (14)	07:32	08:16	08:04
	21:49	21:05	20:26 (14)	20:02	19:01	17:10
19	06:10	06:50	19:47 (14)	07:34	08:17	08:06
	21:48	21:03	20:26 (14)	20:00	18:57	17:09
20	06:11	06:52	19:47 (14)	07:35	08:19	08:07
	21:47	21:01	20:25 (14)	19:58	18:55	17:08
21	06:12	06:53	19:48 (14)	07:37	08:21	08:09
	21:46	20:59	20:25 (14)	19:56	18:53	17:07
22	06:13	06:55	19:47 (14)	07:38	08:22	08:10
	21:45	20:57	20:24 (14)	19:54	18:51	17:06
23	06:15	06:56	19:47 (14)	07:39	08:24	08:12
	21:44	20:55	20:23 (14)	19:52	18:49	17:05
24	06:16	06:57	19:48 (14)	07:41	08:25	08:13
	21:42	20:53	20:23 (14)	19:50	18:48	17:05
25	06:17	06:59	19:48 (14)	07:42	08:27	08:14
	21:41	20:51	20:22 (14)	19:47	18:46	17:04
26	06:18	07:00	19:48 (14)	07:44	08:28	08:16
	21:40	20:49	20:20 (14)	19:45	18:44	17:03
27	06:19	07:02	19:50 (14)	07:45	08:30	08:17
	21:39	20:47	20:20 (14)	19:43	18:42	17:02
28	06:21	07:03	19:51 (14)	07:47	08:31	08:19
	21:38	20:46	20:18 (14)	19:41	18:41	17:02
29	06:22	07:04	19:52 (14)	07:48	08:33	08:20
	21:36	20:44	20:15 (14)	19:39	18:39	17:01
30	06:23	07:06	19:54 (14)	07:49	08:34	08:21
	21:35	20:42	20:14 (14)	19:37	18:37	17:00
31	06:25	07:07	19:56 (14)		08:36	08:23
	21:34	20:40	20:10 (14)		18:35	17:06
Potential sun hours	486	445	379	336	277	260
Total, worst case		883			374	990
Sun reduction		0.72			0.43	0.44
Oper. time red.		0.98			0.98	0.98
Wind dir. red.		0.69			0.61	0.53
Total reduction		0.48			0.25	0.23
Total, real		426			95	224

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker
			(WTG causing flicker last time)

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
 Lenexa, KS, 66219

Description:

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### SHADOW - Calendar

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: H - Participating**

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

#### Assumptions for shadow calculations

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	
1	08:45 17:07	08:23 17:50	07:35 18:34	07:32 20:21	06:34 21:05	05:55 21:45	
2	08:45 17:08	08:21 17:52	07:33 18:35	07:30 20:22	06:32 21:06	05:55 21:46	
3	08:44 17:09	08:20 17:54	07:31 18:37	07:28 20:24	06:31 21:08	05:54 21:46	
4	08:44 17:11	08:18 17:55	07:29 18:39	07:26 20:25	06:29 21:09	05:54 21:47	
5	08:44 17:12	08:17 17:57	07:27 18:40	07:24 20:27	06:28 21:10	05:53 21:48	06:51 (155)
6	08:44 17:13	08:15 17:58	07:25 18:42	07:22 20:28	06:26 21:12	05:53 21:49	06:49 (155)
7	08:44 17:14	08:14 18:00	07:23 18:43	07:20 20:30	06:24 21:13	05:52 21:50	06:48 (155)
8	08:43 17:15	08:12 18:00	08:21 18:45	07:18 20:31	06:23 21:15	05:52 21:51	06:46 (155)
9	08:43 17:16	08:11 18:02	08:19 19:46	07:16 20:33	06:21 21:16	05:51 21:52	06:45 (155)
10	08:43 17:18	08:09 18:03	08:17 19:48	07:13 20:34	06:20 21:17	05:51 21:52	06:44 (155)
11	08:42 17:19	08:08 18:05	08:15 19:49	07:11 20:35	06:18 21:19	05:51 21:53	06:42 (155)
12	08:42 17:20	08:06 18:07	08:13 19:51	07:09 20:37	06:17 21:20	05:50 21:54	06:41 (155)
13	08:41 17:22	16:49 (307) 16:51 (307)	08:04 18:08	08:11 19:52	07:08 20:38	06:16 21:22	06:40 (155)
14	08:40 17:23	16:50 (307) 16:53 (307)	08:03 18:10	08:09 19:54	07:06 20:40	06:14 21:23	06:38 (155)
15	08:40 17:24	16:50 (307) 16:54 (307)	08:01 18:11	08:07 19:55	07:04 20:41	06:13 21:24	06:38 (155)
16	08:39 17:26	16:50 (307) 16:55 (307)	07:59 18:13	08:05 19:57	07:02 20:43	06:12 21:26	06:38 (155)
17	08:38 17:27	16:51 (307) 16:57 (307)	07:58 18:15	08:03 19:58	07:00 20:44	06:10 21:27	06:39 (155)
18	08:38 17:29	16:51 (307) 16:58 (307)	07:56 18:16	08:01 19:58	06:58 20:46	06:09 21:28	06:39 (155)
19	08:37 17:30	16:52 (307) 17:00 (307)	07:54 18:18	07:59 20:01	06:56 20:47	06:08 21:30	06:39 (155)
20	08:36 17:31	16:53 (307) 17:01 (307)	07:52 18:20	07:57 20:03	06:54 20:49	06:07 21:31	06:40 (155)
21	08:35 17:33	16:54 (307) 17:03 (307)	07:50 18:21	07:55 20:04	06:52 20:50	06:06 21:32	06:41 (155)
22	08:34 17:34	16:55 (307) 17:05 (307)	07:49 18:23	07:53 20:06	06:50 20:52	06:04 21:33	06:42 (155)
23	08:33 17:36	16:57 (307) 17:05 (307)	07:47 18:24	07:51 20:07	06:48 20:53	06:03 21:35	06:44 (155)
24	08:32 17:38	17:01 (307) 17:02 (307)	07:45 18:26	07:48 20:09	06:46 20:54	06:02 21:36	06:47 (155)
25	08:31 17:39	17:02 (307) 18:28	07:43 20:10	07:46 20:56	06:45 21:37	06:01 21:58	06:48 (155)
26	08:30 17:41	17:03 (307) 18:29	07:41 20:12	07:44 20:57	06:43 21:38	06:00 21:58	06:48 (155)
27	08:29 17:42	17:04 (307) 18:30	07:39 20:13	07:42 20:59	06:41 21:39	05:59 21:58	06:48 (155)
28	08:28 17:44	17:05 (307) 18:32	07:37 20:15	07:40 21:00	06:39 21:40	05:59 21:58	06:48 (155)
29	08:26 17:45	17:06 (307) 18:33	07:35 20:16	07:38 21:02	06:38 21:41	05:58 21:58	06:48 (155)
30	08:25 17:47	17:07 (307) 18:34	07:33 20:18	07:36 21:03	06:36 21:42	05:57 21:58	06:48 (155)
31	08:24 17:49	17:08 (307) 18:35	07:31 20:19	07:34 21:04	06:34 21:44	05:56 21:58	06:48 (155)
Potential sun hours	273	285	368	409	471	481	146
Total, worst case	71				255		0.70
Sun reduction	0.56				0.67		0.98
Oper. time red.	0.98				0.98		0.57
Wind dir. red.	0.56				0.60		0.39
Total reduction	0.31				0.40		0.39
Total, real	22				101		57

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

20132550- Lindahl Wind Farm

TradeWind Energy, Inc.
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Description:

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SHADOW - Calendar

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab Shadow receptor: H - Participating

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Table with 12 columns (Jan-Dec) and 1 row of values: 4.92, 5.13, 7.45, 8.03, 10.20, 11.21, 11.69, 10.35, 8.68, 5.69, 4.02, 3.69

Operational time

Table with 13 columns (N, NNE, ENE, E, ESE, SSE, S, SSW, WSW, W, WNW, NNW, Sum) and 1 row of values: 660, 333, 352, 411, 608, 961, 789, 574, 695, 904, 1,116, 1,191, 8,594

Idle start wind speed: Cut in wind speed from power curve

Main shadow calculation table with columns for months (July-December) and rows for each hour of the day (01:00-24:00). Includes summary rows for Potential sun hours and various reduction factors.

Table layout: For each day in each month the following matrix apply

Matrix defining table layout: Day in month, Sun rise (hh:mm), Sun set (hh:mm), Minutes with flicker, First time (hh:mm) with flicker, Last time (hh:mm) with flicker, (WTG causing flicker first time), (WTG causing flicker last time)

Project:

**20132550- Lindahl Wind Farm**

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**SHADOW - Calendar**

**Calculation:** A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: I - Participating**

**Assumptions for shadow calculations**

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	
1   08:45	09:16 (104)   08:23		07:35	07:58 (158)   07:32	06:34	06:57 (105)   05:55	
17:07	24   09:40 (104)   17:50		18:34	5   08:03 (158)   20:21	21:05	36   20:39 (13)   21:45	
2   08:45	09:16 (104)   08:21		07:33	07:56 (158)   07:30	06:32	06:55 (184)   05:55	
17:08	25   09:41 (104)   17:52		18:35	8   08:04 (158)   20:22	21:06	41   20:40 (13)   21:46	
3   08:45	09:17 (104)   08:20		07:31	07:54 (158)   07:28	06:31	06:54 (184)   05:54	
17:09	25   09:42 (104)   17:53		18:37	11   08:05 (158)   20:24	21:08	46   20:42 (13)   21:47	
4   08:44	09:18 (104)   08:18		07:29	07:52 (158)   07:26	06:29	06:52 (184)   05:53	
17:10	24   09:42 (104)   17:55		18:38	13   08:05 (158)   20:25	21:09	50   20:43 (13)   21:47	
5   08:44	09:18 (104)   08:17		07:27	07:50 (158)   07:24	06:27	06:51 (184)   05:53	
17:11	24   09:42 (104)   17:57		18:40	14   08:04 (158)   20:27	21:10	54   20:45 (13)   21:48	
6   08:44	09:18 (104)   08:15		07:25	07:48 (158)   07:21	06:26	06:49 (184)   05:52	
17:13	24   09:42 (104)   17:58		18:42	16   08:04 (158)   20:28	21:12	57   20:45 (13)   21:49	
7   08:44	09:19 (104)   08:14		07:23	07:47 (158)   07:19	06:24	06:48 (184)   05:52	
17:14	24   09:43 (104)   18:00		18:43	16   08:03 (158)   20:30	21:13	59   20:46 (13)   21:50	
8   08:43	09:19 (104)   08:12		08:21	08:47 (158)   07:17	06:23	06:46 (184)   05:51	
17:15	24   09:43 (104)   18:00	3	08:39 (316)   18:45	15   09:02 (158)   20:31	21:15	61   20:46 (13)   21:51	
9   08:43	09:21 (104)   08:11		08:34 (316)   08:19	08:48 (158)   07:15	06:21	06:45 (184)   05:51	
17:16	22   09:43 (104)   18:02	6	08:40 (316)   19:46	11   08:59 (158)   20:32	21:16	62   20:47 (13)   21:52	
10   08:43	09:21 (104)   08:09		08:33 (316)   08:17	08:50 (158)   07:13	06:20	06:43 (184)   05:51	
17:17	22   09:43 (104)   18:03	9	08:42 (316)   19:48	6   08:56 (158)   20:34	21:17	63   20:46 (13)   21:52	
11   08:42	09:22 (104)   08:08		08:31 (316)   08:15	19:21 (12)   07:11	06:18	06:43 (184)   05:51	
17:19	22   09:44 (104)   18:05	12	08:43 (316)   19:49	5   19:26 (12)   20:35	21:19	63   20:47 (13)   21:53	
12   08:42	09:23 (104)   08:06		08:29 (316)   08:13	19:18 (12)   07:09	06:17	06:44 (184)   05:50	
17:20	20   09:43 (104)   18:06	14	08:43 (316)   19:51	10   19:28 (12)   20:37	21:20	60   20:47 (13)   21:54	
13   08:41	09:23 (104)   08:04		08:28 (316)   08:11	19:17 (12)   07:07	06:15	06:44 (184)   05:50	
17:21	20   09:43 (104)   18:08	17	08:45 (316)   19:52	12   19:29 (12)   20:38	21:22	56   20:46 (13)   21:54	
14   08:41	09:25 (104)   08:03		08:26 (316)   08:09	19:15 (12)   07:05	06:14	06:45 (184)   05:50	
17:23	18   09:43 (104)   18:10	19	08:45 (316)   19:54	16   19:31 (12)   20:40	21:23	52   20:47 (13)   21:55	
15   08:40	09:26 (104)   08:01		08:24 (316)   08:07	19:15 (12)   07:03	06:13	06:47 (184)   05:50	
17:24	16   09:42 (104)   18:11	21	08:45 (316)   19:55	18   19:33 (12)   20:41	21:24	38   20:47 (13)   21:55	
16   08:39	09:27 (104)   07:59		08:22 (316)   08:05	19:14 (12)   07:02	06:11	06:49 (184)   05:50	
17:25	15   09:42 (104)   18:13	22	08:44 (316)   19:57	20   19:34 (12)   20:43	21:26	34   20:47 (13)   21:56	
17   08:38	09:28 (104)   07:58		08:22 (316)   08:03	19:14 (12)   07:00	06:10	20:20 (13)   05:50	
17:27	12   09:40 (104)   18:15	23	08:45 (316)   19:58	21   19:35 (12)   20:44	21:27	26   20:46 (13)   21:56	
18   08:38	09:31 (104)   07:56		08:22 (316)   08:01	19:13 (12)   06:58	06:09	20:19 (13)   05:50	
17:28	8   09:39 (104)   18:16	22	08:44 (316)   20:00	22   19:35 (12)   20:46	21:28	26   20:45 (13)   21:57	
19   08:37		07:54	08:22 (316)   07:59	19:13 (12)   06:56	06:08	20:20 (13)   05:50	
17:30		18:18	21   08:43 (316)   20:01	22   19:35 (12)   20:47	21:30	25   20:45 (13)   21:57	
20   08:36		07:52	08:23 (316)   07:57	19:14 (12)   06:54	06:07	20:21 (13)   05:50	
17:31		18:19	19   08:42 (316)   20:03	20   19:34 (12)   20:49	21:31	23   20:44 (13)   21:57	
21   08:35		07:50	08:24 (316)   07:55	19:13 (12)   06:52	06:05	20:21 (13)   05:50	
17:33		18:21	17   08:41 (316)   20:04	19   19:32 (12)   20:50	21:32	23   20:44 (13)   21:58	
22   08:34		07:49	08:26 (316)   07:53	19:14 (12)   06:50	06:04	20:22 (13)   05:50	
17:34		18:23	13   08:39 (316)   20:06	16   19:30 (12)   20:52	21:33	21   20:43 (13)   21:58	
23   08:33		07:47	08:28 (316)   07:51	19:16 (12)   06:48	06:03	20:23 (13)   05:51	
17:36		18:24	8   08:36 (316)   20:07	13   19:29 (12)   20:53	21:35	20   20:43 (13)   21:58	
24   08:32		07:45	07:48	19:19 (12)   06:46	06:02	20:24 (13)   05:51	
17:37		18:26	20:09	6   19:25 (12)   20:54	4   07:13 (105)   21:36	18   20:42 (13)   21:58	
25   08:31		07:43	07:46	06:45	07:07 (105)   06:01	20:25 (13)   05:51	
17:39		18:27	20:10	06:43	9   07:16 (105)   21:37	16   20:41 (13)   21:58	
26   08:30		07:41	07:44	06:43	07:05 (105)   06:00	20:27 (13)   05:52	
17:41		18:29	20:12	13   07:18 (105)   21:38	13   20:40 (13)   21:59		
27   08:29		07:39	07:42	06:41	07:04 (105)   05:59	20:29 (13)   05:52	
17:42		18:31	20:13	16   07:20 (105)   21:39	10   20:39 (13)   21:59		
28   08:28		07:37	08:00 (158)   07:40	06:39	07:02 (105)   05:58	20:31 (13)   05:52	
17:44		18:32	2   08:02 (158)   20:15	21:00	18   07:20 (105)   21:40	5   20:36 (13)   21:59	
29   08:26			07:38	06:37	07:00 (105)   05:58		05:53
17:45			20:16	21:02	20   07:20 (105)   21:41		21:58
30   08:25			07:36	06:36	06:59 (105)   05:57		05:53
17:47			20:18	21:03	28   20:37 (13)   21:43		21:58
31   08:24			07:34				05:56
17:49			20:19				21:44
Potential sun hours	273	285	368	410	471	481	
Total, worst case	369	248	335	108	1058		
Sun reduction	0.56	0.50	0.63	0.59	0.67		
Oper. time red.	0.98	0.98	0.98	0.98	0.98		
Wind dir. red.	0.71	0.72	0.66	0.61	0.67		
Total reduction	0.39	0.36	0.41	0.36	0.44		
Total, real	144	88	137	38	466		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
 Lenexa, KS, 66219

Description:

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 wind@eapc.net  
 Calculated:  
 3/4/2016 9:45 AM/2.9.285

### SHADOW - Calendar

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: I - Participating**

#### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

#### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December										
1	05:54	06:26	06:54 (184)	07:09	07:51	18:58 (12)	07:38	08:02 (316)	08:22	09:04 (104)						
2	05:55	06:27	06:54 (184)	07:10	07:35	10	19:08 (12)	17:34	9	08:11 (316)	17:00	22	09:26 (104)			
3	05:55	06:29	06:54 (184)	07:11	07:54	7	19:06 (12)	17:32	6	08:10 (316)	16:59	22	09:26 (104)			
4	05:56	06:30	06:55 (184)	07:13	07:55		08:27 (158)	07:42			08:26	22	09:26 (104)			
5	05:57	06:31	06:57 (184)	07:14	07:57	9	08:36 (158)	17:29		16:58	23	09:28 (104)				
6	05:57	06:33	06:58 (184)	07:16	07:58	13	08:37 (158)	17:28		16:58	24	09:28 (104)				
7	05:58	06:34	06:59 (184)	07:17	08:00	16	08:39 (158)	17:26		16:58	23	09:28 (104)				
8	05:59	06:35	07:01 (184)	07:18	08:01	17	08:39 (158)	17:25		16:58	24	09:29 (104)				
9	06:00	06:37	07:02 (184)	07:20	08:02	15	08:39 (158)	17:23		16:57	24	09:29 (104)				
10	06:01	06:38	07:03 (184)	07:21	08:04	14	08:39 (158)	17:22		16:57	25	09:30 (104)				
11	06:02	06:39	07:04 (184)	07:23	08:05	12	08:39 (158)	17:20		16:57	25	09:30 (104)				
12	06:03	06:41	07:06 (105)	07:24	08:07	9	08:38 (158)	17:19		16:57	25	09:32 (104)				
13	06:04	06:42	07:07 (105)	07:25	08:08	7	08:37 (158)	17:18		16:57	25	09:31 (104)				
14	06:05	06:44	07:08 (105)	07:27	08:10	4	08:36 (158)	17:16		16:57	25	09:32 (104)				
15	06:06	06:45	07:10 (105)	07:28	08:11	1	08:34 (158)	17:15		16:57	25	09:32 (104)				
16	06:07	20:38 (13)	06:46	07:30	08:13			17:14		16:57	25	09:33 (104)				
17	06:08	20:46 (13)	21:08	07:26 (105)	07:31	15	07:26 (105)	20:06		16:57	24	09:33 (104)				
18	06:09	20:35 (13)	06:49	07:14 (105)	07:32	12	07:24 (105)	20:04		16:58	25	09:34 (104)				
19	06:10	20:34 (13)	06:50	07:15 (105)	07:34	9	07:23 (105)	20:02		16:58	25	09:34 (104)				
20	06:11	20:34 (13)	06:52	07:35	19:08 (12)	10	19:11 (12)	18:57	10	09:08 (316)	17:09		16:58	25	09:35 (104)	
21	06:12	20:33 (13)	06:53	07:37	19:03 (12)	10	19:03 (12)	18:19	10	09:08 (316)	17:09		16:58	25	09:35 (104)	
22	06:13	20:32 (13)	06:55	07:38	19:14 (12)	15	19:14 (12)	18:55	15	09:11 (316)	17:08		16:59	25	09:35 (104)	
23	06:15	20:32 (13)	06:56	07:39	19:00 (12)	16	19:00 (12)	18:20	16	08:54 (316)	16:59		16:59	25	09:36 (104)	
24	06:16	20:31 (13)	06:57	07:41	19:16 (12)	18	19:16 (12)	18:53	18	09:12 (316)	17:07		16:59	25	09:36 (104)	
25	06:17	20:30 (13)	06:59	07:42	18:59 (12)	20	18:59 (12)	18:22	20	09:13 (316)	17:06		16:59	25	09:36 (104)	
26	06:18	20:30 (13)	07:00	07:44	19:17 (12)	21	19:17 (12)	18:49	21	09:14 (316)	17:06		16:59	25	09:37 (104)	
27	06:19	07:02 (184)	07:02	07:45	18:57 (12)	21	18:57 (12)	18:25	21	08:51 (316)	16:59		16:59	25	09:37 (104)	
28	06:21	20:57 (13)	07:03	07:47	19:18 (12)	23	19:18 (12)	18:48	23	09:14 (316)	17:05	8	09:17 (104)	17:01	25	09:37 (104)
29	06:22	06:58 (184)	07:04	07:48	18:56 (12)	23	18:56 (12)	18:27	23	08:51 (316)	16:58		09:07 (104)	16:58	25	09:37 (104)
30	06:23	20:57 (13)	07:06	07:49	19:18 (12)	24	19:18 (12)	18:46	24	09:15 (316)	17:04	11	09:18 (104)	17:01	25	09:38 (104)
31	06:25	20:56 (13)	07:07	07:50	18:55 (12)	24	18:55 (12)	18:28	24	08:52 (316)	16:58		09:06 (104)	16:58	25	09:38 (104)
	21:40	20:56 (13)	07:08	07:51	19:17 (12)	22	19:17 (12)	18:44	22	09:14 (316)	17:03	15	09:21 (104)	17:02	25	09:38 (104)
	21:41	07:02 (184)	07:09	07:52	18:55 (12)	20	18:55 (12)	18:30	20	08:54 (316)	16:57		09:05 (104)	16:57	25	09:38 (104)
	21:42	20:57 (13)	07:10	07:53	19:17 (12)	22	19:17 (12)	18:42	22	09:14 (316)	17:02	16	09:21 (104)	17:03	25	09:38 (104)
	21:43	06:58 (184)	07:11	07:54	18:55 (12)	20	18:55 (12)	18:31	20	08:56 (316)	16:58		09:05 (104)	16:58	25	09:38 (104)
	21:44	20:57 (13)	07:12	07:55	19:14 (12)	18	19:14 (12)	18:41	18	09:14 (316)	17:02	18	09:23 (104)	17:04	25	09:39 (104)
	21:45	06:57 (184)	07:13	07:56	18:56 (12)	18	18:56 (12)	18:33	18	08:57 (316)	16:58		09:04 (104)	16:58	25	09:39 (104)
	21:46	20:57 (13)	07:14	07:57	19:12 (12)	16	19:12 (12)	18:39	16	09:13 (316)	17:01	20	09:24 (104)	17:04	25	09:39 (104)
	21:47	06:55 (184)	07:15	07:58	18:56 (12)	16	18:56 (12)	18:34	16	08:59 (316)	16:58		09:04 (104)	16:58	25	09:39 (104)
	21:48	20:57 (13)	07:16	07:59	19:12 (12)	14	19:12 (12)	18:37	14	09:13 (316)	17:00	20	09:24 (104)	17:05	24	09:39 (104)
	21:49	06:54 (184)	07:17	08:00	18:36			18:36		09:01 (316)				16:58	25	09:40 (104)
	21:50	20:57 (13)	07:18	08:01	18:35	11	18:35	17:15		09:12 (316)				17:06	25	09:40 (104)
Potential sun hours	486	445		379	336			277						260		
Total, worst case	432	743		203	366			125						757		
Sun reduction	0.75	0.72		0.69	0.52			0.43						0.44		
Oper. time red.	0.98	0.98		0.98	0.98			0.98						0.98		
Wind dir. red.	0.69	0.64		0.64	0.71			0.71						0.71		
Total reduction	0.51	0.46		0.43	0.36			0.30						0.31		
Total, real	218	341		88	134			38						232		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

**20132550- Lindahl Wind Farm**

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 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
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 3/4/2016 9:45 AM/2.9.285

**SHADOW - Calendar**

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: J - Participating**

**Assumptions for shadow calculations**

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

**Operational time**

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1   08:45	09:28 (104)   08:23		07:35	07:58 (158)   07:32	06:34	06:57 (184)   05:55
17:07	21 09:49 (104)   17:50		18:34	13 08:11 (158)   20:21	21:05	54 20:38 (13)   21:45
2   08:45	09:29 (104)   08:21		07:33	07:56 (158)   07:30	06:32	06:55 (184)   05:55
17:08	20 09:49 (104)   17:52		18:35	15 08:11 (158)   20:22	21:06	57 20:38 (13)   21:46
3   08:45	09:30 (104)   08:20	08:44 (316)   07:31		07:54 (158)   07:28	06:31	06:54 (184)   05:54
17:09	20 09:50 (104)   17:53	3 08:47 (316)   18:37		16 08:10 (158)   20:24	21:08	59 20:39 (13)   21:47
4   08:44	09:31 (104)   08:18	08:42 (316)   07:29		07:52 (158)   07:26	06:29	06:52 (184)   05:53
17:10	19 09:50 (104)   17:55	6 08:48 (316)   18:38		18 08:10 (158)   20:25	21:09	61 20:39 (13)   21:47
5   08:44	09:31 (104)   08:17	08:41 (316)   07:27		07:53 (158)   07:24	06:27	06:51 (184)   05:53
17:11	18 09:49 (104)   17:57	9 08:50 (316)   18:40		16 08:09 (158)   20:27	21:10	62 20:39 (13)   21:48
6   08:44	09:33 (104)   08:15	08:39 (316)   07:25		07:54 (158)   07:21	06:26	06:49 (184)   05:52
17:13	16 09:49 (104)   17:58	12 08:51 (316)   18:42		13 08:07 (158)   20:28	21:12	63 20:38 (13)   21:49
7   08:44	09:34 (104)   08:14	08:38 (316)   07:23		07:56 (158)   07:19	06:24	06:48 (184)   05:52
17:14	15 09:49 (104)   18:00	14 08:52 (316)   18:43		9 08:05 (158)   20:30	21:13	63 20:39 (13)   21:50
8   08:43	09:35 (104)   08:12	08:36 (316)   08:21		07:17	06:23	06:46 (184)   05:51
17:15	13 09:48 (104)   18:00	17 08:53 (316)   18:45		20:31	21:15	64 20:38 (13)   21:51
9   08:43	09:37 (104)   08:11	08:34 (316)   08:19	19:18 (12)   07:15		06:21	06:45 (184)   05:51
17:16	11 09:48 (104)   18:02	19 08:53 (316)   19:46	5 19:23 (12)   20:32		21:16	64 20:38 (13)   21:52
10   08:43	09:38 (104)   08:09	08:33 (316)   08:17	19:15 (12)   07:13		06:20	06:45 (184)   05:51
17:17	9 09:47 (104)   18:03	21 08:54 (316)   19:48	10 19:25 (12)   20:34		21:17	61 20:37 (13)   21:52
11   08:42	09:41 (104)   08:08	08:31 (316)   08:15	19:14 (12)   07:11		06:18	06:46 (184)   05:51
17:19	4 09:45 (104)   18:05	22 08:53 (316)   19:49	12 19:26 (12)   20:35		21:19	55 20:36 (13)   21:53
12   08:42	08:06	08:29 (316)   08:13	19:13 (12)   07:09		06:17	06:47 (184)   05:50
17:20	18:06	24 08:53 (316)   19:51	15 19:28 (12)   20:37		21:20	50 20:36 (13)   21:54
13   08:41	08:04	08:30 (316)   08:11	19:12 (12)   07:07		06:15	06:47 (184)   05:50
17:21	18:08	24 08:54 (316)   19:52	17 19:29 (12)   20:38		21:22	42 20:34 (13)   21:54
14   08:41	08:03	08:30 (316)   08:09	19:11 (12)   07:05		06:14	06:48 (184)   05:50
17:23	18:10	23 08:53 (316)   19:54	20 19:31 (12)   20:40		21:23	30 20:34 (13)   21:55
15   08:40	08:01	08:31 (316)   08:07	19:11 (12)   07:03		06:13	06:50 (184)   05:50
17:24	18:11	21 08:52 (316)   19:55	21 19:32 (12)   20:41		21:24	24 20:33 (13)   21:55
16   08:39	07:59	08:31 (316)   08:05	19:11 (12)   07:01		06:11	20:19 (13)   05:50
17:25	18:13	20 08:51 (316)   19:57	21 19:32 (12)   20:43		21:26	12 20:31 (13)   21:56
17   08:38	07:58	08:33 (316)   08:03	19:11 (12)   07:00		06:10	20:21 (13)   05:50
17:27	18:15	17 08:50 (316)   19:58	20 19:31 (12)   20:44		21:27	8 20:29 (13)   21:56
18   08:38	07:56	08:35 (316)   08:01	19:12 (12)   06:58		06:09	05:50
17:28	18:16	14 08:49 (316)   20:00	18 19:30 (12)   20:46		21:28	21:57
19   08:37	07:54	08:37 (316)   07:59	19:13 (12)   06:56		06:08	05:50
17:30	18:18	9 08:46 (316)   20:01	16 19:29 (12)   20:47		21:30	21:57
20   08:36	07:52	07:57	19:14 (12)   06:54		06:07	05:50
17:31	18:19	20:03	13 19:27 (12)   20:49		21:31	21:57
21   08:35	07:50	07:55	19:15 (12)   06:52		06:05	05:50
17:33	18:21	20:04	8 19:23 (12)   20:50		21:32	21:58
22   08:34	07:49	07:53	06:50	07:12 (105)   06:04		05:50
17:34	18:23	20:06	20:52	5 07:17 (105)   21:33		21:58
23   08:33	07:47	07:50	06:48	07:11 (105)   06:03		05:51
17:36	18:24	20:07	20:53	10 07:21 (105)   21:35		21:58
24   08:32	07:45	07:48	06:46	07:09 (105)   06:02		05:51
17:37	18:26	20:09	20:54	14 07:23 (105)   21:36		21:58
25   08:31	07:43	08:06 (158)   07:46	06:45	07:07 (105)   06:01		05:51
17:39	18:27	3 08:09 (158)   20:10	20:56	27 20:31 (13)   21:37		21:58
26   08:30	07:41	08:04 (158)   07:44	06:43	07:05 (105)   06:00		05:52
17:41	18:29	6 08:10 (158)   20:12	20:57	33 20:32 (13)   21:38		21:59
27   08:29	07:39	08:02 (158)   07:42	06:41	07:04 (105)   05:59		05:52
17:42	18:31	9 08:11 (158)   20:13	20:59	39 20:34 (13)   21:39		21:59
28   08:28	07:37	08:00 (158)   07:40	06:39	07:02 (105)   05:58		05:52
17:44	18:32	11 08:11 (158)   20:15	21:00	44 20:35 (13)   21:40		21:59
29   08:26		07:38	06:37	07:00 (105)   05:58		05:53
17:45		20:16	21:02	48 20:36 (13)   21:41		21:58
30   08:25		07:36	06:36	06:59 (184)   05:57		05:53
17:47		20:18	21:03	51 20:38 (13)   21:43		21:58
31   08:24		07:34		05:56		
17:49		20:19		21:44		
Potential sun hours	273	285	368	410	471	481
Total, worst case	166	304	296	271	829	
Sun reduction	0.56	0.50	0.63	0.59	0.67	
Oper. time red.	0.98	0.98	0.98	0.98	0.98	
Wind dir. red.	0.70	0.72	0.66	0.64	0.65	
Total reduction	0.39	0.36	0.41	0.37	0.43	
Total, real	64	109	120	101	357	

Table layout: For each day in each month the following matrix apply

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Idle start wind speed: Cut in wind speed from power curve

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1	05:54	06:26	06:57 (184)	07:09	07:51	18:52 (12)	07:38	08:02 (316)	08:22	09:24 (104)	
	21:58	21:32	53 20:47 (13)	20:38	19:35	16 19:08 (12)	17:34	20 08:22 (316)	17:00	3 09:27 (104)	
2	05:55	06:27	06:56 (184)	07:10	07:52	18:52 (12)	07:39	08:04 (316)	08:24	09:21 (104)	
	21:58	21:31	58 20:47 (13)	20:36	19:33	14 19:06 (12)	17:32	18 08:22 (316)	16:59	9 09:30 (104)	
3	05:55	06:29	06:55 (184)	07:11	07:54	18:53 (12)	07:41	08:06 (316)	08:25	09:20 (104)	
	21:58	21:29	62 20:47 (13)	20:33	19:31	11 19:04 (12)	17:31	16 08:22 (316)	16:59	11 09:31 (104)	
4	05:56	06:30	06:55 (184)	07:13	07:55	18:54 (12)	07:42	08:08 (316)	08:26	09:20 (104)	
	21:57	21:28	63 20:47 (13)	20:31	19:29	8 19:02 (12)	17:29	14 08:22 (316)	16:58	13 09:33 (104)	
5	05:57	06:31	06:57 (184)	07:14	07:57	18:57 (12)	07:44	08:09 (316)	08:27	09:19 (104)	
	21:57	21:26	63 20:48 (13)	20:29	19:27	2 18:59 (12)	17:28	12 08:21 (316)	16:58	15 09:34 (104)	
6	05:57	06:33	06:58 (184)	07:16	07:58	08:34 (158)	07:45	08:11 (316)	08:29	09:19 (104)	
	21:57	21:25	63 20:48 (13)	20:27	19:25	5 08:39 (158)	17:26	9 08:20 (316)	16:58	16 09:35 (104)	
7	05:58	06:34	06:59 (184)	07:17	08:00	08:30 (158)	07:47	08:13 (316)	08:30	09:18 (104)	
	21:56	21:23	62 20:48 (13)	20:25	19:22	11 08:41 (158)	17:25	6 08:19 (316)	16:58	18 09:36 (104)	
8	05:59	06:35	07:01 (184)	07:18	08:01	08:29 (158)	07:49	08:14 (316)	08:31	09:18 (104)	
	21:56	21:22	62 20:49 (13)	20:23	19:20	14 08:43 (158)	17:23	3 08:17 (316)	16:57	19 09:37 (104)	
9	06:00	06:37	07:02 (184)	07:20	08:02	08:27 (158)	07:50	08:32	09:18 (104)		
	21:55	21:20	60 20:48 (13)	20:21	19:18	16 08:43 (158)	17:22	16:57	20 09:38 (104)		
10	06:01	06:38	07:03 (184)	07:21	08:04	08:27 (158)	07:52	08:33	09:18 (104)		
	21:55	21:18	58 20:47 (13)	20:19	19:16	17 08:44 (158)	17:20	16:57	20 09:38 (104)		
11	06:02	06:39	07:04 (184)	07:23	08:05	08:29 (158)	07:53	08:34	09:19 (104)		
	21:54	21:17	57 20:47 (13)	20:17	19:14	16 08:45 (158)	17:19	16:57	21 09:40 (104)		
12	06:03	06:41	07:06 (184)	07:24	08:07	08:30 (158)	07:55	08:35	09:19 (104)		
	21:53	21:15	55 20:47 (13)	20:15	19:12	14 08:44 (158)	17:18	16:57	21 09:40 (104)		
13	06:04	06:42	07:08 (105)	07:25	08:08	08:32 (158)	07:56	08:36	09:19 (104)		
	21:53	21:13	51 20:46 (13)	20:13	19:10	12 08:44 (158)	17:16	16:57	21 09:40 (104)		
14	06:05	06:44	07:08 (105)	07:27	08:10	08:33 (158)	07:58	08:37	09:19 (104)		
	21:52	21:12	47 20:44 (13)	20:11	19:08	10 08:43 (158)	17:15	16:57	22 09:41 (104)		
15	06:06	06:45	07:10 (105)	07:28	08:11	08:35 (158)	08:00	08:37	09:20 (104)		
	21:51	21:10	43 20:43 (13)	20:09	19:06	8 08:43 (158)	17:14	16:57	22 09:42 (104)		
16	06:07	06:46	07:11 (105)	07:30	08:13	08:36 (158)	08:01	08:38	09:20 (104)		
	21:50	21:08	38 20:41 (13)	20:06	19:04	5 08:41 (158)	17:13	16:57	23 09:43 (104)		
17	06:08	06:48	07:12 (105)	07:31	08:14	08:38 (158)	08:03	08:39	09:21 (104)		
	21:50	21:06	33 20:39 (13)	20:04	19:03	1 08:39 (158)	17:12	16:58	23 09:44 (104)		
18	06:09	06:49	07:14 (105)	07:32	08:16	08:04	08:04	08:40	09:21 (104)		
	21:49	21:04	26 20:38 (13)	20:02	19:01	17:10	16:58	22 09:43 (104)			
19	06:10	06:50	07:15 (105)	07:34	08:17	08:06	08:06	08:40	09:22 (104)		
	21:48	21:03	13 07:28 (105)	20:00	18:57	17:09	16:58	22 09:44 (104)			
20	06:11	06:52	07:16 (105)	07:35	08:19	08:07	08:07	08:41	09:21 (104)		
	21:47	21:01	9 07:25 (105)	19:58	18:55	17:08	16:59	23 09:44 (104)			
21	06:12	06:53	07:37	07:37	08:20	08:09	08:09	08:41	09:22 (104)		
	21:46	20:59	19:56	18:53	17:07	16:59	23 09:45 (104)				
22	06:13	06:55	07:38	19:02 (12)	08:22	08:10	08:10	08:42	09:22 (104)		
	21:45	20:57	19:54	6 19:08 (12)	18:51	17:06	17:00	23 09:45 (104)			
23	06:15	06:56	07:39	18:58 (12)	08:24	09:07 (316)	08:11	08:42	09:23 (104)		
	21:44	20:55	19:52	12 19:10 (12)	18:49	10 09:17 (316)	17:06	17:00	23 09:46 (104)		
24	06:16	06:57	07:41	18:57 (12)	08:25	09:04 (316)	08:13	08:43	09:23 (104)		
	21:42	20:53	19:50	15 19:12 (12)	18:48	15 09:19 (316)	17:05	17:01	23 09:46 (104)		
25	06:17	06:59	07:42	18:55 (12)	08:27	09:02 (316)	08:14	08:43	09:25 (104)		
	21:41	20:51	19:47	17 19:12 (12)	18:46	18 09:20 (316)	17:04	17:01	22 09:47 (104)		
26	06:18	20:34 (13)	07:00	07:44	18:53 (12)	08:28	09:01 (316)	08:16	08:44	09:25 (104)	
	21:40	1 20:35 (13)	20:49	19:45	19 19:12 (12)	18:44	20 09:21 (316)	17:03	17:02	23 09:48 (104)	
27	06:19	20:31 (13)	07:02	07:45	18:53 (12)	08:30	09:00 (316)	08:17	08:44	09:25 (104)	
	21:39	10 20:41 (13)	20:47	19:43	20 19:13 (12)	18:42	22 09:22 (316)	17:02	17:03	23 09:48 (104)	
28	06:21	07:03 (184)	07:03	07:47	18:52 (12)	08:31	09:00 (316)	08:18	08:44	09:26 (104)	
	21:38	18 20:42 (13)	20:46	19:41	21 19:13 (12)	18:41	23 09:23 (316)	17:02	17:04	22 09:48 (104)	
29	06:22	07:00 (184)	07:04	07:48	18:52 (12)	08:33	08:59 (316)	08:20	08:44	09:26 (104)	
	21:36	26 20:44 (13)	20:44	19:39	20 19:12 (12)	18:39	23 09:22 (316)	17:01	17:04	22 09:48 (104)	
30	06:23	06:58 (184)	07:06	07:49	18:51 (12)	08:34	08:59 (316)	08:21	08:44	09:27 (104)	
	21:35	33 20:44 (13)	20:42	19:37	19 19:10 (12)	18:37	24 09:23 (316)	17:00	17:05	21 09:48 (104)	
31	06:25	06:57 (184)	07:07	07:50	18:36	09:01 (316)	08:36	08:45	09:27 (104)		
	21:34	45 20:45 (13)	20:40	18:35	22 09:23 (316)	17:06	22 09:49 (104)				
Potential sun hours	486	445	379	336	277	260					
Total, worst case	133	976	149	357	98	611					
Sun reduction	0.75	0.72	0.69	0.52	0.43	0.44					
Oper. time red.	0.98	0.98	0.98	0.98	0.98	0.98					
Wind dir. red.	0.66	0.65	0.63	0.70	0.72	0.70					
Total reduction	0.49	0.46	0.43	0.36	0.31	0.30					
Total, real	65	450	64	129	30	186					

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

20132550- Lindahl Wind Farm

TradeWind Energy, Inc.
Kevin Walter
Southlake Technology Park, 16105 W 113th St, Ste 1
Lenexa, KS, 66219

Description:

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3/4/2016 9:45 AM/2.9.285

SHADOW - Calendar

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab Shadow receptor: K - Participating

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Table with 12 columns (Jan-Dec) and 2 rows of sunshine probability values.

Operational time

Table with 13 columns (N, NNE, ENE, E, ESE, SSE, S, SSW, WSW, W, WNW, NNW, Sum) and 2 rows of operational time values.

Idle start wind speed: Cut in wind speed from power curve

Main shadow calculation table with columns for months (January-June) and rows for each day of the month, including potential sun hours and reduction percentages.

Table layout: For each day in each month the following matrix apply

Matrix defining table layout: Day in month, Sun rise (hh:mm), Sun set (hh:mm), Minutes with flicker, First time (hh:mm) with flicker, Last time (hh:mm) with flicker, (WTG causing flicker first time), (WTG causing flicker last time)

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:

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3/4/2016 9:45 AM/2.9.285

**SHADOW - Calendar**

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: K - Participating**

**Assumptions for shadow calculations**

Sunshine probability S (Average daily sunshine hours) [BISMARCK]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4.92 5.13 7.45 8.03 10.20 11.21 11.69 10.35 8.68 5.69 4.02 3.69

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
660 333 352 411 608 961 789 574 695 904 1,116 1,191 8,594  
Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December		
1	05:54	20:48 (26)	06:26	07:08	07:51	07:37	08:22	
	21:58	25 21:13 (26)	21:32	20:37	19:35	17:34	17:00	
2	05:55	20:49 (26)	06:27	07:10	07:52	07:39	08:24	
	21:58	25 21:14 (26)	21:31	20:35	19:33	17:32	16:59	
3	05:55	20:48 (26)	06:28	07:11	07:54	07:41	08:25	
	21:58	26 21:14 (26)	21:29	20:33	19:31	17:30	16:59	
4	05:56	20:49 (26)	06:30	07:13	07:55	07:42	08:26	
	21:57	25 21:14 (26)	21:28	20:31	19:29	17:29	16:58	
5	05:57	20:49 (26)	06:31	07:14	07:56	07:44	08:27	
	21:57	26 21:15 (26)	21:26	20:29	19:26	17:27	16:58	
6	05:57	20:48 (26)	06:32	07:15	07:58	07:45	08:28	
	21:57	26 21:14 (26)	21:25	20:27	19:24	17:26	16:58	
7	05:58	20:49 (26)	06:34	07:17	07:59	18:43 (317)	07:47	08:30
	21:56	26 21:15 (26)	21:23	20:25	19:22	6 18:49 (317)	17:24	16:57
8	05:59	20:49 (26)	06:35	07:18	08:01	18:41 (317)	07:48	08:31
	21:56	27 21:16 (26)	21:21	20:23	19:20	10 18:51 (317)	17:23	16:57
9	06:00	20:49 (26)	06:36	07:20	08:02	18:38 (317)	07:50	08:32
	21:55	27 21:16 (26)	21:20	20:21	19:18	13 18:51 (317)	17:22	16:57
10	06:01	20:49 (26)	06:38	07:21	08:04	18:38 (317)	07:52	08:33
	21:55	27 21:16 (26)	21:18	20:19	19:16	11 18:49 (317)	17:20	16:57
11	06:02	20:50 (26)	06:39	07:22	08:05	18:37 (317)	07:53	08:34
	21:54	27 21:17 (26)	21:17	20:17	19:14	9 18:46 (317)	17:19	16:57
12	06:02	20:49 (26)	06:41	07:24	08:07	18:37 (317)	07:55	08:35
	21:53	27 21:16 (26)	21:15	20:15	19:12	8 18:45 (317)	17:17	16:57
13	06:03	20:49 (26)	06:42	07:25	08:08	18:36 (317)	07:56	08:36
	21:53	27 21:16 (26)	21:13	20:13	19:10	6 18:42 (317)	17:16	16:57
14	06:04	20:49 (26)	06:43	07:27	08:10	18:37 (317)	07:58	08:36
	21:52	27 21:16 (26)	21:11	20:11	19:08	4 18:41 (317)	17:15	16:57
15	06:05	20:49 (26)	06:45	07:28	08:11	18:38 (317)	07:59	08:37
	21:51	27 21:16 (26)	21:10	20:08	19:06	1 18:39 (317)	17:14	16:57
16	06:07	20:50 (26)	06:46	07:29	08:13	08:01	08:38	
	21:50	27 21:17 (26)	21:08	20:06	19:04	17:13	16:57	
17	06:08	20:50 (26)	06:48	07:31	08:14	08:02	08:39	
	21:49	26 21:16 (26)	21:06	20:04	19:02	17:11	16:57	
18	06:09	20:50 (26)	06:49	07:32	08:16	08:04	08:39	
	21:48	26 21:16 (26)	21:04	20:02	19:00	17:10	16:58	
19	06:10	20:50 (26)	06:50	20:18 (24)	07:34	08:17	08:05	08:40
	21:48	26 21:16 (26)	21:03	8 20:26 (24)	20:00	18:57	17:09	16:58
20	06:11	20:51 (26)	06:52	20:15 (24)	07:35	08:19	08:07	08:41
	21:47	25 21:16 (26)	21:01	12 20:27 (24)	19:58	18:55	17:08	16:59
21	06:12	20:51 (26)	06:53	20:14 (24)	07:36	08:20	08:08	08:41
	21:46	25 21:16 (26)	20:59	14 20:28 (24)	19:56	18:53	17:07	16:59
22	06:13	20:52 (26)	06:55	20:13 (24)	07:38	08:22	08:10	08:42
	21:44	24 21:16 (26)	20:57	16 20:29 (24)	19:54	18:51	17:06	16:59
23	06:14	20:53 (26)	06:56	20:12 (24)	07:39	08:23	08:11	08:42
	21:43	21 21:14 (26)	20:55	16 20:28 (24)	19:52	18:49	17:05	17:00
24	06:16	20:53 (26)	06:57	20:11 (24)	07:41	08:25	08:13	08:43
	21:42	20 21:13 (26)	20:53	15 20:26 (24)	19:49	18:47	17:04	17:01
25	06:17	20:54 (26)	06:59	20:12 (24)	07:42	08:27	08:14	08:43
	21:41	18 21:12 (26)	20:51	13 20:25 (24)	19:47	18:46	17:04	17:01
26	06:18	20:55 (26)	07:00	20:11 (24)	07:44	08:28	08:16	08:43
	21:40	16 21:11 (26)	20:49	11 20:22 (24)	19:45	18:44	17:03	17:02
27	06:19	20:56 (26)	07:02	20:11 (24)	07:45	08:30	08:17	08:44
	21:39	13 21:09 (26)	20:47	9 20:20 (24)	19:43	18:42	17:02	17:03
28	06:21	20:58 (26)	07:03	20:13 (24)	07:46	08:31	08:18	08:44
	21:37	11 21:09 (26)	20:45	6 20:19 (24)	19:41	18:40	17:01	17:03
29	06:22	21:00 (26)	07:04	20:13 (24)	07:48	08:33	08:20	08:44
	21:36	8 21:08 (26)	20:43	4 20:17 (24)	19:39	18:39	17:01	17:04
30	06:23	07:06			07:49	08:34	08:21	08:44
	21:35	20:41			19:37	18:37	17:00	17:05
31	06:24	07:07				08:36	08:22	08:44
	21:33	20:39				18:35	17:06	17:06
Potential sun hours	486	445		379	336		277	260
Total, worst case	681		124			68		
Sun reduction	0.75		0.72			0.52		
Oper. time red.	0.98		0.98			0.98		
Wind dir. red.	0.72		0.69			0.61		
Total reduction	0.52		0.49			0.31		
Total, real	357		61			21		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
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Description:

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 3/4/2016 9:45 AM/2.9.285

**SHADOW - Calendar**

**Calculation:** A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor:** L - Participating

**Assumptions for shadow calculations**

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

**Operational time**

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1   08:45	09:16 (13)   08:23		07:35	08:03 (15)   07:32	06:34	05:55
17:07	28 09:44 (13)   17:50		18:34	25 08:28 (15)   20:21	21:05	21:45
2   08:45	09:16 (13)   08:21		07:33	08:03 (15)   07:30	06:32	05:55
17:08	29 09:45 (13)   17:52		18:35	25 08:28 (15)   20:22	21:06	21:46
3   08:45	09:17 (13)   08:20		07:31	08:03 (15)   07:28	06:31	05:54
17:09	29 09:46 (13)   17:53		18:37	24 08:27 (15)   20:24	21:08	21:47
4   08:45	09:17 (13)   08:18		07:30	08:03 (15)   07:26	06:29	05:53
17:10	30 09:47 (13)   17:55		18:39	23 08:26 (15)   20:25	21:09	21:48
5   08:44	09:18 (13)   08:17		07:28	08:04 (15)   07:24	06:27	05:53
17:11	29 09:47 (13)   17:57		18:40	21 08:25 (15)   20:27	21:11	21:48
6   08:44	09:18 (13)   08:16		07:26	08:05 (15)   07:22	06:26	05:52
17:13	29 09:47 (13)   17:58		18:42	19 08:24 (15)   20:28	21:12	21:49
7   08:44	09:18 (13)   08:14		07:24	08:06 (15)   07:20	06:24	05:52
17:14	30 09:48 (13)   18:00		18:43	16 08:22 (15)   20:30	21:13	21:50
8   08:44	09:18 (13)   08:13		08:22	09:08 (15)   07:17	06:23	05:52
17:15	30 09:48 (13)   18:00		18:45	12 09:20 (15)   20:31	21:15	21:51
9   08:43	09:19 (13)   08:11		08:19		06:21	05:51
17:16	30 09:49 (13)   18:02		19:46		20:33	21:16
10   08:43	09:19 (13)   08:09		08:17		07:13	06:20
17:17	30 09:49 (13)   18:03		19:48		20:34	21:18
11   08:42	09:19 (13)   08:08		08:15		07:11	06:18
17:19	31 09:50 (13)   18:05		19:49		20:36	21:19
12   08:42	09:19 (13)   08:06		08:13		07:09	06:17
17:20	31 09:50 (13)   18:07		19:51		20:37	21:20
13   08:41	09:20 (13)   08:05		08:11		07:07	06:15
17:21	31 09:51 (13)   18:08		19:52		20:38	21:22
14   08:41	09:21 (13)   08:03		08:09		07:05	06:14
17:23	31 09:52 (13)   18:10		19:54		20:40	21:23
15   08:40	09:21 (13)   08:01		08:07		07:04	06:13
17:24	31 09:52 (13)   18:11		19:55		20:41	21:24
16   08:39	09:21 (13)   07:59		08:05		07:02	06:11
17:26	31 09:52 (13)   18:13		19:57		20:43	21:26
17   08:39	09:21 (13)   07:58		08:03		07:00	06:10
17:27	31 09:52 (13)   18:15		19:58		20:44	21:27
18   08:38	09:22 (13)   07:56		08:01		06:58	06:09
17:28	30 09:52 (13)   18:16		20:00		20:46	21:28
19   08:37	09:22 (13)   07:54		07:59		06:56	06:08
17:30	30 09:52 (13)   18:18		20:01		20:47	21:30
20   08:36	09:24 (13)   07:52		07:57		06:54	06:07
17:31	29 09:53 (13)   18:19		20:03		20:49	21:31
21   08:35	09:24 (13)   07:51		07:55		06:52	06:05
17:33	27 09:51 (13)   18:21		20:04		20:50	21:32
22   08:34	09:25 (13)   07:49		07:53		06:50	06:04
17:34	26 09:51 (13)   18:23		20:06		20:52	21:33
23   08:33	09:26 (13)   07:47		07:51		06:48	06:03
17:36	25 09:51 (13)   18:24		20:07		20:53	21:35
24   08:32	09:27 (13)   07:45		07:48		06:46	06:02
17:37	24 09:51 (13)   18:26		20:09		20:55	21:36
25   08:31	09:28 (13)   07:43		07:46		06:45	06:01
17:39	22 09:50 (13)   18:27		20:10		20:56	21:37
26   08:30	09:30 (13)   07:41		07:44		06:43	06:00
17:41	19 09:49 (13)   18:29		20:12		20:58	21:38
27   08:29	09:32 (13)   07:39		07:42		06:41	05:59
17:42	16 09:48 (13)   18:31		20:13		20:59	21:39
28   08:28	09:33 (13)   07:37		07:40		06:39	05:58
17:44	13 09:46 (13)   18:32		20:15		21:00	21:40
29   08:26	09:37 (13)		07:38		06:37	05:58
17:45	6 09:43 (13)		20:16		21:02	21:42
30   08:25			07:36		06:36	05:57
17:47			20:18		21:03	21:43
31   08:24			07:34			05:56
17:49			20:19			21:44
Potential sun hours	273	284	368	410	471	481
Total, worst case	778	144	165	442	277	
Sun reduction	0.56	0.50	0.63	0.67	0.70	
Oper. time red.	0.98	0.98	0.98	0.98	0.98	
Wind dir. red.	0.71	0.70	0.70	0.60	0.59	
Total reduction	0.39	0.35	0.44	0.40	0.41	
Total, real	306	51	72	177	114	

**Table layout: For each day in each month the following matrix apply**

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
 Lenexa, KS, 66219

Description:

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 Calculated:  
 3/4/2016 9:45 AM/2.9.285

**SHADOW - Calendar**

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: L - Participating**

**Assumptions for shadow calculations**

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

**Operational time**

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:54 21:58	06:48 (14) 06:57 (14)	06:26 21:32	06:52 (14) 07:03 (14)	07:09 20:38	07:51 19:35
2	05:55 21:58	06:47 (14) 06:58 (14)	06:27 21:31	06:53 (14) 07:00 (14)	07:10 20:36	07:52 19:33
3	05:55 21:58	06:47 (14) 06:59 (14)	06:29 21:29	07:12 20:34	07:54 19:31	07:41 17:31
4	05:56 21:58	06:46 (14) 06:59 (14)	06:30 21:28	07:13 20:32	07:55 19:29	07:42 17:29
5	05:57 21:57	06:46 (14) 07:00 (14)	06:31 21:26	07:14 20:30	07:57 19:27	07:44 17:28
6	05:58 21:57	06:46 (14) 07:01 (14)	06:33 21:25	07:16 20:27	07:58 19:25	07:46 17:26
7	05:58 21:56	06:45 (14) 07:01 (14)	06:34 21:23	07:17 20:25	08:00 19:23	07:47 17:25
8	05:59 21:56	06:45 (14) 07:02 (14)	06:35 21:22	07:19 20:23	08:01 19:21	07:49 17:23
9	06:00 21:55	06:45 (14) 07:03 (14)	06:37 21:20	08:03 20:21	08:03 19:18	07:50 17:22
10	06:01 21:55	06:45 (14) 07:04 (14)	06:38 21:18	08:04 20:19	08:04 19:16	07:52 17:20
11	06:02 21:54	06:45 (14) 07:05 (14)	06:39 21:17	08:06 20:17	08:06 19:14	07:53 17:19
12	06:03 21:54	06:44 (14) 07:05 (14)	06:41 21:15	08:07 20:15	08:07 19:12	07:55 17:18
13	06:04 21:53	06:44 (14) 07:06 (14)	06:42 21:13	08:08 20:13	08:08 19:10	07:57 17:16
14	06:05 21:52	06:43 (14) 07:05 (14)	06:44 21:12	08:10 20:11	08:10 19:08	07:58 17:15
15	06:06 21:51	06:43 (14) 07:06 (14)	06:45 21:10	08:11 20:09	08:11 19:07	08:00 17:14
16	06:07 21:51	06:43 (14) 07:06 (14)	06:46 21:08	08:13 20:07	08:13 19:05	08:01 17:13
17	06:08 21:50	06:43 (14) 07:06 (14)	06:48 21:06	08:14 20:04	08:14 19:03	08:03 17:12
18	06:09 21:49	06:43 (14) 07:07 (14)	06:49 21:05	08:16 20:02	08:16 19:01	08:04 17:11
19	06:10 21:48	06:44 (14) 07:08 (14)	06:51 21:03	08:18 20:00	08:18 18:59	08:06 17:09
20	06:11 21:47	06:43 (14) 07:08 (14)	06:52 21:01	08:19 19:58	08:19 18:55	08:07 17:08
21	06:12 21:46	06:43 (14) 07:08 (14)	06:53 20:59	08:21 19:56	08:21 18:53	08:09 17:07
22	06:13 21:45	06:43 (14) 07:08 (14)	06:55 20:57	08:22 19:54	08:22 18:51	08:10 17:06
23	06:15 21:44	06:43 (14) 07:08 (14)	06:56 20:55	08:24 19:52	08:24 18:49	08:12 17:06
24	06:16 21:43	06:43 (14) 07:08 (14)	06:58 20:53	08:25 19:50	08:25 18:48	08:13 17:05
25	06:17 21:41	06:44 (14) 07:07 (14)	06:59 20:51	08:27 19:48	08:27 18:46	08:14 17:04
26	06:18 21:40	06:44 (14) 07:07 (14)	07:00 20:50	08:28 19:45	08:28 18:44	08:16 17:03
27	06:20 21:39	06:46 (14) 07:07 (14)	07:02 20:48	08:30 19:43	08:30 18:42	08:17 17:02
28	06:21 21:38	06:47 (14) 07:06 (14)	07:03 20:46	08:31 19:41	08:31 18:41	08:19 17:02
29	06:22 21:36	06:48 (14) 07:06 (14)	07:05 20:44	08:33 19:39	08:33 18:39	08:20 17:01
30	06:23 21:35	06:49 (14) 07:04 (14)	07:06 20:42	08:35 19:37	08:35 18:37	08:21 17:00
31	06:25 21:34	06:50 (14) 07:03 (14)	07:07 20:40	08:36 19:36	08:36 18:36	08:22 17:00
Potential sun hours	486	445	379	336	277	260
Total, worst case	603	18	313	453	859	
Sun reduction	0.75	0.72	0.52	0.43	0.44	
Oper. time red.	0.98	0.98	0.98	0.98	0.98	
Wind dir. red.	0.60	0.60	0.70	0.71	0.71	
Total reduction	0.44	0.43	0.37	0.31	0.31	
Total, real	268	8	114	139	266	

**Table layout: For each day in each month the following matrix apply**

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
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Project: 20132550- Lindahl Wind Farm

TradeWind Energy, Inc.
Kevin Walter
Southlake Technology Park, 16105 W 113th St, Ste 1
Lenexa, KS, 66219

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SHADOW - Calendar

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab Shadow receptor: M - Participating

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [BISMARCK]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4.92 5.13 7.45 8.03 10.20 11.21 11.69 10.35 8.68 5.69 4.02 3.69

Operational time
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
660 333 352 411 608 961 789 574 695 904 1,116 1,191 8,594
Idle start wind speed: Cut in wind speed from power curve

Table with 12 columns for months (January to December) and multiple rows for each day (1-31) showing shadow data like start/end times, sun hours, and reduction percentages.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)

Project:  
**20132550- Lindahl Wind Farm**

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 3/4/2016 9:45 AM/2.9.285

**SHADOW - Calendar**

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: O - Participating**

**Assumptions for shadow calculations**

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

**Operational time**

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June			
1	08:45	08:23	08:56 (20)	07:35	07:58 (22)	07:32	06:34	06:57 (98)	05:55
	17:07	17:50	20 09:16 (20)	18:34	16 08:14 (22)	20:21	21:05	11 07:08 (98)	21:45
2	08:45	08:21	08:56 (20)	07:33	07:56 (22)	07:30	06:32	06:55 (98)	05:55
	17:08	17:52	19 09:15 (20)	18:35	18 08:14 (22)	20:22	21:06	13 07:08 (98)	21:46
3	08:45	08:20	08:58 (20)	07:32	07:57 (22)	07:28	06:31	06:54 (98)	05:54
	17:09	17:53	17 09:15 (20)	18:37	16 08:13 (22)	20:24	21:08	15 07:09 (98)	21:47
4	08:45	08:19	08:58 (20)	07:30	07:58 (22)	07:26	06:29	06:52 (98)	05:53
	17:10	17:55	15 09:13 (20)	18:39	13 08:11 (22)	20:25	21:09	16 07:08 (98)	21:48
5	08:44	08:17	09:00 (20)	07:28	07:59 (22)	07:24	06:27	06:51 (98)	05:53
	17:11	17:57	12 09:12 (20)	18:40	10 08:09 (22)	20:27	21:11	18 07:09 (98)	21:49
6	08:44	08:16	09:02 (20)	07:26		07:22	06:26	06:49 (98)	05:52
	17:13	17:58	8 09:10 (20)	18:42		20:28	21:12	19 07:08 (98)	21:49
7	08:44	08:14		07:24		07:19	06:24	06:48 (98)	05:52
	17:14	18:00		18:43		20:30	21:13	21 07:09 (98)	21:50
8	08:44	08:13		08:22		07:17	06:23	06:46 (98)	05:51
	17:15	18:00		18:45		20:31	21:15	22 07:08 (98)	21:51
9	08:43	08:11		08:20		07:15	06:21	06:47 (98)	05:51
	17:16	18:02		19:46		20:33	21:16	21 07:08 (98)	21:52
10	08:43	08:09		08:17		07:13	06:20	06:47 (98)	05:51
	17:17	18:03		19:48		20:34	21:18	19 07:06 (98)	21:53
11	08:42	08:08		08:15		07:11	06:18	06:48 (98)	05:50
	17:19	18:05		19:49		20:36	21:19	18 07:06 (98)	21:53
12	08:42	08:06		08:13		07:09	06:17	06:49 (98)	05:50
	17:20	18:06		19:51		20:37	21:20	17 07:06 (98)	21:54
13	08:41	08:05		08:11		07:07	06:15	06:49 (98)	05:50
	17:21	18:08		19:52		20:38	21:22	15 07:04 (98)	21:55
14	08:41	08:03		08:09		07:05	06:14	06:51 (98)	05:50
	17:23	18:10		19:54		20:40	21:23	12 07:03 (98)	21:55
15	08:40	08:01		08:07		07:03	06:13	06:53 (98)	05:50
	17:24	18:11		19:55		20:41	21:25	8 07:01 (98)	21:56
16	08:39	07:59		08:05		07:02	06:11	06:36 (99)	05:50
	17:25	18:13		19:57		20:43	21:26	1 06:37 (99)	21:56
17	08:39	07:58		08:03		07:00	06:10	06:35 (99)	05:50
	17:27	18:15		19:58		20:44	21:27	3 06:38 (99)	21:57
18	08:38	07:56		08:01		06:58	06:09	06:33 (99)	05:50
	17:28	18:16		20:00		20:46	21:28	4 06:37 (99)	21:57
19	08:37	09:03 (20)	07:54	07:59		06:56	06:08	06:32 (99)	05:50
	17:30	4 09:07 (20)	18:18	20:01		20:47	21:30	6 06:38 (99)	21:57
20	08:36	09:02 (20)	07:52	07:57		06:54	06:06	06:31 (99)	05:50
	17:31	7 09:09 (20)	18:19	20:03		20:49	21:31	7 06:38 (99)	21:58
21	08:35	09:01 (20)	07:51	07:55		06:52	06:05	06:30 (99)	05:50
	17:33	9 09:10 (20)	18:21	20:04		20:50	21:32	8 06:38 (99)	21:58
22	08:34	09:00 (20)	07:49	07:53		06:50	06:04	06:29 (99)	05:50
	17:34	12 09:12 (20)	18:23	20:06		20:52	21:34	9 06:38 (99)	21:58
23	08:33	08:58 (20)	07:47	07:51		06:48	06:03	06:28 (99)	05:51
	17:36	14 09:12 (20)	18:24	1 08:11 (22)	20:07	20:53	21:35	10 06:38 (99)	21:58
24	08:32	08:57 (20)	07:45	08:08 (22)	07:48	06:46	06:02	06:27 (99)	05:51
	17:37	16 09:13 (20)	18:26	5 08:13 (22)	20:09	20:55	21:36	11 06:38 (99)	21:59
25	08:31	08:56 (20)	07:43	08:06 (22)	07:46	06:45	06:01	06:26 (99)	05:51
	17:39	18 09:14 (20)	18:27	8 08:14 (22)	20:10	20:56	21:37	12 06:38 (99)	21:59
26	08:30	08:55 (20)	07:41	08:04 (22)	07:44	06:43	06:00	06:26 (99)	05:52
	17:41	20 09:15 (20)	18:29	10 08:14 (22)	20:12	20:58	21:38	13 06:39 (99)	21:59
27	08:29	08:55 (20)	07:39	08:02 (22)	07:42	06:41	05:59	06:25 (99)	05:52
	17:42	21 09:16 (20)	18:31	12 08:14 (22)	20:13	20:59	21:39	13 06:38 (99)	21:59
28	08:28	08:54 (20)	07:37	08:00 (22)	07:40	06:39	05:58	06:24 (99)	05:52
	17:44	21 09:15 (20)	18:32	14 08:14 (22)	20:15	21:00	3 07:05 (98)	13 06:37 (99)	21:59
29	08:27	08:55 (20)		07:38		06:37	07:00 (98)	05:58	06:24 (99)
	17:45	21 09:16 (20)		20:16		21:02	6 07:06 (98)	13 06:37 (99)	21:59
30	08:25	08:55 (20)		07:36		06:36	06:59 (98)	05:57	06:25 (99)
	17:47	21 09:16 (20)		20:18		21:03	8 07:07 (98)	11 06:36 (99)	21:59
31	08:24	08:55 (20)		07:34		07:34	05:56	06:26 (99)	
	17:48	21 09:16 (20)		20:19		21:44	10 06:36 (99)		
Potential sun hours	273	284	368	410	472	482			
Total, worst case	205	141	73	17	389	13			
Sun reduction	0.56	0.50	0.63	0.59	0.67	0.70			
Oper. time red.	0.98	0.98	0.98	0.98	0.98	0.98			
Wind dir. red.	0.72	0.71	0.70	0.61	0.60	0.59			
Total reduction	0.40	0.36	0.43	0.35	0.40	0.41			
Total, real	82	50	32	6	156	5			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker
			(WTG causing flicker last time)

**Project:**  
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**SHADOW - Calendar**

**Calculation:** A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor:** O - Participating

**Assumptions for shadow calculations**

Sunshine probability S (Average daily sunshine hours) [BISMARCK]  
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 4.92 5.13 7.45 8.03 10.20 11.21 11.69 10.35 8.68 5.69 4.02 3.69

**Operational time**  
 N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 660 333 352 411 608 961 789 574 695 904 1,116 1,191 8,594  
 Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:54	06:26	06:59 (98)	07:09	07:51	08:23
	21:58	21:32	17 07:16 (98)	20:38	19:35	17:00
2	05:55	06:27	06:58 (98)	07:10	07:52	08:24
	21:58	21:31	19 07:17 (98)	20:36	19:33	16:59
3	05:55	06:29	06:57 (98)	07:11	07:54	08:25
	21:58	21:29	20 07:17 (98)	20:34	19:31	16:59
4	05:56	06:30	06:56 (98)	07:13	07:55	08:26
	21:58	21:28	21 07:17 (98)	20:32	19:29	16:58
5	05:57	06:31	06:57 (98)	07:14	07:57	08:28
	21:57	21:26	21 07:18 (98)	20:30	19:27	16:58
6	05:57	06:33	06:58 (98)	07:16	07:58	08:29
	21:57	21:25	20 07:18 (98)	20:27	19:25	16:58
7	05:58	06:34	06:59 (98)	07:17	08:00	08:30
	21:56	21:23	19 07:18 (98)	20:25	19:23	16:57
8	05:59	06:35	07:01 (98)	07:18	08:01	08:31
	21:56	21:22	17 07:18 (98)	20:23	19:21	16:57
9	06:00	06:37	07:02 (98)	07:20	08:03	08:32
	21:55	21:20	16 07:18 (98)	20:21	19:18	16:57
10	06:01	06:37 (99)	07:03 (98)	07:21	08:04	08:33
	21:55	3 06:40 (99)	14 07:17 (98)	20:19	19:16	16:57
11	06:02	06:36 (99)	07:04 (98)	07:23	08:06	08:34
	21:54	7 06:43 (99)	12 07:16 (98)	20:17	19:14	16:57
12	06:03	06:35 (99)	07:06 (98)	07:24	08:07	08:35
	21:54	9 06:44 (99)	10 07:16 (98)	20:15	19:12	16:57
13	06:04	06:33 (99)	07:07 (98)	07:25	08:09	08:36
	21:53	11 06:44 (99)	8 07:15 (98)	20:13	19:10	16:57
14	06:05	06:33 (99)	07:08 (98)	07:27	08:10	08:37
	21:52	12 06:45 (99)	5 07:13 (98)	20:11	19:08	16:57
15	06:06	06:32 (99)	07:10 (98)	07:28	08:12	08:38
	21:51	14 06:46 (99)	2 07:12 (98)	20:09	19:06	16:57
16	06:07	06:33 (99)	07:30	08:13	08:36 (22)	08:38
	21:51	13 06:46 (99)	20:07	19:05	9 08:45 (22)	17:13
17	06:08	06:34 (99)	07:31	08:15	08:38 (22)	08:39
	21:50	13 06:47 (99)	21:06	20:04	7 08:45 (22)	17:12
18	06:09	06:35 (99)	07:32	08:16	08:40 (22)	08:40
	21:49	12 06:47 (99)	21:05	20:02	4 08:44 (22)	17:10
19	06:10	06:36 (99)	06:50	07:34	08:18	08:06
	21:48	12 06:48 (99)	21:03	20:00	18:57	17:09
20	06:11	06:38 (99)	06:52	07:35	08:19	08:07
	21:47	11 06:49 (99)	21:01	19:58	18:55	17:08
21	06:12	06:39 (99)	06:53	07:37	08:21	08:09
	21:46	10 06:49 (99)	20:59	19:56	18:53	17:07
22	06:13	06:40 (99)	06:55	07:38	08:22	08:10
	21:45	9 06:49 (99)	20:57	19:54	18:51	17:06
23	06:15	06:41 (99)	06:56	07:40	08:24	08:12
	21:44	8 06:49 (99)	20:55	19:52	18:49	17:05
24	06:16	06:42 (99)	06:57	07:41	08:25	08:13
	21:43	6 06:48 (99)	20:53	19:50	18:48	17:05
25	06:17	06:43 (99)	06:59	07:42	08:27	08:15
	21:41	5 06:48 (99)	20:51	19:48	18:46	17:04
26	06:18	06:44 (99)	07:00	07:44	08:28	08:16
	21:40	4 06:48 (99)	20:50	19:45	18:44	17:03
27	06:19	06:46 (99)	07:02	07:45	08:30	08:17
	21:39	2 06:48 (99)	20:48	19:43	18:42	17:02
28	06:21	07:05 (98)	07:03	07:47	08:31	08:19
	21:38	5 07:10 (98)	20:46	19:41	18:41	17:02
29	06:22	07:02 (98)	07:04	07:48	08:33	08:20
	21:36	10 07:12 (98)	20:44	19:39	18:39	17:01
30	06:23	07:00 (98)	07:06	07:49	08:35	08:21
	21:35	14 07:14 (98)	20:42	19:37	18:37	17:00
31	06:25	06:59 (98)	07:07	07:51	08:36	08:22
	21:34	16 07:15 (98)	20:40	19:35	18:35	17:00
Potential sun hours	486	445	379	336	277	260
Total, worst case	206	221	129	298		
Sun reduction	0.75	0.72	0.52	0.43		
Oper. time red.	0.98	0.98	0.98	0.98		
Wind dir. red.	0.60	0.61	0.70	0.72		
Total reduction	0.44	0.44	0.36	0.31		
Total, real	91	96	47	93		

**Table layout: For each day in each month the following matrix apply**

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:  
**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:  
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Calculated:  
3/4/2016 9:45 AM/2.9.285

**SHADOW - Calendar**

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab **Shadow receptor: Q - Non-Participating**

**Assumptions for shadow calculations**

Sunshine probability S (Average daily sunshine hours) [BISMARCK]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4.92 5.13 7.45 8.03 10.20 11.21 11.69 10.35 8.68 5.69 4.02 3.69

Operational time  
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
660 333 352 411 608 961 789 574 695 904 1,116 1,191 8,594  
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:44   08:22   07:35			07:31   06:34   05:55	05:54   06:25   07:08			07:51   18:53 (180)   07:37			08:22	
2	17:07   17:50   18:33			20:20   21:04   21:44	21:58   21:32   20:37			19:35   14   19:07 (180)   17:33			16:59	
3	08:44   08:21   07:33			07:29   06:32   05:54	05:54   06:27   07:10			07:52   18:53 (180)   07:39			08:24	
4	17:08   17:51   18:35			20:22   21:06   21:45	21:58   21:31   20:35			19:32   13   19:06 (180)   17:32			16:59	
5	08:44   08:20   07:31			07:27   06:30   05:53	05:55   06:28   07:11			07:53   18:52 (180)   07:41			08:25	
6	17:09   17:53   18:37			20:23   21:07   21:46	21:58   21:29   20:33			19:30   11   19:03 (180)   17:30			16:58	
7	08:44   08:18   07:29			07:25   06:29   05:53	05:55   06:29   07:12			07:55   18:52 (180)   07:42			08:26	
8	17:10   17:55   18:38			20:25   21:09   21:47	21:57   21:28   20:31			19:28   9   19:01 (180)   17:29			16:58	
9	08:44   08:17   07:27			07:23   06:27   05:52	05:56   06:31   07:14			07:56   18:52 (180)   07:44			08:27	
10	17:11   17:56   18:40			20:26   21:10   21:48	21:57   21:26   20:29			19:26   7   18:59 (180)   17:27			16:58	
11	08:44   08:15   07:25			07:21   06:25   05:52	05:57   06:32   07:15			07:58   18:53 (180)   07:45			08:28	
12	17:12   17:58   18:41			20:28   21:12   21:49	21:57   21:25   20:27			19:24   4   18:57 (180)   17:26			16:57	
13	08:44   08:14   07:23			07:19   06:24   05:51	05:58   06:33   07:17			07:59   18:54 (180)   07:47			08:29	
14	17:13   17:59   18:43			20:29   21:13   21:50	21:56   21:23   20:25			19:22   1   18:55 (180)   17:24			16:57	
15	08:43   08:12   08:21		3	18:20 (180)   20:29	21:13	21:50	21:56	21:23	20:25			
16	17:14   18:01   18:44			19:16 (180)   07:17	06:22	05:51	05:59	06:35	07:18			
17	08:43   08:11   08:19			19:21 (180)   20:31	21:14	21:51	21:56	21:21	20:23			
18	17:16   18:01   19:46			19:15 (180)   07:15	06:21	05:51	05:59	06:36	07:19			
19	08:43   08:09   08:17			19:23 (180)   20:32	21:16	21:51	21:55	21:20	20:21			
20	17:17   18:03   19:47			19:14 (180)   07:13	06:19	05:50	06:00	06:38	07:21			
21	08:42   08:07   08:15			19:24 (180)   20:34	21:17	21:52	21:51	21:18	20:19			
22	17:18   18:04   19:49			19:14 (180)   07:11	06:18	05:50	06:01	06:39	07:22			
23	08:42   08:06   08:13			19:26 (180)   20:35	21:19	21:53	21:54	21:17	20:17			
24	17:19   18:06   19:50			19:14 (180)   07:09	06:16	05:50	06:02	06:40	07:24			
25	08:41   08:04   08:11			19:28 (180)   20:37	21:20	21:54	21:53	21:15	20:15			
26	17:21   18:08   19:52			19:15 (180)   07:07	06:15	05:50	06:03	06:42	07:25			
27	08:40   08:03   08:09			19:28 (180)   20:38	21:21	21:54	21:53	21:13	20:12			
28	17:22   18:09   19:53			19:16 (180)   07:05	06:14	05:49	06:04	06:43	07:26			
29	08:40   08:01   08:07			19:27 (180)   20:40	21:23	21:55	21:52	21:11	20:10			
30	17:24   18:11   19:55			19:18 (180)   07:03	06:12	05:49	06:05	06:44	07:28			
31	08:39   07:59   08:05			19:24 (180)   20:41	21:24	21:55	21:51	21:10	20:08			
Potential sun hours												
Total, worst case	273	284	368	410	472	482	486	445	379	336	277	260
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

20132550- Lindahl Wind Farm

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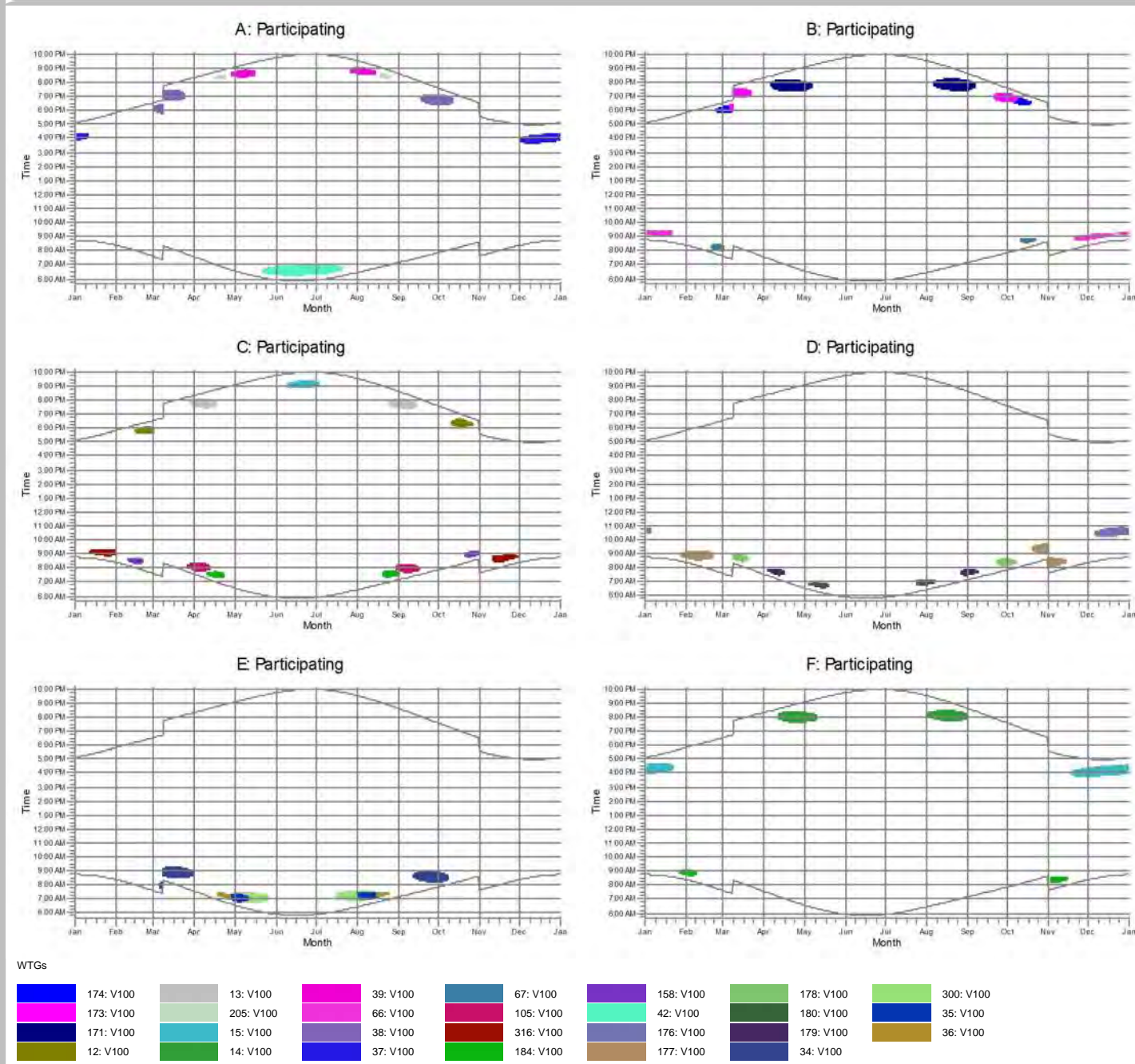
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 wind@eapc.net  
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**SHADOW - Calendar, graphical**

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab



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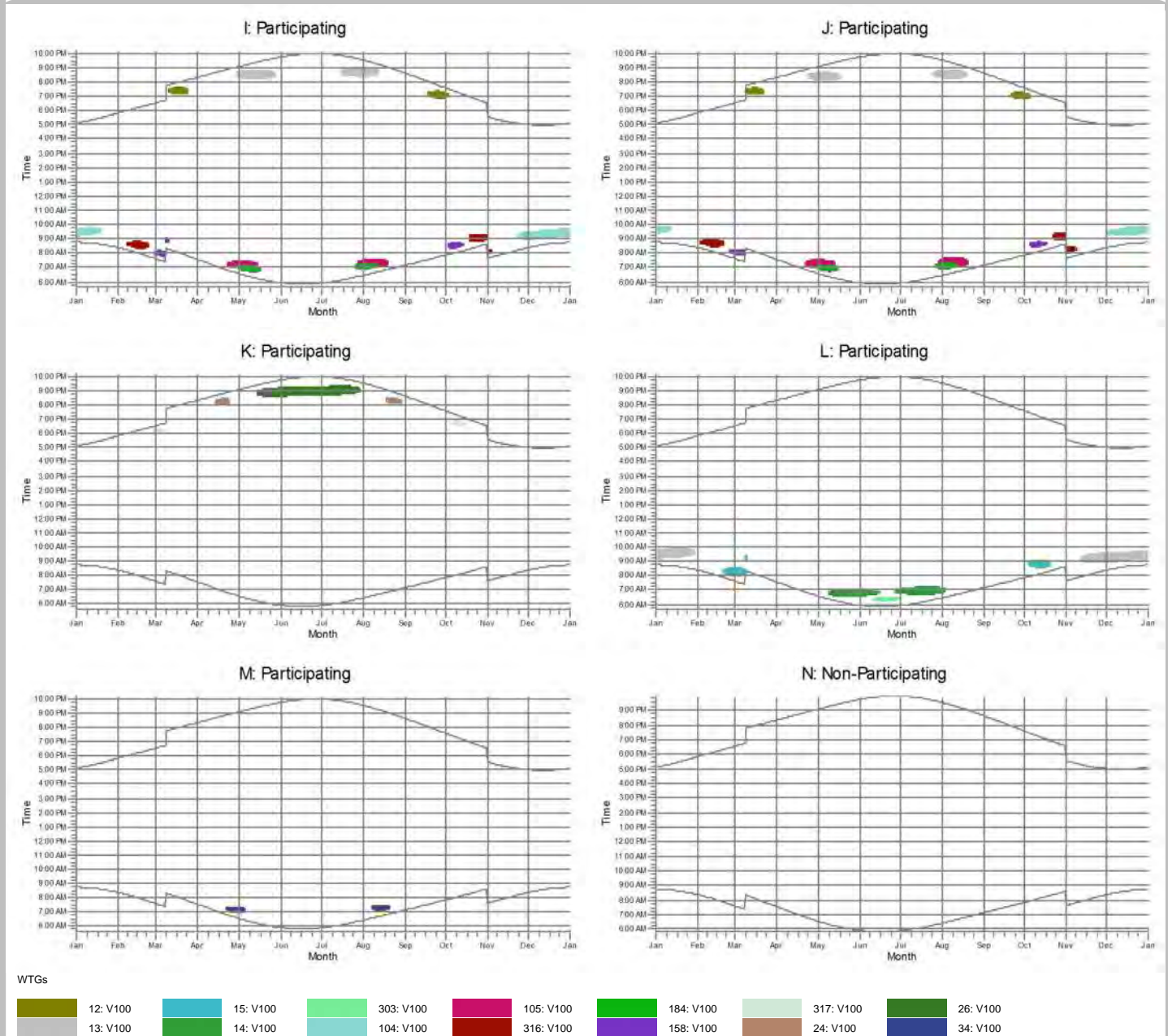
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### SHADOW - Calendar, graphical

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab



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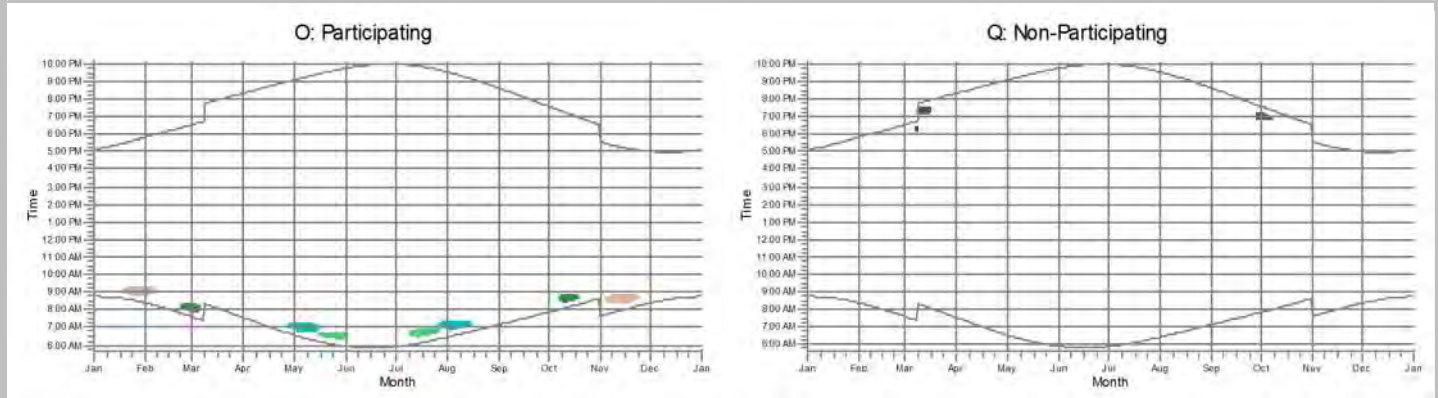
wind@eapc.net

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### SHADOW - Calendar, graphical

Calculation: A060 V100 Realistic Flicker w/Out Obstacles DNV Tab



WTGs

- 20: V100
- 98: V100
- 22: V100
- 99: V100
- 180: V100

## **Appendix G: windPRO V100 Shadow Flicker Report, W/ Obstacles for Select Receptor**

Project:

**20132550- Lindahl Wind Farm**

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**SHADOW - Main Result**

**Calculation:** A060 V100 80m HH Realistic Flicker w/ Obstacles DNV Tab

**Assumptions for shadow calculations**

Maximum distance for influence 1,500 m  
 Minimum sun height over horizon for influence 3 °  
 Day step for calculation 1 days  
 Time step for calculation 1 minutes

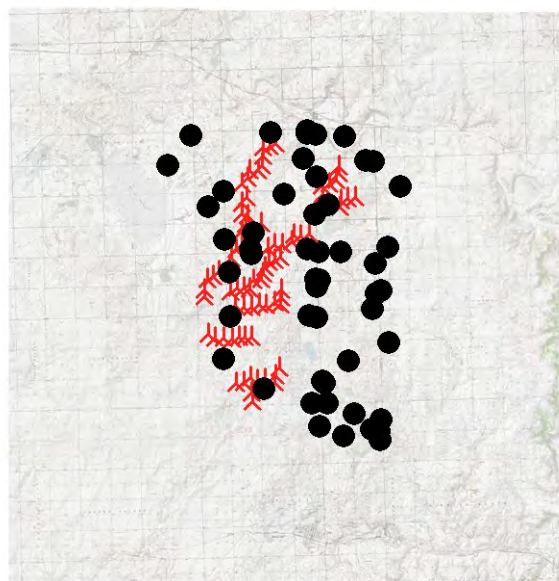
Sunshine probability S (Average daily sunshine hours) [BISMARCK]  
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 4.92 5.13 7.45 8.03 10.20 11.21 11.69 10.35 8.68 5.69 4.02 3.69

Operational hours are calculated from WTGs in calculation and wind distribution:

DNV Shadow

Operational time  
 N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 660 333 352 411 608 961 789 574 695 904 1,116 1,191 8,594  
 Idle start wind speed: Cut in wind speed from power curve

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:  
 Height contours used: Height Contours: 20100616\_Lindahl\_10ft\_HCL.wpo (1)  
 Obstacles used in calculation  
 Eye height: 1.5 m  
 Grid resolution: 10.0 m



Scale 1:400,000  
 New WTG Shadow receptor

**WTGs**

UTM NAD83 Zone: 13			WTG type									
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	RPM		
		[m]					[kW]	[m]	[m]	[RPM]		
5	646,913	5,375,455	745.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
6	646,888	5,375,080	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
12	648,327	5,377,151	750.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
13	648,570	5,377,592	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
14	648,872	5,378,572	753.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
15	648,872	5,377,853	752.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
18	649,189	5,379,368	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
20	648,867	5,380,033	744.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
22	649,124	5,380,328	729.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
24	651,007	5,377,868	749.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
26	651,525	5,378,000	751.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
27	651,616	5,378,348	758.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
28	651,987	5,378,290	755.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
29	652,436	5,378,405	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
34	654,047	5,379,834	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
35	654,478	5,380,290	740.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
36	654,876	5,380,346	731.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
37	649,468	5,369,552	735.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
38	649,403	5,370,046	745.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
39	648,989	5,370,563	740.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
40	649,348	5,370,846	749.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
41	649,714	5,370,690	746.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
42	650,635	5,370,574	746.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
43	650,667	5,370,918	744.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
45	650,882	5,371,340	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
66	649,309	5,375,532	733.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		
67	649,484	5,375,990	732.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9		

To be continued on next page...

Project:

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 Lenexa, KS, 66219

Description:

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 Calculated:  
 3/4/2016 10:05 AM/2.9.285

**SHADOW - Main Result**

**Calculation:** A060 V100 80m HH Realistic Flicker w/ Obstacles DNV Tab

...continued from previous page

UTM NAD83 Zone: 13				WTG type										
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	RPM				
			[m]								[kW]	[m]	[m]	[RPM]
68	649,889	5,375,994	741.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
69	650,008	5,376,321	740.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
70	650,956	5,375,465	751.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
84	648,982	5,374,557	737.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
85	648,553	5,374,643	733.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
98	648,903	5,381,054	722.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
99	649,170	5,381,363	721.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
100	649,950	5,382,038	713.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
101	650,030	5,382,496	712.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
104	650,119	5,376,639	740.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
105	650,267	5,377,632	746.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
150	650,663	5,383,159	707.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
151	650,947	5,375,049	753.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
152	650,911	5,374,694	758.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
154	650,163	5,374,664	746.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
155	649,378	5,374,555	741.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
156	649,818	5,374,694	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
158	650,613	5,377,049	737.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
164	649,406	5,372,982	725.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
165	647,909	5,372,903	716.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
166	647,487	5,372,910	715.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
171	647,671	5,376,427	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
173	647,364	5,376,192	740.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
174	647,056	5,376,002	741.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
175	653,143	5,380,511	713.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
176	653,130	5,380,927	710.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
177	653,497	5,381,062	704.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
178	653,850	5,381,276	700.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
179	654,022	5,381,604	696.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
180	654,011	5,381,966	694.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
183	649,728	5,381,758	721.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
184	650,599	5,377,842	746.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
205	648,594	5,370,523	731.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
206	650,092	5,370,737	743.7 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
300	654,134	5,380,179	734.1 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
302	648,870	5,379,451	759.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
303	649,079	5,378,913	759.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
304	649,308	5,381,738	716.8 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
305	650,346	5,383,045	709.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
306	650,021	5,382,956	710.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
307	647,090	5,373,129	713.2 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
308	649,061	5,372,960	722.4 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
309	648,724	5,372,961	720.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
310	648,383	5,372,885	719.3 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
311	648,975	5,375,560	734.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
312	648,641	5,375,554	726.9 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
313	648,297	5,375,376	728.5 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
314	649,928	5,378,956	741.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
315	650,591	5,374,779	748.6 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
316	650,301	5,376,922	735.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				
317	650,917	5,377,197	740.0 V100	Yes	VESTAS	V100-2,000	2,000	100.0	80.0	14.9				

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
 Lenexa, KS, 66219

Description:

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 Calculated:  
 3/4/2016 10:05 AM/2.9.285

**SHADOW - Main Result**

**Calculation:** A060 V100 80m HH Realistic Flicker w/ Obstacles DNV Tab

**Shadow receptor-Input**

UTM NAD83 Zone: 13

No.	Name	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
				[m]	[m]	[m]	[m]	[°]	[°]	
A	Participating	650,034	5,370,204	742.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
B	Participating	648,222	5,376,376	731.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
C	Participating	649,350	5,377,570	737.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
D	Participating	652,833	5,381,417	705.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
E	Participating	653,476	5,379,925	741.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
F	Participating	649,476	5,378,474	747.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
G	Participating	650,400	5,383,729	711.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
H	Participating	648,263	5,374,042	728.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
I	Participating	649,372	5,377,319	734.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
J	Participating	649,411	5,377,350	734.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
K	Participating	652,350	5,377,616	735.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
L	Participating	647,974	5,378,125	736.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
M	Participating	652,746	5,379,403	722.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
N	Non-Participating	652,934	5,377,454	728.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
O	Participating	647,905	5,380,657	723.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
P	Non-Participating	647,929	5,371,803	716.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
Q	Non-Participating	655,444	5,382,262	682.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
R	Non-Participating	654,346	5,383,551	675.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
S	Participating	652,445	5,374,111	759.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
T	Non-Participating	652,124	5,382,382	698.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
U	Non-Participating	652,329	5,383,668	691.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
V	Participating	647,113	5,379,805	712.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
W	Non-Participating	652,318	5,383,827	691.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
X	Non-Participating	655,873	5,382,222	689.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
Y	Non-Participating	651,119	5,380,491	705.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
Z	Non-Participating	652,848	5,375,611	736.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AA	Participating	654,105	5,377,449	726.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BB	Non-Participating	652,820	5,375,995	733.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
CC	Participating	652,849	5,373,992	753.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
DD	Non-Participating	652,780	5,383,651	684.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
EE	Non-Participating	653,014	5,375,966	734.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
FF	Non-Participating	652,597	5,369,477	749.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
GG	Participating	653,163	5,370,620	746.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
HH	Non-Participating	657,270	5,380,900	701.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
II	Participating	653,237	5,370,521	746.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
JJ	Non-Participating	653,421	5,369,486	746.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
KK	Non-Participating	656,603	5,377,699	728.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
LL	Non-Participating	652,987	5,368,263	755.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
MM	Non-Participating	655,962	5,376,837	710.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
NN	Non-Participating	646,183	5,383,581	712.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
OO	Participating	654,514	5,371,692	765.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
PP	Non-Participating	644,980	5,381,994	704.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
QQ	Participating	654,816	5,368,880	743.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
RR	Non-Participating	654,290	5,367,724	742.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
SS	Non-Participating	656,021	5,375,274	710.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
TT	Non-Participating	656,242	5,375,429	710.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
UU	Non-Participating	655,800	5,374,456	722.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
VV	Non-Participating	655,758	5,368,066	719.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
WW	Participating	656,662	5,372,675	722.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
XX	Non-Participating	656,251	5,368,598	741.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
YY	Non-Participating	656,161	5,367,989	720.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
ZZ	Non-Participating	656,215	5,367,523	716.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
 Kevin Walter  
 Southlake Technology Park, 16105 W 113th St, Ste 1  
 Lenexa, KS, 66219

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**SHADOW - Main Result**

**Calculation:** A060 V100 80m HH Realistic Flicker w/ Obstacles DNV Tab

**Calculation Results**

Shadow receptor

No.	Name	Shadow, worst case		Shadow, expected values	
		Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
A	Participating	26:45	59	0:34	10:55
B	Participating	11:11	77	0:17	3:55
C	Participating	54:04	156	0:55	21:36
D	Participating	43:30	159	0:32	15:52
E	Participating	53:33	128	0:40	22:45
F	Participating	64:21	148	0:39	22:04
G	Participating	0:00	0	0:00	0:00
H	Participating	13:27	85	0:20	5:11
I	Participating	48:47	141	0:29	19:58
J	Participating	23:10	74	0:28	10:25
K	Participating	36:13	115	0:28	17:31
L	Participating	67:32	195	0:31	25:14
M	Participating	5:13	27	0:17	2:05
N	Non-Participating	0:00	0	0:00	0:00
O	Participating	28:12	133	0:22	10:58
P	Non-Participating	0:00	0	0:00	0:00
Q	Non-Participating	2:43	18	0:14	1:00
R	Non-Participating	0:00	0	0:00	0:00
S	Participating	0:00	0	0:00	0:00
T	Non-Participating	0:00	0	0:00	0:00
U	Non-Participating	0:00	0	0:00	0:00
V	Participating	0:00	0	0:00	0:00
W	Non-Participating	0:00	0	0:00	0:00
X	Non-Participating	0:00	0	0:00	0:00
Y	Non-Participating	0:00	0	0:00	0:00
Z	Non-Participating	0:00	0	0:00	0:00
AA	Participating	0:00	0	0:00	0:00
BB	Non-Participating	0:00	0	0:00	0:00
CC	Participating	0:00	0	0:00	0:00
DD	Non-Participating	0:00	0	0:00	0:00
EE	Non-Participating	0:00	0	0:00	0:00
FF	Non-Participating	0:00	0	0:00	0:00
GG	Participating	0:00	0	0:00	0:00
HH	Non-Participating	0:00	0	0:00	0:00
II	Participating	0:00	0	0:00	0:00
JJ	Non-Participating	0:00	0	0:00	0:00
KK	Non-Participating	0:00	0	0:00	0:00
LL	Non-Participating	0:00	0	0:00	0:00
MM	Non-Participating	0:00	0	0:00	0:00
NN	Non-Participating	0:00	0	0:00	0:00
OO	Participating	0:00	0	0:00	0:00
PP	Non-Participating	0:00	0	0:00	0:00
QQ	Participating	0:00	0	0:00	0:00
RR	Non-Participating	0:00	0	0:00	0:00
SS	Non-Participating	0:00	0	0:00	0:00
TT	Non-Participating	0:00	0	0:00	0:00
UU	Non-Participating	0:00	0	0:00	0:00
VV	Non-Participating	0:00	0	0:00	0:00
WW	Participating	0:00	0	0:00	0:00
XX	Non-Participating	0:00	0	0:00	0:00
YY	Non-Participating	0:00	0	0:00	0:00
ZZ	Non-Participating	0:00	0	0:00	0:00

Project:

**20132550- Lindahl Wind Farm**

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 Kevin Walter  
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**SHADOW - Main Result**

**Calculation:** A060 V100 80m HH Realistic Flicker w/ Obstacles DNV Tab

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
5	V100	0:00	0:00
6	V100	0:00	0:00
12	V100	15:51	5:45
13	V100	91:03	34:54
14	V100	50:30	22:08
15	V100	43:21	13:27
18	V100	0:00	0:00
20	V100	9:54	3:25
22	V100	4:12	1:34
24	V100	4:03	1:48
26	V100	29:58	15:00
27	V100	0:00	0:00
28	V100	0:00	0:00
29	V100	0:00	0:00
34	V100	31:27	13:26
35	V100	8:24	3:26
36	V100	2:01	0:47
37	V100	0:00	0:00
38	V100	0:00	0:00
39	V100	0:00	0:00
40	V100	0:00	0:00
41	V100	0:00	0:00
42	V100	26:45	10:55
43	V100	0:00	0:00
45	V100	0:00	0:00
66	V100	7:42	2:40
67	V100	3:29	1:14
68	V100	0:00	0:00
69	V100	0:00	0:00
70	V100	0:00	0:00
84	V100	2:29	0:58
85	V100	0:00	0:00
98	V100	8:48	3:38
99	V100	5:18	2:11
100	V100	0:00	0:00
101	V100	0:00	0:00
104	V100	20:34	6:46
105	V100	10:23	4:23
150	V100	0:00	0:00
151	V100	0:00	0:00
152	V100	0:00	0:00
154	V100	0:00	0:00
155	V100	8:36	3:34
156	V100	0:00	0:00
158	V100	3:19	1:09
164	V100	0:00	0:00
165	V100	0:00	0:00
166	V100	0:00	0:00
171	V100	0:00	0:00
173	V100	0:00	0:00
174	V100	0:00	0:00
175	V100	0:00	0:00
176	V100	10:27	3:14
177	V100	18:16	6:22
178	V100	6:23	2:42
179	V100	3:52	1:34

To be continued on next page...

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.

Kevin Walter

Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

Description:

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wind@eapc.net

Calculated:

3/4/2016 10:05 AM/2.9.285

**SHADOW - Main Result****Calculation:** A060 V100 80m HH Realistic Flicker w/ Obstacles DNV Tab

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
180	V100	7:15	2:53
183	V100	0:00	0:00
184	V100	9:27	3:32
205	V100	0:00	0:00
206	V100	0:00	0:00
300	V100	25:48	10:43
302	V100	0:00	0:00
303	V100	1:11	0:28
304	V100	0:00	0:00
305	V100	0:00	0:00
306	V100	0:00	0:00
307	V100	2:22	0:38
308	V100	0:00	0:00
309	V100	0:00	0:00
310	V100	0:00	0:00
311	V100	0:00	0:00
312	V100	0:00	0:00
313	V100	0:00	0:00
314	V100	0:00	0:00
315	V100	0:00	0:00
316	V100	8:08	2:51
317	V100	2:12	0:44

Project:

**20132550- Lindahl Wind Farm**

TradeWind Energy, Inc.  
Kevin Walter  
Southlake Technology Park, 16105 W 113th St, Ste 1  
Lenexa, KS, 66219

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wind@eapc.net  
Calculated:  
3/4/2016 10:05 AM/2.9.285

**SHADOW - Calendar**

Calculation: A060 V100 80m HH Realistic Flicker w/ Obstacles DNV Tab Shadow receptor: I - Participating

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [BISMARCK]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.92	5.13	7.45	8.03	10.20	11.21	11.69	10.35	8.68	5.69	4.02	3.69

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
660	333	352	411	608	961	789	574	695	904	1,116	1,191	8,594

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1   08:45	09:16 (104)   08:23	07:35		07:32	06:34	20:27 (13)   05:55
17:07	24   09:40 (104)   17:50	18:34		20:21	21:05	12   20:39 (13)   21:45
2   08:45	09:16 (104)   08:21	07:33		07:30	06:32	20:25 (13)   05:55
17:08	25   09:41 (104)   17:52	18:35		20:22	21:06	15   20:40 (13)   21:46
3   08:45	09:17 (104)   08:20	07:31		07:28	06:31	20:24 (13)   05:54
17:09	25   09:42 (104)   17:53	18:37		20:24	21:08	18   20:42 (13)   21:47
4   08:44	09:18 (104)   08:18	07:29		07:26	06:29	20:22 (13)   05:53
17:10	24   09:42 (104)   17:55	18:38		20:25	21:09	21   20:43 (13)   21:47
5   08:44	09:18 (104)   08:17	07:27		07:24	06:27	20:21 (13)   05:53
17:11	24   09:42 (104)   17:57	18:40		20:27	21:10	24   20:45 (13)   21:48
6   08:44	09:18 (104)   08:15	07:25		07:21	06:26	20:20 (13)   05:52
17:13	24   09:42 (104)   17:58	18:42		20:28	21:12	25   20:45 (13)   21:49
7   08:44	09:19 (104)   08:14	07:23		07:19	06:24	20:20 (13)   05:52
17:14	24   09:43 (104)   18:00	18:43		20:30	21:13	26   20:46 (13)   21:50
8   08:43	09:19 (104)   08:12	08:21		07:17	06:23	20:19 (13)   05:51
17:15	24   09:43 (104)   18:00	18:45		20:31	21:15	27   20:46 (13)   21:51
9   08:43	09:21 (104)   08:11	08:19		07:15	06:21	20:19 (13)   05:51
17:16	22   09:43 (104)   18:02	19:46		20:32	21:16	28   20:47 (13)   21:52
10   08:43	09:21 (104)   08:09	08:17		07:13	06:20	20:18 (13)   05:51
17:17	22   09:43 (104)   18:03	19:48		20:34	21:17	28   20:46 (13)   21:52
11   08:42	09:22 (104)   08:08	08:15		19:21 (12)   07:11	06:18	20:18 (13)   05:51
17:19	22   09:44 (104)   18:05	19:49	5	19:26 (12)   20:35	21:19	29   20:47 (13)   21:53
12   08:42	09:23 (104)   08:06	08:13		19:18 (12)   07:09	06:17	20:19 (13)   05:50
17:20	20   09:43 (104)   18:06	19:51	10	19:28 (12)   20:37	21:20	28   20:47 (13)   21:54
13   08:41	09:23 (104)   08:04	08:11		19:17 (12)   07:07	06:15	20:18 (13)   05:50
17:21	20   09:43 (104)   18:08	19:52	12	19:29 (12)   20:38	21:22	28   20:46 (13)   21:54
14   08:41	09:25 (104)   08:03	08:09		19:15 (12)   07:05	06:14	20:18 (13)   05:50
17:23	18   09:43 (104)   18:10	19:54	16	19:31 (12)   20:40	21:23	29   20:47 (13)   21:55
15   08:40	09:26 (104)   08:01	08:07		19:15 (12)   07:03	06:13	20:19 (13)   05:50
17:24	16   09:42 (104)   18:11	19:55	18	19:33 (12)   20:41	21:24	28   20:47 (13)   21:55
16   08:39	09:27 (104)   07:59	08:05		19:14 (12)   07:02	06:11	20:19 (13)   05:50
17:25	15   09:42 (104)   18:13	19:57	20	19:34 (12)   20:43	21:26	28   20:47 (13)   21:56
17   08:38	09:28 (104)   07:58	08:03		19:14 (12)   07:00	06:10	20:20 (13)   05:50
17:27	12   09:40 (104)   18:15	19:58	21	19:35 (12)   20:44	21:27	26   20:46 (13)   21:56
18   08:38	09:31 (104)   07:56	08:01		19:13 (12)   06:58	06:09	20:19 (13)   05:50
17:28	8   09:39 (104)   18:16	20:00	22	19:35 (12)   20:46	21:28	26   20:45 (13)   21:57
19   08:37		07:54   07:59		19:13 (12)   06:56	06:08	20:20 (13)   05:50
17:30		18:18   20:01	22	19:35 (12)   20:47	21:30	25   20:45 (13)   21:57
20   08:36		07:52   07:57		19:14 (12)   06:54	06:07	20:21 (13)   05:50
17:31		18:19   20:03	20	19:34 (12)   20:49	21:31	23   20:44 (13)   21:57
21   08:35		07:50   07:55		19:13 (12)   06:52	06:05	20:21 (13)   05:50
17:33		18:21   20:04	19	19:32 (12)   20:50	21:32	23   20:44 (13)   21:58
22   08:34		07:49   07:53		19:14 (12)   06:50	06:04	20:22 (13)   05:50
17:34		18:23   20:06	16	19:30 (12)   20:52	21:33	21   20:43 (13)   21:58
23   08:33		07:47   07:51		19:16 (12)   06:48	06:03	20:23 (13)   05:51
17:36		18:24   20:07	13	19:29 (12)   20:53	21:35	20   20:43 (13)   21:58
24   08:32		07:45   07:48		19:19 (12)   06:46	06:02	20:24 (13)   05:51
17:37		18:26   20:09	6	19:25 (12)   20:54	21:36	18   20:42 (13)   21:58
25   08:31		07:43   07:46			06:01	20:25 (13)   05:51
17:39		18:27   20:10			21:37	16   20:41 (13)   21:58
26   08:30		07:41   07:44			06:00	20:27 (13)   05:52
17:41		18:29   20:12			21:38	13   20:40 (13)   21:59
27   08:29		07:39   07:42			05:59	20:29 (13)   05:52
17:42		18:31   20:13			21:39	10   20:39 (13)   21:59
28   08:28		07:37   07:40			05:58	20:31 (13)   05:52
17:44		18:32   20:15			21:40	5   20:36 (13)   21:59
29   08:26					05:58	05:53
17:45					21:41	21:58
30   08:25					06:36	20:31 (13)   05:57
17:47					21:03	6   20:37 (13)   21:43
31   08:24						05:56
17:49						21:44
Potential sun hours	273	285	368	410	471	481
Total, worst case	369		220		6	620
Sun reduction	0.56		0.63		0.59	0.67
Oper. time red.	0.98		0.98		0.98	0.98
Wind dir. red.	0.71		0.64		0.71	0.71
Total reduction	0.39		0.40		0.41	0.47
Total, real	143		87		2	289

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)



Project:

**20132550- Lindahl Wind Farm**

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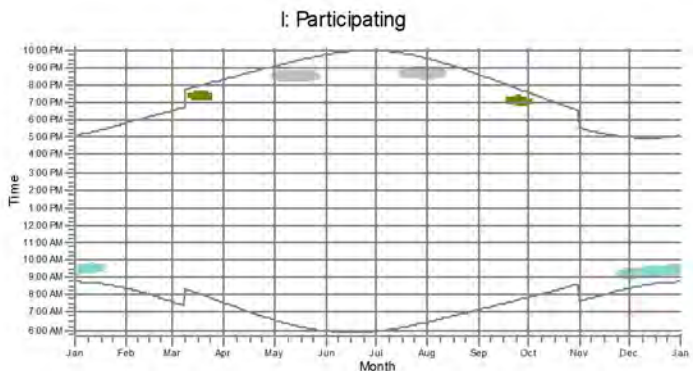
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### SHADOW - Calendar, graphical

Calculation: A060 V100 80m HH Realistic Flicker w/ Obstacles DNV Tab



WTGs

12: V100    13: V100    104: V100