

**GH WindFarmer Report
City of Summerside Wind Plant
Summerside_4xV90_ReducedNoiseOperation_28100
8.wow
28 October 2008**

1 General report information

WindFarmer version v3.6.1.0
 C:\FPS Work\Current
 Projects\Summerside\Summerside_2008\ReducedNoiseOperatingModes\Summerside_4xV90_ReducedNoiseOperation_281008.wow
 October 28, 2008

2 Project: Summerside

Project Summerside
 Number of turbines 4

3 Project: Summerside - Project energy capture summary

Site capacity	12.0	MW
Ideal energy production	35	GWh/yr
Topographic efficiency	100.56	%
Array efficiency	97.22	%
Electrical efficiency	98.00	%
Availability	95.00	%
Other Factors	99.00	%
Icing and blade degradation	96.00	%
Substation maintenance	99.800	%
Utility downtime	99.800	%
Power curve turbulence variation	99.800	%
Hysteresis	99.800	%
Sector Management	100.00	%
Estimated annual net energy production	30.0	GWh/yr
Estimated capacity factor	28.5	%

4 Project: Summerside - Turbines Table

Turbine ID	Turbine label	Turbine type name	Hub height (m)	Rotor diameter (m)	Capacity (kW)
1		Vestas V90 (3.0 MW) - Mode 2 (106.8dBA)	80.0	90.0	3000
2		Vestas V90 (3.0 MW) - Mode 1 (107.8dBA)	80.0	90.0	3000
3		Vestas V90 (3.0 MW) - Mode 0 (109.4dBA)	80.0	90.0	3000
4		Vestas V90 (3.0 MW) - Mode 2 (106.8dBA)	80.0	90.0	3000

Table 1 - Turbines Table - Part 1

Turbine ID	Eastings (m)	Northings (m)	Height of base (m)	Nearest turbine ID	Distance to nearest turbine (m)
1	438296.0	5142663.0	11	2	541.0
2	438830.0	5142576.0	8	1	541.0
3	438848.0	5143324.0	6	2	748.2
4	438263.0	5142105.0	12	1	559.0

Table 2 - Turbines Table - Part 2

Turbine ID	Wind resource grid ID	Mean free wind speed (m/s)	Mean Ambient Turbulence Intensity (%)	Mean wind speed (m/s)	Mean Turbulence Intensity (%)	Ideal yield (MWh/yr)	Gross yield (MWh/yr)	Net yield (MWh/yr)
1	1	7.75	11.2	7.65	11.7	8625	8632	7379
2	1	7.77	11.2	7.65	11.8	8832	8893	7534
3	1	7.87	11.0	7.75	11.4	8899	9128	7741
4	4	7.69	11.3	7.63	11.6	8625	8524	7364

Table 3 - Turbines Table - Part 3

Turbine ID	Capacity Factor (%)	Topographic Efficiency (%)	Array Efficiency (%)	Power curve turbulence variation (%)	Hysteresis of power curve (%)	Sector Management (%)	Perturbed Energy Yield (MWh/yr)	Perturbed Mean Windspeed (m/s)
1	28.06	100.079	97.39	99.8	99.8	100.0	6943	7.52
2	28.65	100.69	96.50	99.8	99.8	100.0	7085	7.54
3	29.44	102.57	96.60	99.8	99.8	100.0	7284	7.63
4	28.00	98.83	98.41	99.8	99.8	100.0	6926	7.46

Table 4 - Turbines Table - Part 4

Note: The turbulence intensity is only valid with the eddy viscosity wake method.

Note: The topographic effect is only valid with the eddy viscosity or the modified PARK wake methods and with a frequency table associated.



Figure 1 - 4xV90_T4bySewageLagoon_281008



-  - Turbine
-  - Dwelling

Figure 2 - 4xV90_T4bySewageLagoon_281008 - legend

5 Project: Summerside - Dwellings

Dwelling ID	Dwelling name	Distance to nearest turbine (m)	Eastings (m)	Northings (m)	Altitude (m)	Turbine exclusion radius (m)
1		537.0	438317.0	5143244.0	7.7	400.0
2		530.1	438319.0	5143358.0	8.4	400.0
3		555.5	438305.0	5143441.0	8.8	400.0
4		996.4	437890.0	5143598.0	14.7	400.0
5		1190.3	437728.0	5143727.0	16.2	400.0
6		1236.2	437642.0	5143712.0	18.3	400.0
7		1250.1	437676.0	5143759.0	18.0	400.0
8		1248.8	437696.0	5143806.0	18.0	400.0
9		1198.7	437632.0	5143661.0	18.3	400.0
10		1073.7	437597.0	5143478.0	19.1	400.0
11		986.8	437617.0	5143379.0	18.6	400.0
12		1012.1	437423.0	5143175.0	20.1	400.0
13		729.5	437567.0	5142635.0	19.2	400.0
14		704.5	437605.0	5142526.0	19.7	400.0
15		622.4	437723.0	5142420.0	24.8	400.0
16		552.7	437793.0	5142434.0	23.3	400.0
17		421.6	437946.0	5142428.0	19.6	400.0
18		608.5	437696.0	5142326.0	25.3	400.0
19		458.5	437805.0	5142084.0	21.2	400.0
20		482.7	437791.0	5142004.0	20.9	400.0
21		516.8	437784.0	5141911.0	19.7	400.0
22		675.6	437760.0	5141654.0	21.7	400.0
23		598.1	439428.0	5142589.0	11.0	400.0
24		424.8	439191.0	5142352.0	10.9	400.0
25		441.0	439184.0	5142313.0	11.7	400.0
26		466.3	439181.0	5142269.0	12.5	400.0
27		626.6	439362.0	5142245.0	12.5	400.0
28		553.3	439189.0	5142155.0	13.5	400.0
29		652.4	439184.0	5142028.0	13.5	400.0
30		728.1	439195.0	5141946.0	13.4	400.0
31		771.5	439179.0	5141888.0	13.5	400.0
32		912.1	439171.0	5141730.0	14.6	400.0
33		1015.7	439105.0	5141537.0	17.4	400.0
34		620.8	438073.0	5141514.0	19.8	400.0
35		783.9	438561.0	5141380.0	18.9	400.0
36		1361.2	440206.0	5143418.0	0.0	400.0
37		1346.1	440186.0	5143471.0	0.0	400.0
38		1323.4	440155.0	5143532.0	0.0	400.0
39		1302.2	440114.0	5143629.0	0.0	400.0

Table 5 - Project: Summerside - Dwellings

6 Project: Summerside - Dwellings noise

Dwelling ID	Noise prediction (dB(A))	Noise limit type	Absolute noise limit (dB(A))	Relative to background noise limit (dB(A))	Background noise reference ID
1	44.38	Absolute	45.00	Not applicable	Not applicable
2	43.88	Absolute	45.00	Not applicable	Not applicable
3	43.24	Absolute	45.00	Not applicable	Not applicable
4	38.32	Absolute	45.00	Not applicable	Not applicable
5	36.47	Absolute	45.00	Not applicable	Not applicable
6	35.99	Absolute	45.00	Not applicable	Not applicable
7	35.97	Absolute	45.00	Not applicable	Not applicable
8	35.86	Absolute	45.00	Not applicable	Not applicable
9	36.17	Absolute	45.00	Not applicable	Not applicable
10	36.78	Absolute	45.00	Not applicable	Not applicable
11	37.38	Absolute	45.00	Not applicable	Not applicable
12	36.69	Absolute	45.00	Not applicable	Not applicable
13	39.57	Absolute	45.00	Not applicable	Not applicable
14	40.12	Absolute	45.00	Not applicable	Not applicable
15	41.67	Absolute	45.00	Not applicable	Not applicable
16	42.64	Absolute	45.00	Not applicable	Not applicable
17	44.99	Absolute	45.00	Not applicable	Not applicable
18	41.29	Absolute	45.00	Not applicable	Not applicable
19	42.59	Absolute	45.00	Not applicable	Not applicable
20	41.99	Absolute	45.00	Not applicable	Not applicable
21	41.27	Absolute	45.00	Not applicable	Not applicable
22	38.77	Absolute	45.00	Not applicable	Not applicable
23	41.61	Absolute	45.00	Not applicable	Not applicable
24	43.99	Absolute	45.00	Not applicable	Not applicable
25	43.69	Absolute	45.00	Not applicable	Not applicable
26	43.26	Absolute	45.00	Not applicable	Not applicable
27	40.83	Absolute	45.00	Not applicable	Not applicable
28	41.96	Absolute	45.00	Not applicable	Not applicable
29	40.74	Absolute	45.00	Not applicable	Not applicable
30	39.91	Absolute	45.00	Not applicable	Not applicable
31	39.52	Absolute	45.00	Not applicable	Not applicable
32	38.26	Absolute	45.00	Not applicable	Not applicable
33	37.11	Absolute	45.00	Not applicable	Not applicable
34	39.43	Absolute	45.00	Not applicable	Not applicable
35	37.88	Absolute	45.00	Not applicable	Not applicable
36	34.23	Absolute	45.00	Not applicable	Not applicable
37	34.28	Absolute	45.00	Not applicable	Not applicable
38	34.38	Absolute	45.00	Not applicable	Not applicable
39	34.44	Absolute	45.00	Not applicable	Not applicable

Table 6 - Project: Summerside - Dwellings noise

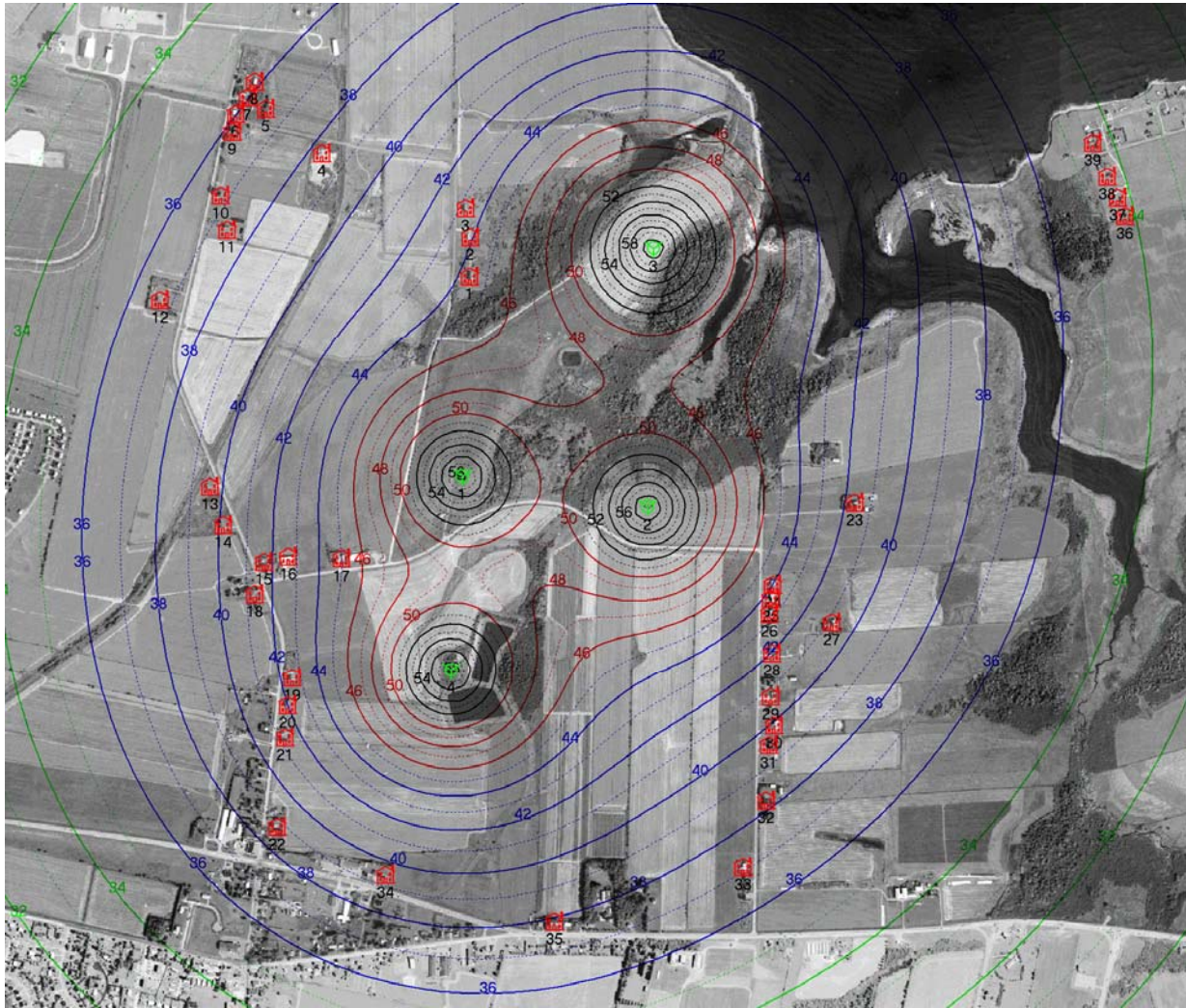


Figure 3 - 4xV90_T4byLagoon_NoiseReducedOperation_281008

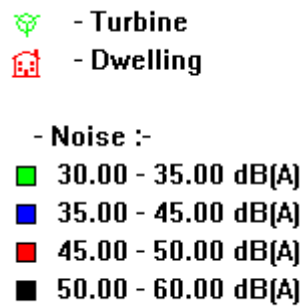


Figure 4 - 4xV90_T4byLagoon_NoiseReducedOperation_281008 - legend

7 Workbook noise options

Form of noise model to be used
 Ground Effect
 Ground Effect
 Ground factor around turbines

Complex (ISO9613) General
 Porous Ground
 ISO9613 General
 0.80

Ground factor everywhere else	0.80	
Meteorological correction factor Co	0.00	dB
Other attenuations to be considered	0.00	dB
Initial default noise limit to use when placing dwellings	45.00	dB(A)
Relative to background noise	0.00	dB(A)
Calculation grid spacing	10.00	m
Height above ground for noise mapping	2.00	m
Use DTM height data	Yes	
Octave Spreading	Yes	

Octave band (Hz)	Attenuation coefficient (dB/km)
31.5	0.00
63.0	0.10
125.0	0.40
250.0	1.00
500.0	1.90
1000.0	3.70
2000.0	9.70
4000.0	32.80
8000.0	117.00

Table 7 - Atmospheric Attenuation for Octave Bands of Noise

8 Project: Summerside - Project options

Site reference air density	1.225	kg/m ³
Site reference height	0.0	m
Lapse rate	-0.113	(kg/m ³)/km
Direction shifted sector probabilities	No	
Topography corrected wake model	Yes	
Input Electrical Efficiency	Manual	
Power curve turbulence variation	Manual	
Hysteresis	Manual	
Sector Management	Manual	

Please note: direction shift and topography correction to wake model are only applied when used in conjunction with frequency tables

9 Workbook options

Wake model	Eddy viscosity	
Topographic effect	Yes	
Array effect	Yes	
Maximum wind speed for energy calculation	70	m/s
Number of direction steps	72	
Minimum separation distance	3.0	diameters

Please note: direction shift and topography correction to wake model are only applied when used in conjunction with frequency tables

10 Project: Summerside - Turbine types

Turbine type	Vestas V90 (3.0 MW) - Mode 0 (109.4dBA)	
Diameter	90.0	m
Hub height	80.0	m
Number of blades	3	
Air density for power curve	1.225	kg/m ³
Power regulation	Pitch	
Cut-In windspeed	4.0	m/s
Cut-Out windspeed	25.0	m/s

Turbine Classification:		
Certification according to	None	
Turbine Class	None	
Sub-Class	None	
V mean	0	m/s
V ref	0	m/s
Design Turbulence	0	%
Slope parameter - a	0	

Hub height wind speed (m/s)	Electrical power (kW)	Thrust coefficient (-)	Rotor speed (rpm)	Reactive power (kVAr)
0.0	0.0	0.000	0.00	0.0
1.0	0.0	0.000	0.00	0.0
2.0	0.0	0.000	0.00	0.0
3.0	0.0	0.000	0.00	0.0
4.0	77.0	0.815	16.10	0.0
5.0	190.0	0.818	16.10	0.0
6.0	353.0	0.823	16.10	0.0
7.0	581.0	0.823	16.10	0.0
8.0	886.0	0.824	16.10	0.0
9.0	1273.0	0.802	16.10	0.0
10.0	1710.0	0.730	16.10	0.0
11.0	2145.0	0.648	16.10	0.0
12.0	2544.0	0.564	16.10	0.0
13.0	2837.0	0.490	16.10	0.0
14.0	2965.0	0.390	16.10	0.0
15.0	2995.0	0.304	16.10	0.0
16.0	3000.0	0.246	16.10	0.0
17.0	3000.0	0.203	16.10	0.0
18.0	3000.0	0.170	16.10	0.0
19.0	3000.0	0.144	16.10	0.0
20.0	3000.0	0.124	16.10	0.0
21.0	3000.0	0.107	16.10	0.0
22.0	3000.0	0.094	16.10	0.0
23.0	3000.0	0.082	16.10	0.0
24.0	3000.0	0.073	16.10	0.0
25.0	3000.0	0.065	16.10	0.0

Table 8 - Turbine performance for Vestas V90 (3.0 MW) - Mode 0 (109.4dBA)

Turbine noise options:

Turbine produces tonal noise	No
Noise in octave bands	Yes

Octave band (Hz)	Sound Power Level (dB(A))
31.5	86.00
63.0	95.70
125.0	96.80
250.0	101.40
500.0	103.50
1000.0	104.60
2000.0	100.30
4000.0	95.00
8000.0	85.10

Table 9 - Sound Power Level for Vestas V90 (3.0 MW) - Mode 0 (109.4dBA)

Specify absolute sound power level	Yes
Specify variation of sound power level with wind speed	No
Turbine type	Vestas V90 (3.0 MW) - Mode 1 (107.8dBA)
Diameter	90.0 m
Hub height	80.0 m
Number of blades	3
Air density for power curve	1.225 kg/m ³
Power regulation	Pitch
Cut-In windspeed	4.0 m/s
Cut-Out windspeed	25.0 m/s
Turbine Classification:	
Certification according to	None
Turbine Class	None
Sub-Class	None
V mean	0 m/s
V ref	0 m/s
Design Turbulence	0 %
Slope parameter - a	0

Hub height wind speed (m/s)	Electrical power (kW)	Thrust coefficient (-)	Rotor speed (rpm)	Reactive power (kVAr)
0.0	0.0	0.000	0.00	0.0
1.0	0.0	0.000	0.00	0.0
2.0	0.0	0.000	0.00	0.0
3.0	0.0	0.000	0.00	0.0
4.0	77.0	0.815	16.10	0.0
5.0	190.0	0.818	16.10	0.0
6.0	353.0	0.823	16.10	0.0
7.0	581.0	0.823	16.10	0.0
8.0	886.0	0.824	16.10	0.0
9.0	1272.0	0.802	16.10	0.0
10.0	1696.0	0.730	16.10	0.0
11.0	2106.0	0.648	16.10	0.0
12.0	2489.0	0.564	16.10	0.0
13.0	2797.0	0.490	16.10	0.0
14.0	2951.0	0.390	16.10	0.0
15.0	2993.0	0.304	16.10	0.0
16.0	2999.0	0.246	16.10	0.0
17.0	3000.0	0.203	16.10	0.0
18.0	3000.0	0.170	16.10	0.0
19.0	3000.0	0.144	16.10	0.0
20.0	3000.0	0.124	16.10	0.0
21.0	3000.0	0.107	16.10	0.0
22.0	3000.0	0.094	16.10	0.0
23.0	3000.0	0.082	16.10	0.0
24.0	3000.0	0.073	16.10	0.0
25.0	3000.0	0.065	16.10	0.0

Table 10 - Turbine performance for Vestas V90 (3.0 MW) - Mode 1 (107.8dBA)

Turbine noise options:

Turbine produces tonal noise No
Noise in octave bands Yes

Octave band (Hz)	Sound Power Level (dB(A))
31.5	86.00
63.0	92.80
125.0	96.80
250.0	100.30
500.0	101.50
1000.0	102.40
2000.0	98.80
4000.0	94.40
8000.0	88.70

Table 11 - Sound Power Level for Vestas V90 (3.0 MW) - Mode 1 (107.8dBA)

Specify absolute sound power level Yes
Specify variation of sound power level with wind speed No

Turbine type Vestas V90 (3.0 MW) - Mode 2 (106.8dBA)
Diameter 90.0 m
Hub height 80.0 m
Number of blades 3
Air density for power curve 1.225 kg/m³
Power regulation Pitch
Cut-In windspeed 4.0 m/s
Cut-Out windspeed 25.0 m/s

Turbine Classification:
Certification according to None

Turbine Class	None	
Sub-Class	None	
V mean	0	m/s
V ref	0	m/s
Design Turbulence	0	%
Slope parameter - a	0	

Hub height wind speed (m/s)	Electrical power (kW)	Thrust coefficient (-)	Rotor speed (rpm)	Reactive power (kVAr)
0.0	0.0	0.000	0.00	0.0
1.0	0.0	0.000	0.00	0.0
2.0	0.0	0.000	0.00	0.0
3.0	0.0	0.000	0.00	0.0
4.0	77.0	0.815	16.10	0.0
5.0	190.0	0.818	16.10	0.0
6.0	353.0	0.823	16.10	0.0
7.0	581.0	0.823	16.10	0.0
8.0	885.0	0.824	16.10	0.0
9.0	1258.0	0.802	16.10	0.0
10.0	1641.0	0.730	16.10	0.0
11.0	2004.0	0.648	16.10	0.0
12.0	2353.0	0.564	16.10	0.0
13.0	2671.0	0.490	16.10	0.0
14.0	2888.0	0.390	16.10	0.0
15.0	2976.0	0.304	16.10	0.0
16.0	2997.0	0.246	16.10	0.0
17.0	3000.0	0.203	16.10	0.0
18.0	3000.0	0.170	16.10	0.0
19.0	3000.0	0.144	16.10	0.0
20.0	3000.0	0.124	16.10	0.0
21.0	3000.0	0.107	16.10	0.0
22.0	3000.0	0.094	16.10	0.0
23.0	3000.0	0.082	16.10	0.0
24.0	3000.0	0.073	16.10	0.0
25.0	3000.0	0.065	16.10	0.0

Table 12 - Turbine performance for Vestas V90 (3.0 MW) - Mode 2 (106.8dBA)

Turbine noise options:

Turbine produces tonal noise	No
Noise in octave bands	Yes

Octave band (Hz)	Sound Power Level (dB(A))
31.5	85.00
63.0	88.70
125.0	94.80
250.0	98.30
500.0	100.40
1000.0	102.00
2000.0	98.60
4000.0	94.20
8000.0	88.30

Table 13 - Sound Power Level for Vestas V90 (3.0 MW) - Mode 2 (106.8dBA)

Specify absolute sound power level	Yes
Specify variation of sound power level with wind speed	No