Project:
Springbrook Wind Turbine

Description:
This anaylsis has been based on background noise levels. More information on this report can be found in the specialist chapter of the Environmental Report.

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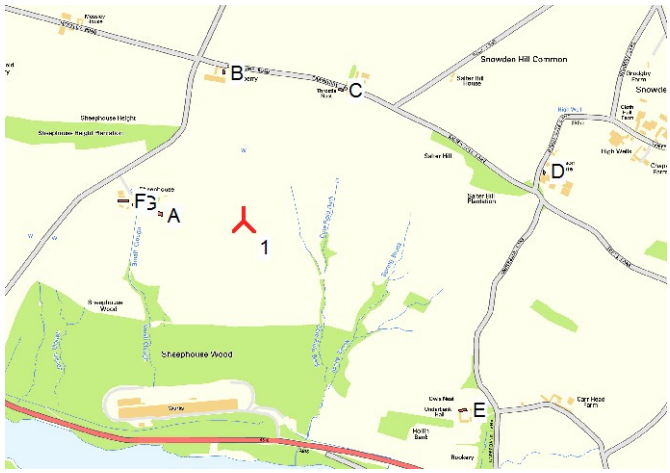
Calculated:
03/05/2013 10:27/2.7.490

DECIBEL - Main Result

Calculation: EWT Single Turbine

Noise propagation model:
ISO 9613-2 United Kingdom
Wind speed:
4.0 m/s - 12.0 m/s, step 1.0 m/s
Ground attenuation:
General, Ground factor: 0.5
Type of demand in calculation:
WTG noise is compared to ambient noise plus 5dB margin with the option of a floor setting (e.g. 35dB)
Noise values in calculation:
All noise values are 90% exeedence values (L90) designed to show compliance with ETSU-R-97 limits
Pure tones:
Pure and Impulse tone penalty are added to WTG source noise
Calculation height above ground level:
4.0 m
Octave band data required



Scale 1:25,000

New WTG Noise sensitive area

WTGs

	BN (AIRY) (Normal)				WTG type							Noise data							
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Creator	Name	First wind speed	LwaRef	Last wind speed	LwaRef	Pure tones	Octave data
	BN (AIRY) (Normal)		[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]	[m/s]	[dB(A)]		
1	424,825	400,304	288.1	EWT DW54 500 54.0 !O! hub: 50.0 m...	Yes	EWT	DW54-500	500	54.0	50.0	EMD	Level 0 - Guaranteed - DW52/DW54*500 - 03-2012	4.0	96.0	12.0	100.5	3 dB	Generic *)

***)Notice: One or more noise data for this WTG is generic or input by user**

Calculation Results

Sound Level

Noise sensitive area		BN (AIRY) (Normal)				Demands	Sound Level		Demands fulfilled ?
No.	Name	East	North	Z	Imission height	Max Noise demand	Max From WTGs	Max exceedence	Noise
				[m]	[m]	[dB(A)]	[dB(A)]	[dB(A)]	
A	Sheephouse Farm	424,553	400,336	280.9	4.0	56.3	38.9	0.0	Yes
B	Cranberry	424,760	400,795	302.7	4.0	51.0	33.3	0.0	Yes
C	Throstle Nest	425,136	400,742	299.0	4.0	53.6	32.4	0.0	Yes
D	Dyson Cote 2	425,815	400,463	301.4	4.0	47.7	25.8	0.0	Yes
E	Underbank	425,536	399,684	229.6	4.0	53.6	26.3	0.0	Yes
F	Sheephouse C & D	424,441	400,371	281.9	4.0	56.3	35.6	0.0	Yes
G	Sheephouse B	424,466	400,359	281.1	4.0	56.3	36.2	0.0	Yes

Distances (m)

	WTG
NSA	1
A	270
B	490
C	535
D	1005
E	949
F	386
G	360

Project:
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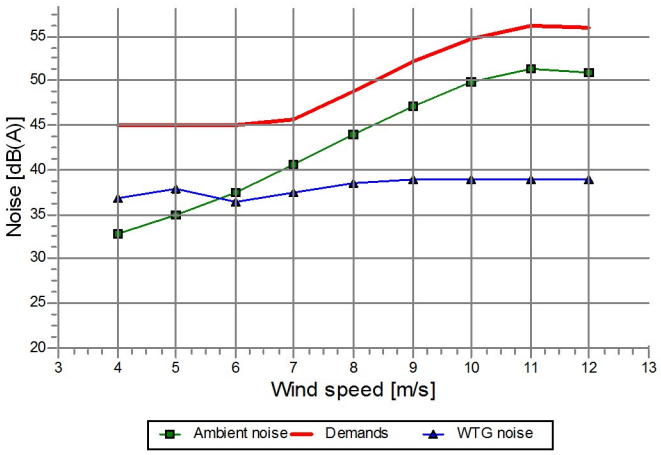
03/05/2013 10:27/2.7.490

DECIBEL - Detailed results

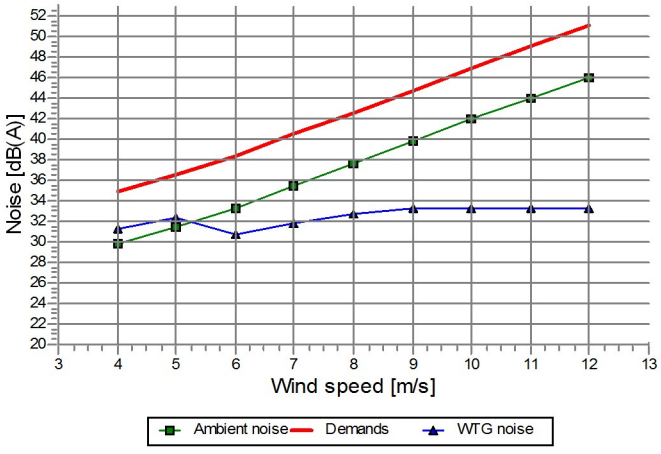
Calculation: EWT Single Turbine **Noise calculation model:** ISO 9613-2 United Kingdom

Sheephouse Farm (A)



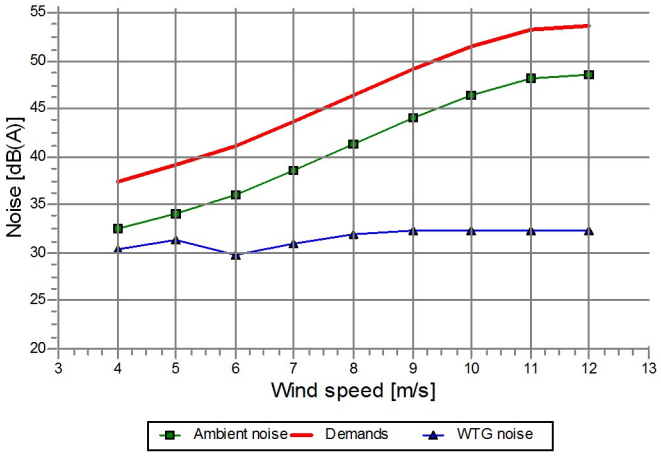
		Demands		Sound Level	
Wind speed	Ambient noise	Margin	Demands	WTG noise	Demands fulfilled ?
[m/s]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
4.0	32.9	5.0	45.0	36.9	Yes
5.0	34.9	5.0	45.0	37.9	Yes
6.0	37.5	5.0	45.0	36.4	Yes
7.0	40.6	5.0	45.6	37.4	Yes
8.0	43.9	5.0	48.9	38.4	Yes
9.0	47.1	5.0	52.1	38.9	Yes
10.0	49.8	5.0	54.8	38.9	Yes
11.0	51.3	5.0	56.3	38.9	Yes
12.0	50.9	5.0	55.9	38.9	Yes

Cranberry (B)



		Demands		Sound Level	
Wind speed	Ambient noise	Margin	Demands	WTG noise	Demands fulfilled ?
[m/s]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
4.0	29.8	5.0	34.8	31.3	Yes
5.0	31.5	5.0	36.5	32.3	Yes
6.0	33.3	5.0	38.3	30.8	Yes
7.0	35.4	5.0	40.4	31.8	Yes
8.0	37.5	5.0	42.5	32.8	Yes
9.0	39.7	5.0	44.7	33.3	Yes
10.0	41.9	5.0	46.9	33.3	Yes
11.0	44.0	5.0	49.0	33.3	Yes
12.0	46.0	5.0	51.0	33.3	Yes

Throstle Nest (C)



		Demands		Sound Level	
Wind speed	Ambient noise	Margin	Demands	WTG noise	Demands fulfilled ?
[m/s]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
4.0	32.5	5.0	37.5	30.4	Yes
5.0	34.1	5.0	39.1	31.4	Yes
6.0	36.1	5.0	41.1	29.9	Yes
7.0	38.6	5.0	43.6	30.9	Yes
8.0	41.4	5.0	46.4	31.9	Yes
9.0	44.1	5.0	49.1	32.4	Yes
10.0	46.5	5.0	51.5	32.4	Yes
11.0	48.2	5.0	53.2	32.4	Yes
12.0	48.6	5.0	53.6	32.4	Yes

Project:
Springbrook Wind Turbine

Description:
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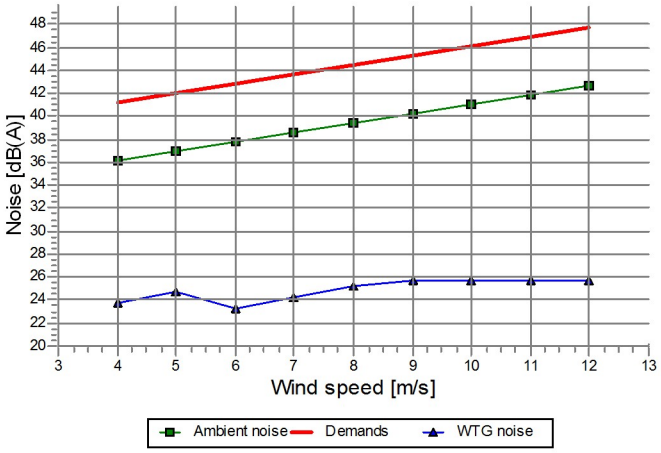
DECIBEL - Detailed results

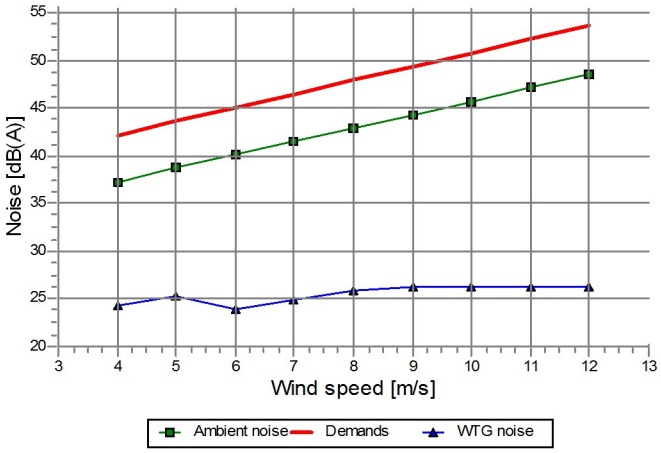
Calculation: EWT Single Turbine **Noise calculation model:** ISO 9613-2 United Kingdom

Dyson Cote 2 (D)



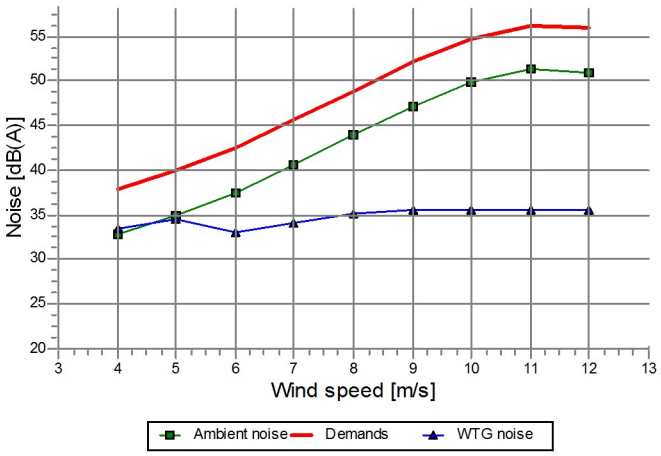
Wind speed	Ambient noise	Demands Margin	Demands	Sound Level WTG noise	Demands fulfilled ?
[m/s]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
4.0	36.2	5.0	41.2	23.8	Yes
5.0	37.0	5.0	42.0	24.8	Yes
6.0	37.8	5.0	42.8	23.3	Yes
7.0	38.6	5.0	43.6	24.3	Yes
8.0	39.4	5.0	44.4	25.3	Yes
9.0	40.3	5.0	45.3	25.8	Yes
10.0	41.1	5.0	46.1	25.8	Yes
11.0	41.9	5.0	46.9	25.8	Yes
12.0	42.7	5.0	47.7	25.8	Yes

Underbank (E)



Wind speed	Ambient noise	Demands Margin	Demands	Sound Level WTG noise	Demands fulfilled ?
[m/s]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
4.0	37.2	5.0	42.2	24.3	Yes
5.0	38.7	5.0	43.7	25.3	Yes
6.0	40.1	5.0	45.1	23.8	Yes
7.0	41.5	5.0	46.5	24.8	Yes
8.0	42.9	5.0	47.9	25.8	Yes
9.0	44.3	5.0	49.3	26.3	Yes
10.0	45.7	5.0	50.7	26.3	Yes
11.0	47.2	5.0	52.2	26.3	Yes
12.0	48.6	5.0	53.6	26.3	Yes

Sheephouse C & D (F)



Wind speed	Ambient noise	Demands Margin	Demands	Sound Level WTG noise	Demands fulfilled ?
[m/s]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
4.0	32.9	5.0	37.9	33.6	Yes
5.0	34.9	5.0	39.9	34.6	Yes
6.0	37.5	5.0	42.5	33.1	Yes
7.0	40.6	5.0	45.6	34.1	Yes
8.0	43.9	5.0	48.9	35.1	Yes
9.0	47.1	5.0	52.1	35.6	Yes
10.0	49.8	5.0	54.8	35.6	Yes
11.0	51.3	5.0	56.3	35.6	Yes
12.0	50.9	5.0	55.9	35.6	Yes

Project:
Springbrook Wind Turbine

Description:
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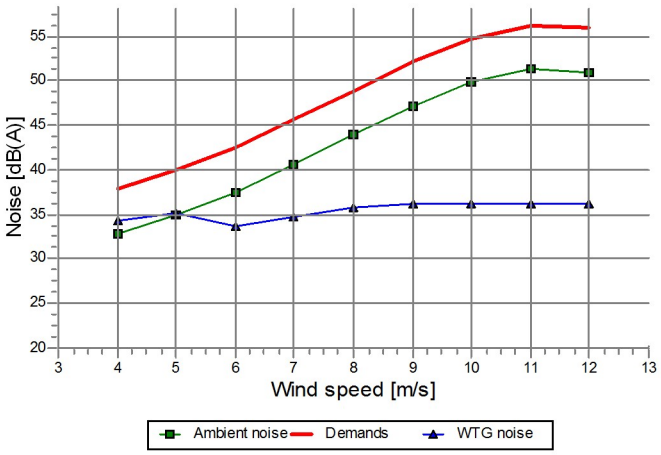
DECIBEL - Detailed results

Calculation: EWT Single Turbine **Noise calculation model:** ISO 9613-2 United Kingdom

Sheephouse B (G)



		Demands		Sound Level	
Wind speed	Ambient noise	Margin	Demands	WTG noise	Demands fulfilled ?
[m/s]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
4.0	32.9	5.0	37.9	34.2	Yes
5.0	34.9	5.0	39.9	35.2	Yes
6.0	37.5	5.0	42.5	33.7	Yes
7.0	40.6	5.0	45.6	34.7	Yes
8.0	43.9	5.0	48.9	35.7	Yes
9.0	47.1	5.0	52.1	36.2	Yes
10.0	49.8	5.0	54.8	36.2	Yes
11.0	51.3	5.0	56.3	36.2	Yes
12.0	50.9	5.0	55.9	36.2	Yes

Project:
Springbrook Wind Turbine

Description:
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Calculated:
03/05/2013 10:27/2.7.490

DECIBEL - Assumptions for noise calculation

Calculation: EWT Single Turbine **Noise calculation model:** ISO 9613-2 United Kingdom

Noise calculation model:
ISO 9613-2 United Kingdom
Wind speed:
4.0 m/s - 12.0 m/s, step 1.0 m/s
Ground attenuation:
General, Ground factor: 0.5
Meteorological coefficient, C0:
0.0 dB
Type of demand in calculation:
3: WTG noise is compared to ambient noise plus margin (UK, AT etc.)
Noise values in calculation:
All noise values are 90% exeedance values (L90)
Pure tones:
Pure and Impulse tone penalty are added to WTG source noise
Height above ground level, when no value in NSA object:
4.0 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)
Octave data required
Air absorption

63 [db/km]	125 [db/km]	250 [db/km]	500 [db/km]	1,000 [db/km]	2,000 [db/km]	4,000 [db/km]	8,000 [db/km]
0.1	0.4	1.0	1.9	3.7	9.7	32.8	117.0

WTG: EWT DW54 500 54.0 !O!
Noise: Level 0 - Guaranteed - DW52/DW54*500 - 03-2012

Source	Source/Date	Creator	Edited
Manufacturer	14/03/2012	EMD	17/08/2012 11:23

Based on EWT Specification S-1005020-R02.
The warranted sound power levels are based on actual measurements executed by an independent noise measurement institute according to the preferred methods set out in IEC-61400-11.
Uncertainty levels are included in the warranted sound power levels.
At 5m/s a maximum tonal noise penalty of 2,5dB shall be considered according to ETSU-R-97 guidelines.
The values given in the table are valid for normal operational mode (rotation speed 0-24 RPM)
The calculation of the standardized wind speed at 10m height according to IEC 61400-11 is based on a terrain roughness length Z0=0,05m.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Penalty [dB]		Octave data 63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
ExtraPolated	50.0	4.0	96.0	Yes	2.5	Generic data	75.6	82.6	86.0	88.6	88.4	85.5	80.7	71.2
From Windcat		5.0	97.0	Yes	2.5	Generic data	76.6	83.6	87.0	89.6	89.4	86.5	81.7	72.2
From Windcat		6.0	98.0	No		Generic data	77.6	84.6	88.0	90.6	90.4	87.5	82.7	73.2
From Windcat		7.0	99.0	No		Generic data	78.6	85.6	89.0	91.6	91.4	88.5	83.7	74.2
From Windcat		8.0	100.0	No		Generic data	79.6	86.6	90.0	92.6	92.4	89.5	84.7	75.2
From Windcat		9.0	100.5	No		Generic data	80.1	87.1	90.5	93.1	92.9	90.0	85.2	75.7
From Windcat		10.0	100.5	No		Generic data	80.1	87.1	90.5	93.1	92.9	90.0	85.2	75.7
ExtraPolated		11.0	100.5	No		Generic data	80.1	87.1	90.5	93.1	92.9	90.0	85.2	75.7
ExtraPolated		12.0	100.5	No		Generic data	80.1	87.1	90.5	93.1	92.9	90.0	85.2	75.7

NSA: Sheephouse Farm-A
Predefined calculation standard: British
Imission height(a.g.l.): Use standard value from calculation model

Ambient noise:

4.0 [m/s]	5.0 [m/s]	6.0 [m/s]	7.0 [m/s]	8.0 [m/s]	9.0 [m/s]	10.0 [m/s]	11.0 [m/s]	12.0 [m/s]
32.9 dB(A)	34.9 dB(A)	37.5 dB(A)	40.6 dB(A)	43.9 dB(A)	47.1 dB(A)	49.8 dB(A)	51.3 dB(A)	50.9 dB(A)

Margin or Allowed additional exposure: 5.0 dB(A)
Sound level always accepted: 45.0 dB(A)
Distance demand: 0.0 m

Project:
Springbrook Wind Turbine

Description:
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Calculated:
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DECIBEL - Assumptions for noise calculation

Calculation: EWT Single Turbine **Noise calculation model:** ISO 9613-2 United Kingdom

NSA: Cranberry-B
Predefined calculation standard: British
Imission height(a.g.l.): Use standard value from calculation model

Ambient noise:

4.0 [m/s]	5.0 [m/s]	6.0 [m/s]	7.0 [m/s]	8.0 [m/s]	9.0 [m/s]	10.0 [m/s]	11.0 [m/s]	12.0 [m/s]
29.8 dB(A)	31.5 dB(A)	33.3 dB(A)	35.4 dB(A)	37.5 dB(A)	39.7 dB(A)	41.9 dB(A)	44.0 dB(A)	46.0 dB(A)

Margin or Allowed additional exposure: 5.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 0.0 m

NSA: Throstle Nest-C
Predefined calculation standard: British
Imission height(a.g.l.): Use standard value from calculation model

Ambient noise:

4.0 [m/s]	5.0 [m/s]	6.0 [m/s]	7.0 [m/s]	8.0 [m/s]	9.0 [m/s]	10.0 [m/s]	11.0 [m/s]	12.0 [m/s]
32.5 dB(A)	34.1 dB(A)	36.1 dB(A)	38.6 dB(A)	41.4 dB(A)	44.1 dB(A)	46.5 dB(A)	48.2 dB(A)	48.6 dB(A)

Margin or Allowed additional exposure: 5.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 0.0 m

NSA: Dyson Cote 2-D
Predefined calculation standard: British
Imission height(a.g.l.): Use standard value from calculation model

Ambient noise:

4.0 [m/s]	5.0 [m/s]	6.0 [m/s]	7.0 [m/s]	8.0 [m/s]	9.0 [m/s]	10.0 [m/s]	11.0 [m/s]	12.0 [m/s]
36.2 dB(A)	37.0 dB(A)	37.8 dB(A)	38.6 dB(A)	39.4 dB(A)	40.3 dB(A)	41.1 dB(A)	41.9 dB(A)	42.7 dB(A)

Margin or Allowed additional exposure: 5.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 0.0 m

NSA: Underbank-E
Predefined calculation standard: British
Imission height(a.g.l.): Use standard value from calculation model

Ambient noise:

4.0 [m/s]	5.0 [m/s]	6.0 [m/s]	7.0 [m/s]	8.0 [m/s]	9.0 [m/s]	10.0 [m/s]	11.0 [m/s]	12.0 [m/s]
37.2 dB(A)	38.7 dB(A)	40.1 dB(A)	41.5 dB(A)	42.9 dB(A)	44.3 dB(A)	45.7 dB(A)	47.2 dB(A)	48.6 dB(A)

Margin or Allowed additional exposure: 5.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 0.0 m

NSA: Sheephouse C & D-F
Predefined calculation standard: British
Imission height(a.g.l.): Use standard value from calculation model

Ambient noise:

4.0 [m/s]	5.0 [m/s]	6.0 [m/s]	7.0 [m/s]	8.0 [m/s]	9.0 [m/s]	10.0 [m/s]	11.0 [m/s]	12.0 [m/s]
32.9 dB(A)	34.9 dB(A)	37.5 dB(A)	40.6 dB(A)	43.9 dB(A)	47.1 dB(A)	49.8 dB(A)	51.3 dB(A)	50.9 dB(A)

Margin or Allowed additional exposure: 5.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 0.0 m

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DECIBEL - Assumptions for noise calculation

Calculation: EWT Single Turbine **Noise calculation model:** ISO 9613-2 United Kingdom

NSA: Sheephouse B-G
Predefined calculation standard: British
Imission height(a.g.l.): Use standard value from calculation model

Ambient noise:

4.0 [m/s]	5.0 [m/s]	6.0 [m/s]	7.0 [m/s]	8.0 [m/s]	9.0 [m/s]	10.0 [m/s]	11.0 [m/s]	12.0 [m/s]
32.9 dB(A)	34.9 dB(A)	37.5 dB(A)	40.6 dB(A)	43.9 dB(A)	47.1 dB(A)	49.8 dB(A)	51.3 dB(A)	50.9 dB(A)

Margin or Allowed additional exposure: 5.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 0.0 m