Moncrieff, Evelyn

From: Norman, Phil
Sent: 12 March 2015 15:58
To: _planningadvice
Subject: FW: Acoustic Report for Horizon Wind Turbine
Attachments: 15458.pdf

Please scan attached to H14-0680-14 as 6SUP.

From: Chris Gilbert [mailto:chris@aapb.co.uk]
Sent: 10 March 2015 14:08
To: 'moyman007@gmail.com'; Branson, Steve
Subject: Acoustic Report for Horizon Wind Turbine

Good afternoon Keith / Steve,

Following our telephone conversation this morning, find attached the report associated with the Wind Turbine installation at Horizon Power Ltd in Pode Hole. As discussed the turbine levels would be classed as acceptable in all the guidance used within the report, including the 5 dB level difference criteria likely to be set as a condition by South Holland District Council.

If you wish to discuss the project further, then please do not hesitate to contact me.

Kind Regards,

Chris

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Acoustic Associates
PETERBOROUGH

INITIAL ENVIRONMENTAL NOISE ASSESSMENT FOR A PROPOSED WIND TURBINE AT HORIZON POWER LIMITED SITE, PODE HOLE

CLIENT:	Horizon Power Ltd 14 Miles Bank Spalding PE11 3EZ
CONTACT:	Mr Keith Brooks
REPORTED BY:	Chris Gilbert MIOA, FIDiagE
CHECKED BY:	Sean Sullivan MIOA, MIDiagE
REPORT No.:	CG/J2915/15458
DATE:	March 2015

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SUMMARY

An initial environmental noise assessment has been carried out associated with the proposed installation of an 18 metre high wind turbine to be located at land to the rear of Horizon Power Ltd, 14 Mile Bank, Pode Hole, Spalding.

The assessment shows that based on the wind turbine data supplied, an acceptable noise situation should occur for the residents of the nearest dwellings, and when the installation is complete, the additional mitigation measures of earth bunds may reduce noise emissions.

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1 OBJECTIVES

1.1 To carry out an initial environmental *noise assessment associated with the installation of an 18 metre high wind turbine to be located on land to the rear of Horizon Power Ltd, 14 Mile Bank, Pode Hole, Spalding.

2 CONCLUSIONS

2.1 Taking the worst case scenario of the typical background level compared to the highest predicted wind turbine level, would give L_{A90} 34.5 dB(A) against a predicted L_{Aeq} 39.3 dB(A), equating to around 4.8 dB. This is deemed acceptable when compared to the proposed South Holland District Council criteria.

2.2 The worst affected assessed location has a predicted internal noise level associated with the turbine operating at 6 m/s of around 24 dB(A). This is significantly below, i.e. better than, the current guidance for internal noise levels.

2.3 It should be noted that the ambient wind noise at the external façade of the building will increase due to the environmental noise affecting trees / hedges etc at 6 m/s (as used for the predicted level of the turbine), therefore, the effects of the turbine would be notably less. Additionally, earth bunds are likely to be formed acting as additional barriers around the site when construction starts, again possibly reducing the noise impact.

3 RECOMMENDATIONS

3.1 Should confirmation be required as to the actual measured levels of the turbine, then additional measurements could be taken once the unit is installed.

4 BACKGROUND

Horizon Power Ltd approached Acoustic Associates (Peterborough) to undertake initial background noise measurements associated with the proposed installation of a wind turbine at their site in Pode Hole. The turbine is reported to be an initial installation in the UK which will be a training resource, which will not necessarily operate on a 24/7 basis.

This initial assessment has been undertaken following discussions with Steve Branson from South Holland District Council to estimate the likely noise effect of running the turbine during night time periods, at the nearest dwellings.

*** see Appendix 1 for a Glossary of Terms**

5 POLICY, GUIDANCE AND STANDARDS

5.1 Local Authority Guidelines

Although it is likely that the final assessment will be conducted when this new design of turbine is fully commissioned, so specific noise levels can be assessed more accurately, the initial assessment has been undertaken at the nearest dwelling to determine the difference between the ambient levels and the predicted specific noise levels when the turbine is operating. This was initially suggested by Steve Branson as being 5dB above existing levels when comparing the existing L_{A90} to the predicted L_{Aeq}.

It has been stated by Horizon Power Ltd that the turbine is a UK training resource, therefore, if night time noise levels are proven to be an issue when the turbine is installed, the operational times can be controlled.

5.2 World Health Organisation Guidance

5.2.1 In addition to the above, it is worth noting that the World Health Organisation (WHO) has published guidelines for community noise, as shown in Table 1 (see Reference 3). This WHO document gives guidance for the levels of noise both inside and outside of dwellings.

Specific Environment	Critical Health Effect(s)	L_{Aeq} (dB)	Time Base (hours)	L_{Amax}, fast (dB)
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

Note: The 'daytime' and 'night-time' periods are generally referred to as 0700 to 2300 and 2300 to 0700 hours respectively.

Table 1. World Health Organisation Noise Guidance Levels (Reference 3)

5.2.2 In addition to the above the WHO in 2009 published guidelines for night-time noise outside dwellings (Reference 4). These state:

"…..an $L_{night,outside}$ of 40 dB should be the target of the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. $L_{night,outside}$ value of 55 dB is recommended as an interim target for the countries where the NNG cannot be achieved in the short term for various reasons, and where policy-makers choose to adopt a stepwise approach……. $L_{night,outside}$ of 40 dB is equivalent to the LOAEL for night noise."

5.3 British Standard BS 8233

British Standard BS8233:2014 (Reference 4) also gives guidance on indoor ambient noise levels, as shown in Table 2.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining Room / Area	40 dB $L_{Aeq,16hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Table 2. British Standard BS8233 : 2014 Indoor Ambient Noise Levels For Dwellings

5.4 Noise Measurements

5.4.1 Ambient Noise

Attended and unattended noise measurements were conducted from Friday 27th February 2015; 22:30 to Saturday 28th February: 00:45. During the measurements 6 locations, as shown in Figure 2, were used to determine the typical ambient noise levels in different parts of the site.

Location 1 was used as an unattended location where a meter was left for the full period logging in 15 minute intervals. This site was chosen due to its close proximity to the nearest dwelling, as shown in the adjacent photograph.



Table 3 below details the other location points used during the monitoring exercise.

Location	Details of Location	Comments
1	North East Corner of Site	Nearest dwelling opposite location
2	Front access road to site	Adjacent A151
3	Car Park of Bromley Memorial Hall	Adjacent A151
4	Centre of site	25 m East of warehouse
5	Between warehouses	25m into centre of warehouses
6	Wind Turbine Location	Approximate location of new wind turbine placement

Table 3 – Monitoring Locations

5.5 Computer Noise Model of the Site And Surrounding Area

A basic computer noise model of the site and surrounding area was generated using Wolfel IMMI Computer Noise Modelling Software (Reference 5) which uses the methods given in ISO 9613 –2 (Reference 4) to calculate noise levels across the proposed site. The model was calibrated with the noise measurements taken on site.

6 RESULTS

6.1 Measured Noise Levels

The results from the ambient noise monitoring are shown below in Table 4 detailing the 'energy average' noise level ($L_{Aeq,T}$), background noise levels ($L_{A90,T}$) and maximum noise levels ($L_{Amax,T}$) measured during the measurement periods on 27th / 28th February 2015.

Location	Time (Hours)	Ambient Noise Level $L_{Aeq,T}$ dB(A)	Background Noise Level $L_{A90,T}$ dB(A)	Maximum Noise Level $L_{Amax,T}$ dB(A)	Comments
1	22:30 – 22:45	43.6	36.2	57.4	Unattended measurements, whilst setting up and collecting instrumentation; noise from distant traffic, birds, wind in hedges when collecting equipment. Wind speed 3 m/s on collection
	22:45 - 23:00	43.7	35.2	64.9	
	23:00 – 23:15	48.6	36.6	72.6	
	23:15 – 23:30	42.2	35.6	55.2	
	23:30 – 23:45	41.7	34.0	56.6	
	23:45 – 00:00	40.1	33.3	57.6	
	00:00 – 00:15	39.6	34.5	53.1	
	00:15 – 00:30	40.8	34.3	57.0	
	00:30 – 00:45	44.3	35.5	64.1	
2	22:45 – 23:00	62.6	37.8	84.5	Dog in distance audible, traffic noise, fan noise. 13 cars passed on A151 22:45-23:00, 11 cars passed by during 23:00-23:15
	23:00 – 23:15	61.7	38.8	80.5	
	23:15 – 23:17	44.2	40.3	54.6	
3	23:30 – 23:45	65.0	35.0	87.0	13 cars, 2 HGVs passed on A151 23:30-23:45, 9 cars passed by during 23:45-00:00
	23:45 – 00:00	63.9	34.7	90.3	
	00:00 – 00:02	43.4	33.5	58.6	
4	00:13 – 00:18	53.6	52.2	60.4	Fan Noise from warehouse
5	00:19 – 00:22	69.5	68.7	71.2	Fan Noise from warehouse
6	00:27 – 00:30	35.5	31.9	51.1	Wind in trees, distant fan noise, trickling water from Vernatt's drain, birds. Wind speed 2.8 m/s
	00:30 – 00:45	37.4	32.7	52.1	
	00:45 – 00:46	37.1	35.4	42.6	

Table 4 - Measured Noise Levels at Monitoring Locations

6.2 Specific Noise Source

The noise levels of the operational wind turbine are not accurately known at present, due to the new nature of the product. To enable predictions to be conducted, data from a similar turbine has been used during this initial assessment. The data supplied from the EOCYCLE 25 as shown in Appendix 2 has been used, and validated within the computer model. The noise data selected for the predictions is an L_{Aeq} of 55.5 dB(A) at 0 metres, based on the emissions at a wind speed of 6 m/s.

6.3 Calculated Noise Levels Within the Amenity Areas of the Proposed Dwellings

Noise predictions were carried out for Assessment Locations in the amenity areas of a selection of the nearest dwellings (3.5m from the building façades at a height of 1.5m above the ground), see Figure 2 for details. The noise levels predicted in the amenity areas during the daytime period are shown below in Table 5.

Assessment Location	Predicted Amenity Area Noise Level $L_{Aeq,T}$ dB(A)
A – Near Location 1	39.3
B – half way along Clay Drove	38.4
C – A151 / Clay Drove property	32.6
D – Reference / Validation Location	50.2

Table 5 – Daytime Predicted Amenity Area Levels

Predicted noise level within the amenity area of all the selected plots are shown to be significantly below a level of 50 dB(A). This is below the level where "moderate annoyance" is likely according to the WHO Guidelines. This is deemed to be an acceptable noise situation.

6.4 External Noise Level Comparison – as suggested by South Holland District Council

Comparing the measured ambient noise levels in Table 4 to the predicted noise data in Table 5 would give a level difference which could be used to determine the likely subjective effect of installing the turbine. Taking the worst case scenario of the typical background level compared to the highest predicted level, would give 39.3 dB(A) - 34.5 dB(A), equating to around 4.8 dB. This would be deemed acceptable when compared to the proposed criteria of + 5 dB.

It should be noted that the ambient wind noise at the external façade of the building will increase due to the environmental noise affecting trees / hedges etc at 6 m/s (as used for the predicted level), therefore, the effects of the turbine would be notably less. Additionally, earth bunds are likely to be formed acting as additional barriers around the site when construction starts, again possibly reducing the noise impact.

6.5 Internal Noise Level Calculations

Assuming a partially open window gives a sound reduction of around 15 dB(A), the worst affected assessed location would have a predicted internal noise level associated with the turbine operating at 6 m/s of around 24 dB(A). Again, it should be noted that the ambient wind noise at the external façade of the building will increase relative to the turbine data used, therefore, the effects of the turbine would be notably less.

REFERENCES

1 National Policy Planning Framework (NPPF)
Published July, 2012 by Department for Communotoes and Local Government
ISBN: 978-1-4098-3408-3

2 Noise Policy Statement for England - Published March 2010 by DEFRA

3 World Health Organisation (WHO) – Guidelines for Community Noise
Published 1999

4 British Standard BS8233:2014 (BS 8233)
Guidance on sound insulation and noise reduction for buildings

5 ISO 9613 – 2:
Acoustics – Attenuation of sound during propagation outdoors

6 Wolfel IMMI Computer Noise Modelling Software

APPENDIX 1 – Glossary of Terms

Sound Pressure	The variation of ambient pressure that is detected by the ear as sound.
Noise	Unwanted sound
deciBel (dB)	Ten times the logarithm of the square of the ratio of the Sound Pressure to a reference pressure (20 micro-Pascal's).
Sound Pressure Level (Lp)	The decibel version of the Sound Pressure.
A-Weighting	A frequency weighting which simulates the response of the ear. An A-Weighted Sound Pressure Level is denoted by L_{pA} and has units of dB(A)
$L_{Aeq,T}$	The value of the A-weighted sound pressure level, in decibels [dB(A)], of a continuous steady sound that within a specified time interval (T), for example 16 hours, has the same mean-square sound pressure as a sound that varies with time. Therefore, the average over a 16 hour period would be denoted as $L_{Aeq,16h}$
$L_{Amax,T}$	The maximum A-Weighted sound pressure level that was encountered during the measurement period.
$L_{A90,T}$	The A-Weighted sound pressure level that is exceeded for 90% of the time (T). This is usually used a measure of background noise.
Free Field	Where noise can propagate freely without any reflections from buildings etc.
Octave Band	A band of frequencies the upper limit of which is twice the lower limit. They are known by their centre frequency, e.g., 63, 125, 250, 500, 1000, 2000
NPSE Critera	
NOEL	No Observed Effect Level
LOAEL	Lowest Observed Adverse Effect Level
SOAEL	Significant Observed Adverse Effect Level

APPENDIX 2 - Noise Instrumentation

Type	Manufacturer	Description	Serial number	Last Calibration Date	Calibration Certificate No.
Svan 957	Svantek	Sound Level Meter	27591	10/06/2014	148881
GA 607	Castle	Sound Level Calibrator	043186	10/06/2014	148880
Svan 957	Svantek	Sound Level Meter	27517	18/02/2014	147055
GA 607	Castle	Sound Level Calibrator	039873	18/02/2014	147054

The calibration of the instrumentaiton was checked at the start and end of the tests and there was no significant drift.

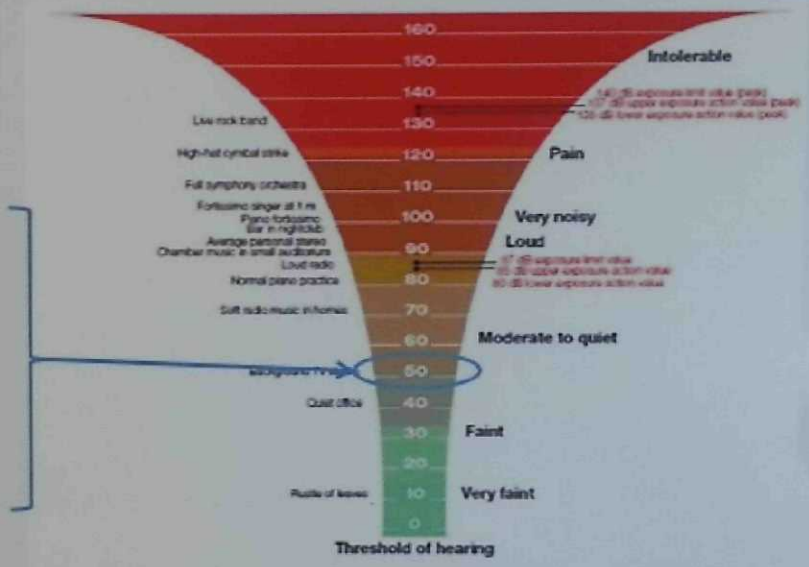
APPENDIX 3 – Wind Turbine Data Sheet

EOCYCLE

THE EOCYCLE 25:
A QUIET TURBINE UNDER ALL WIND REGIMES

- Actual noise emissions (third-party certified measurements)

Average Wind Speed	Noise Level in dBA vs distance from base according to AWEA standard	
In m/s	60 m	0 m
2	49,33	54,79
3	49,62	55,09
4	49,87	55,33
5	49,97	55,43
6	50,06	55,52
7	50,13	55,59
8	50,14	55,60
9	50,43	55,89
10	52,01	57,47



Low noise emissions due to:

- Very moderate variable rotor speed range (30 to 90 rpm);
- Aerodynamically efficient blade profile;
- Gearless direct-drive design.

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FIGURE 1 - Location Plan of the Site (Showing Monitoring Locations 1 – 6)

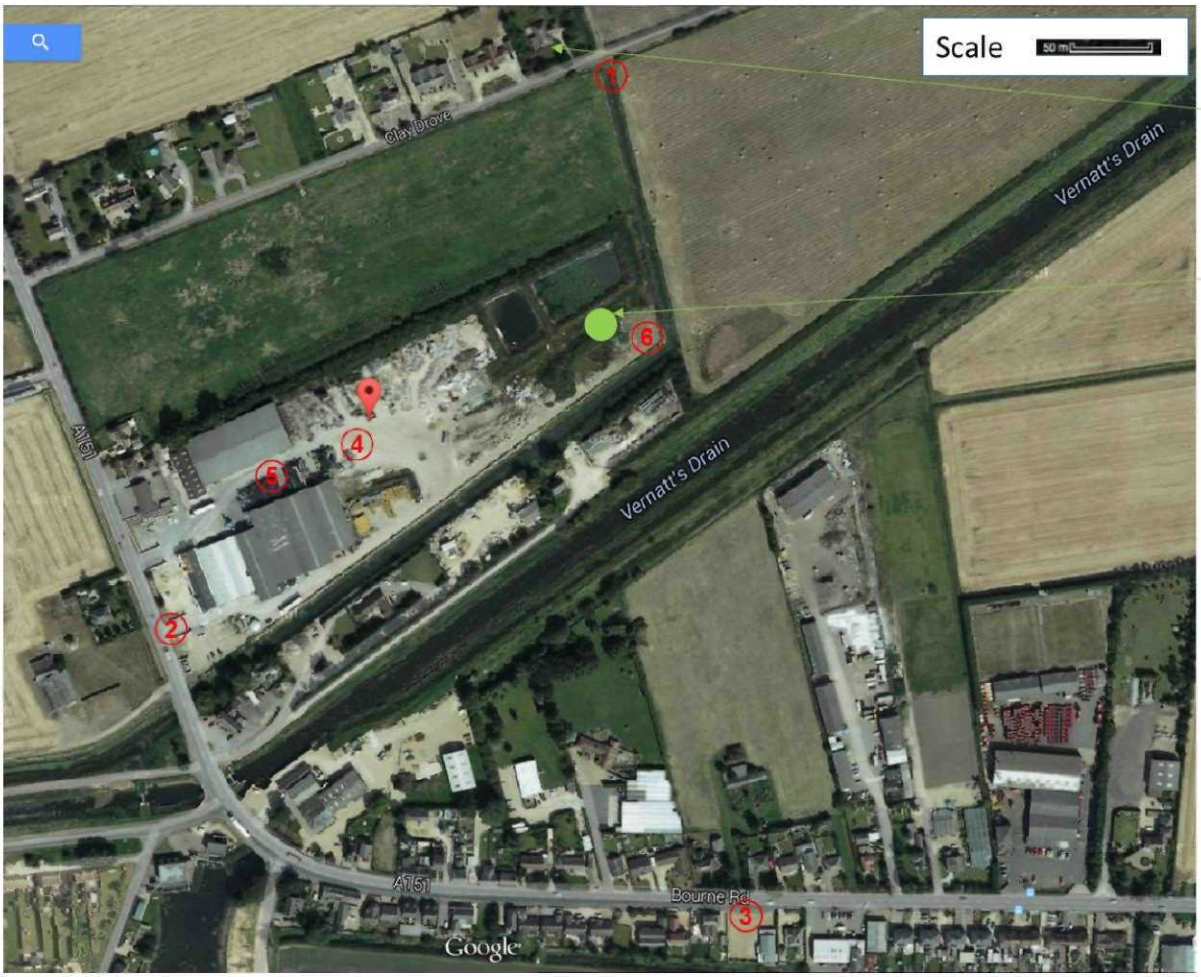


FIGURE 2 – Night Time Noise Contours

