Technical Report

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Project

Barnsley BSF
Wind Turbine Noise Assessment
Kirk Balk School

Prepared for

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Summary

As part of the redevelopment of Kirk Balk School, it is proposed to install a small wind turbine on the roof of one of the new buildings. The noise level that would be caused by the wind turbine at neighbouring buildings has been predicted and its acceptability assessed following the guidelines of the Final Report (ETSU-R-97) of the Working Group on Noise Control from Wind Turbines.

The predicted noise levels at the nearest dwellings are well within the recommended fixed noise level criteria for both daytime and night-time operation. Therefore, we conclude that the wind turbine noise should be considered acceptable for all dwellings in the vicinity of the school.





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1. Introduction

As part of the first phase of the BSF development for Barnsley, it is proposed to erect one or more wind turbines at each end of the schools in the scheme. In seeking planning approval for this, it is necessary to have assessed the acceptability of noise from the wind turbines affecting not only the school, but also the nearby residents. This report considers the noise impact from the operation of one wind turbine at Kirk Balk School.

2. Proposed Wind Turbine Installation

As part of the redevelopment of Kirk Balk School it is proposed to erect one wind turbine on the school premises. It would be located on top of one of the two school buildings as indicated on the plan in Appendix 1. One location is 75 metres from houses at the back of Hawshaw Lane and the other location 85 metres from houses on West Street

The type of wind turbine proposed is the Renewable Devices Swift Rooftop Model 1.5kW.

3. Assessment Methodology

The method of assessing noise impact on-site follows that recommended by the Working Group on Noise from Wind Turbines – Final Report (ETSU-R-97).

The wind turbine noise level, expressed as L_{A90}, is predicted at the most affected dwelling(s). If appropriate a tonal correction is made. These predictions are based on measurements done by the manufacturer. We understand that they are waiting for results from an independent test organisation.

The background noise level, expressed as $L_{A90\text{-}10min}$, is measured at the dwelling(s). This must normally be done at different times and at wind speeds over the range at which the wind turbine is expected to operate, because the background noise level will vary considerably with wind speed. The wind speed as a 10 minute average is measured simultaneously, at the recommended reference height of 10 metres above ground level, at a location representative of the proposed wind turbine siting. The corresponding wind speed at hub height of the proposed turbine is calculated by adjusting the measured speeds according to the equation given in the ETSU report.

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The predicted wind turbine noise level is then compared with both

- fixed noise level criteria
- the background noise level as a function of wind speed

The corrected wind turbine noise is considered acceptable outside dwellings if it is no greater than:

- 35dB $L_{A90\text{-}10min}$ during the daytime
- 43dB $L_{A90\text{-}10min}$ during the night-time

  OR

- the background $L_{A90\text{-}10min}$ +5dB at any time

If the turbine is quiet, such that the fixed noise level criteria are satisfied, then there is no need to determine the background noise level.

4. Wind Turbine Noise Levels

The published sound power level at 8m/s for the Swift Model 1.5kW is 66dBA (L_{Wa}) with no tonal correction needed. The published noise slope is 1.97 dB/m/s, that is the change in noise level for a 1m/s change in wind speed.

The Working Party guidelines use the L_{A90} of the turbine and the index for assessment, using the relationship $L_{A90} = L_{Aeq}$-2dB. They recommend assessment is done up to an average wind speed of 12m/s (at 10m height).

5. Background Noise Measurement

Ambient noise levels (L_{A90} and L_{Aeq}) were measured at different times of day and under different conditions as follows:

i) During the middle of the night-time with no or low wind (below the speed at which the turbines would operate)

ii) During the late evening, as being representative of the quietest part of daytime, with no or low wind

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Measurement positions were located close to residential properties that were thought most likely to be affected by wind turbine noise. These were houses in Hawshaw Lane and West Street as shown in the plan in Appendix 1. Measurements at the back of houses in Hawshaw Lane have not yet been taken. However, as it happens, the wind turbine noise is low enough so that the background noise does not affect the ETSU criteria (see Section 6 below).

The measurements of night-time and evening background noise have been made along West Street for assessing other plant noise. That assessment is not part of this report.

The equipment used to make the measurements and other survey details are given in Appendix 2.

The results are tabulated in Appendix 3. Measurements of L_{Aeq} are included for information although not used in this assessment.

6. Assessment

The predicted noise levels from the turbine at the nearest residences, for a wind speed of 12m/s at hub height are as follows

- Hawshaw Lane – houses at rear – 27 dBL_{A90}
- West Street – 26 dBL_{A90}

These levels are well within the daytime and night-time criteria of respectively 35 and 43$dBL_{A90\text{-}10mins}$

7. Concusion

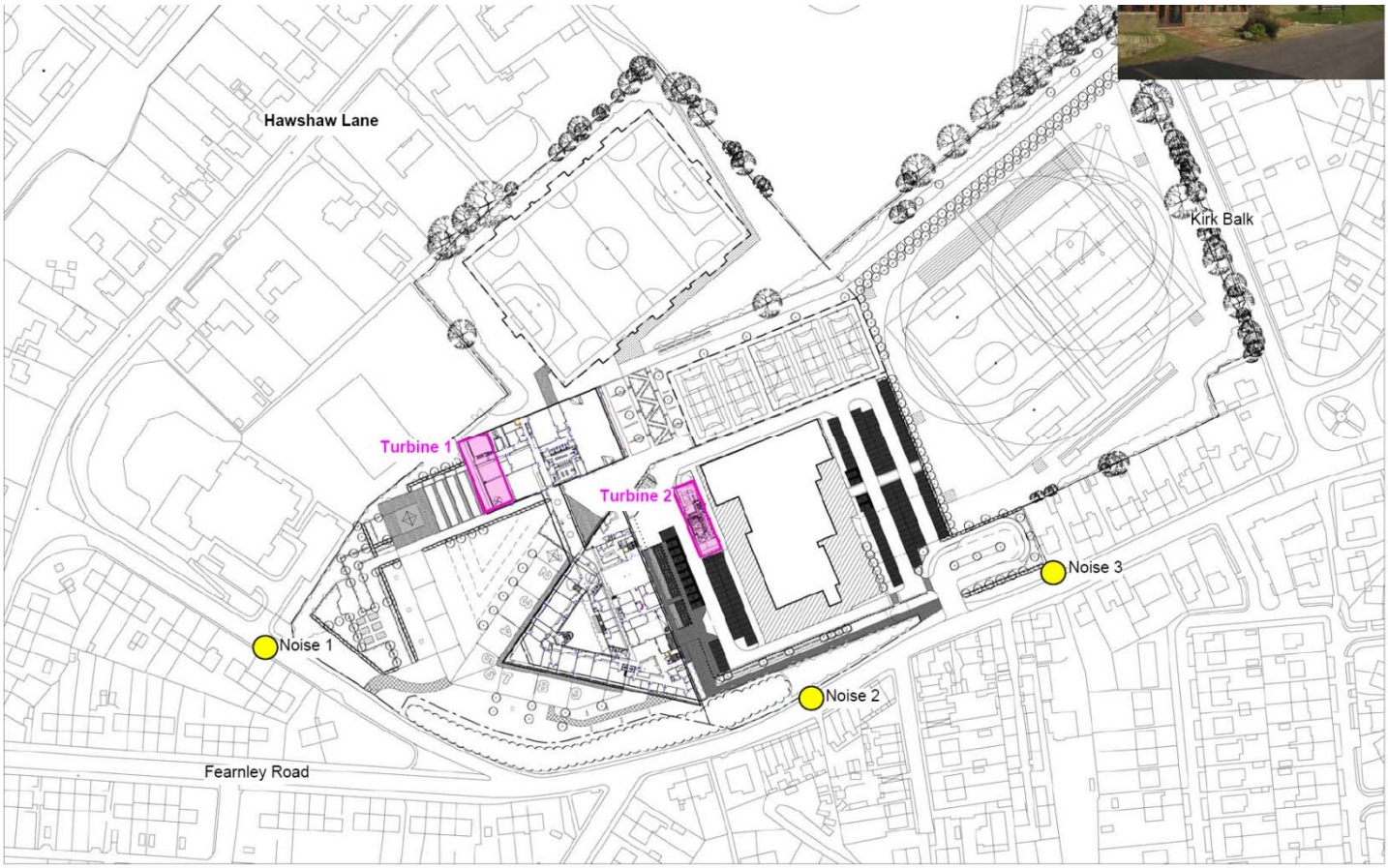
A Swift model 1.5kW wind turbine, operating at either of the two proposed locations, would produce noise levels at neighbouring dwellings that are well within the criteria of acceptability.

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Appendix 1

Plan showing Measurement Locations



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Appendix 2

Survey Details

A1. Location of Surveys

Kirk Balk, Barnsley. For measurement positions see Appendix 1

A2. Dates & Type of Surveys

13/14 October 2009 – Evening/Night-time, no/low wind

A3. Personnel Present During Surveys

Mark Hinds

A4. Instrumentation

Bruel & Kjaer

Type 4231 Sound Level Calibrator, S/N 2665089
Type 2270 Sound Level Meter, S/N 2623080
Type 4189 Microphone, S/N 2638475

A5. Calibration Procedure

Before and after the survey the measurement apparatus was check calibrated to an accuracy of $\pm$0.3 dB using the type 4231 Sound Level Calibrator

A.6 Survey Procedure

Ambient noise levels were monitored at various positions around the site as shown in Appendix 1. The measurements are tabulated in Appendix 3, and explanations of the parameters used are listed in Appendix 4.

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Appendix 3

Survey Results at *Kirk Balk School*

Measured Ambient Noise Levels (dB re $2x10^{-5}$ Pa)

Evening/Night

Date Position	Time	L_{A90}	L_{Aeq}	Comments
13.10.09				
1	20:59	46	49	
2	21:14	46	60	
3	21:27	45	56	
1	21:42	40	46	
2	21:59	41	56	
3	22:02	44	52	
1	22:14	38	44	
2	22:22	41	55	
3	22:29	44	53	Fan on Leisure Centre
1	22:39	40	50	
2	22:48	39	57	
3	22:55	44	52	Fan
14.10.09				
3	01:58	42	45	Fan
2	02:07	35	48	
1	02:18	36	39	
3	02:30	43	46	Nearby vehicle, fan
2	02:39	37	45	
1	02:50	33	36	
3	03:01	43	45	Fan
2	03:11	35	40	
1	03:21	35	40	
3	03:40	43	45	Fan
2	03:47	35	38	
1	03:55	35	39	

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Appendix 4

Noise Measurement Parameter Definitions

L_{A90} - The "A" weighted sound pressure level that is exceeded for 90% of the measurement period. It is commonly used as the "Background Noise Level".

L_{Aeq} - The "A" weighted equivalent continuous sound pressure level. A representation of a continuous sound level containing the same amount of sound energy as the measured varying noise, over the measurement period. It can be considered as the "average" noise level.

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