ACOUSTICS CENTRAL

NYMNPA

04/06/2024

Grouse Hill Caravan Park, Wind Turbine

Acoustic Feasibility Assessment

20240216-0 R1

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Grouse Hill Caravan Park, Wind Turbine

Acoustic Feasibility Assessment

20240216-0 R1

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Document History and Version Control

Version	Purpose/Change	Author	Date
V1.0	First Issue	Matthew Heyes BSc (hons) MIOA	4th June 2024

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Executive Summary

It is proposed to install a new 15kW wind turbine at Grouse Hill Caravan Park, Fylingdales.

The local planning authority have requested a noise feasibility study to establish if the noise impact of the development is suitable or if more assessment work is required to ensure that the noise impact is suitably controlled.

To this end Acoustics Central has been instructed to carry out an acoustic assessment of the proposed turbine. The level of detail of the assessment is suitable for a feasibility study.

The existing background noise levels at the nearest noise sensitive properties have been quantified by installing a noise monitor on the site over a typical weekday period. The background noise levels at various windspeeds have not been quantified due to this being a feasibility study.

Noise limits for the purposed turbine have been set based on guidance from ETSU-R-97 and the noise impact, at the nearest noise sensitive receptors, has been modelled based on noise data from the manufacturer. The noise generated by the turbine has been calculated for wind speeds between 5m/s and 12m/s (the upper speed for ETSU-R-97 assessments).

The assessment has shown that the calculated noise levels from the turbine are below the proposed noise limits and so the impact is considered to be suitable.

ACOUSTICS CENTRAL

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Attachments

1 Introduction

1.1 Planning permission is sought to install a single wind turbine at Grouse Hill Caravan Park in Fylingdales. As part of the planning application the Local Planning Authority have requested a noise impact assessment for the proposed turbine. Jack Hopper, Senior Environmental Health Officer at North Yorkshire Council has requested the following:

"... there is significant uncertainty surrounding the potential for amenity noise impacts without properly assessing it.

It could alleviate concerns somewhat if the application is supported with, for example, a noise risk assessment from a suitably qualified person which in turn will determine whether or not a full assessment is necessary. This might involve a preliminary assessment of things like acoustic specification of the installation, blade swish modelling and quantifying existing background levels *at nearby receptors to address some of the uncertainty."*

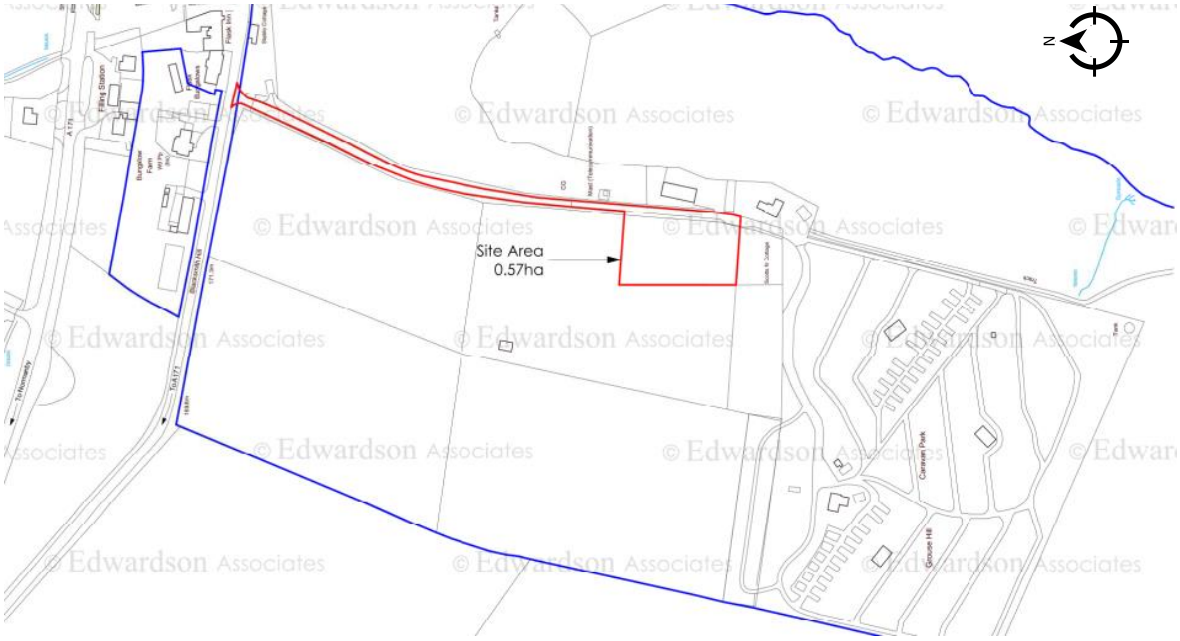
1.2 Acoustics Central have been instructed to undertake a risk assessment, covering the noise impact, of the proposed turbine as requested by the Council.

1.3 This report sets out the methodology and results of an environmental noise survey undertaken at the development site, along with the assessments undertaken using the survey data as a basis, and any conclusion and recommendations for additional assessment work arising from the assessments.

2 Site Location

2.1 Existing

2.1.1 The site is located at Grouse Hill Caravan Park. The proposed turbine is proposed to be located to the north of the caravan pitches. The caravan park is surrounded by wooded areas to the south and west. To the east of site is a mixture of Yorkshire county park and arable land. To the north of site are arable fields owned by the caravan park owner, beyond these are dwellings located within Fylingdales.



F1 Site location Plan

2.1.2 The red line in the site plan above shows the development site. The blue line shows the area owed by Grouse Hill Caravan Park. This includes some of the closest dwellings located within Fylingdales.

2.1.3 It is proposed to install a single CF15 Turbine which has a maximum power of 15kW and a hub height of 15m, within the existing top field.

3 Policy and Guidance

3.1 National Planning Policy Framework

3.1.1 The National Planning Policy Framework (NPPF)[1] sets out the Government's planning policies for England and how these are expected to be applied.

3.1.2 Paragraph 180 states:

Planning policies and decisions should contribute to and enhance the natural and local *environment by (…) preventing new and existing development from contributing to, being put at* unacceptable risk from, or being adversely affected by, unacceptable levels *of (…) noise pollution.*

3.1.3 Paragraph 191 states:

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

3.1.4 NPPF paragraph 191 refers to the Noise Policy Statement for England, details of which are set out in the following section.

Noise Policy Statement for England[2]

3.1.5 The Noise Policy Statement for England (NPSE) seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The statement applies to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise.

3.1.6 The statement sets out the long-term vision of the government's noise policy, which is to "promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development".

3.1.7 The NPSE adopts established concepts from toxicology that are currently being applied to noise effects. The concept details noise level thresholds, at which the effects of an exposure may be classified into a specific category. The classification categories as detailed within NPSE are as follows:

- No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;

[1] National Planning Policy Framework – Ministry of Housing, Communities and Local Government, September 2023
[2] https://www.gov.uk/government/publications/noise-policy-statement-for-england

- Lowest Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

3.1.8 The first aim of the NPSE is to avoid significant adverse effects on health and quality of life, taking into account the guiding principles of sustainable development. The second aim considers situations where effects are established between the LOAEL and SOAEL. In such circumstances, all reasonable steps should be taken to mitigate and minimise the effects. However, this does not mean that such adverse effects cannot occur. The third aim seeks to improve health and quality of life, where possible, through the pro-active management of noise, whilst also taking account of the guiding principles of sustainable development.

3.1.9 It is recognised that the SOAEL does not have a single objective noise-based level that is applicable to all sources of noise in all situations; therefore the SOAEL is likely to be different for different sources, receptors and at different times of the day.

Planning Practice Guidance[3]

3.1.10 Planning practice guidance on noise attempts to clarify the thresholds set out above. To this end, the table below taken from the guidance summarises the noise exposure hierarchy, based on the likely average response.

[3] https://www.gov.uk/guidance/noise--2

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level (NOEL)			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level (NOAEL)			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

T1 Summary of the noise exposure hierarchy, based on the likely average response

3.2 Local Council

3.2.1 Jack Hopper, Senior Environmental Health Offices at North Yorkshire Council, has stated the following regarding the requirement for a noise impact assessment:

"... there is significant uncertainty surrounding the potential for amenity noise impacts without properly assessing it.

It could alleviate concerns somewhat if the application is supported with, for example, a noise risk assessment from a suitably qualified person which in turn will determine whether or not a full assessment is necessary. This might involve a preliminary assessment of things like acoustic specification of the installation, blade swish modelling and quantifying existing background levels *at nearby receptors to address some of the uncertainty."*

3.2.2 As detailed above a preliminary noise impact assessment is required to establish if the noise impact of the turbine is appropriate or if additional assessment work is required to more accurately assess the impact and provide potential mitigation measures.

3.3 ETSU-R-97 The Assessment & Rating of Noise from Wind Farms

General

3.3.1 ETSU-R-97 provides guidance for the assessment of noise impact from wind farms and so is the relevant document to consider when assessing the turbines noise impact:

"This document describes a framework for the measurement of wind farm noise and gives indicative noise levels thought to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on wind farm development or adding *unduly to the costs and administrative burdens on wind farm developers of local authorities."*

3.3.2 The document set's external noise limits based on both internal and external noise criteria and states that:

*"The noise limits applied to protect the external amenity should only apply to those area*s of the property which are frequently used for relaxation or activities for which a quiet environment is *highly desirable"*

3.3.3 The above makes clear that noise limits for external amenity areas should only be considered where the area is frequently used for relaxation or activities for which a quiet environment is highly desirable. Based on this, small front gardens, which are mainly used for car parking and small areas of flower beds, may not require any noise limits.

Background Noise Levels

3.3.4 A full assessment in line with ETSU-R-97 requires the background noise levels to be measured over a range of wind speeds and directions. This is to take account of the variation in noise climate due to the effect of the wind, along with the increase background noise levels which can be expected at higher wind speeds.

"The Noise Working Group is of the opinion that one should only seek to place limits on noise over a range of wind speeds up to 12m/s which measured at 10m height on the wind farm site. There are four reasons for restricting the noise limits to this range of wind speed:

Wind speeds are not often measured at wind speeds greater than 12m/s at 10m height

Reliable measurements of background noise levels and turbine noise will be difficult to make in high winds

Turbine manufacturers are unlikely to be able to provide information on sound power levels at such high wind speed for similar reasons

If a wind farm meets noise limits at wind speeds lower than 12m/s it is most unlikely to cause any greater loss of amenity at higher wind speeds.

3.3.5 The requirement to measure the background noise levels over various windspeeds and directions is a significant undertaking which can take several weeks to complete.

Noise Limits

3.3.6 ETSU-R-97 sets noise limits relative to the existing background noise level, at the different windspeeds, along with absolute limits which apply when the existing background noise climate is very low:

"The recommendation of the Noise Working Group is that, generally, the noise limits should be set relative to the existing background noise at nearest noise-sensitive properties and that the limits should reflect the variation in both turbine source noise and background noise with wind speed. We have also considered whether the low noise limits which this could imply in particularly quiet areas are appropriate and have concluded that it is not necessary to use a margin above background approach in such low-noise environments. This would be unduly restrictive on development which are recognised as having wider national and global benefits. Such low limits are, in any event, not necessary in order to offer a reasonable degree of *protection to the wind farm neighbour."*

3.3.7 Wind turbines generally operate 24 hours a day and so the noise limits must take account of the most sensitive times when it will be working. Some turbines have the ability to restrict their operations at certain times and in certain wind conditions and so different limits are derived during the day and night time periods:

"Separate noise limits should apply for day-time and for night-time. The reason for this is that during the night the protection of external amenity becomes less important and the emphasis should be on preventing sleep disturbance. Day-time noise limits will be derived from background noise data taken during quiet parts of the day and similarly the night-time limits will be deriver from background noise data collected during the night.

Quiet day-time periods are defined as:

All evenings from 6pm to 11pm

Plus Saturday afternoon from 1pm to 6pm,

Plus all Sunday, 7am to 6pm.

Night time is defined as 11pm to 7am."

3.3.8 The noise limits provided within ETSU-97 are reproduced below.

*"Noise f*rom the wind farm should be limited to 5dB(A) above background for both day- and night-time (with the exception for the lower limits and simplified method described below), remembering that the background levels of each period may be different.

In low noise environments the day-time level of the LA90 of the wind farm noise should be limited to an absolute level within the range for 35-40 dB(A). The actual value chosen within this range should depend upon a number of factors:

The number of dwellings in the neighbourhood of the wind farm

The effect of noise limits on the number of kWh generated

The duration and level of exposure.

The Noise Working Group recommends that the fixed limit for night-time is 43dB(A). This limit is derived from the 35dB(A) sleep disturbance criteria referred to in Planning Policy Guidance Note 24 (PPG24). An allowance of 10dB(A) has been made for attenuation through an open window (free-field to internal) and 2dB subtracted to account for the use of LA90 rather than $L_{Aeq,\ 10min}$.

The Noise Working Group recommends that both day- and night-time lower fixed limits can be increased to 45dB(A) and that consideration should be given to increasing the permissible margin above background where the occupier of the property has some financial involvement in the wind farm.

3.4 IOA – A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise – May 2013

3.4.1 The IOA GPG (Institute of Acoustics Good Practice Guide) provides a guide for undertaking assessments in line with ETSU-R-97:

"This guide presents current good practice in the application of the ETSU-R-97 assessment methodology for all wind turbine developments above 50 kW, reflecting the original principles within ETSU-R-97, and the results of research carried out and experience gained since ETSU-R-97 *was published."*

3.4.2 With regards to smaller developments, such as the single 15kW turbine proposed at Grouse Hill, the IOA GPG states the following:

"Smaller development such as single turbines warrant a simplified procedure (either based on ETSU-R-97 or other method agreed with the LPA), commensurate with the size and impact of the *project."*

3.4.3 The document provides advice for undertaking the noise survey and assessment work in line with RTSU-R-97, but does not contain any additional guidance.

3.4.4 A flow cart for assessing the noise impact of wind turbines, in line with the guidance from ETSU-R-97, is provided within the document. This states that where the noise from the turbine at the nearest dwellings is below 35 dB(A) additional assessment work is not required. Where the calculated level is above this a survey is required in line with ETSU-R-97 guidance.

3.4.5 With regards to Amplitude Modulation the document states the following under "Other Matters":

"The evidence in relation to "Excess" or "Other" Amplitude Modulation (AM) is still developing. At the time of writing, current practice is not to assign a planning condition to deal with AM."

3.4.6 It is understood that this is because of a lack of assessment work in to how to quantify Amplitude Modulation and no methodology on how to predict its occurrence.

3.5 WHO Guidelines 2018

3.5.1 Noise criteria for new wind farms are provided in WHO Guidelines 2018 and are reproduced below:

For average noise exposure, the GDG conditionally recommends reducing noise levels produced by wind turbines below 45 dB Lden, as wind turbine noise above this level is associated with adverse health effects.

No recommendation is made for average night noise exposure Lnight of wind turbines. The quality of evidence of night-time exposure to wind turbine noise is too low to allow a recommendation.

To reduce health effects, the GDG conditionally recommends that policymakers implement suitable measures to reduce noise exposure from wind turbines in the population exposed to levels above the guideline values for average noise exposure. No evidence is available, however, to facilitate the recommendation of one particular type of intervention over another.

3.5.2 The L_{den} limit above refers to the day-evening-night level which is a descriptor of noise level based on the L_{eq} over a whole 24 hour day with a penalty of 10 dB(A) for night time noise (2300-0700) and an additional penalty of 5 dB(A) for evening noise (1900-2300).

3.6 IOA Noise Working Group (Wind Turbine Noise) Amplitude Modulation Working Group "A Method for Rating Amplitude Modulation in Wind Turbine Noise".

3.6.1 This document has been prepared to propose a method for measuring and rating amplitude modulation in wind turbine noise. Amplitude modulation is described by the document as:

"Amplitude modulation (in this context) is a regular fluctuation in the level of noise, the period of fluctuation being related to the rotational speed of the turbine. This characteristic of the sound *might be described by a listener as a regular 'swish', 'whoomph', or 'thump', depending on the cause and the severity of the modulation."*

3.6.2 The document states that it is generally accepted that there are two manifestations of wind turbine Amplitude Modulation:

"It is now generally accepted that there are two manifestations of wind turbine AM. An observer close to a wind turbine will experience 'blade swish' because of the directional characteristics of the noise radiated from the trailing edge of the blades as it rotates towards and then away from them. This effect is reduced for an observer on or close to the (horizontal) turbine axis, and therefore would not generally be expected to be significant at typical separation distances, at least on relatively level sites. The RenewableUK AM project (RenewableUK 2013) has coined the *term 'normal' AM (NAM) for this inherent characteristic of wind turbine noise, which has long* been recognised and was discussed in ETSU-R-97 in 1996 (ETSU, 1996).

In some cases, a form of AM is observed at residential distances from a wind turbine (or turbines). *The sound is generally heard as a periodic 'thumping' or 'whoomphing' noise containing* relatively low frequencies. This type of noise was identified in 2002 to 2004 by Frits van den Berg (van den Berg 2005) and in a UK study on low frequency noise from wind farms in 2006 (Hayes, M. 2006). The prevalence of this type of modulation is subject to debate. On sites where it has been reported, occurrences appear to be occasional, although they can persist for several hours under some conditions, dependent on atmospheric factors, including wind speed and direction.

It was proposed in the RenewableUK 2013 study that the fundamental cause of this type of AM is transient stall of the airflow over the blades as these experience periodic (blade passing frequency related) changes in the inflow wind speed as they rotate. Transient stall represents a fundamentally different mechanism from blade swish and can be heard at relatively large distances, primarily downwind of the rotor blade. The RenewableUK AM report adopted the term *'Other AM' (OAM) for this characteristic. Elsewh*ere it might be reported as Excessive Amplitude *Modulation (EAM)."*

3.6.3 The document provides potential methodologies on how the presence of Amplitude Modulation could be recorded once the turbine in installed and states the following regarding rating the noise following the assessment:

"There is currently no generally agreed rating methodology for wind turbine AM."

3.6.4 The standard goes on to state:

New Zealand Standard NZS 6808: 2010 provided a penalty mechanism but noted that there was no objective test available. Authorities in Australia and Finland have published some guidance on rating methodologies and associated limits, although these are either unvalidated or in draft form. In the UK, planning conditions intended to address AM have been imposed on a small number of wind farms to develop a scheme of assessment. These conditions have been based either on the time-series method adopted at Den Brook, which has been the subject of much debate and legal challenge, or the frequency-domain method proposed by RenewableUK (RenewableUK, 2013). However, in virtually all cases, planning officers and inspectors, in granting wind farm planning permission, have declined to impose an AM condition; as either they have considered that the need for such a condition had not been demonstrated, or that there was no robust scientific basis for framing such a condition, or both. In a number of cases, a condition requiring a scheme for assessing AM to be agreed with the local planning authority has been imposed; this form of condition relies on the premise that an appropriate method of assessing AM will be available within the development timescale. A scheme of this type has been discharged by Maldon District Council in respect of Turncole Wind Farm. The scheme was based on an amended RenewableUK methodology.

3.6.5 Whilst the document provides some recommendations on how Amplitude Modulation can be measured/quantified for an existing turbine there is currently no methodology to undertake an assessment of Amplitude Modulation prior to installation of the turbine. Due to this there is no method to ensure that it does not occur through the planning process.

3.7 Proposed Methodology

3.7.1 The aim of this report is to assess the feasibility of the new turbine with respect to the noise impact in order to establish if a full assessment in line with ETSU-R-97 is required. It is therefore proposed to undertake a shorter noise survey in line with standard survey conditions (wind speeds below 5m/s with no periods of rain) to quantify the background noise climate.

3.7.2 Noise limits, based on the guidance within ETSU-R-97 will be set based on the measured noise levels and absolute criteria. These limits are 5 dB above the existing background noise level, or 35 dB(A) during the day and 43 dB(A) at night, whichever is higher.

3.7.3 The noise levels from the turbine operating at up to 12m/s will then be compared to these noise limits, where the turbine meets the limits it is considered to be a reasonable indication that the noise impact of the turbine is suitable.

4 Environmental Noise Survey

4.1 General

4.1.1 To quantify the noise levels around the development site unattended noise measurements were made between the 7th and 10th April 2024.

4.2 Guidance and Standards

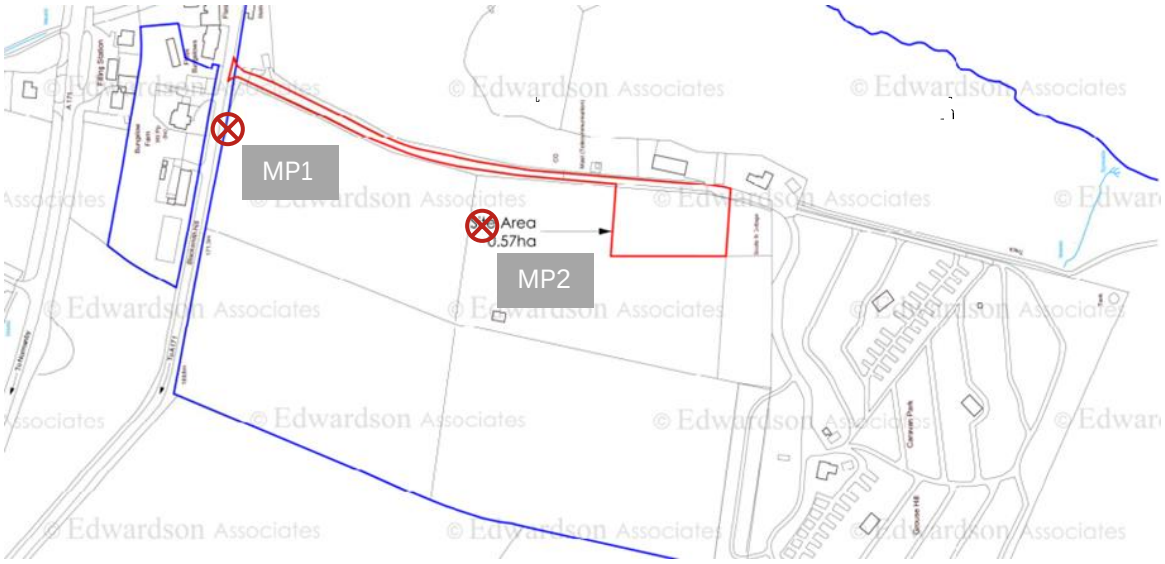
4.2.1 The survey instrumentation, methodology and reporting of results have been carried out following guidance contained within British Standard 7445-1:2003 - *'Description and measurement of environmental noise - Part 1: Guide to quantities and procedures'*.

4.3 Measurement Positions

4.3.1 The noise measurements were made at a two positions as detailed below:

- MP1 – Unattended noise measurement position located 1.5m adjacent to Fylingdales Road
- MP2 – Unattended noise measurement position located 1.5m on the northern boundary of the upper field.

4.3.2 The measurement positions are shown on the figure below.



OS Map

F2 Measurement Locations

4.4 Noise Measurement Equipment

4.4.1 All noise measurements were made with the equipment detailed in the following table:

Item	Manufacturer	Type
Sound Level Analyser (x2)	Nti	XL2-TA
Microphone (x2)	NTi Audio	MC230
Pre-Amp (x2)	NTi Audio	MA220
Acoustic Calibrator	NTi	CAL200

T2 Equipment used during noise measurements

4.4.2 The sound level analysers presented in the above table conform to the Type 1 specification as given in BS EN 61672-1:2003 - *'Electroacoustics* - Sound level meters - *Part 1: Specifications'*. The calibrator presented in the above table conforms to the Class 1 specification as specified in IEC 60942:2003 – *'Electroacoustics* - *Sound calibrators'*.

Traceable Calibration

4.4.3 The measurement instrumentation, including sound level analysers, preamplifiers and microphones have undergone traceable calibration by either a competent laboratory or the equipment manufacturer within the last two years.

4.4.4 The acoustic calibrator has undergone traceable calibration by either a competent laboratory or the equipment manufacturer within the last year. The calibration certificates for the above equipment can be provided on request.

4.4.5 A field calibration check was undertaken on the noise measurement equipment before and after the survey to ensure a consistent and acceptable level of accuracy was maintained. No significant drift (greater than 0.2dB) was noted to have occurred.

4.5 Data Recorded

4.5.1 Noise data was recorded in all relevant indices, including L_{Aeq}, L_{A90}, $L_{AMax,F}$ and $L_{AMax,S}$. Octave band data for each of the above indices was also recorded, the filters for which met the requirements of BS EN 61260:1996, Class 1.

4.5.2 Noise data was recorded over sequential 15-minute periods for the duration of the survey in which all indices and octave band spectra were recorded. One-minute sequential data was also recorded for the L_{Aeq} and L_{Amax} metrics to allow for more detailed analysis of the noise climate. Audio recordings were also made during the survey in order to facilitate noise source identification when reviewing the data.

4.6 Meteorological Conditions

4.6.1 Weather conditions during setup and collection of the equipment were warm and dry with no cloud coverage. Observations around the site and local area showed that there were some periods of higher wind speed and some very light rain during the survey. These periods have been excluded from the assessment data where they are deemed to have noticeably affected it.

4.7 Noise Climate

4.7.1 When setting up and collecting the measurement equipment the noise climate was dominated by road traffic of vehicles on the A171.

4.8 Results

4.8.1 The full measurement results are shown in attached time history in 20240216-0 R1 TH01-TH02

4.8.2 A summary of results of the noise survey at the measurement positions is presented in the following table.

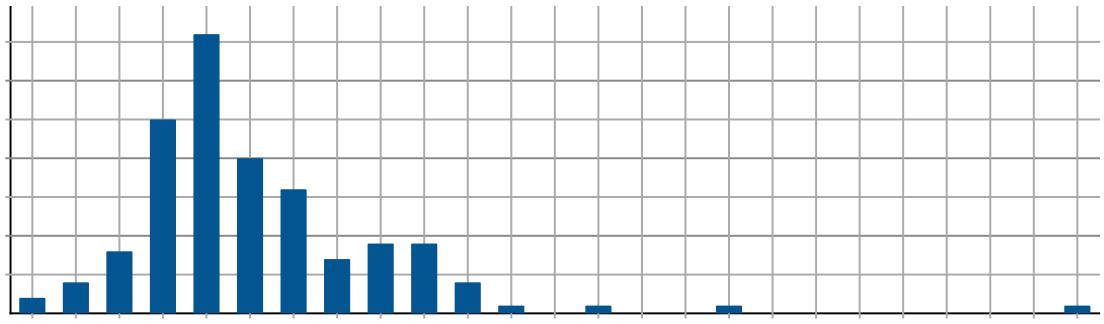
Date	Measured $L_{Aeq,T}$ at position MP1		Measured $L_{Aeq,T}$ at position MP2	
	Daytime (0700-2300 only)	Night time (2300-0700)	Daytime (0700-2300 only)	Night time (2300-0700)
Tuesday 7th	48*	42	47*	39
Wednesday 8th	47	46	47	43
Thursday 9th	57**	46	50**	47
Friday 10th	48*	-	45*	-

T3 Measured ambient noise levels

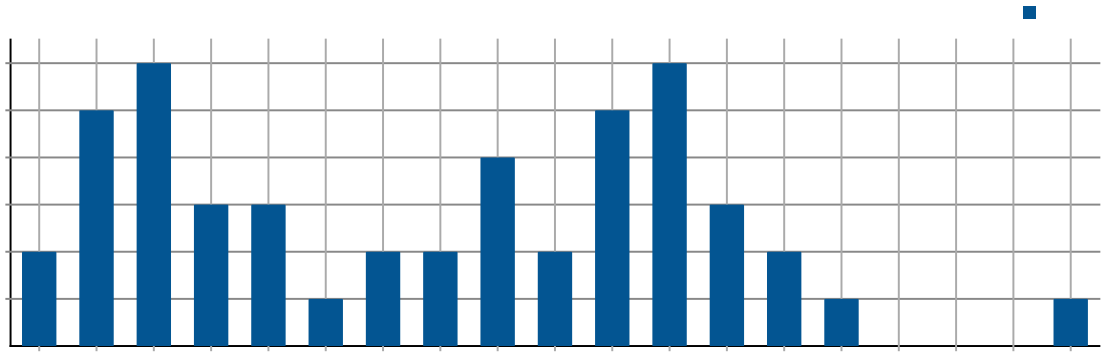
*Partial Measurements

** Measurement affected by significant noise source near MP1 between 13:30-14:00

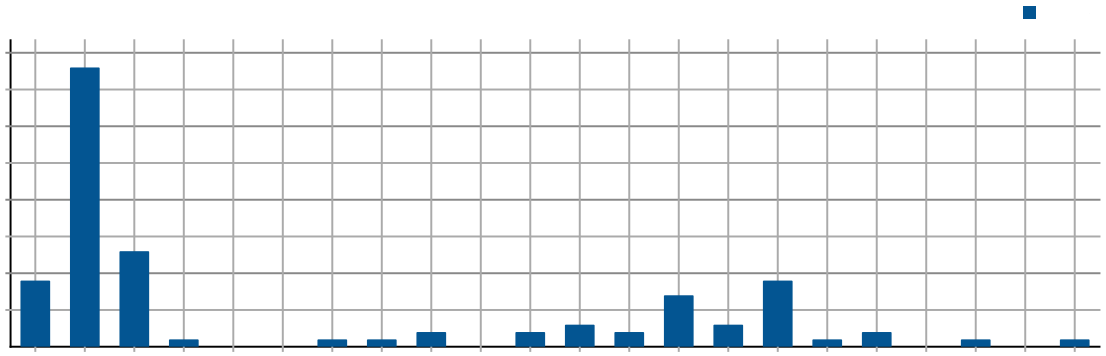
4.8.3 Day, evening and night time histograms of the background noise levels (L_{A90}) for MP1 are shown below:



F3 MP1, L_{A90} daytime (0700-1900)

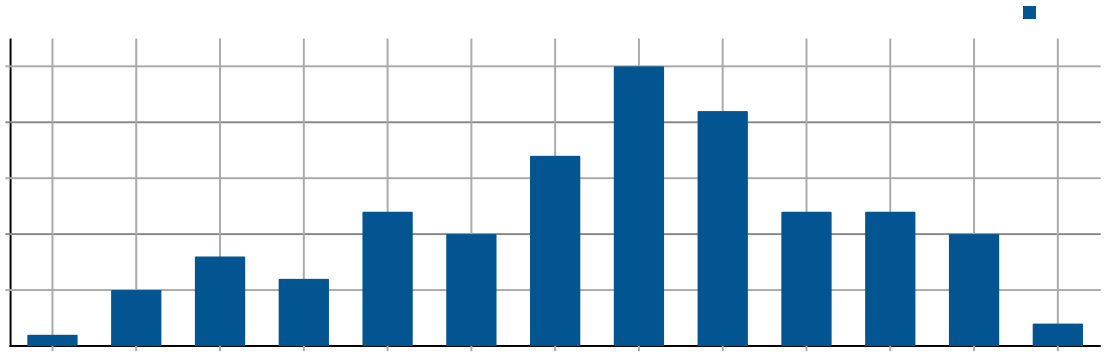


F4 MP1, L_{A90} evening (1900-2300)

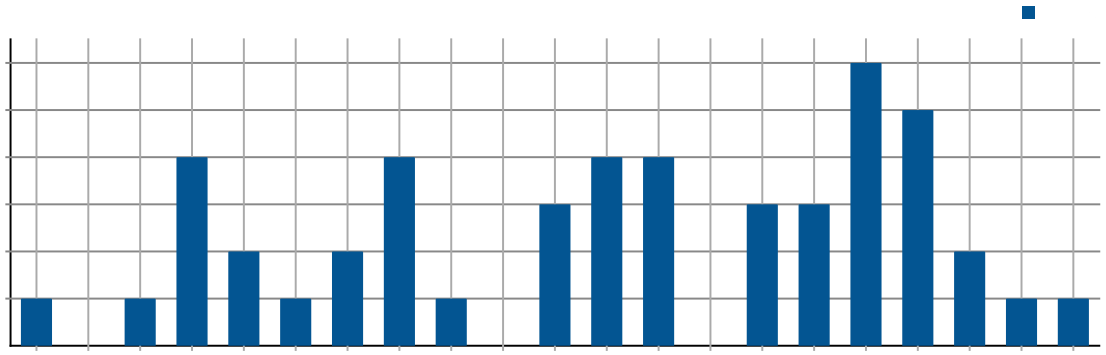


F5 MP1, L_{A90} Night (2300-0700)

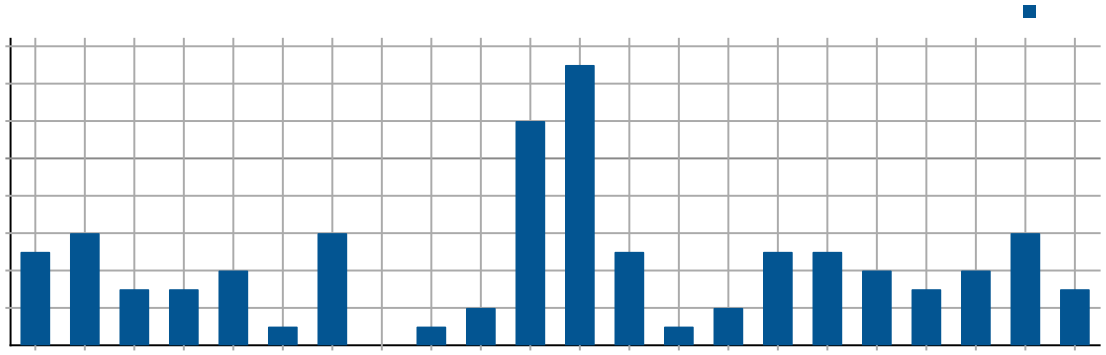
4.8.4 Day, evening and night time histograms of the background noise levels (L_{A90}) measured at position MP2 are shown below:



F6 MP2, L_{A90} daytime (0700-1900)



F7 MP2, L_{A90} evening (1900-2300)



F8 MP2, L_{A90} Night (2300-0700)

4.8.5 Representative background noise levels for the day, evening and night time noise levels have been assessed based on analysis of the time history and histograms above. The representative levels are shown below:

Location	Representative $L_{A90,15min}$, dB		
	Daytime (0700-1900 only)	Evening (1900-2300)	Night time (2300-0700)
MP1	37	27	23
MP2	41	31	28

T4 Representative Background Noise Levels

5 Noise Impact Assessment

5.1 Noise Sources

5.1.1 A computer noise model of the site has been constructed using CadnaA noise prediction software. The model area covers the site itself along with the nearest dwellings to the north in Fylingdales and to the east on Wragby Farm.

5.1.2 Noise levels form the turbine have been provided by the manufacturer and are shown in attached Appendix C. The model has been run based on the manufacturer's sound power level at 8m/s of 87dB. Additional wind speeds have been modelled by adjusting the sound power levels by 1.74 dB/m/s as per the noise slope provided by the manufacturer.

5.1.3 The data provided by the manufacturer states that no noise penalties are required as part of the assessment.

5.2 Noise Modelling Parameters

5.2.1 The model has been setup with the following parameters and best practice assumptions.

Ref.	Set with model
Standards	ISO 9613-2:1996
Ground Absorption	0.5 coefficient (ETSU-97 recommended)
Meteorological Conditions	10 degrees Celsius; 70% humidity; and Wind from source to receiver.
Receptor Height	Upper floor window height, based on observations on site.
Source Modelling	The noise source has been modelled as a point source at the hub height of 15m above local ground level.
Buildings and barriers	All acoustically relevant existing structures and buildings in the immediate surroundings of the site have been included within the model.
Terrain	Contours for the site has been taken from Cadmapper.com
Site Layout	As per Edwardson Associates drawing ref 101

T5 Noise Modelling Parameters

5.3 Criteria

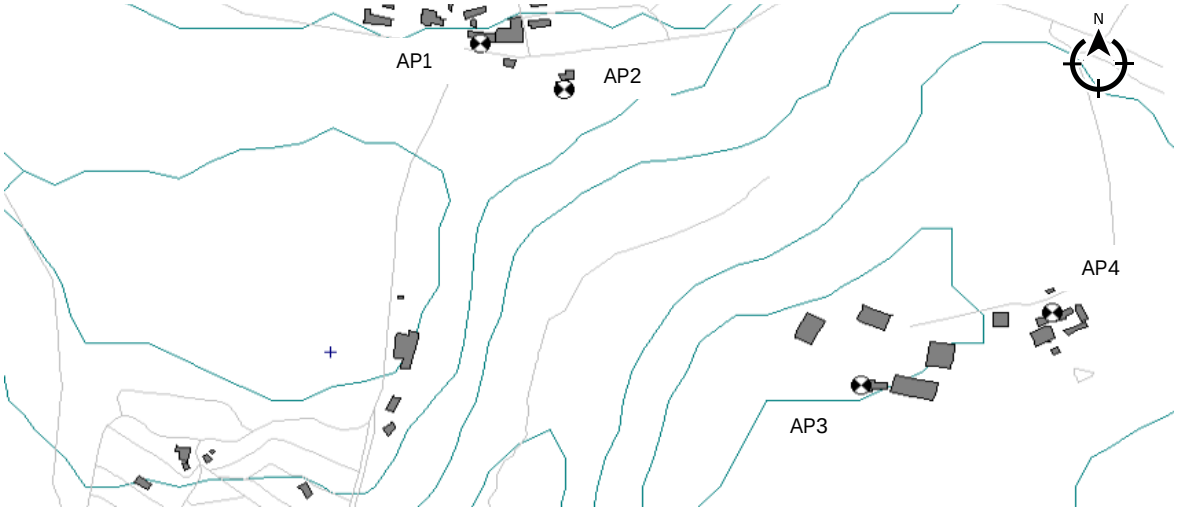
5.3.1 The day and night time noise limits have been derived from the guidance in section 3 and the measured background noise levels detailed in section 4.8 above. As required by ESTU-R-97 the daytime noise limits have been based on the measured noise levels in the evening and absolute criteria, Noise levels at night are based on the absolute criteria as the measured noise levels were very low. These are shown below:

Location	Noise Limit, dB	
	Daytime (0700-2300 only)	Night time (2300-0700)
MP1	35[4]	43[4]
MP2	36	43[4]

T6 Noise limits at the nearest residential properties.

5.4 Assessment Positions

5.4.1 Receptor positions have been placed in the model, 1m from the nearest windows or in external amenity areas as represented in the figure below by black and white circles.



F1 Assessment positions

5.4.2 The assessment positions are numbered AP1 to AP4 and are considered to be representative of the nearest noise sensitive properties.

[4] ETSU absolute criteria (35dB during the day, 43dB at night)

5.5 Assessment Results

5.5.1 The resultant noise levels at the assessment positions, for windspeeds between 5m/s and 12m/s, along with the lowest noise limit set for the development are shown in the table below:

Location	5	6	7	8	9	10	11	12
AP1	14	16	17	19	21	23	24	26
AP2	18	20	21	23	25	27	28	30
AP3	15	17	18	20	22	24	25	27
AP4	10	12	13	15	17	19	20	22
Lowest noise limit set	**35**	**35**	**35**	**35**	**35**	**35**	**35**	**35**

T7 Resultant noise levels

5.5.2 The results above show that noise from the turbine is at least 5dB below the proposed noise limits at all times, including at the highest windspeeds. This is considered to be a good indication that the noise impact from the turbine is low and so no additional assessment work is considered to be necessary.

6 Conclusion

6.1 Planning permission is sought to install a single wind turbine at Grouse Hill Caravan Park in Fylingdales. As part of the planning application the Local Planning Authority have requested a noise impact assessment for the proposed turbine. Jack Hopper, Senior Environmental Health Officer at North Yorkshire Council has requested the following:

"... there is significant uncertainty surrounding the potential for amenity noise impacts without properly assessing it.

It could alleviate concerns somewhat if the application is supported with, for example, a noise risk assessment from a suitably qualified person which in turn will determine whether or not a full assessment is necessary. This might involve a preliminary assessment of things like acoustic specification of the installation, blade swish modelling and quantifying existing background levels *at nearby receptors to address some of the uncertainty."*

6.2 Acoustics Central have undertaken an initial noise feasibility study for the development. The works undertaken include quantifying the existing background noise levels via a short term (3 day) unattended noise survey, calculating the noise levels of the turbine at the nearest dwellings at various wind speeds and comparing the resultant levels to the noise limits set in ETSU-R-97.

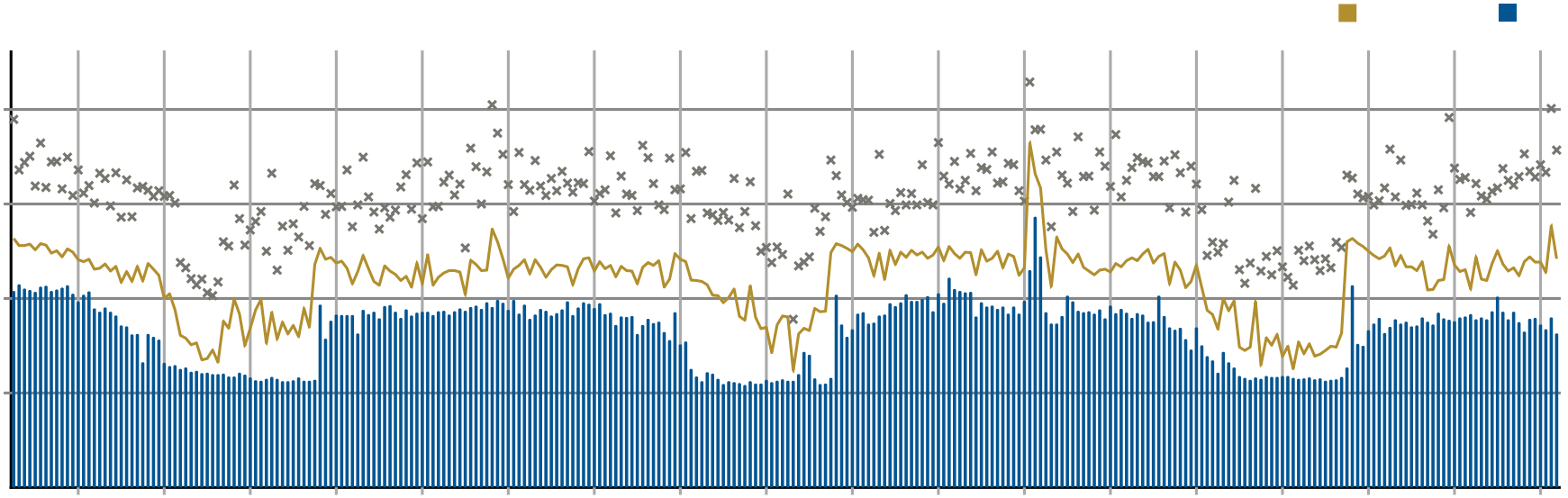
6.3 The assessment has calculated that noise from the turbine will be below the ETSU-R-97 noise limits at all wind speeds up to 12m/s. It is considered that this demonstrates that the noise impact from the turbine is suitable and so no further assessment work is required.

Acoustic Feasibility Assessment

4th June 2024

20240216-0 R1 TH01-TH02

Noise Levels Recorded at Position MP1, 7th May to 10th May 2024

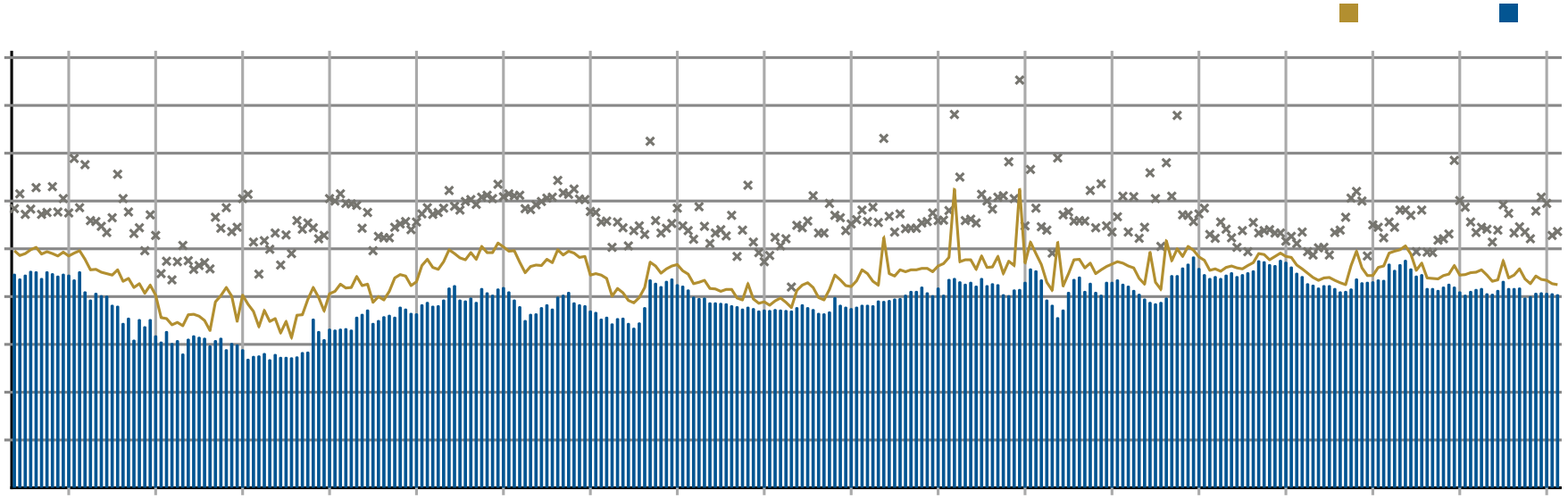


Acoustic Feasibility Assessment

4th June 2024

20240216-0 R1 TH02

Noise Levels Recorded at Position MP2, 7th May to 10th May 2024



Appendix A

Glossary of Acoustics Terms – Noise Levels

Single Figures and Spectra

Generally speaking, the human ear is capable of hearing noise within the frequency range 20Hz to 20kHz. To make handling of data more meaningful and manageable, the range is often divided into 'bands', each of which covers a specific part.

For most acoustics applications, either octave or third-octave bands are used. Each band has a specific centre frequency which is used to identify it. When reported, the band centre frequency is given, along with the associated noise level, e.g. 63dB L_{eq} at 500Hz.

Noise levels can also be reported as single figure values where all energy contained within the measured frequency range is summed to provide a single figure. However, as the human ear does not hear noise at different frequencies with equal loudness, a weighting curve is often applied to levels before summing to account for this fact.

The most common curve is the A-weighting curve, and its use is denoted by including the letter 'A' with either the index e.g. 63dB L_{Aeq}, or with the decibel suffix (if the index is described elsewhere), e.g. 63dBA. 'B' and 'C' weighting curves may also be applied, depending on the application. A 'Z' is used to indicate a single figure where no weighting has been applied, e.g. 63dB L_{Zeq}.

Noise Level Indices

Noise level measurements can be made and reported in a variety of indices. The index is reported using the letter L to indicate Level, followed by, for example, abbreviations to represent the specifics of the index, and time intervals where applicable. The most commonly used are given below.

$L_{eq,T}$, (dB) - Equivalent Continuous Sound Pressure Level

The $L_{eq,T}$ value is the sound pressure level in decibels of a continuous steady sound that within a specified time interval, T, has the same mean-squared sound pressure as a sound that varies with time. It is often used as a descriptor of the ambient noise climate, and commonly seen as a single A-weighted figure $L_{Aeq,T}$.

L_{max}, (dB) - Maximum Sound Pressure Level

The L_{max} value is the highest recorded sound pressure level in decibels averaged across a specified time constant during a noise measurement of certain duration. Two time constants are used, Fast and Slow, where the time constants are 0.125s and 1s respectively. The time constant is denoted in the index, $L_{max,F}$ for Fast and $L_{max,S}$ for Slow. It is often used to identify transient events that have a high-level relative to the ambient noise climate, and commonly seen as a single A-weighted figure L_{Amax}.

$L_{10,T}$, (dB) - Equivalent Continuous Sound Pressure Level

The $L_{10,T}$, value is the sound pressure level in decibels that is exceeded for 10% of a given time interval, T. It is often used as a measurement of noise from transportation sources such as road and rail. It is commonly seen as a single A-weighted figure $L_{A10,T}$.

$L_{90,T}$, (dB) - Equivalent Continuous Sound Pressure Level

The $L_{90,T}$, value is the sound pressure level in decibels that is exceeded for 90% of a given time interval, T. It is often used as a descriptor of the background noise climate, and commonly seen as a single A-weighted figure $L_{A90,T}$.

Appendix B

Document Naming and Version Control Policy

All documents are issued with a unique number which comprises the principle 8-digit project and 1-digit subsection numbers, for example 20151203-0, and a reference indicting iteration of document type, for example R1 for Report 1, M2 for Memorandum 2 etc.

All documents employ version control through the use of a unique version number. The version numbers employ two levels of hierarchy, and use the format illustrated below:

V 1 . 2

Major Minor

Major

A major revision occurs when the report is revised to reflect significant changes in design strategy. For example, wide scale changes to building footprint or general arrangements, changes to principle construction type (e.g. masonry to lightweight), reselection of mechanical services plant etc. A change in strategy that takes place within the same RIBA work stage for example will prompt a major revision to a document.

Minor

A minor revision occurs when the report is revised to reflect minor changes to the design implementation. For example a change in the type of natural vent, extract fan, surface finish etc. to be used, on the project. Minor revisions will also occur when there is a change in wording of the report text.

Reporting

The Document History and Version Control table on the second page of each report identifies the versions through which the document has moved, along with the date, author that produced the version, and a description of its purpose or change.

Electronic File Naming

Reports issued electronically use the following format:

2012xxxx	- x	Rx	Noise Assessment Report	v1.0	yyyy.mm.dd	.pdf
Project Number		Subsection Report Number	Report Name	Version	Date	File Extension

Appendix C

Manufacturer's noise data

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4.0 Acoustic Test Results including Noise label

This is a summary of the evaluation of the CF15 wind turbine noise over a range of wind speeds and directions. Characterizations of the turbines apparent sound power level, 1/3 octave bands, and tonality are made.

Acoustic noise data was gathered on four separate days in the months of November and December in 2011. On all four days, winds were primarily out of the South West, ranging from 184° to 277°. Meteorological and wind turbine data has been gathered continuously since commissioning of the CF15 on February 4th, 2011.

The resulting acoustic performance for normal operation in accordance with the BWEA standard is as follows:

Wind speed dependence	**1.74 dB/m/s**
Immission Sound Pressure Level at 60m $L_{p,60m}$	**47 dBA**
Immission Sound Pressure Level at 25m $L_{p,25m}$	**55 dBA**

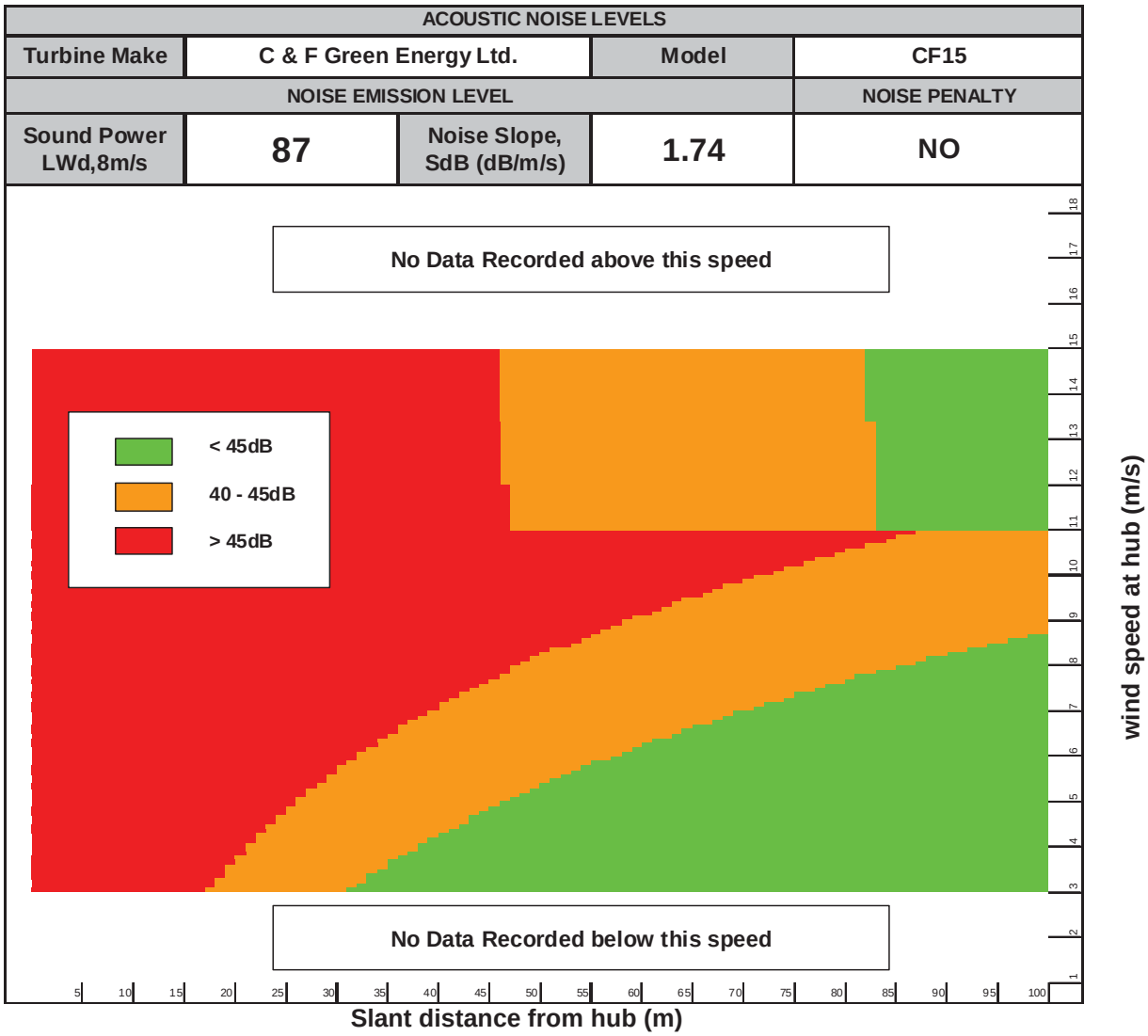

Figure 1 – Noise Immission Map for CF15

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