



Appendix 7

Moorshield Wind Farm

Noise Planning Update by Hayes McKenzie, February 2022

Moorshield Wind Farm Limited

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Noise Planning Update
for Moorshield Wind Farm Limited
Andy McKenzie, Hayes McKenzie Partnership Ltd
3543_N03_EXT2, 23 February 2022

1. INTRODUCTION

- 1.1 This document has been submitted to summarise the planning situation in respect of noise from the proposed Moorshield wind farm and to introduce a proposed planning condition on noise which has been agreed to satisfy the potential concerns of Scottish Power, operators of the nearby Whitelee wind farm including extensions.

2. CURRENT PLANNING SITUATION IN RESPECT OF NOISE

- 2.1 A noise assessment, carried out by Arcus Consultancy Services, was provided as Appendix 4 to the Supporting Statement submitted with the planning application for Moorshield wind farm (Application Ref 2020/0217/TP).
- 2.2 The assessment was carried out by deriving noise limits for potentially affected residential properties from background noise measurements, in line with ETSU-R-97¹ as referenced by National Planning Policy. The ETSU-R-97 noise limits, which apply to all wind farms noise affected any residential location (the overall noise limits) , were then corrected for the predicted contribution from Whitelee wind farm and extensions to provide limits for Moorshield wind farm acting alone. Compliance with these limits by Moorshield ensures that cumulative wind farm noise will not exceed the overall noise limits.
- 2.3 The Appendix 4 noise assessment concluded as follows:

'An assessment of potential noise effects associated with the Development has been carried out.

Construction noise will be limited in duration and confined to working hours as specified by the Council and therefore can be adequately controlled through the application of good practice measures and secured by planning condition. This will ensure that any noise from the Development site during construction will be adequately controlled.

Operational noise has been assessed in accordance with ETSU-R-97 and in line with current best

¹ ETSU-R-97, The Assessment & Rating of Noise from Wind Farms, DTI 1996

practice. It has been shown that the Development would comply with the requirements of ETSU-R-97 at all receptor locations.

The cumulative effects of the Development in conjunction with nearby wind energy developments either operational, consented or the subject of a current planning application were taken into consideration in the above assessment, in accordance with ETSU-R-97 and the GPG.

Noise during decommissioning will be of a similar nature to that of construction and will be managed through best practice or other guidance or legislation relevant at the time.'

2.4 The Arcus noise assessment was subsequently reviewed by AECOM Ltd, on behalf of East Renfrewshire Council (ERC). This review raised a number of issues and concluded that:

'Whilst noise is unlikely to present a sufficient reason to refuse planning permission, it will be necessary to determine appropriate noise level limits and whether operational power constraints are required prior to granting consent.

It will also be necessary to determine the potential impacts of substation and construction noise. Our recommendation is that the application could not be supported without further information on these areas.'

2.5 This further information was subsequently provided by Hayes McKenzie on 14th October 2021 in Note 3543_N02_EXT2 including:

- Comments on possible noise from the proposed sub-station.
- An assessment of construction noise at Shieldhill Farm.
- Details of alternative turbine types fitting the dimensions proposed for the development.
- Details of additional wind turbine development in the area.
- Supply and review of the baseline noise measurement report carried out in connection with the Whitelee development.

2.6 This was concluded to be sufficient to address the comments in the AECOM review but that further information could be provided, if required, as necessary. No further request for information has been received.

3. PLANNING CONDITION ON NOISE

- 3.1 Because of concerns raised by Scottish Power Renewables (SPR) over proposed planning conditions on noise for the proposed Soame wind farm (Application Ref. 2014/0820/TP), Hayes McKenzie agreed a revised condition with SPR, which was also agreed by ERC², for submission to the Planning Inquiry on the refusal of permission by the Council (appeal Reference PPA-220-2048).
- 3.2 This appeal was dismissed and has been followed by the application for the smaller Moorshield wind farm. Because of the previous concerns raised by SPR, Hayes McKenzie have agreed a variation on the condition agreed with them, and ERC, for Soame, to be proposed for the Moorshield development.

Noise Limits Derived in the Appendix 4 Noise Assessment

- 3.3 These are described in the Appendix 4 (A4) noise assessment at Section 3, with the limits proposed contained in paragraph 3.4 of that document at Table 6. These are stated, in A4 paragraph 2.8.7, to have been derived by logarithmically subtracting the cumulative noise levels (excluding noise due to the development) from the cumulative noise limits which are provided in A4 paragraph 3.3 at Table 5, as discussed in the Hayes McKenzie note as submitted to ERC on 14th October 2021. In this way, the limits at Table 6 are specifically set at the 'budget' which remains for any additional development, once the operation of Whitelee wind farm is taken into account, and ensures that cumulative noise levels will not exceed the derived cumulative noise limits assuming Moorshield wind farm operates at or below these derived limits.
- 3.4 As described in that note, however, there appears to be an error in A4 Table 6 wherein the night-time limits for Shieldhill at 4, 5 and 6 m/s should be set at 43.3, as per the day-time limits, not at 44.1, and bearing in mind it's financial involvement. This has been agreed with SPR.
- 3.5 It has also been agreed with SPR that, where the limits derived at A4 Table 6 are lower than derived for Soame, these limits would be used in preference to those in the proposed condition for Soame agreed with SPR. On that basis the limits for the residential properties of Shieldhill and Highfield are taken from the Arcus ES but for the others are as per the agreed Soame condition.

Planning Condition on Noise as Agreed with SPR

- 3.6 The limits described above have been agreed with SPR in the proposed noise condition for

² In practice, Hayes McKenzie have only seen the conditions from ERC prior to the removal of Whitelee Phase 3 from the calculation of the remaining noise budget referred to in Paragraph 2.1, but it may be assumed that ERC adopted the same limits as were agreed with SPR following this slight change.

Moorshield, together with the use of the limits previously agreed for other properties as used in the condition proposed for Soame and agreed with both SPR and ERC. This followed the same principles as described above whereby the cumulative noise levels, excluding the proposed development (in that case Soame), were subtracted from the overall derived cumulative noise limits, to provide the remaining noise budget for new development.

- 3.7 In addition, the titles of Table 1 and Table 2 in the condition have been changed to bring them into line with best practice, and a note has been added to Table 3 for clarity.
- 3.8 The proposed condition is appended to this note.

Appendix 1:

Proposed Moorshield Noise Condition Wording

The rating level of noise immissions from the combined effects of the wind turbines approved by this permission ('Moorshield wind turbines') (including the application of any tonal penalty) when determined in accordance with the attached Guidance Notes (to this condition), shall not exceed the values for the relevant integer wind speed set out in, or derived from, the tables attached to this condition (Appendix 1) at any dwelling which is lawfully existing or has planning permission at the date of this permission and:

a) The wind farm operator shall continuously log power production, wind speed and wind direction, all in accordance with Guidance Note 1(d). These data shall be retained for a period of not less than 24 months. The wind farm operator shall provide this information in the format set out in Guidance Note 1(e) to the Planning Authority on its request, within 14 days of receipt in writing of such a request.

b) No electricity shall be exported until the wind farm operator has submitted to the Planning Authority for written approval a list of proposed independent consultants who may undertake compliance measurements in accordance with this condition. Amendments to the list of approved consultants shall be made only with the prior written approval of the Planning Authority.

c) Within 21 days from receipt of a written request from the Planning Authority following a complaint to it from an occupant of a dwelling alleging noise disturbance at that dwelling, the wind farm operator shall, at its expense, employ a consultant approved by the Planning Authority to assess the level of noise immissions from the wind farm at the complainant's property in accordance with the procedures described in the attached Guidance Notes. The written request from the Planning Authority shall set out at least the date, time and location that the complaint relates to and any identified atmospheric conditions, including wind direction, and include a statement as to whether, in the opinion of the Planning Authority, the noise giving rise to the complaint contains or is likely to contain a tonal component. Where in the opinion of the Planning Authority such a complaint relates to noise from the combined effects of the Moorshield wind turbines and those on Whitelee Adjacent Wind Energy Development, responsibility for assessment of compliance with the noise limits contained in the tables attached to this condition (including any associated requirement to stop the Moorshield wind turbines to undertake this assessment) shall firstly be undertaken for noise from the Moorshield wind turbines by the operator of the Moorshield wind turbines. "Whitelee Adjacent Wind Energy Development" shall mean the Whitelee Windfarm (the Section 36 consent and deemed planning permission granted by the Scottish Ministers in April 2006), Whitelee Windfarm Extension Phase 1 (the Section 36 consent and deemed planning permission granted by the Scottish Ministers for an extension to Whitelee Windfarm in May 2009) and Whitelee Windfarm Extension Phase 2 (the Section 36 consent and deemed planning permission granted by the Scottish Ministers for an extension to Whitelee Windfarm in December 2009). Where the Planning Authority has received a valid complaint about noise from the Whitelee Adjacent Wind Energy Development, requiring assessment of the compliance with the noise limits applicable to that site, and where in the opinion of the Planning Authority there may be an acoustically relevant contribution from the operation of the wind turbines hereby approved which may influence that assessment, the turbines hereby approved shall be shut-down during the hours of 2300-0500 for wind speeds and directions specified by the Planning Authority as corresponding to the conditions causing those complaints, and for a specified duration, to allow such an assessment to be carried out. Details of shut-downs shall be provided by a report from the system controlling the wind farm operation.

d) The assessment of the rating level of noise immissions shall be undertaken in accordance with an assessment protocol that shall previously have been submitted to and approved in writing by the Planning Authority. The protocol shall include the proposed measurement location identified in accordance with the Guidance Notes where measurements for compliance checking purposes shall be undertaken, whether noise giving rise to the complaint is anticipated to contain or is likely to contain

a tonal component, and also the range of meteorological and operational conditions (which shall include the range of wind speeds, wind directions, power generation and times of day) to determine the assessment of rating level of noise immissions. The proposed range of conditions shall be those which prevailed during times when the complainant alleges there was disturbance due to noise, having regard to the written request of the Planning Authority under paragraph (c), and such others as the independent consultant considers likely to result in a breach of the noise limits.

e) Where a dwelling to which a complaint is related is not listed in the tables attached to this condition, the wind farm operator shall submit to the Planning Authority for written approval proposed noise limits selected from those listed in the Tables to be adopted at the complainant's dwelling for compliance checking purposes. The proposed noise limits are to be those limits selected from the Tables specified for a listed location which the independent consultant considers as being most appropriate, with justification provided in the consultant's assessment. The rating level of noise immissions resulting from the combined effects of the wind turbines approved by this permission when determined in accordance with the attached Guidance Notes shall not exceed the noise limits approved in writing by the Planning Authority for the complainant's dwelling.

f) The wind farm operator shall provide to the Planning Authority the independent consultant's assessment of the rating level of noise immissions undertaken in accordance with the Guidance Notes within 2 months of the date of the written request of the Planning Authority for compliance measurements to be made under paragraph (c), unless the time limit is extended in writing by the Planning Authority. The assessment shall include all data collected for the purposes of undertaking the compliance measurements, such data to be provided in the format set out in Guidance Note 1(e) of the Guidance Notes. The instrumentation used to undertake the measurements shall be calibrated in accordance with Guidance Note 1(a) and certificates of calibration shall be submitted to the Planning Authority with the independent consultant's assessment of the rating level of noise immissions.

g) Where a further assessment of the rating level of noise immissions from the wind farm is required pursuant to Guidance Note 4(c), the wind farm operator shall submit a copy of the further assessment within 21 days of submission of the independent consultant's assessment pursuant to paragraph (d) above unless the time limit has been extended in writing by the Planning Authority.

Appendix 1 Tables

Table 1 – Noise Limits 0700-2300 (dB LA90)

Location	Standardised 10 metre-height Wind Speed (as defined in accordance with the attached Guidance Notes to the noise condition)									
	3	4	5	6	7	8	9	10	11	12
Shieldhill*	43.3	43.3	43.3	43.3	43.3	43.3	43.3	45.7	47.7	49.4
Moor Farm	30.0	30.0	30.0	30.0	31.5	33.1	34.9	36.7	38.4	39.9
Highfield Farm	38.7	38.7	38.7	38.7	40.0	42.1	44.3	46.3	48.1	49.7
South Moorhouse*	45.0	45.8	45.3	46.9	48.5	50.2	51.8	53.3	54.9	56.5
Greenfield	30.0	30.0	30.0	30.0	31.2	35.1	39.1	42.7	46.0	48.6
Bennan Farm	42.7	43.9	45.1	46.6	48.2	50.0	51.8	53.9	56.0	58.2
Swan Cottages	40.0	39.7	39.9	41.5	43.1	44.9	46.6	48.2	49.9	51.4

* Financially Involved

Table 2 – Noise Limits 2300-0700 (dB LA90)

Location	Standardised 10 metre-height Wind Speed (as defined in accordance with the attached Guidance Notes to the noise condition)									
	3	4	5	6	7	8	9	10	11	12
Shieldhill*	43.3	43.3	43.3	43.3	43.3	43.3	43.3	44.2	47.3	49.7
Moor Farm	33.0	33.0	33.0	33.0	33.0	33.0	33.1	35.6	38.0	40.1
Highfield Farm	42.0	42.0	42.0	42.0	42.0	42.0	42.1	45.1	47.7	49.9
South Moorhouse*	45.0	44.9	44.8	44.7	44.5	46.5	48.4	50.3	52.2	54.0
Greenfield	33.0	33.0	33.0	33.0	33.0	34.4	39.0	43.1	46.5	48.7

<i>Bennan Farm</i>	43.0	42.9	42.7	42.6	42.4	44.7	47.7	51.1	55.0	59.3
<i>Swan Cottages</i>	43.0	42.9	42.7	42.5	42.3	44.3	46.3	48.2	50.2	52.0

* Financially Involved

Table 3: Coordinate locations of the properties listed in Tables 1 and 2.

Property	Easting	Northing
<i>Moor Farm</i>	250850	648050
<i>Shieldhill</i>	251233	649238
<i>Highfield Farm</i>	250408	649634
<i>South Moorhouse</i>	252569	651217
<i>Greenfield</i>	254147	649810
<i>Bennan Farm</i>	251633	651306
<i>Swan Cottages</i>	252424	651417

Note to Table 3: The geographical coordinate references are provided for the purpose of identifying the general location of dwellings to which a given set of noise limits applies.

Guidance Notes for Noise Condition

These notes are to be read with and form part of the noise condition. They further explain the condition and specify the methods to be employed in the assessment of complaints about noise immissions from the wind farm. The rating level at each integer wind speed is the arithmetic sum of the wind farm noise level as determined from the bin-average described in Guidance Note 2 of these Guidance Notes and any tonal penalty applied in accordance with Guidance Note 3. Reference to ETSU-R-97 refers to the publication entitled "The Assessment and Rating of Noise from Wind Farms" (1997) published by the Energy Technology Support Unit (ETSU) for the Department of Trade and Industry (DTI).

Guidance Note 1

(a) Values of the $L_{A90,10\text{-minute}}$ noise statistic should be measured at the complainant's property, using a sound level meter of EN 60651/BS EN 60804 Type 1, or BS EN 61672 Class 1 quality (or the equivalent UK adopted standard in force at the time of the measurements) set to measure using the fast time weighted response as specified in BS EN 60651/BS EN 60804 or BS EN 61672-1 (or the equivalent UK adopted standard in force at the time of the measurements). This should be calibrated in accordance with the procedure specified in BS 4142: 1997 (or the equivalent UK adopted standard in force at the time of the measurements). Measurements shall be undertaken in such a manner to enable a tonal penalty to be applied in accordance with Guidance Note 3.

(b) The microphone should be mounted at 1.2 – 1.5 metres above ground level, fitted with a two-layer windshield or suitable equivalent approved in writing by the Planning Authority, and placed outside the complainant's dwelling. Measurements should be made in "free field" conditions. To achieve this, the microphone should be placed at least 3.5 metres away from the building facade or any reflecting surface except the ground at the approved measurement location. In the event that the consent of the complainant for access to his or her dwelling to undertake compliance measurements is withheld, the wind farm operator shall submit for the written approval of the Planning Authority details of the proposed alternative representative measurement location prior to the commencement of measurements and the measurements shall be undertaken at the approved alternative representative measurement location.

(c) The $L_{A90,10\text{-minute}}$ measurements should be synchronised with measurements of the 10-minute arithmetic mean wind and operational data logged in accordance with Guidance Note 1(d), including the power generation data from the turbine control systems of the wind farm.

(d) To enable compliance with the conditions to be evaluated, the wind farm operator shall continuously log arithmetic mean wind speed in metres per second and wind direction in degrees from north at hub height for each turbine, and at any on site meteorological mast(s), if available, together with the arithmetic mean power generated by each turbine, all in successive 10-minute periods. All 10-minute arithmetic average mean wind speed data measured at hub height shall be 'standardised' to a reference height of 10 metres as described in ETSU-R-97 at page 120 using a reference roughness length of 0.05 metres. It is this standardised 10 metre height wind speed data, as determined from whichever source is agreed in writing with the Planning Authority as being most appropriate to the noise compliance measurements being undertaken, which is correlated with the noise measurements determined as valid

in accordance with Guidance Note 2, such correlation to be undertaken in the manner described in Guidance Note 2. All 10-minute periods shall commence on the hour and in 10-minute increments thereafter.

(e) Data provided to the Planning Authority in accordance with the noise condition shall be provided in comma separated values in electronic format.

(f) A data logging rain gauge shall be installed in the course of the assessment of the levels of noise immissions. The gauge shall record over successive 10-minute periods synchronised with the periods of data recorded in accordance with Note 1(d).

Guidance Note 2

(a) The noise measurements shall be made so as to provide not less than 20 valid data points as defined in Guidance Note 2 (b)

(b) Valid data points are those measured in the conditions specified in the agreed written protocol under paragraph (d) of the noise condition, but excluding any periods of rainfall measured in the vicinity of the sound level meter. Rainfall shall be assessed by use of a rain gauge that shall log the occurrence of rainfall in each 10-minute period concurrent with the measurement periods set out in Guidance Note 1.

(c) For those data points considered valid in accordance with Guidance Note 2(b), values of the $L_{A90,10\text{-minute}}$ noise measurements and corresponding values of the 10-minute standardised ten metre height wind speed, as derived from the site measured wind speed source(s) agreed in writing with the Planning Authority in accordance with Guidance Note 1(d), shall be divided into 1 m/s wide 'bins', each bin being 1 metre per second wide and centred on integer wind speeds, with at least 5 data-points contained within each bin. An arithmetic mean of the data-points in each bin shall be calculated at each integer speed and define the measured noise level for each wind speed bin.

Guidance Note 3

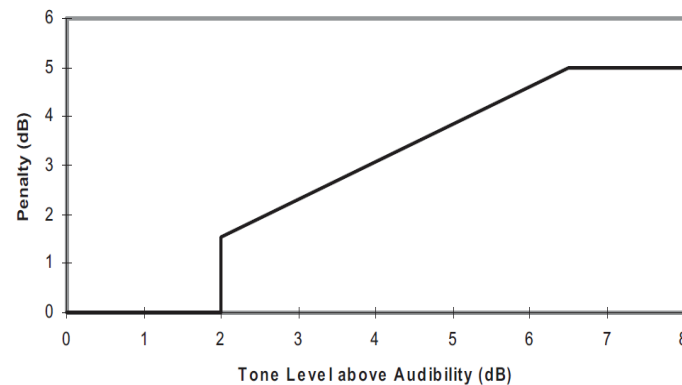
(a) Where, in accordance with the approved assessment protocol under paragraph (d) of the noise condition, noise immissions at the location or locations where compliance measurements are being undertaken contain or are likely to contain a tonal component, a tonal penalty is to be calculated and applied using the following rating procedure.

(b) For each 10-minute interval for which $L_{A90,10\text{-minute}}$ data have been determined as valid in accordance with Guidance Note 2 a tonal assessment shall be performed on noise immissions during 2 minutes of each 10-minute period. The 2 minute periods should be spaced at 10-minute intervals provided that uninterrupted uncorrupted data are available ("the standard procedure"). Where uncorrupted data are not available, the first available uninterrupted clean 2 minute period out of the affected overall 10-minute period shall be selected. Any such deviations from the standard procedure, as described in Section 2.1 on pages 104-109 of ETSU-R-97, shall be reported.

(c) For each of the 2-minute samples the tone level above or below audibility shall be calculated by comparison with the audibility criterion given in Section 2.1 on pages 104-109 of ETSU-R-97.

(d) The average tone level above audibility shall be calculated for each wind speed bin, each bin being 1 metre per second wide and centred on integer wind speeds. Samples for which the tones were below the audibility criterion or no tone was identified, a value of zero audibility shall be substituted for that bin.

(e) The tonal penalty for each wind speed bin is derived from the margin above audibility of the tone according to the figure below.



Guidance Note 4

(a) If a tonal penalty is to be applied in accordance with Guidance Note 3 the rating level of the turbine noise at each wind speed is the arithmetic sum of the measured noise level as determined from the average for that wind speed bin described in Guidance Note 2 and the penalty for tonal noise as derived in accordance with Guidance Note 3 at each integer wind speed within the range specified by the Planning Authority in its written protocol under paragraph (d) of the noise condition.

(b) If no tonal penalty is to be applied then the rating level of the turbine noise at each wind speed is equal to the measured noise level as determined from the average for that wind speed bin described in Guidance Note 2.

(c) In the event that the rating level is above the limit(s) set out in the Tables attached to the noise conditions or the noise limits for a complainant's dwelling approved in accordance with paragraph (e) of the noise condition, the independent consultant shall undertake a further assessment of the rating level to correct for background noise so that the rating level relates to wind turbine noise immission only.

(d) The wind farm operator shall ensure that all necessary wind turbines in the development are turned off for such period as the independent consultant requires to undertake any further noise measurements required under Guidance Note 4(c). If the number of turbines to be turned off are less than the total number of turbines on the site then this shall be agreed in advance with the Planning Authority.

(e) To this end, the steps in Guidance Note 2 shall be repeated with the required number of turbines shut-down in accordance with Guidance Note 4(d) in order to determine the background noise (L3) at each integer wind speed within the range requested by the Planning Authority in its written request under paragraph (c) and the approved protocol under paragraph (d) of the noise condition.

(f) The wind farm noise (L1) at this speed shall then be calculated as follows where L2 is the measured level with turbines running but without the addition of any tonal penalty:

$$L_1 = 10 \log \left[10^{L_2/10} - 10^{L_3/10} \right]$$

(g) The rating level shall be re-calculated by adding arithmetically the tonal penalty (if any is applied in accordance with Note 3) to the derived wind farm noise L1 at that integer wind speed.

(h) If the rating level after adjustment for background noise contribution and adjustment for tonal penalty (if required in accordance with Guidance Note 3 above) at any integer wind speed lies at or below the values set out in the Tables attached to the conditions or at or below the noise limits approved by the Planning Authority for a complainant's dwelling in accordance with paragraph (e) of the noise condition then no further action is necessary. If the rating level at any integer wind speed exceeds the values set out in the Tables attached to the conditions or the noise limits approved by the Local Planning Authority for a complainant's dwelling in accordance with paragraph (e) of the noise condition then the development fails to comply with the conditions.