

# Appendix 11.2 Cumulative Development Review

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# Appendix 11.2 Cumulative Development Review

## Introduction

This appendix details the results of a desk top noise review of the other wind farm developments which were identified in the vicinity of the Proposed Development. Consideration was given to those developments for which a valid application has been registered, planning approval has been granted, or which are operational.

The results of the previous review have been updated based on the current status of the wind farms formerly identified, and these have been used to inform the completed cumulative noise assessment.

## Hare Hill Wind Farm – Operational

This development is located within East Ayrshire Council area and has the planning reference number 94/0097/DPP.

The Additional Environmental Information (AEI) report (October 2014), submitted for the Hare Hill Extension Wind Farm (see below), details a cumulative noise assessment including for the original Hare Hill Wind Farm application. It is confirmed that the original Hare Hill Wind Farm comprises 20 operational Vestas V47 wind turbines with hub heights of 39m. Noise emission data for this turbine type is presented in the AEI report, as duplicated within Tables 1 and Table 2. The data in Table 1 is stated to include a +2dB uncertainty correction.

**Table 1 - Sound Power Level Data for Vestas V47, L<sub>WA</sub>, dB(A)**

	Standardised 10m Wind Speed (ms <sup>-1</sup> )								
	4	5	6	7	8	9	10	11	12
L <sub>WA</sub>	101.0	101.5	101.9	102.4	102.8	103.3	103.7	104.2	104.6
<i>Data includes a +2dB uncertainty correction</i>									

**Table 2 - Octave Band Sound Power Level Data for the Vestas V47 L<sub>WA</sub>, dB(A)**

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
dB(A)	78.2	86.1	89.8	95.2	97.0	92.98	87.9	69.2

This development was granted planning approval at appeal in March 1997. The Hare Hill Extension Wind Farm ES states that:

*“The Planning Conditions for Hare Hill (Inquiry Report dated 5 March 1997) do not include any conditions relating to noise limits. However, the Reporter makes reference to noise and states that noise levels at the nearest properties (Blackcraig and Hillend) would be likely to be below the 35 dB, L<sub>A90,10min</sub> limit proposed in the then-emerging guidelines (ETSU-R-97).”*

The above detail is reaffirmed in the Hare Hill Wind Farm Extension AEI report, recognising that this approved development could generate higher noise levels within the bounds of its existing planning permission. To address this, noise modelling work for Hare Hill Extension Wind Farm included a further +2dB correction to the data detailed in Table 1 above. It is stated that ‘These [the sound power level data with additional +2dB correction] have been used to calculate worst-case predicted noise levels for Hare Hill’.

The turbine locations for the original Hare Hill Wind Farm have been determined from a review of Ordnance Survey referenced aerial photography, and are detailed in Table 3.

**Table 3 – Hare Hill Wind Farm Turbine Locations**

Turbine Number	Easting	Northing
1	264554	610274
2	264501	610041
3	264663	609953
4	264661	610155

<b>Turbine Number</b>	<b>Easting</b>	<b>Northing</b>
5	264855	610060
6	265023	609932
7	265020	609749
8	264845	609591
9	264992	609513
10	265039	609358
11	265101	609206
12	265296	609853
13	265461	610028
14	265476	609823
15	265648	609943
16	265903	609878
17	266740	610015
18	266927	609935
19	267062	610187
20	266964	610359

## Hare Hill Wind Farm Extension –Operational

This development is primarily located within the East Ayrshire Council area and has the planning reference number 07/0809/FL. A section of the site access track is located within the Dumfries and Galloway Council area. The planning application submitted to EAC for this development was initially lodged in 2007. Construction of the development was completed in 2016.

Planning consent for the development was granted for a 39 turbine development. Subsequent to consent revisions were made to the scheme, and an acoustic assessment prior to construction considered noise effects arising from a 36 turbine layout. The construction completion report details only 35 turbines. The consideration of cumulative noise effects from Hare Hill Extension with the proposed Sandy Knowe development has considered the 36 turbine layout.

The turbine locations detailed within this assessment are duplicated in Table 4.

**Table 4 – Hare Hill Extension Wind Farm Turbine Locations and hub heights**

<b>Turbine Number</b>	<b>Easting</b>	<b>Northing</b>	<b>Hub Height</b>
1	266488	609723	49
2	266246	609582	49
3	266048	609562	60
4	265774	609399	49
5	266432	609456	65
6	266262	609336	65
7	266039	609350	65
8	265880	609192	55
9	265671	609199	49
10	265612	608929	44
11	265807	608960	55
12	266052	609046	60
13	266254	609029	60
14	266461	608968	65
15	266676	608935	65
16	266539	608766	65
17	266333	608796	65
18	266130	608856	60
19	265945	608741	49
20	266039	608525	49
21	266285	608577	65

Turbine Number	Easting	Northing	Hub Height
22	266311	608361	49
23	266489	608292	44
24	266692	608236	49
25	266877	608356	65
26	267095	608430	65
27	267250	608591	65
28	267500	608531	65
29	267290	608344	65
30	267046	608196	65
31	266843	608102	49
32	267011	607971	65
33	266597	607835	65
34	266402	607844	65
35	266211	607920	60
36	266260	607679	65

The turbine model adopted for the development was the Gamesa G52 850kW, with hub heights ranging from 44m to 65m, for which the applicant provided current manufacturer noise emission data to EAC by means of a confidential appendix which has been approved. A summary of the data applied in the noise prediction and assessment work is presented, and is duplicated in Tables 5 and 6. The data detailed within Table 5 is 'declared' sound power level data, for which additional uncertainty corrections are not required to be added for noise level prediction work in accordance with the IoA GPG.

Table 6 presents both 'average' and 'pessimistic' spectra for the G52. It is stated that only the pessimistic data was used in the completed assessment work, to represent a worst case.

**Table 5 – Declared Sound Power Levels, Gamesa G52 850kW, Various Hub Heights, dB(A)**

Hub Height	Standardised 10m Wind Speed (ms <sup>-1</sup> )								
	4	5	6	7	8	9	10	11	12
44	94.7	98.8	102.9	104.7	105.6	105.8	105.8	105.8	105.8
49	94.9	99.2	103.2	104.8	105.7	105.8	105.8	105.8	105.8
55	95.2	99.5	103.5	105.0	105.8	105.8	105.8	105.8	105.8
60*	95.4	99.8	103.7	105.4	105.8	105.8	105.8	105.8	105.8
65	95.6	100.0	103.8	105.1 <sup>1</sup>	105.8	105.8	105.8	105.8	105.8

\* Interpolated form data for 55 and 65m hub heights

**Table 6 - Octave Band Sound Power Level Data for Gamesa G52, L<sub>WA</sub>, dB(A)**

Spectrum	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Average	81.0	87.9	92.9	94.5	94.1	91.6	86.1	75.3
Pessimistic	82.4	88.9	93.3	94.7	93.8	90.9	85.2	72.8

It is confirmed that 'Hillend', the closest receptor to the east, is owned by the development site land owner and that it is tenanted. It is stated that evidence has been provided to EAC confirming that both the owner and the tenants have confirmed that they would be financial beneficiaries of the development.

## Sanquhar Community Wind Farm – Consented

This development is located within the Dumfries and Galloway Council area and has the planning reference number 10/P/3/0182

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1 In the Hare Hill AEI Report, this is stated as 105.8, but this has been identified as an error by comparison against the original turbine source data report.

The decision notice for this development is dated the 18 February 2014, and constitutes consent for a development including the following detail:

- 12 turbines;
- 79.5m hub height;
- 130m tip height; and
- Total rated output of up to 50MW.

Planning condition 6 of this approval stipulates the locations at which the proposed turbines are to be installed, stating:

*“6. That the turbines, meteorological mast, tracks and substation compound shall not be erected in any position other than the positions indicated on Figure 1.4 Rev A (Drawing Ref 016-121030-7115) of the amended drawings dated 2 November 2012, unless the Council as planning authority has given written approval for any such variation. Any such variation shall not exceed 50 metres in any direction from that shown on the originally approved plans.”*

Correspondence regarding a non-material variation to the planning consent noted that only 9 of the consented 12 turbines would be constructed, and that the chosen turbine model for the development was the Vestas V112 3.45 MW turbine. Turbines T2, T6 and T10 were dropped from the initially consented layout. The drawing reference of the new layout is 016-160609-7330.

The turbine locations for the 9 turbine scheme are provided in Table 7.

**Table 7 – Sanquhar Community Wind Farm Turbine Locations**

<b>Turbine Number</b>	<b>Easting</b>	<b>Northing</b>
1	271343	607571
3	271414	607235
4	270976	607081
5	270508	607182
7	270745	607985
8	270089	607054
9	269670	607543
11	269085	607945
12	268745	607608

Planning Condition 7 requires that no development takes place until the exact details of the proposed turbines, including sound levels, are submitted to and approved in writing by the Planning Authority. This condition also stipulates that the hub height and tip heights do not exceed 80m and 130m respectively.

*“7. That no development in respect of this planning permission shall take place unless the exact details of the proposed turbines (including size, type, external finish/colour, power rating, sound levels), the meteorological mast and all associated apparatus have been submitted to and approved in writing by the Council as planning authority. For the avoidance of doubt, the height of the turbines hereby granted planning permission shall not exceed 80m to hub and 130m to tip above ground level. The development hereby granted planning permission shall not be brought into use unless it has been implemented in complete accordance with such details as may be so approved”.*

This condition has been discharged by the council following submission of technical detail for the Vestas V112, with 74 m hub height. Noise emission data for this turbine is provided in Table 8 summarised below:

**Table 8 – Broad-band Sound Power Level Data for the Vestas V112 at Hub Height, L<sub>WA</sub>, dB(A)**

Hub Height Wind Speed, m/s	Broad-band Sound Power Level, dB(A)	Hub Height Wind Speed, m/s	Broad-band Sound Power Level, dB(A)
3	92.9	12	105.4
4	93.4	13	105.4
5	94.0	14	105.4
6	96.7	15	105.4
7	99.8	16	105.4
8	102.7	17	105.4
9	104.8	18	105.4
10	105.4	19	105.4
11	105.4	20	105.4

**Table 9 - Octave Band Sound Power Level Data for the Vestas V112, Standardised to 10 m Wind Speed, L<sub>WA</sub>, dB(A)**

Standardised 10m Wind Speed (m/s)	Octave Band Centre Frequency (Hz)								
	31.5	63	125	250	500	1k	2k	4k	8k
5	65.7	76.7	85.1	89.3	91.0	91.9	88.5	83.6	69.5
6	66.9	77.6	86.7	91.0	92.8	93.8	90.3	85.5	71.6
7	70.7	81.2	90.6	94.9	96.6	97.6	94.1	89.2	75.3
8	74.2	84.8	94.2	98.5	100.1	101.1	97.6	92.7	78.7
9	76.3	87.4	96.6	101.1	102.8	104.0	100.3	95.5	81.9
10	75.4	86.6	95.7	100.3	102.4	103.7	99.7	95.3	82.6
11	76.3	86.8	91.5	94.6	96.6	99.1	93.8	90.6	71.8
12	77.2	80.3	91.7	94.3	96.5	99.2	94.2	89.7	69.6

Planning condition 27 stipulates the noise level limits to which the proposed development must confirm. This condition is as follows:

*“27. That at wind speeds not exceeding 12 m/s as measured or calculated at a height of 10m above ground level at the wind farm, the wind farm noise emission level at any dwelling existing at the time of this permission shall comply with the following:*

*(a) During night time hours, as defined in ETSU-R-97 as 23.00 to 07.00 on all days, the wind farm noise emission level shall not exceed 43 dB L<sub>A90,10min</sub> or the ETSU-R-97 derived “night hours” noise limit based on the measured A<sub>90,10min</sub> background noise level plus 5dB(A), whichever is the greater.*

*(b) At all other times, the wind farm noise emission level shall not exceed 35dB L<sub>A90, 10 min</sub> or the ETSU-R-97 derived “quiet waking hours” noise limit based on the measured LA90, 10 min background noise level plus 5dB(A), whichever is the greater.*

*(c) The above noise emission limits may be increased to 45 dB L<sub>A90,10min</sub> or the relevant ETSU-R-97 derived “quiet waking hours” or “night hours” noise limit based on the measured L<sub>A90,10min</sub> noise level plus 5dB(A), whichever is the greater, when measured at any dwelling owned by persons with financial involvement with the wind farm.*

*(d) Measured background noise levels referred to in this condition shall be those recorded by the regression lines in Chapter 12 of the ACIA*

*Engineering Acoustics Report Number 2351.01/ifb dated 15th January 2010 for the proposed Sanquhar Community Wind Farm.”*

Condition 28 stipulated a procedure to be followed in the case of a noise related complaint being raised.

## Sanquahar ‘Six’ Wind Farm - Consented

This development is located within the Dumfries and Galloway Council area and has the planning reference number 15/P/3/0166

### **Planning Application Form**

The planning application form for this development describes it as including 6 turbines with a generating capacity of 19.8 MW.

### **Environmental Statement Introduction (ES Section 1)**

Section 1 of the ES states that the proposed development includes 6 turbines with a maximum tip height of 130m, and that the candidate turbines have a rated capacity of 3.3 MW.

Section 2 of the ES reiterates that the proposed development includes 6 turbines with a maximum tip height of 130m, and that the candidate turbines have a rated capacity of 3.3 MW. This section also details the turbine locations as duplicated in Table 10.

**Table 10 – Sanquahar ‘Six’ Wind Farm Turbine Locations**

Turbine Number	Easting	Northing
1	268961	607041
2	268565	607161
3	268104	606865
4	267638	606605
5	267418	606025
6	267071	605656

### **Environmental Statement Noise and Vibration Chapter (ES Section 11)**

The turbine locations detailed within Table 10 are duplicated within Section 11 of the ES. The candidate turbine for this development, as used in the reported noise level prediction and assessment work is the Senvion MM92 operating in ‘normal mode’ (i.e. not a reduced noise operating mode). It is stated that this is a candidate to be installed under the existing planning permission. The noise emission data presented in Tables 11 and 12 are detailed. It is stated that these data were derived from test results and that a 1.6dB uncertainty factor is included within this data. It is also stated that reported spectral data (Table 12) was taken from a test report of a similar machine.

**Table 11 - Sound Power Level Data for the Senvion MM92 3.0MW, Normal Mode, L<sub>WA</sub>, dB(A) -**

	Standardised 10m Wind Speed (m·s <sup>-1</sup> )									
	3	4	5	6	7	8	9	10	11	12
L <sub>WA</sub>	90.8	94.1	98.6	102.3	104.6	104.8	104.8	104.8	104.8	104.8

**Table 12 - Octave Band Sound Power Level Data used in Sanquahar ‘Six’ Wind Farm, L<sub>WA</sub>, dB(A)**

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
dB(A)	84.9	93.1	98.7	100.4	98.4	92.7	86.0	82.8

## Glenmuckloch Wind Farm – Consented

There is a separation distance of over 4 km between the closest turbines of the Proposed Development and the proposed Glenmuckloch Wind Farm. In addition, of the receptors located between these developments, some are closer to the Proposed Development and some are closer to the Glenmuckloch Wind Farm. As such, each development is subject to different controlling properties in terms of noise impact / generation. Each development is also in an opposite direction from the intervening properties.



In accordance with the IoA GPG, depending upon the set-back distances involved, during up-wind propagation, noise levels will be reduced by at least 10dB (compared to downwind propagation). The IoA GPG also states the following when considering the need for cumulative assessment:

*“During scoping of a new wind farm development consideration should be given to cumulative noise impacts from any other wind farms in the locality. If the proposed wind farm produces noise levels within 10 dB of any existing wind farm/s at the same receptor location, then a cumulative noise impact assessment is necessary.*

*Equally, in such cases where noise from the proposed wind farm is predicted to be 10 dB greater than that from the existing wind farm (but compliant with ETSU-R-97 in its own right), then a cumulative noise impact assessment would not be necessary.”*

Accordingly, Glenmuckloch Wind Farm has been scoped out of the completed cumulative noise assessment.

## Lethans Wind Farm – Planning Application Register

This development is located further north-west than the proposed Glenmuckloch Wind Farm and has therefore been scoped-out of the completed cumulative noise assessment

## Ulzieside Wind Farm – Planning Application Register

This development is located more than 4 km to the south-east of the Proposed Development. This development is further removed than the Sanquhar Community and Sanquahar ‘Six’ Wind Farms and has therefore been scoped-out of the completed noise assessment.

## Whiteside Hill Wind Farm – Under Construction

This development is located more than 4 km to the south of the Proposed Development. This development is further removed than the Sanquhar Community and Sanquahar ‘Six’ Wind Farms and has therefore been scoped-out of the completed noise assessment.

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