



Aultmore Wind Farm Redesign

Technical Appendix 12.2: Baseline Noise Measurements 2007

Vattenfall Wind Power Ltd

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Baseline Noise Measurements - 2007

12.2.1 Introduction

The proposed development is located to the north of Keith, Moray. This report describes the baseline noise measurements that were undertaken in 2007, and the derivation of appropriate noise limits. These measurements were carried out in relation to a previous submission of the proposed wind farm which included only the eastern cluster of turbines. In addition, the measurements described in this document have been supplemented by two further measurement locations with monitoring carried out in 2023. These supplemental measurements are detailed within Annex 12.2-1.

The 2007 baseline noise measurements were carried out at five locations agreed with Moray Council in line with ETSU-R-97, *The Assessment and Rating of Noise from Wind Farms*. In addition, the measured data has been re-analysed to be in line with the Institute of Acoustics document, *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Noise from Wind Turbines*, and Moray Council's *Moray Onshore Wind Energy Supplementary Guidance* which were both published after the monitoring took place. Measured noise levels have been correlated with hub height wind speeds (standardised to 10m) calculated from two measurement heights, one at least 60% of the turbine hub height, and one at least 15m below this, in line with the recommendations within the IOA publication. The wind speed measurements were made using a met mast sited within proposed turbine cluster closest to the measurement locations.

Noise limits have been derived according to ETSU-R-97, *The Assessment and Rating of Noise from Wind Farms* and in line with consultation responses from Moray Council (MC).

12.2.2 Policy and Guidance

Baseline noise measurements were carried out in accordance with the methodology prescribed by ETSU-R-97 *The Assessment and Rating of Noise from Wind Turbines*¹. The accompanying guidance produced by the Institute of Acoustics (IOA) in their document, *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Noise from Wind Turbines*² and the Moray Council (MC) document *Moray Onshore Wind Energy Supplementary Guidance*³ have also been followed where possible, and any deviations have been highlighted. These guidance documents are discussed below.

12.2.2.1 The Assessment and Rating of Noise from Wind Farms: ETSU-R-97

ETSU-R-97, *The Assessment and Rating of Noise from Wind Farms*, presents the recommendations of the Working Group on Noise from Wind Turbines, set up in 1993 by the Department of Trade and Industry (DTI) as a result of difficulties experienced in applying the noise guidelines existing at the time to wind farm noise assessments. The group comprised independent experts on wind turbine noise, wind farm developers, DTI personnel and local authority Environmental Health Officers. In September 1996 the Working Group published its findings by way of report ETSU-R-97. This document describes a framework for the measurement of wind farm noise and specifies noise limits, which were derived with reference to existing standards and guidance relating to noise emission from various sources.

ETSU-R-97 recommends that, although noise limits should be set relative to existing background and should reflect the variation of both turbine and background noise with wind speed; this can imply very low noise limits in particularly quiet areas, in which case, "it is not necessary to use a

¹ ETSU-R-97, 1996. *The Assessment and Rating of Noise from Wind Farms*.

² Institute of Acoustics, May 2013. *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise*.

³ Moray Council, 2017, *Moray Onshore Wind Energy Supplementary Guidance*



margin above background in such low-noise environments. This would be unduly restrictive on developments which are recognised as having wider 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."

For daytime periods, the noise limit is 35-40dB L_{A90} or 5dB(A) above the 'quiet daytime hours' prevailing background noise, whichever is the greater. The actual value within the 35-40dB(A) range depends on the number of dwellings in the vicinity; the impact of the limit on the number of kWh generated; and the duration and level of exposure.

For night-time periods the noise limit is 43dB L_{A90} or 5dB(A) above the prevailing night-time hours background noise, whichever is the greater. The 43dB(A) lower limit is based on an internal sleep disturbance criteria of 35dB(A) with an allowance of 10dB(A) for attenuation through an open window and 2dB(A) subtracted to account for the use of the L_{A90} rather the L_{Aeq} noise measurement index ((see Section 12.2.2.2 (below)).

At properties that are occupied by residents with a direct financial benefit from the wind farm, the daytime and night-time lower limiting values are increased to 45dB L_{A90} .

It is stated that the $L_{A90,10min}$ noise descriptor should be adopted for both background and wind farm noise levels and that, for the wind farm noise, this is likely to be between 1.5 and 2.5dB less than the L_{Aeq} measured over the same period. The $L_{Aeq,t}$ is the equivalent continuous 'A' weighted sound pressure level occurring over the measurement period 't'. It is often used as a description of the average ambient noise level. Use of the L_{A90} descriptor for wind farm noise allows reliable measurements to be made without corruption from relatively loud, transitory noise events from other sources.

With regard to multiple wind farms in a given area, ETSU-R-97 specifies that the absolute noise limits and margins above background should relate to the cumulative impact of all wind turbines in the area contributing to the noise received at the properties in question. Existing wind farms should therefore be included in cumulative predictions of noise level for proposed wind turbines and not considered as part of the prevailing background noise.

12.2.2.2 A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise

In May 2013, the IOA published *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise*. This was subsequently endorsed by the Scottish Government and is referenced in *Web Based Planning Advice, Onshore Wind Turbines*. The publication of the Good Practice Guide (GPG) followed a review of current practice carried out for the Department of Energy and Climate Change (DECC) and an IOA discussion document which preceded the GPG.

The GPG includes sections on Context; Background Data Collection; Data Analysis and Noise Limit Derivation; Noise Predictions; Cumulative Issues; Reporting; and Other Matters including Planning Conditions, Amplitude Modulation, Post Completion Measurements and Supplementary Guidance Notes. The Context section states that the guide "*presents current good practice in the application of the ETSU-R-97 assessment methodology for all wind turbine development 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*". It adds that "*the noise limits in ETSU-R-97 have not been examined as these are a matter for Government*".

12.2.2.3 Moray Onshore Wind Energy Supplementary Guidance

The MC guidance note on wind turbine developments for developments with rotor diameter greater than 16m references the use of ETSU-R-97 and the IOA GPG.



12.2.3 Consultation with Moray Council

The following details the primary stages of consultation with MC regarding the noise assessment for the proposed development.

12.2.3.1 Scoping

A scoping report was submitted and responses received in March 2022. The scoping response noise section is included in Annex 12.2-1. Key points include:

- Agreement in use of ETSU-R-97 and IOA GPG guidance
- Agreement in use of 2007 baseline measurements from previous scheme to account for eastern cluster
- Agreement of two supplementary baseline measurement locations to account for western cluster
- Agreement of scoping out construction noise assessment
- Reference to IOA GPG guidance on cumulative schemes to include
- Notification of intention for fixed portion of night hours noise limit to be 40 rather than 43 dB L_{A90}

12.2.3.2 Methodology Letter to EHO

In May 2022, following the scoping response, a letter (reference '3507_L01_EXT1' dated 18th May 2022) was drafted and sent to an MC Environmental Health Officer (EHO) to confirm the measurement locations and re-iterate the methodological specifics detailed within the scoping report and response. This letter and the related correspondence between SLR, Hayes McKenzie and MC is included at Annex 12.2-1. The key areas of agreement from these exchanges included:

- Confirmation of financial involvement impacts on noise limits;
- Clarification of metrological information available for the 2007 baseline measurements and that this will be sufficient to meet the IOA GPG requirements for the proposed hub height of the new scheme;
- The cumulative operational assessment will consider the Aultmore site operating at the same time as the existing Myreton I & II, Netherton, Followsters and Balnamoon turbines and including for the consented Lurg Hill wind farm; and
- Confirmation that construction effects other than basting can be scoped out.

12.2.3.3 Limits Agreement with EHO

In August 2023 email correspondence and a phone call (later summarised via email) occurred between the lead HMPL consultant and EHO to agree the noise limits and related specifics. Specifics of this methodology and the cumulative assessment followed in September, October and November 2023. The emails are included at Annex 12.2-1 (including that detailing the attendance at installation). The key areas of agreement from these exchanges included:

- Agreement that the area of study would be defined by the Aultmore alone predicted 30 dB L_{A90} noise contour;
- Agreement of Aultmore alone and cumulative noise limit fixed portions:
 - o 40dB L_{A90} for night hours
 - o 38dB L_{A90} for Aultmore alone during day hours
 - o 40dB L_{A90} for cumulative assessment during day hours;



- Agreement of no significant impact if Aultmore alone is more than 10dB below the cumulative predicted noise level;
- Agreement that existing financial involvement and other arrangements between properties and neighbouring schemes would apply when considering cumulative assessment including said neighbouring scheme; and
- Inclusion of example Remaining Noise Budget methodology and derived limits within a Technical Appendix 12.4.

12.2.4 Baseline Noise Measurements

Baseline noise measurements were carried out to characterise the existing noise environment and to allow for appropriate noise limits to be derived for the proposed development in line with the agreements with MC.

12.2.4.1 Noise Survey Methodology and Instrumentation

Larson Davis 820 sound level meters corresponding to the Type 1 standard in IEC 651, *Sound Level Meters*, were used for the noise measurements. The calibration certificates for the sound level meters and the Brüel and Kjær 4231 (serial number 2218188) and Larson Davis CAL200 (serial number 3599) Class 1 sound level calibrators used for the surveys are given in Annex 12.2-2.

The microphones were fitted with double skin windshields based on the recommended design in ETSU W/13/00386/REP and derived from the Gracey & Associates model 8310 design and mounted on a tripod at a height of 1.2m. Wind speeds and noise measurements were averaged for successive 10-minute measurement intervals.

The sound level meters were left at the 5 measurement positions for a period of 19 days from the 10th to 29th May 2007. A fault developed with the equipment left at Aultmore Lodge so further measurements were carried out over an 18-day period from 30th May to 17th June 2007 at this location.

Wind speeds and direction were measured at 25 and 70m using anemometry mounted on a met mast sited within the eastern cluster of the proposed development. To monitor rainfall a tipping bucket rain gauge was installed at the Aultmore Lodge baseline measurement location for the first phase of the survey, however no rain data was measured for the second half of the survey.

12.2.4.2 Noise Survey Measurement Locations

The measurement locations were selected based on noise predictions for a preliminary turbine layout. The locations of these dwellings suggested these properties would be amongst the nearest properties to the eastern (original) cluster of turbines. The measurement locations are shown at Figure 12.2.1 which also shows the location of the eastern cluster of proposed wind turbines.





Figure 12.2.1 Baseline noise measurement locations

The measurement positions and equipment used at each location are described at Table 12.2.1.

Table 12.2.1 Baseline noise measurement details

Location Name	Easting	Northing	Meter Serial Number	Date of Last Calibration (Valid for 2 years)
Aultmore Lodge (second period)	349127	859533	1254	09/10/2006
Drodland	345320	857563	1491	17/08/2006
Hillhead Farm	344459	860084	1258	01/03/2007
Myreside	348548	857452	1254	09/10/2006
School Hill	346303	861318	0675	10/07/2007

The sound level meters were calibrated before and after installation. The GPG states that a calibration drift of no greater than 0.5dB during the survey period is within an acceptable tolerance and requires no correction. Where a drift of between 0.5 and 1.0dB occurs the data can still be used, but if the drift is over-reading for baseline noise measurements (where it would produce higher limits), the measured values should be corrected. A drift not greater than 0.5 dB was measured on collection of the equipment for all locations other than Hillhead Farm, where a drift of -0.7dB was measured. As the drift at Hillhead Farm was negative (the equipment was under-reading) this is more conservative, and so the data has been used without adjustment.



12.2.4.3 Baseline Measurement Results

The measured acoustic data has been correlated with the standardised 10m height wind speed derived from the data measured using the on-site Met Mast in order to determine the prevailing background noise level during the night and quiet daytime periods.

The hub height wind speed was calculated from the measured 70m and 25m height wind speeds based on the wind shear exponent between the two measurement heights using the formula;

$$V_h = V_1 \left[\frac{H_h}{H_u} \right]^m$$

where: V_h is the hub height wind speed at height H_h , and V_1 is the upper measured wind speed at height H_u

and: m is the shear exponent according to:

$$m = \left(\log \frac{U_1}{U_2} \right) / \left(\log \frac{H_1}{H_2} \right)$$

where: U_1 is the wind speed at height H_1 and U_2 is the wind speed at height H_2 .

The standardised 10 m height wind speed was calculated by correcting the calculated hub height wind speed at 115 m, assuming a logarithmic wind shear profile as described by the following formula;

$$V_{10} = V_h \left(\frac{\ln \left(\frac{10}{z_0} \right)}{\ln \left(\frac{h}{z_0} \right)} \right)$$

where: V_{10} is the 10 m wind speed

V_h is the wind speed at hub height h

z_0 is the reference ground roughness length of 0.05 m

Annex 12.2-4 shows the wind speed and direction data measured throughout the night and quiet daytime periods of the background noise.

12.2.4.4 Data Filtering

The measured noise data was separated into the relevant time periods for night-time and quiet daytime hours as defined within ETSU-R-97, and any period where rainfall was measured on the rain gauge, and one period either side (due to the lag effect of a tipping bucket rain gauge) was excluded from the derivation of the average baseline noise levels at all locations.

In addition manual exclusions were carried out at each of the locations. These exclusions were carried out where noise levels were significantly elevated not in line with wind speed. This was a mixture of individual isolated datapoints (likely due to short term events such as a car or tractor idling nearby, or people talking nearby) and extended periods over several hours (agricultural works nearby, rain effects not accounted for by the rain gauge such as sharp rises in watercourse flow).

For all locations significantly more extraneous noise was noted between the hours of 03:00 and 07:00 each day, likely a combination of road traffic noise from the A96, agricultural activities and dawn chorus, and therefore these night hours were excluded from the analysis throughout.

12.2.4.5 Existing Turbine Noise

No existing turbine noise was noted during any of the 2007 site visits.



12.2.4.6 Baseline Results

Annex 12.2-5 shows the measured background noise level over a range of wind speeds for each measurement location during the quiet day-time hours and night-time periods, with respect to the standardised 10m height wind speed. A 3rd order polynomial regression line has been plotted through the average measured noise data to derive the prevailing background noise levels.

The resulting derived prevailing background noise levels at each location are summarised in Table 12.2.2.

Table 12.2.2 Prevailing background noise levels at each measurement location (dB L_{A90})

Location Name	Time Period	Standardised 10 m Height Wind Speeds										
		2	3	4	5	6	7	8	9	10	11	12
Aultmore Lodge	Night-Time	24	26	26	28	30	34	- ⁴	-	-	-	-
	Quiet Day	27	28	30	33	36	39	44	-	-	-	-
Drodland	Night-Time	20	20	21	23	25	28	32	36	41	-	-
	Quiet Day	24	25	27	28	30	33	36	39	43	48	-
Hillhead Farm	Night-Time	20	22	25	28	31	35	38	41	44	-	-
	Quiet Day	24	26	28	30	33	35	38	40	42	44	-
Myreside	Night-Time	17	17	19	21	25	29	33	38	43	-	-
	Quiet Day	24	25	26	28	30	33	36	39	42	45	-
School Hill	Night-Time	20	22	23	26	28	32	36	40	44	-	-
	Quiet Day	24	25	27	30	33	36	39	43	47	51	-

12.2.5 Derivation of Noise Limits

The night and daytime noise limits have been derived from the prevailing background noise levels in line with ETSU-R-97 whereby the limits are set at the greater of the lower limiting value of plus 5 dB above the prevailing background noise level. It was agreed with MC that the lower limiting values should be 40dB L_{A90} for the night-time and 38dB L_{A90} for Aultmore alone and 40dB L_{A90} cumulatively during the day-time. The resultant noise limits are shown in Annex 12.2-5 along with the background noise levels. The resultant night and day-time noise limits are shown below in Table 12.2.3. Note that where background noise levels rose with decreasing wind speed, or no data is available for higher wind speeds, the limits have been flattened off to be conservative.

⁴ Where no data was measured at or above a wind speed a '-' is displayed and the associated noise limits in Table B.3 will be held at the same level as for the highest available wind speeds.



Table 12.2.3 Derived noise limits at each location (dB L_{A90})

Location Name	Limit Period	Standardised 10 m Height Wind Speeds											
		2	3	4	5	6	7	8	9	10	11	12	
Aultmore Lodge	Night-Time	40	40	40	40	40	40	40	40	40	40	40	40
	Day-Time Aultmore Alone	38	38	38	38	38	38	38	41	44	49	49	49
	Day-Time Cumulative	40	40	40	40	40	40	40	41	44	49	49	49
Drodland	Night-Time	40	40	40	40	40	40	40	40	40	40	41	46
	Day-Time Aultmore Alone	38	38	38	38	38	38	38	38	38	41	44	48
	Day-Time Cumulative	40	40	40	40	40	40	40	40	40	41	44	48
Hillhead Farm	Night-Time	40	40	40	40	40	40	40	40	40	43	46	49
	Day-Time Aultmore Alone	38	38	38	38	38	38	38	38	40	43	45	47
	Day-Time Cumulative	40	40	40	40	40	40	40	40	40	43	45	47
Myreside	Night-Time	40	40	40	40	40	40	40	40	40	40	43	48
	Day-Time Aultmore Alone	38	38	38	38	38	38	38	38	38	41	44	47
	Day-Time Cumulative	40	40	40	40	40	40	40	40	40	41	44	47
School Hill	Night-Time	40	40	40	40	40	40	40	40	40	41	45	49
	Day-Time Aultmore Alone	38	38	38	38	38	38	38	38	41	44	48	52
	Day-Time Cumulative	40	40	40	40	40	40	40	40	41	44	48	52

12.2.6 Conclusions

Baseline noise measurements were undertaken at five residential receptor locations in the vicinity of the previous potential development (similar to the proposed development eastern cluster).

The results of the baseline noise measurements were used to derive appropriate noise limits in line with ETSU-R-97, The Assessment and Rating of Noise from Wind Farms, the Institute of Acoustics document, A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Noise from Wind Turbines and the methodology agreed with Moray Council.

12.2.7 References

International Electrotechnical Commission, 2000. *Sound level meters*. IEC 60651:1979/AMD2:2000.

Department of Energy and Climate Change, 2011. *Report on DECC Research Contract 01.08.09.01/492A (Analysis), Analysis of How Noise Impacts are Considered in the Determination of Wind Farm Planning Applications*.



Department of Trade and Industry, 1996. *Noise Measurements in Windy Conditions*. ETSU W/13/00386/REP.

ETSU-R-97, 1996. *The Assessment and Rating of Noise from Wind Farms*.

Institute of Acoustics, July 2012. *Discussion Document on A Good Practice Guide to the Application of ETSU-R-97 for Wind Turbine Noise Assessment*.

Institute of Acoustics, May 2013. *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise*.

Moray Council, 2017. *Moray Onshore Wind Energy Supplementary Guidance*.



Annex 12.2-1 Correspondence with Moray Council



Q18. Confirmation is requested that the cultural heritage study areas are considered appropriate for the assessment.

Given the increase in scale/height and number of turbines proposed, we would ask that consideration is given to extending the study area for designated historic environment assets from 5km from the outer edge of the red line site boundary to 10km from the outer edge of the red line site boundary. We would also expect regionally significant (undesigned) historic environment assets to be assessed to similar level as designated assets.

For undesigned historic environment assets, a study area extending 1km from the outer edge of the red line site boundary would be acceptable.

In addition, the transport route should also be subject to assessment for any potential direct impact on historic environment assets (designated and undesigned) which may be impacted by any proposed changes to the roadway. This might include bridges, boundary/mile stones, monuments/memorials, troughs/fountains etc, or e.g. cropmark sites where significant road widening/detours are required.

A further site which should be included in the Cultural Heritage assessment is Durn Hill hillfort, on the outer edge of the 10km boundary and at the higher end of the ZTV spectrum (Aberdeenshire HER NJ56SE0003); this site is currently undergoing assessment for designation as a Scheduled Monument. I note it is included as a viewpoint (VP15) in Landscape Visual Assessment chapter (chapter 6).

As stated above, current data should be obtained from source not through Pastmap; data for designated sites should be obtained from HES, data for undesigned sites should be obtained from Aberdeenshire Council's Archaeological Service who are archaeological service providers to the Moray and Aberdeenshire Councils.

Q19. Other Consultees

All relevant consultees have been identified.

11. Noise**Q20. Scope of Assessment**

In terms of considering what other wind farm development should be considered for the cumulative assessment, it is recommended that the appointed consultant review the Institute of Acoustics (IOA) bulletin article of January/February 2016 on cumulative noise, as well as ETSU-r -97 and the associated IOA "*Good Practice Guide To The Application of ETSU-R-97 For The Assessment And Rating Of Wind Turbine Noise.*". The IOA GPG notes in Section 5.1.4 "If the proposed wind farm produces noise levels within 10dB of any existing wind farm/s at the same receptor location, then a cumulative noise impact assessment is necessary"

Q21. Other Consultees

None

Q22. Scoping Out Construction Noise and Operational Vibration

While it is accepted that construction noise and operational vibration can be scoped out there is discussion on the creation and use of borrow pits on the site and no mention of the potential for blasting and associated vibration and air overpressure effects. PAN 50 Annex D Control of Blasting at Surface Mineral Workings should therefore be referred to, unless it is clear that no blasting is proposed and this can be covered by a suitably worded condition.

Further baseline noise measurements – it is noted that a further two receptors will be chosen and anticipate this will be in relation to the westerly grouping of 5 wind turbines. This Section is content to be contacted and, where possible, meet the appointed noise consultants during the installation phase, as recommended by the IOA GPG. Having reviewed the indicative layout in the context of the extent of the site, it would be useful to clarify if existing met mast(s) are to be used for the baseline background survey or whether more localised LIDAR systems are to be used. IOA GPG discusses large sites where more than one wind measuring system may be required to gather accurate information.

Section 11.2.2 of Scoping Report – mention is made of the night time fixed limit of L A 90 43 dB at night as appropriate. This Section applies a lower absolute level of 40 dBA at night and this should be accounted for in the EIA/Planning Application submission.

12 Access, Traffic and Transport**Q23. The proposed route to site**

The 'track' leading from the B9016 to the site is an adopted public road, the U72L Oxhill Road. Traffic counts are required for both the B9016 and the U72L. The U72L is a single track road with limited passing opportunities. The ALRA must therefore include swept path analysis for the entire length of the U72L. The road will also need to be upgraded to accommodate the movements of construction vehicles. It should be noted that until the quality of the materials taken from on-site borrow pits has been established as acceptable for use, all materials to construct the access tracks must be assumed to be sourced off site.

Q24. Other Consultees

Moray Council Structures team to establish whether bridges and culverts on the route need upgrading to accommodate the additional heavy vehicles.

18th May 2022
Our Ref: 3507_L01_EXT1

██████████
Environmental Health Officer

The Moray Council
Council Office
High Street
Elgin
IV30 1BX

Dear Mr. ██████████

Hayes McKenzie Partnership Ltd. is currently providing consulting services to SLR Consulting Limited (on behalf of Vattenfall) in respect of noise that could arise from the introduction of the proposed revised Aultmore Wind Farm. A Scoping Report for the revised development proposals, different to the Aultmore scheme consented in 2014, was submitted to the Energy Consents Unit (ECU) in November 2021 and a response was received in March 2022.

This letter sets out the proposed noise assessment methodology in terms of current planning requirements. The approach will form the basis of the assessment to be supplied as part of an Environmental Impact Assessment Report (EIAR) supporting the Section 36 (S36) planning application.

The assessment is proposed to be undertaken in accordance with the requirements of ETSU-R-97, *The Assessment and Rating of Noise from Wind Farms*, as referred to in PAN1/2011, *Planning and Noise*, and the recommendations of the Institute of Acoustics (IOA) publication, *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise* (GPG), as endorsed by the Scottish Government.

The guidance discussed above requires that background noise measurements are undertaken at a number of properties surrounding a development area with the results being correlated with measured wind speed data collected from the site. This enables the prevailing background noise levels for 'amenity' and 'night-time' periods at the monitoring locations to be derived over a range of wind speeds and relevant noise limits to be derived in relation to each.

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The most important part of the noise assessment will comprise a comparison of the predicted noise levels resulting from the introduction of the site over a range of wind speeds with the noise limits referred to above, at the neighbouring dwellings, and derived in accordance with ETSU-R-97.

The limits prescribed within ETSU-R-97 are in the range of 35-40 dB L_{A90} , or 5 dB above the amenity hours prevailing background levels, whichever is the greater, for the daytime periods; and 43 dB L_{A90} , or 5 dB above the prevailing night-time background levels, whichever is the greater, for night-time periods. It is noted that Moray Council would prefer lower night-time limits, as indicated within the Scoping Opinion.

The actual daytime value within the 35-40 dB L_{A90} range depends on the number of dwellings in the vicinity of the site; the effect of the limit on the number of kWh generated; and the duration of the level of exposure to wind farm noise. Given the generating capacity of the site and the relatively few neighbouring dwellings a limit at the higher end of the range could be considered appropriate in some instances, particularly in relation to the assessment of cumulative noise impacts. The ETSU-R-97 guidance also allows for concessions in relation to operational noise where a dwelling/occupier has some form of financial involvement with the wind farm which is subject of the limits.

Background noise measurements, at dwellings located close to the eastern cluster of turbines, were undertaken in 2007 as part of the planning application for the consented Aultmore scheme (Ref. 07/02375/EIA, 2014). The noise, rain and wind data collected as part of the survey has been reviewed and reanalysed in view of the revised Aultmore proposals and is considered to conform with the requirements of the ETSU-R-97 and GPG documentation. As a result, further baseline/background noise monitoring is not considered necessary for locations neighbouring the eastern cluster of turbines. Furthermore, ETSU-R-97 requires that background noise measurements are determined in the absence of any existing turbine noise and the presence of various small operational turbines near to the Aultmore site could influence potential results at some dwellings. The 2007 monitoring was undertaken at the following dwellings and as shown at the supporting Figure:

- Myreside (348548, 857452);
- Aultmore Lodge (349127, 859533);
- Drodland (345320, 857563);
- Hillhead Farm (344459, 860084); and,
- School Hill (346303, 861318).

Further background noise monitoring will, however, be undertaken at two locations neighbouring the western cluster of turbines. This will be undertaken once appropriate meteorological monitoring equipment is available

to support the further survey works (i.e. when a met. mast of appropriate dimensions, SoDAR or LiDAR device is installed at the site). The approximate noise survey locations will be as follows:

- Auchinderran (340828, 855333), Ryeriggs (340170, 856090) or Croft of Ryeriggs 340207, 856492);
- Newtonbrae (342541, 856013), Blackhills (342988, 856449) or Newtonbrae II, (342828, 856183).

Please note that the particular monitoring locations will depend on access permissions, the presence of existing turbines and changes in the layout of the site. In many instances it will be the case that certain monitoring results from the 2007 and new survey information are used to represent a cluster of dwellings. The exact location of each measurement position for the further survey works will be determined through liaison with the residents of the two selected properties and other relevant third parties if necessary. Many of the other properties surrounding the western cluster of turbines are located outside the 35 dB L_{A90} noise contour for which background noise monitoring is not necessary under the remit of ETSU-R-97.

The re-derived prevailing background noise levels based on the 2007 survey information and from the further survey proposals will be used to represent the remaining dwellings surrounding the site.

The limits described within ETSU-R-97 restrict the combined noise impact of all turbines at any given property and existing turbine noise should not be considered to be part of the existing prevailing background noise levels. Existing operational turbines in the area are expected to be of a sufficient distance away to have no substantive effect on potential background levels. However, this will be reviewed once the data is collected and the analysis is undertaken.

The cumulative operational assessment will consider the Aultmore site operating at the same time as the existing Myreton I & II, Netherton and Balnamoon turbines and including for the consented Lurg Hill wind farm. The noise assessment may include a discussion and/or consider the potential cumulative noise impact based on the planning condition levels from the existing and consented wind farm sites and consider where properties may be financially involved with certain turbines or wind farms. However, an initial review of applicable planning conditions indicates that actual turbine noise levels may be lower, particularly when considering the effects of wind direction.


The construction of the proposed turbines will occur at distances that are highly unlikely to breach typical construction noise limits prescribed within BS 5228, *Code of Practice for Noise and Vibration Control on Construction & Open Sites*. This combined with the temporary nature of the works means that a detailed assessment of the construction noise impacts is not considered necessary. However, possible upgrades to local

roads and provision of additional access tracks could occur in close proximity to neighbouring dwellings. Only these relatively minor aspects of the proposed development will be considered more specifically, and a detailed construction noise assessment is not considered to be required for this site. However, this aspect will be kept under review throughout the EIA process.

I'd be grateful if could you review the information provided here and, if you're happy with the proposals, confirm your agreement with the approach.

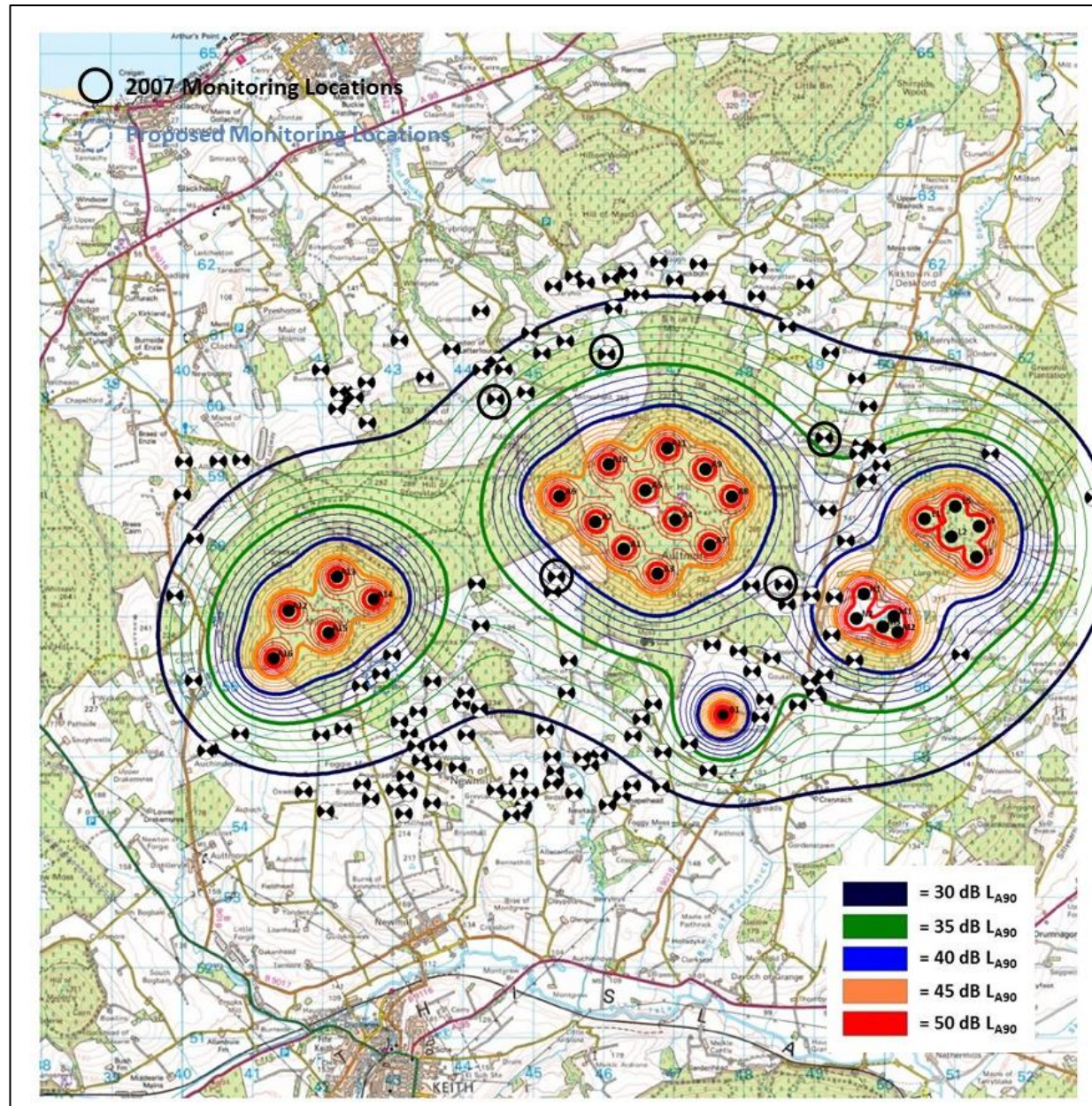
Sincerely,



 BSc MIOA
Principal Acoustic Consultant



Hayes McKenzie — Consultants in Acoustics



Robin Woodward

From: [REDACTED]
Sent: 04 July 2022 17:49
To: [REDACTED]
Cc: [REDACTED]
Subject: RE: 22/06 Aultmore Wind Farm Redesign

Categories: Important information

Hi [REDACTED]
There's plenty on the go so a reminder is welcome here.
Yes, I had read the response below and am content with the reply, apologies for not writing sooner. I site visited recently and noted that Langlanburn turbine hasn't been built. From recollection it was to be a 60kw proposal but there's no sign of it moving forward.

If time permits I would like to meet on site at the background installation period and in the meantime hope this confirmation email assists.

Kind regards
[REDACTED]

From: [REDACTED]
Sent: 04 July 2022 15:27
To: [REDACTED]
Cc: [REDACTED]
Subject: RE: 22/06 Aultmore Wind Farm Redesign

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Hi [REDACTED]

Do you have any further comments on the noise assessment proposals?

I assume the responses to your comments are satisfactory but it would be good to get confirmation either way.

Don't hesitate to call if you'd like to discuss further.

Kind regards, [REDACTED]

[REDACTED]
BSc MIOA

Principal Acoustic Consultant | Hayes McKenzie Partnership Ltd



From: [REDACTED]
Sent: 09 June 2022 17:51
To: [REDACTED]
Subject: RE: 22/06 Aultmore Wind Farm Redesign

Hi [REDACTED]

Thanks for the response, much appreciated.

I have some responses from our noise consultant to your comments below:

1. Financial involvement – ETSU –R -97 highlights concessions of higher limits where there is a “Direct Financial Involvement” at a dwelling . I have no supporting evidence that such a direct link exists at this proposal and on this basis I would expect normal ETSU limits to be considered for the development.

We also expect this will be the case, but the situation may change. Appropriate evidence in respect of financial involvement will be provided if necessary.

2. Historical background noise measurements (07/02375/EIA) – can you give further detail on the review you carried out to support the historical noise measurement as up to current standards. My recollection was that direct hub height measurement may have been used but if you can elaborate that would be helpful, given the timeframe predates the IOA GPG and updated methodologies from then.

The met. mast located at the eastern cluster of turbines during the historical survey works had anemometry installed at 25 and 75 m height. The GPG states that hub-height wind speeds may be calculated from two heights provided that the higher measurement height is no lower than 60% of hub height. The maximum hub-height considered for the purposes of the new assessment is approximately 122.5 m. As such, the height of the mast anemometry conforms with the GPG requirements, allowing the relevant hub-height and corresponding standardised 10 m height wind speed data determined using the appropriate formulae.

3. Background locations- I appreciate at this stage the final locations will be dependent on several factors as you highlight and I am content that two additional locations are chosen. Where time permits I am happy to meet onsite as previously noted in the Scoping Opinion. The reference to the addition of meteorological equipment clarifies that there appears to be a localised source of wind speed measurement to cover the additional western portion of the site.

We'll get in touch once we have made the appropriate survey arrangements. We can always provide photos and details of the measurement locations for your review once the equipment is installed if you're not able to attend.

4. Cumulative noise assessment – I appreciate this is still at an early stage and I note the reference to consideration of Myreton 1 and 2, Netherton, Balnamoon and consented Lurg Hill. I am seeking clarification on the process used to scope in/out wind turbines in the area for the cumulative assessment . I briefly reviewed our planning applications and noted a consented EWT-DW-54 at Follosters (13/00479/APP), as well as an E 48 at Drodland (12/01388/APP) and a smaller scale NPS-60-23-37 at Langlanburn (13/01790/APP). From my recollection of the area the last two consented application don't appear to have gone forward, however, Follosters is I believe operational. Clarification on this aspect would be appreciated.

We'll review this information and provide further detail as part of the noise assessment. In general, we won't include turbines of less than 50 kW generating capacity (as the GPG indicates), we'll also discount any turbines that would have predicted noise levels 10 dB below the potential noise levels from the combined operational levels from other development in the area at relevant dwellings, as the impact of such can be considered negligible on that basis.

We're aware of the operational Followsters turbine, as well as another turbine called Garrelhill and will include these as part of the cumulative assessment along with the developments identified above. As the Drodland turbines consent has now lapsed and it doesn't appear to have been built we are unlikely to include this in our assessment. It is understood that the Langlanburn turbine has less than 50 kW capacity, so we'll discount this turbine from the assessment. Please let us know if you'd like any further discussion on this point.

5. Scoping out construction noise/vibration – I agree with the comment that a site specific construction assessment for noise is not necessary. I am seeking clarification if it is known if blasting of borrow pits is to occur ?

At present, it is not known if blasting will be required on the borrow pits, although we certainly cannot discount it at this stage. Once we have further information we can provide an update.

I hope the above is useful – if not please don't hesitate to get in touch.

I have copied in our noise consultant, [REDACTED] for info and by way of introduction.

Kind regards

[REDACTED]

[REDACTED]

[REDACTED]

SLR Consulting Limited
Floor 2, 4/5 Lochside View, Edinburgh Park, Edinburgh, EH12 9DH

From: [REDACTED]
Sent: 07 June 2022 11:37
To: [REDACTED]
Cc: [REDACTED]
Subject: RE: 22/06 Aultmore Wind Farm Redesign

Hi [REDACTED]

I've looked over the supporting letter from Hayes Mackenzie and attach my comments. I hope this helps in the meantime and look forward to hearing back.

Kind regards

[REDACTED]

From: [REDACTED] >
Sent: 06 June 2022 11:45
To: [REDACTED] >
Subject: RE: 22/06 Aultmore Wind Farm Redesign

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Hi [REDACTED]

Thanks for the update, much appreciated.

Please feel free to get in touch with me on 0 [REDACTED] if that would be easier for any questions.

Kind regards

[REDACTED]



SLR Consulting Limited
Floor 2, 4/5 Lochside View, Edinburgh Park, Edinburgh, EH12 9DH

From: [Redacted]
Sent: 02 June 2022 10:42
To: [Redacted]
Subject: RE: 22/06 Aultmore Wind Farm Redesign

Hi [Redacted]
I acknowledge receipt of this email and haven't had time to review the proposals yet due to workload. I will review this early next week and refresh my understanding of the Aultmore proposal and reply in writing then. Apologies I haven't managed to reply thus far.

Kind regards
[Redacted]

From: [Redacted]
Sent: 25 May 2022 14:58
To: [Redacted]
Cc: [Redacted]
Subject: RE: 22/06 Aultmore Wind Farm Redesign

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Hi [Redacted]
In December 2021 SLR submitted a Scoping Report to the ECU in relation to a proposed redesign of the consented Aultmore wind farm, located between Keith and Cullen. The Scoping response from TMC was received in January 2022, and we had another call with [Redacted] and the TMC planning team on the 2nd March.

Further to information in the Scoping Report and in response to the comments in the TMC scoping response I attach a letter from the noise specialist engaged on the project setting out some additional information and a list of receptors we consider may be suitable to act as background noise monitoring locations.

We would welcome any comment you have on these locations, and would seek to agree that you are content with the locations proposed. Hayes Mckenzie would be happy to meet with you during installation as suggested in the scoping response from TMC.

I have copied in [Redacted] the noise consultant for info.

Kind regards
[Redacted]

SLR Consulting Limited
Floor 2, 4/5 Lochside View, Edinburgh Park, Edinburgh, EH12 9DH

From: [REDACTED]
Sent: 25 May 2022 12:59
To: [REDACTED]
Cc: [REDACTED]
Subject: RE: 22/06 Aultmore

Yes send it direct to [REDACTED] and Cc me. I have copied him so you have his email address.

[REDACTED]
[REDACTED] MRTPI | Senior Planning Officer (Development Management) | Economic Growth & Development
[REDACTED] | [website](#) | [facebook](#) | [twitter](#) | [instagram](#) | [news](#)



Please note my working pattern is Tuesday-Friday

From: [REDACTED]
Sent: 25 May 2022 12:02
To: [REDACTED]
Subject: RE: 22/06 Aultmore

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Hi [REDACTED]

I have a letter from our noise consultant for the EHO regarding proposed background noise monitoring locations. Do you want me to send this you for circulation, or do you have an email address for [REDACTED] the EHO I can use directly (whilst copying you in)?

Many thanks



[REDACTED]
[REDACTED]
[REDACTED]

SLR Consulting Limited
Floor 2, 4/5 Lochside View, Edinburgh Park, Edinburgh, EH12 9DH



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From: [REDACTED]

Sent: 04 March 2022 08:52

To: [REDACTED]

Subject: 22/06 Aultmore

[REDACTED]

Further to our meeting on Wednesday I just wanted to confirm that we will not be providing a written response at present and will likely reconvene once the project has developed.

I can confirm as I said at the meeting that the internal consultees who were not present at the meeting have all advised that they have nothing to add to the comments made on the Scoping request. I would be happy to seek further advice from them if you want to present anything new or amended.

Our preference would be that you present one updated package for further discussion rather than individual elements but we can see how things progress.

Regards

[REDACTED]

[REDACTED] | Senior Planning Officer (Development Management) | Economic Growth & Development
[REDACTED] | [website](#) | [facebook](#) | [twitter](#) | [instagram](#) | [news](#)



Please note my working pattern is Tuesday-Friday

[REDACTED]

From: [REDACTED]
Sent: 06 November 2023 13:23
To: [REDACTED]
Subject: RE: 3507: Aultmore Wind Farm

Hi [REDACTED]

I just wanted to update you on this. Given your preference, I have now included an appendix to our noise chapter detailing some derived RNB limits along with the methodology used for this.

I have also included details within the chapter of where we have assumed a cumulative noise limit or agreement based on an existing schemes planning conditions, and also a brief assessment based on the cessation of these agreements (due to the related scheme no longer operating) for the properties affected.

Regards,

[REDACTED]

BSc MIOA

Principal Consultant & Quality Manager | Hayes McKenzie Partnership Ltd

[REDACTED]

Registered in England and Wales at Lintrathen House, West Dean, Salisbury SP5 1JL. Registration No. 5211418

From: [REDACTED]
Sent: Friday, October 6, 2023 12:33 AM
To: [REDACTED]
Subject: RE: 3507: Aultmore Wind Farm

Hi [REDACTED]

I'm just getting finished for leave Friday evening till 17th and just wanted to come back on the response below highlighted in yellow-

I don't think I've seen this approach before in my area and can you direct me to any Planning Enquiries/decisions where this approach being used. I consider the IOA technical bulletin on Cumulative noise and IOA GPG as the points of reference and would appreciate where this approach sits within that framework. Eg is the approach to consider that existing sites will operate 2 to 3 dB above predicted but less than full limits ? Some clarification would be welcome.

If you are able to clarify the Direct Financial Involvement situation too in bullet 5 below and identify the property that would be helpful.

Many thanks

[REDACTED]

From: R [REDACTED]
Sent: 04 September 2023 12:01
To: [REDACTED]
Subject: RE: 3507: Aultmore Wind Farm

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Hi [REDACTED]

We are showing whether or not the cumulative predicted noise levels would meet the noise limits derived in accordance with the below or not. We have recently not been specifying the site specific (RNB) noise limits within the EIA Noise chapter, but just showing that the site can operate with no significant impact based on those limits and then agreeing the site specific limits at the conditioning stage. We are not assuming sites are operating at their limits.

Regards,

[REDACTED]

[REDACTED]

BSc MIOA

Principal Consultant & Quality Manager | Hayes McKenzie Partnership Ltd

[REDACTED]

Registered in England and Wales at Lintrathen House, West Dean, Salisbury SP5 1JL. Registration No. 5211418

From: [REDACTED]

Sent: Thursday, August 31, 2023 2:28 PM

To: [REDACTED]

Subject: RE: 3507: Aultmore Wind Farm

Hi [REDACTED]

Thanks for taking the call on Tuesday.

In summary

Point 1 is noted and agreed

Point 2 – yes 38 dB for the proposed site (or bsl +5, whichever is greater). 40 dBA cumulative daytime is accepted by this Section for daytime (or bsl+5, whichever is greater)

Point 3- 40 dBA cumulative for night hours accepted (or bsl +5, whichever is greater)

Point 4 – yes 10 dB below is accepted

Point 5- Direct financial involvement – does the owner of the turbine(s) occupy a property ? Tenants in rented properties of the turbine owner won't receive direct financial involvement and 45 limit wouldn't apply. I think the approach is reasonable as you detail if DFI exists and maybe in an associated consent – If you can identify the development I can check consent conditions .

More broadly is the cumulative assessment currently applying consented limits in the assessment ? Or are you considering the “ remaining noise budget” approach yet .

Hope these comments assist you moving forward with various project aspects just now and look forward to hearing back on the existing development and Direct Financial Involvement.

Many thanks

[REDACTED]

From: [REDACTED]

Sent: 28 August 2023 10:19

To: [REDACTED]

Subject: RE: 3507: Aultmore Wind Farm

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Hi [REDACTED]

I was just about to phone you before heading out to our equipment storage, but then realised I don't have your number.

Assuming you're busy this morning, either let me know your number and I'll give you a call this afternoon when I'm free, or we can try tomorrow morning after 11 or before 10?

In response though:

1. Yes, I selected 30 dB related to being 10 dB below a 40 dB cumulative limit.
2. It sounds like 38 individual, 40 dB cumulative would be acceptable to you for day hours.
3. I suspected you might request 40 dB to be the night limit, and I have already discussed this with our clients and they agree this is acceptable for this project.
4. It sounds like using 10 dB below existing levels is acceptable to you.
5. Regarding financial involvement with other schemes, the reasoning behind this is if the proposed scheme can meet 38+5 dB during day hours for instance on its own, but the neighbouring site is at 43-44 dB already as they are financially involved, this allows the proposed scheme to add a small increase to this, but be by far the lesser contributor, rather than making meeting limits impossible if the neighbouring scheme is allowed to essentially have a higher limit on its own that the proposed scheme can have cumulatively. What we don't think is appropriate is using a financial involvement with another scheme to allow the proposed scheme to be higher than the 38+5 dB limit alone in the first place.

Regards,

[REDACTED]
[REDACTED]
[REDACTED]

Principal Consultant & Quality Manager | Hayes McKenzie Partnership Ltd

[REDACTED]

Registered in England and Wales at Lintrathen House, West Dean, Salisbury SP5 1JL. Registration No. 5211418

From: [REDACTED]

Sent: Friday, August 25, 2023 4:40 PM

To: [REDACTED]

Subject: RE: 3507: Aultmore Wind Farm

Hi [REDACTED]

Apologies I have not managed to call this morning. Can I call Monday morning for a quick catch up ? (or Tuesday if on public holiday)

A few points from the 5 bullet points to assist discussion

1. 2016 Acoustics bulletin uses anything at and under 25 instead of 30 – I presume 30 and under is aimed at no increase in cumulative 40 dB ?
2. Yes, agree
3. Moray Council would use 40 day and night , noting ETSU has 43 dB
4. Yes
5. Not seen this approach before – is this scenario likely to exist.

Hope this helps for now and speak soon

Kind regards

From: [REDACTED]
Sent: 23 August 2023 11:14
To: [REDACTED]
Subject: RE: 3507: Aultmore Wind Farm

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Hi [REDACTED]

Thanks, will await your call.

Regards,

[REDACTED]
[REDACTED]
[REDACTED]

Principal Consultant & Quality Manager | Hayes McKenzie Partnership Ltd

[REDACTED]

Registered in England and Wales at Lintrathen House, West Dean, Salisbury SP5 1JL. Registration No. 5211418

From: [REDACTED]
Sent: Tuesday, August 22, 2023 2:17 PM
To: [REDACTED]
Subject: RE: 3507: Aultmore Wind Farm

Thanks [REDACTED] for getting back to me.
I'm off work Wednesday and Thursday and on site visits on Friday but will aim to call late morning for a catch up.

Many thanks

[REDACTED]

From: [REDACTED]
Sent: 21 August 2023 17:51
To: [REDACTED]
Subject: RE: 3507: Aultmore Wind Farm

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Hi [REDACTED]

Coincidentally I'm actually on site up your way tomorrow, so can't do a call then, but should be available the rest of the week. Mornings are usually better if possible.

Regards,

[Redacted]
[Redacted]
[Redacted]

Principal Consultant & Quality Manager | Hayes McKenzie Partnership Ltd

[Redacted]

Registered in England and Wales at Lintrathen House, West Dean, Salisbury SP5 1JL. Registration No. 5211418

From: [Redacted]
Sent: Monday, August 21, 2023 3:09 PM
To: [Redacted]
Subject: RE: 3507: Aultmore Wind Farm

Hi [Redacted]
Sorry for not getting back sooner. I'm wondering if we could have a chat around 3 30 tomorrow afternoon to discuss if free then ?

Many thanks

[Redacted]

From: [Redacted]
Sent: 08 August 2023 14:55
To: [Redacted]
Subject: RE: 3507: Aultmore Wind Farm

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Hi [Redacted]

We are now carrying out the final noise assessment for the proposed Aultmore Wind Farm, and I was hoping we could have a discussion/come to an agreement on the appropriate ETSU limits for the daytime hours and the general assessment criterion. Given that there are other developments in the immediate area with similar limits, I wanted to proposed the following based on the scale of the scheme and cumulative effects from the existing developments:

- If Aultmore alone predicted noise levels are below 30 dB L_{A90} then no further consideration is required
- If Aultmore alone is below 38 dB L_{A90} or background +5 dB (the higher of) & cumulative predicted noise levels are below 40 dB L_{A90} or background +5 dB (the higher of) during day hours no significant impact is expected
- If Aultmore alone & cumulative predicted noise levels are below 43 dB L_{A90} or background +5 dB (the higher of) during night hours no significant impact is expected
- Where existing noise levels (from all schemes other than Aultmore) are more than 10 dB above predicted noise levels for Aultmore alone, then no significant impact is expected
- Where a residential property has a financial interest (or other arrangement) agreed with a neighbouring scheme, the same arrangement/limit can be applied to cumulative predicted noise levels when considering whether a significant impact is expected

Let me know if it's useful to arrange a call or similar to discuss this, or what further information you might require to support this.

Regards,

[Redacted]

Principal Consultant & Quality Manager | Hayes McKenzie Partnership Ltd

[Redacted]

Registered in England and Wales at Lintrathen House, West Dean, Salisbury SP5 1JL. Registration No. 5211418

From: [Redacted] <>
Sent: Friday, January 13, 2023 9:37 AM
To: R [Redacted]
Subject: RE: 3507: Aultmore Wind Farm Additional Background Noise Monitoring - Install 18th Jan 23

Hi [Redacted]
Many thanks for the email here. I am not able to attend the installation but hope that another colleague can manage. Can you clarify when you hope to arrive at Auchinderran and approximate finish time after Newtonbrae (or other suitable alternative).

I look forward to hearing back from you.

Kind regards

[Redacted]

From: [Redacted]
Sent: 11 January 2023 10:36
To: [Redacted]
Subject: 3507: Aultmore Wind Farm Additional Background Noise Monitoring - Install 18th Jan 23

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Hi [Redacted]

I believe my colleague [Redacted] was in contact with you last year regarding the proposed assessment methodology and monitoring locations for the noise aspects of the proposed Aultmore Wind Farm, which I have attached here for ease of reference.

The LiDAR was installed at the end of last year so we're now in a position to carry out the background noise monitoring at two locations. These will be Auchinderran and Newtonbrae (the primary options detailed with the methodology).

My colleague [REDACTED] (Cc'd) will be installing this equipment on the morning of Wednesday 18th January 2023, and I wanted to extend an invitation should you wish to attend the installation. The detailed of the installation will, of course, be included within the noise chapter of the ES should you not be available.

Let me know if you have any queries or concerns regarding this.

Regards,

[REDACTED]

Principal Consultant & Quality Manager | Hayes McKenzie Partnership Ltd

[REDACTED]

Hayes McKenzie — Consultants in Acoustics


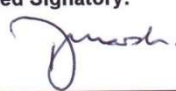


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Annex 12.2-2 Calibration Certificates



CERTIFICATE OF CALIBRATION																																																		
Telephone: +44 (0)1642 876 410		Laboratory address: MTS Consultancy 17 Elvington Close Billingham TS23 3YS		UKAS CALIBRATION 0607																																														
Date of Issue: 23rd August 2006		Certificate Number: U 9020																																																
<p>Client: Hayes McKenzie Partnership Lintrathen House, Rectory Hill West Dean Salisbury SP5 1JL</p> <p style="text-align: center;">Sound Calibrator Bruel & Kjaer Model 4231 Serial Number 2218188</p> <p>Two Reference Calibrators, each calibrated by the National Physical Laboratory, were used to establish the sensitivity of the measurement chain. The same measurement chain is then used to determine the output level of the Object Calibrator by the difference between its output and that of the nominated Reference Calibrator. Six independent measurements of the third-octave band sound pressure levels produced by the Reference Calibrators and the Object Calibrator are averaged to minimise uncertainties of the calibration. The measurement chain consists of an NPL-Calibrated Reference Microphone and internally calibrated Reference Preamplifier and Reference Analyser.</p> <p>The sound pressure level generated by the calibrator in its WS2 configuration was measured by reference to Brüel & Kjaer Type 4133 Microphone number 1093782, most recently calibrated by National Physical Laboratory in September 2005 and Brüel & Kjaer Type 4231 Sound Calibrator number 2326247, most recently calibrated by National Physical Laboratory in June 2006. The values measured were:</p> <table border="1"> <tr> <td>Output Level:</td> <td>93.86</td> <td>dB re 20µPa</td> <td>+/- 0.14dB (k = 2.0)</td> </tr> <tr> <td>Fundamental Frequency:</td> <td>999.98</td> <td>Hz</td> <td>+/- 0.11 Hz (k = 2.0)</td> </tr> <tr> <td>Total Harmonic Distortion</td> <td>0.487</td> <td>%</td> <td>+/- 0.010 % (k = 2.0)</td> </tr> </table> <p>The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been calculated in accordance with UKAS publication M3003 (Dec 1997).</p> <p>Measurement Conditions:</p> <table> <tr> <td>Temperature</td> <td>21.8</td> <td>°C</td> </tr> <tr> <td>Atmospheric Pressure</td> <td>1014.3</td> <td>mBar</td> </tr> <tr> <td>Relative Humidity</td> <td>58.9</td> <td>%</td> </tr> </table> <p>Test Equipment:</p> <table> <thead> <tr> <th>Equipment</th> <th>Manufacturer</th> <th>Model</th> <th>Serial No.</th> <th>Traceability Ref.</th> <th>Cal. Due</th> </tr> </thead> <tbody> <tr> <td>Reference Microphone</td> <td>Brüel & Kjaer</td> <td>4133</td> <td>1093782</td> <td>TE 101</td> <td>Sep-06</td> </tr> <tr> <td>Reference Calibrator</td> <td>Brüel & Kjaer</td> <td>4231</td> <td>2326247</td> <td>TE 129</td> <td>Sep-07</td> </tr> <tr> <td>Real-Time Frequency Analyser</td> <td>Larson Davis</td> <td>2900</td> <td>0492</td> <td>TE 108</td> <td>Jul-07</td> </tr> </tbody> </table> <p>Date of Receipt: 21st August 2006 Date of Measurement: 22nd August 2006</p> <p style="text-align: right;">Approved Signatory:  David Marsh</p> <p>Page 1 of 1</p> <p style="text-align: center;"><i>PLEASE SEND ALL DELIVERIES TO:</i> MTS Consultancy, The Grange Business Centre, Belasis Avenue, Billingham TS23 1LG</p> <p style="text-align: center;">Telephone: 01642 876410 Fax: 01723 500094 E-Mail: dmarsh@slmcal.co.uk or tsherris@slmcal.co.uk</p>						Output Level:	93.86	dB re 20µPa	+/- 0.14dB (k = 2.0)	Fundamental Frequency:	999.98	Hz	+/- 0.11 Hz (k = 2.0)	Total Harmonic Distortion	0.487	%	+/- 0.010 % (k = 2.0)	Temperature	21.8	°C	Atmospheric Pressure	1014.3	mBar	Relative Humidity	58.9	%	Equipment	Manufacturer	Model	Serial No.	Traceability Ref.	Cal. Due	Reference Microphone	Brüel & Kjaer	4133	1093782	TE 101	Sep-06	Reference Calibrator	Brüel & Kjaer	4231	2326247	TE 129	Sep-07	Real-Time Frequency Analyser	Larson Davis	2900	0492	TE 108	Jul-07
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CERTIFICATE OF CALIBRATION																											
Issued by:	MTS Consultancy																										
Telephone: +44 (0)1642 876 410	Laboratory address: 17 Elvington Close Billingham TS23 3YS England																										
Date of Issue:	6th March 2007	Certificate Number:		U9793																							
<p style="text-align: center; color: green; font-size: small;">Please note delivery address below</p>																											
Client:	Hayes McKenzie 16a The Courtyard Dean Hill Park, West Dean Salisbury, SP5 1EY																										
<h2 style="margin: 0;">Sound Calibrator</h2>																											
Larson Davis	Model CAL200	Serial Number 3599																									
<p style="font-size: x-small;">Two Reference Calibrators, each calibrated by the National Physical Laboratory, were used to establish the sensitivity of the measurement chain. The same measurement chain is then used to determine the output level of the Object Calibrator by the difference between its output and that of the nominated Reference Calibrator. Six independent measurements of the third-octave band sound pressure levels produced by the Reference Calibrators and the Object Calibrator are averaged to minimise uncertainties of the calibration. The measurement chain consists of an NPL-Calibrated Reference Microphone and internally calibrated Reference Preamplifier and Reference Analyser.</p>																											
<p style="font-size: x-small;">As well as providing a traceable measurement of the sound pressure level in the cavity of the Object Calibrator, the Calibrator's frequency and total harmonic distortion are also measured. Frequency is determined from the average of six independent measurements using a multimeter with a current UKAS-accredited calibration. The total harmonic distortion is measured from the average of three independent measurements by third octave analysis, subtracting the level of the fundamental frequency from the sum of the combined harmonics in the frequency band to 20kHz. The complete procedure is detailed in the MTS Consultancy work procedure WP01.</p>																											
<p style="font-size: x-small;">The sound pressure level generated by the calibrator in its WS2 configuration was measured by reference to Brüel & Kjær Type 4133 Microphone number 1093782 and Brüel & Kjær Type 4231 Sound Calibrator number 2326247. The values measured were:</p>																											
Output Level 1:	94.03	dB re 20µPa	+/- 0.14 dB (k= 2.00)																								
Fundamental Frequency 1:	1000.38	Hz	+/- 0.12 Hz (k= 2.00)																								
Total Harmonic Distortion 1:	0.491	%	+/- 0.011 % (k= 2.00)																								
Output Level 2:	114.07	dB re 20µPa	+/- 0.14 dB (k= 2.00)																								
Fundamental Frequency 2:	1000.39	Hz	+/- 0.12 Hz (k= 2.00)																								
Total Harmonic Distortion 2:	0.616	%	+/- 0.011 % (k= 2.00)																								
<p style="font-size: x-small;">The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k (individually calculated as above), to provide a level of confidence of approximately 95%. The uncertainty evaluation has been calculated in accordance with UKAS publication M3003 (Dec 1997).</p>																											
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Relative Humidity	40.8	%																									
<p style="color: red; font-size: x-small;">This measurement is valid only for the above device configured for calibration of a WS-2 microphone under the above environmental conditions. For deviation of prevailing conditions, the manufacturer's literature for the calibrator should be referred to.</p>																											
<p>Test Equipment:</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <thead> <tr> <th style="width: 20%;">Equipment</th> <th style="width: 15%;">Manufacturer</th> <th style="width: 10%;">Model</th> <th style="width: 10%;">Serial No.</th> <th style="width: 15%;">Traceability Ref.</th> <th style="width: 10%;">Calibration Due</th> </tr> </thead> <tbody> <tr> <td>Reference Microphone</td> <td>Brüel & Kjær</td> <td>4133</td> <td>1093782</td> <td>TE 101</td> <td>Jan-08</td> </tr> <tr> <td>Reference Calibrator</td> <td>Brüel & Kjær</td> <td>4231</td> <td>2326247</td> <td>TE 129</td> <td>Jun-07</td> </tr> <tr> <td>Real-Time Frequency Analyser</td> <td>Larson Davis</td> <td>2900</td> <td>0492</td> <td>TE 108</td> <td>Jun-07</td> </tr> </tbody> </table>				Equipment	Manufacturer	Model	Serial No.	Traceability Ref.	Calibration Due	Reference Microphone	Brüel & Kjær	4133	1093782	TE 101	Jan-08	Reference Calibrator	Brüel & Kjær	4231	2326247	TE 129	Jun-07	Real-Time Frequency Analyser	Larson Davis	2900	0492	TE 108	Jun-07
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Reference Calibrator	Brüel & Kjær	4231	2326247	TE 129	Jun-07																						
Real-Time Frequency Analyser	Larson Davis	2900	0492	TE 108	Jun-07																						
Date of Receipt:		5th March 2007																									
Date of Measurement:		6th March 2007																									
Approved Signatory:			 Tony Sherris																								
<p style="font-size: x-small;">Page 1 of 1</p>																											
<p style="font-size: x-small;">This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standards and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This Certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.</p>																											
<p style="color: green; font-weight: bold; font-size: small;">PLEASE SEND ALL DELIVERIES TO:</p> <p style="color: green; font-weight: bold; font-size: small;">MTS Consultancy, The Grange Business Centre, Belasis Avenue, Billingham TS23 1LG</p>																											
<p>Telephone: 01642 876410 Fax: 01642 876411 E-Mail: dmarsh@slmcal.co.uk or tsherris@slmcal.co.uk</p>																											



ProsCon Environmental Ltd
Calibration Certificate
Sound Level Meter

ProsCon Environmental Limited
Calibration Centre
 The Grange Business Centre, Belasis Ave
 Billingham, TS23 1LG
 Phone +44 (0)1642 876410
 Fax +44 (0)1642 876411
 Email dmarsh@slmcal.co.uk
 or tsherris@slmcal.co.uk

Certificate Number: 9501

Client: Hayes McKenzie Partnership Ltd
 16A The Courtyard
 Dean Hill Park
 West Dean
 Salisbury SP5 1EY

Instrument Make: Larson Davis
Instrument Model: 820
Serial Number: 0675

Microphone Make: Larson Davis
Microphone Model: 2541
Serial Number: 3582

Preamplifier Make: Larson Davis
Preamplifier Model: 828
Serial Number: 0721

Calibrator Make: not supplied
Calibrator Model:
Calibrator Serial Number:
Calibrator Adaptor:
Calibrator Certification Ref:

Extension Cable: calibrated with 5m cable supplied

This is to certify that the above instrument was calibrated according to MTS Consultancy Measurement Procedures and was found to comply as summarised below. The measurements were carried out using the Test Equipment listed below, all of whose calibrations are traceable to UK National Standards. The management controls of MTS Consultancy are registered in its Quality Manual Issue C/2 dated November 2005, and are designed to be in compliance with BS EN ISO/IEC 17025: 2005. Copies of the relevant certificates, test procedures and test results, together with the traceability of test equipment are filed with MTS Consultancy and extracts are available on request

This instrument was tested in accordance with the recommendations of BS 7580: Part 1 1997 (not all tests were performed) with the following results:

	<i>Manufacturer's Specification</i>	<i>BS EN 60651 Type 1</i>
Self-Generated Noise:	Complies	no specification – measured 18.3 dB(A)
Dynamic Linearity – electrical response:	Complies	Complies between 22.0 and 131.7 dB(A)
Frequency Weighting A - electrical response:	Complies	Complies
Frequency Weighting A - acoustic response:	Complies	Complies
Frequency Weighting C - electrical response:	Complies	Complies
Time Weightings F, S, I (Detector):	Complies	Complies
Microphone Response:	Fails	Complies (assessed as overall acoustic specification)

No modifications were necessary in order to achieve the above specification
 Calibrated at 113.91 dB re 20µPa, 250 Hz – calibration offset = 7.5 dB

Test Equipment:

Equipment	Manufacturer	Model	Serial No.	Traceability Ref.	Cal. Due
Condenser Microphone	Larson Davis	2541	4295	TE 102	October 2007
Acoustic Calibrator 250Hz	Larson Davis	CA250	2807	TE 104	September 2007
Real-Time Frequency Analyser	Larson Davis	2900	0604	TE 138	July 2007

Date of Receipt: 8th January 2007
 Date of Calibration: 10th January 2007
 Date of Certificate Issue: 10th January 2007

Authorised Signatory:

T A Sherris

Tony Sherris

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ProsCon Environmental Ltd
Calibration Certificate
Sound Level Meter
Larson Davis Model 820

ProsCon Environmental Limited
Calibration Centre
 The Grange Business Centre, Belasis Ave
 Billingham, TS23 1LG
 Phone +44 (0)1642 876410
 Fax +44 (0)1723 500094
 Email dmarsh@slmcal.co.uk
 or sherris@slmcal.co.uk

Certificate Number: 9115

Client: Hayes McKenzie
 Linrathen House
 Rectory Hill, West Dean
 Salisbury, SP5 1JL

Instrument Make:	Larson Davis	Microphone Make:	GRAS
Instrument Model:	820	Microphone Model:	40AE
Serial Number:	1254	Serial Number:	25522
Preamplifier Make:	Larson Davis	Calibrator Make:	not supplied
Preamplifier Model:	828	Calibrator Model:	
Serial Number:	1776	Calibrator Serial Number:	
Extension Cable:	Check Calibrated with cable supplied	Calibrator Adaptor:	
		Calibrator Certification Ref:	

This is to certify that the above instrument was calibrated according to MTS Consultancy Measurement Procedures and was found to comply as summarised below. The measurements were carried out using the Test Equipment listed below, all of whose calibrations are traceable to UK National Standards. The management controls of MTS Consultancy are registered in its Quality Manual Issue C/2 dated November 2005, which are designed to be in compliance with BS EN ISO/IEC 17025 : 2005. Copies of the relevant certificates, test procedures and test results, together with the traceability of test equipment are filed with MTS Consultancy and extracts are available on request.

This instrument was tested in accordance with the recommendations of BS 7580: Part 1 1997 (not all tests were performed) with the following results:

	Manufacturer's Specification	BS EN 60651 Type 1
Self-Generated Noise:	Complies	no specification – measured 13.9 dB(A)
Dynamic Linearity – electrical response:	Complies	Complies between 21.0 and 125.9 dB(A)
Frequency Weighting A - electrical response:	Complies	Complies
Frequency Weighting A - acoustic response:		Complies
Frequency Weighting C - electrical response:	FAILS	Complies
Time Weightings F, S, I (Detector):	Complies	Complies
Microphone Response:		Complies (assessed as overall acoustic specification)

No modifications were necessary in order to achieve the above specification
Calibrated at 113.91 dB re 20µPa, at 250 Hz – calibration offset = 5.6 dB
Polarisation Voltage 0 V

Test Equipment:

Equipment	Manufacturer	Model	Serial No.	Traceability Ref.	Cal. Due
Condenser Microphone	Larson Davis	2541	4295	TE 102	August 2006
Acoustic Calibrator 250Hz	Larson Davis	CA 250	2807	TE 104	September 2007
Real-Time Frequency Analyser	Larson Davis	2900	0604	TE 138	July 2006

Date of Receipt: 13th September 2006
 Date of Calibration: 17th September to 9th October 2006
 Date of Certificate: 9th October 2006

Authorised Signatory *RA Sherris*
 Tony Sherris





NATA Report No.: 44423-cal-01 Report Date: 17/08/06 Calibration Date: 17/08/06 Page 1 of 14

Calibration Report on:

Larson Davis

Model :LD 820


Sound Level Meter

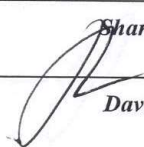
Serial Number : 1491

NATA Accredited Laboratory Number: 1163

The tests, calibrations or measurements covered by this document have been performed in accordance with NATA requirements which include the requirements of ISO/IEC 17025 and are traceable to Australian national standards of measurement. This document shall not be reproduced, except in full.



Testing Officer: 

N.A.T.A. Signatory: 

Shane Mitchell

David Jenkins

sam44423.doc



ProsCon Environmental Ltd

Calibration Certificate

Sound Level Meter

ProsCon Environmental Limited
Calibration Centre
 The Grange Business Centre, Belasis Ave
 Billingham, TS23 1LG
 Phone +44 (0)1642 876410
 Fax +44 (0)1642 876411
 Email dmarsh@slmcal.co.uk
 or tsherris@slmcal.co.uk

Certificate Number: 9765

Client:

Hayes McKenzie
 16a The Courtyard
 Dean Hill Park
 West Dean
 Salisbury, SP5 1EY

Instrument Make:	Larson Davis	Microphone Make:	Larson Davis
Instrument Model:	820	Microphone Model:	2541
Serial Number:	1258 (IHF3)	Serial Number:	6448
Preamplifier Make:	Larson Davis	Calibrator Make:	not supplied
Preamplifier Model:	828	Calibrator Model:	
Serial Number:	1782	Calibrator Serial Number:	
Extension Cable:	calibrated with cable supplied	Calibrator Adaptor:	
		Calibrator Certification Ref:	

This is to certify that the above instrument was calibrated according to MTS Consultancy Measurement Procedures and was found to comply as summarised below. The measurements were carried out using the Test Equipment listed below, all of whose calibrations are traceable to UK National Standards. The management controls of MTS Consultancy are registered in its Quality Manual Issue C/2 dated November 2005, and are designed to be in compliance with BS EN ISO/IEC 17025: 2005. Copies of the relevant certificates, test procedures and test results, together with the traceability of test equipment are filed with MTS Consultancy and extracts are available on request

This instrument was tested in accordance with the recommendations of BS 7580: Part 1 1997 (not all tests were performed) with the following results:

	Manufacturer's Specification	BS EN 60651 Type 1
Self-Generated Noise:	Complies	no specification – measured 16.7 dB(A)
Dynamic Linearity – electrical response:	Complies	Complies between 22.0 and 129.5 dB(A)
Frequency Weighting A - electrical response:	Complies	Complies
Frequency Weighting A - acoustic response:	Complies	Complies
Frequency Weighting C - electrical response:	Complies	Complies
Burst (RMS accuracy):	Complies	Complies
Time Weightings F, S, I (Detector):	Complies	Complies
Microphone Response:	Complies	Complies (assessed as overall acoustic specification)

No modifications were necessary in order to achieve the above specification
Calibrated at 93.90 dB re 20µPa, 1 KHz – calibration offset = 9.0 dB**

** Set calibration level on instrument to 93.83 dB (93.9 dB - 0.07 dB*) for calibrator listed below
 (* 0.07 dB is the difference between free-field sensitivity and pressure sensitivity for the above microphone type)

Polarisation Voltage 200 V

Test Equipment:

Equipment	Manufacturer	Model	Serial No.	Traceability Ref.	Cal. Due
Real-Time Frequency Analyser	Larson Davis	2900	0604	TE 138	July 2007
Digital Multimeter	Hewlett Packard	34401A	MY41046986	TE 152	April 2007
Acoustic Calibrator 1kHz	Brüel & Kjær	4231	2326247	TE 129	June 2007

Date of Receipt: 27th February 2007
 Date of Calibration: 27th February to 1st March 2007
 Date of Certificate Issue: 1st March 2007

Authorised Signatory:



Tony Sherris
 Page 1 of 12



Annex 12.2-3 Baseline Measurement Location Details



Aultmore Lodge

Description of Measurement Position

Aultmore Lodge is located to the north-east of the proposed development. The noise monitoring equipment was located in the front garden of the property in a free-field location.

Description of Local Noise Environment

At site visits the predominant noise sources affecting the local environment included wind in foliage, dogs barking, birdsong and rain.



Figure B.2 Aultmore Lodge noise monitoring photos



Drodland

Description of Measurement Position

Drodland is located to the south-west of the proposed development. The noise monitoring equipment was located in a grass area in front of the property in a free-field location.

Description of Local Noise Environment

At site visits the predominant noise sources affecting the local environment included farm machinery, cows and birdsong.



Figure B.3 Drodland noise monitoring photos



Hillhead Farm

Description of Measurement Position

Hillhead Farm is located to the north-west of the proposed development. The noise monitoring equipment was located in the rear garden of the property in a free-field location.

Description of Local Noise Environment

At site visits the predominant noise sources affecting the local environment included birdsong, wind in foliage, and rain.



Figure B.4 Hillhead Farm noise monitoring photos



Myreside

Description of Measurement Position

Myreside is located to the south-east of the proposed development. The noise monitoring equipment was located in the garden of the property in a free-field location.

Description of Local Noise Environment

At site visits the predominant noise sources affecting the local environment included dogs barking, birdsong and rain.



Figure B.5 Myreside noise monitoring photos



School Hill

Description of Measurement Position

School Hill is located to the north of the proposed development. The noise monitoring equipment was located on a fence post of the fence surrounding the property.

Description of Local Noise Environment

At site visits the predominant noise sources affecting the local environment included birdsong and rain.



Figure B.6 School Hill noise monitoring photos



Annex 12.2-4 Wind Conditions During Survey



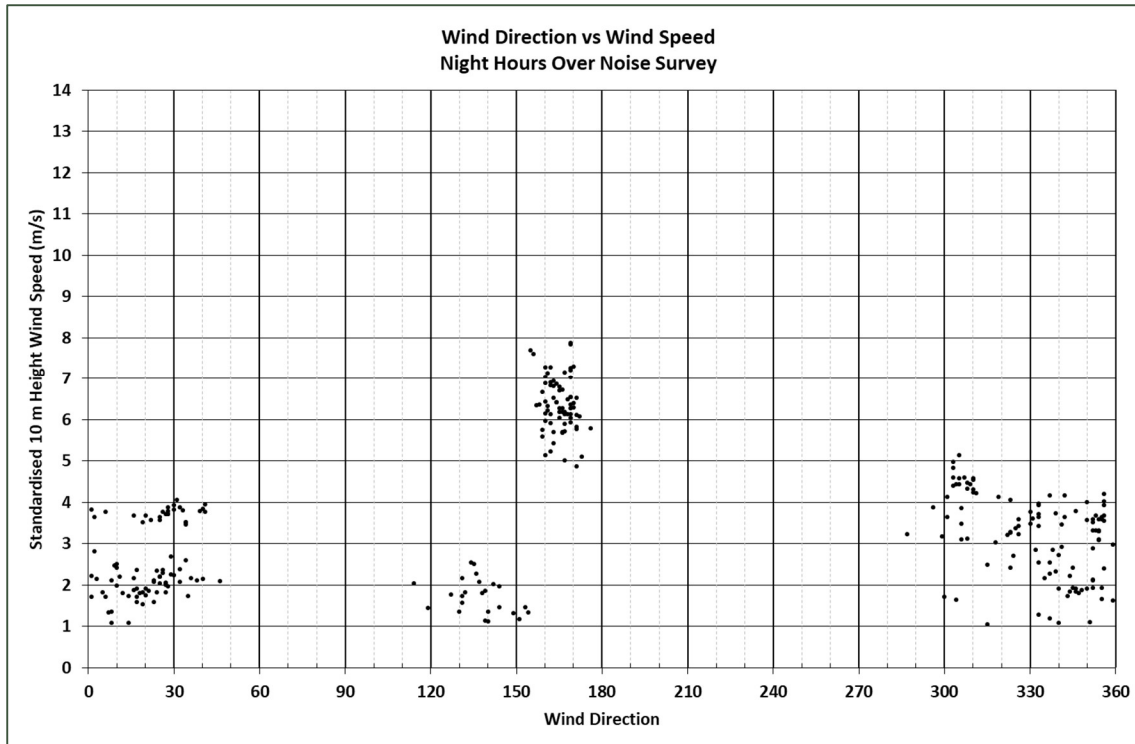


Figure B.7 Variation of wind speed and direction during night hours – Aultmore Lodge

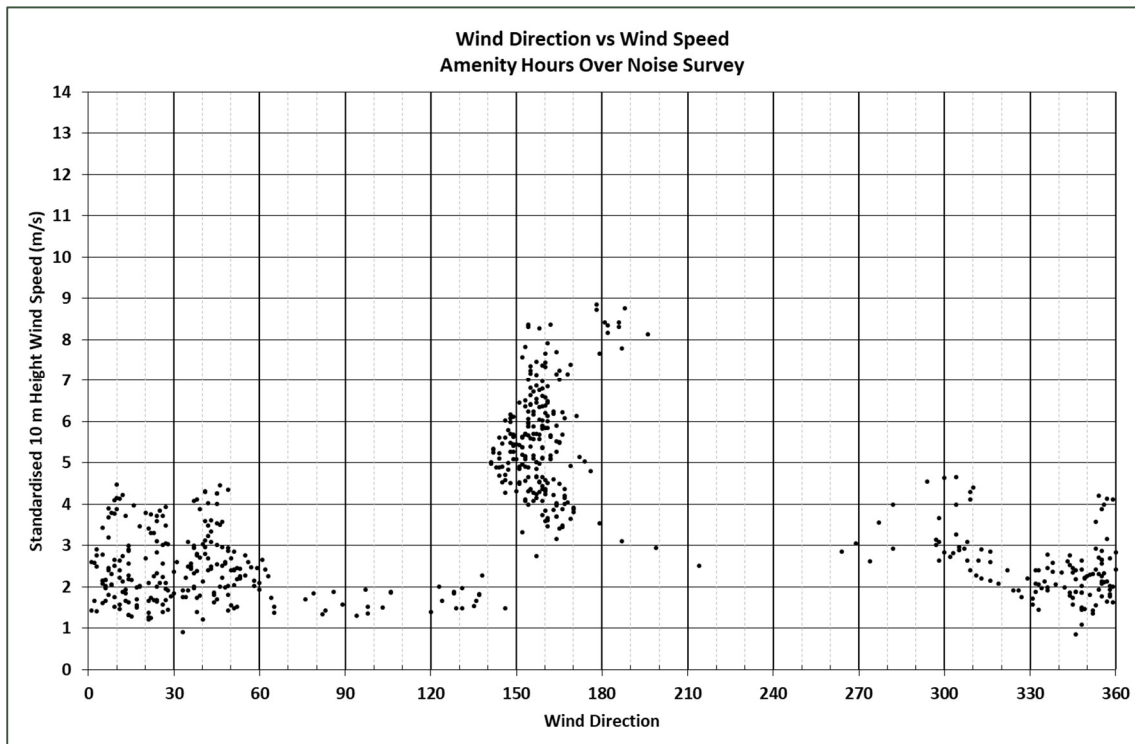


Figure B.8 Variation of wind speed and direction during quiet day-time hours – Aultmore Lodge



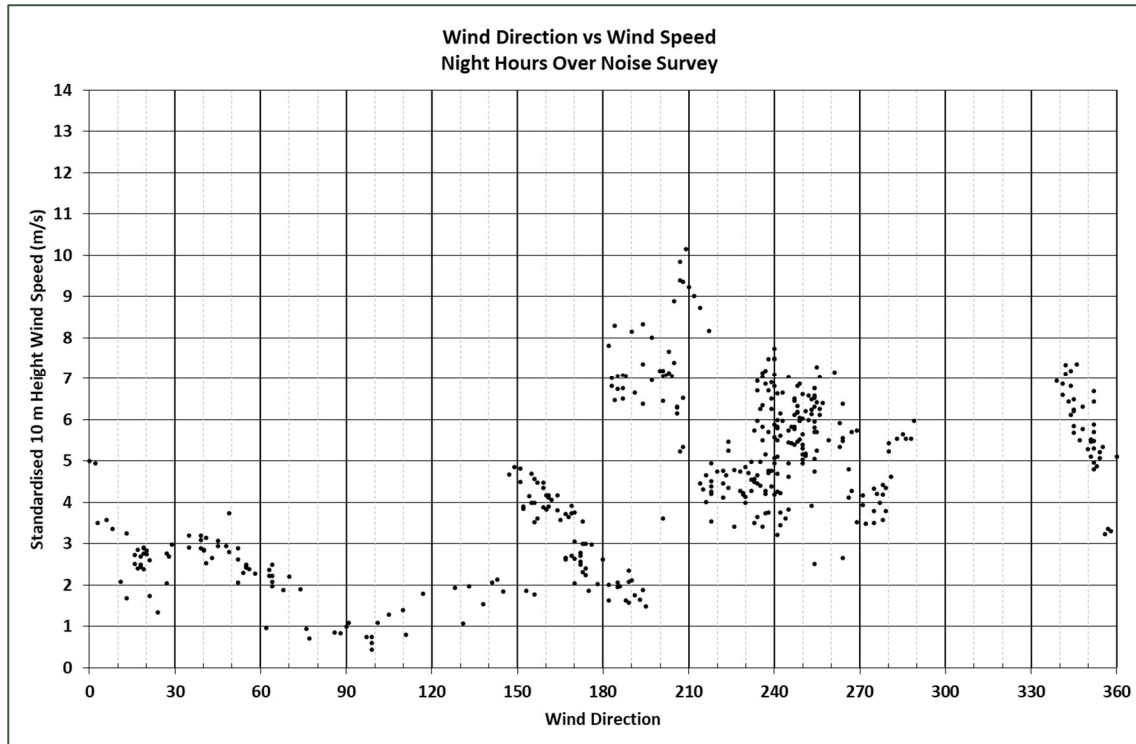


Figure B.9 Variation of wind speed and direction during night hours – Other locations⁵

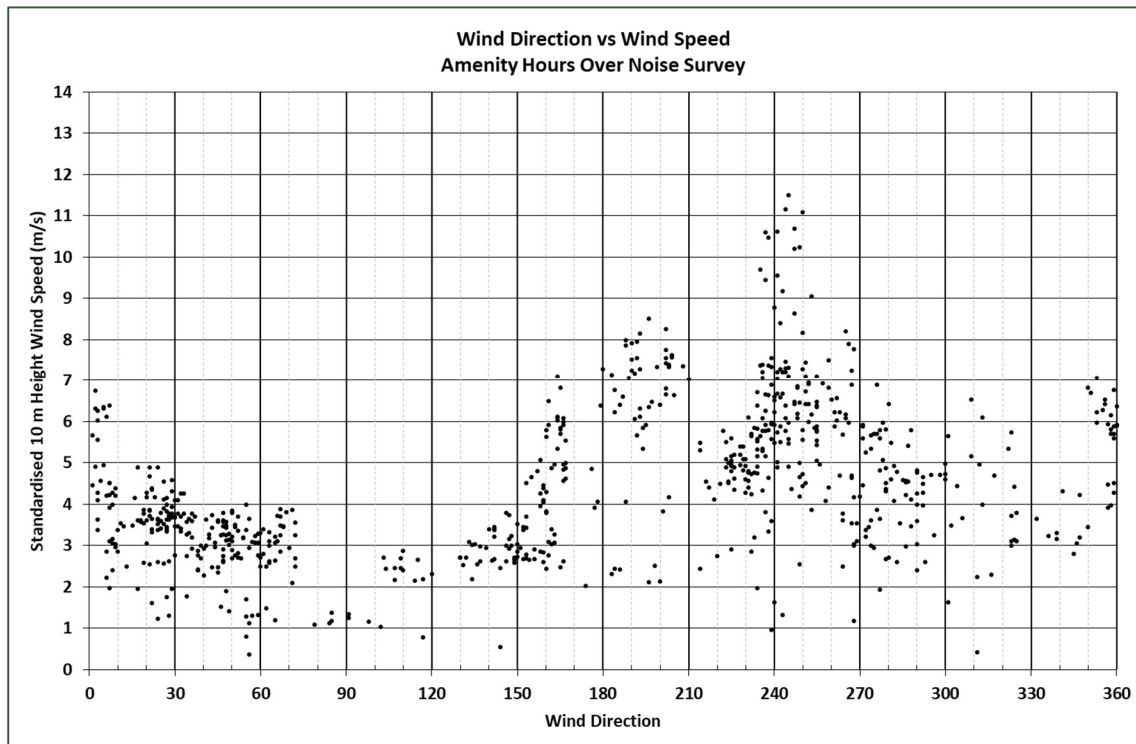


Figure B.10 Variation of wind speed and direction during quiet day-time hours – Other locations

⁵ Although there is a slight variation in available wind speeds and directions based on manual exclusions for each location, the data-set available is largely the same for the four locations where measurements were carried out concurrently.



Annex 12.2-5 Baseline Measurement Results and Derived Limits



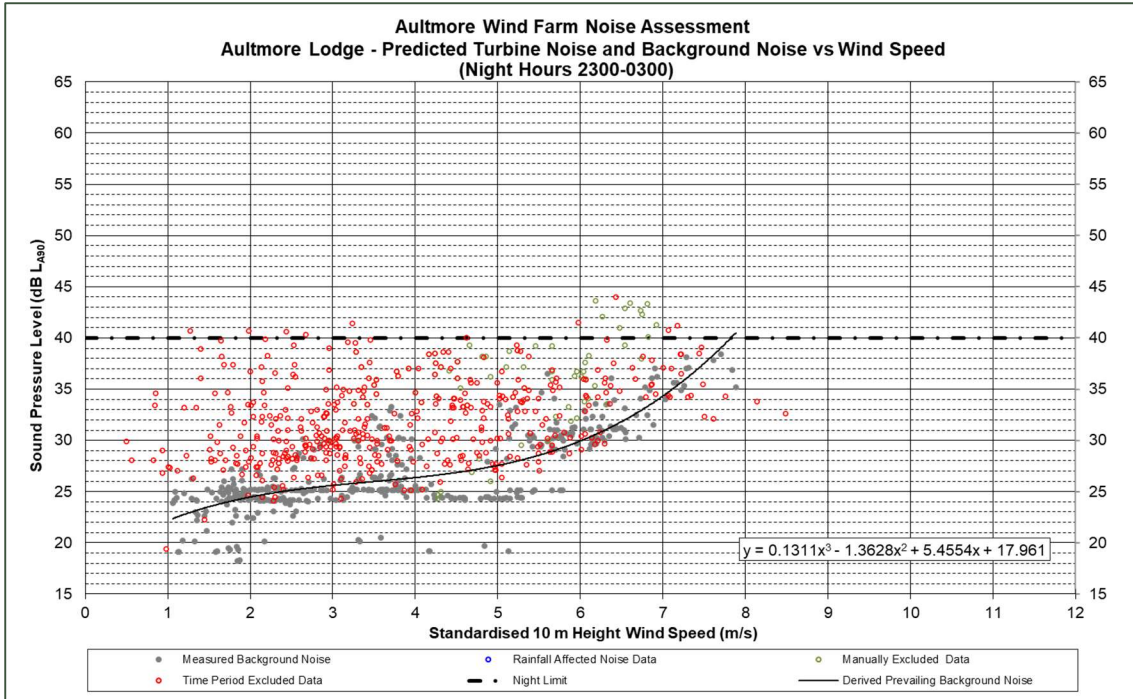


Figure 12.2.11 Baseline measurement results at Aultmore Lodge; night

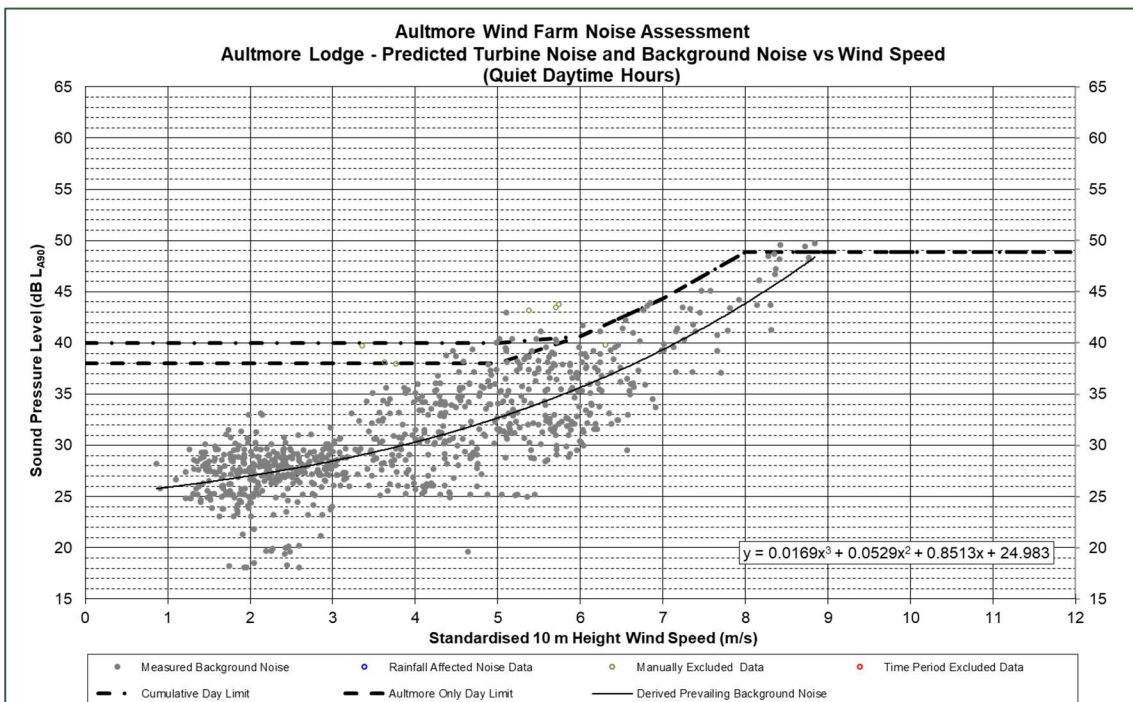


Figure 12.2.12 Baseline measurement results at Aultmore Lodge; quiet daytime



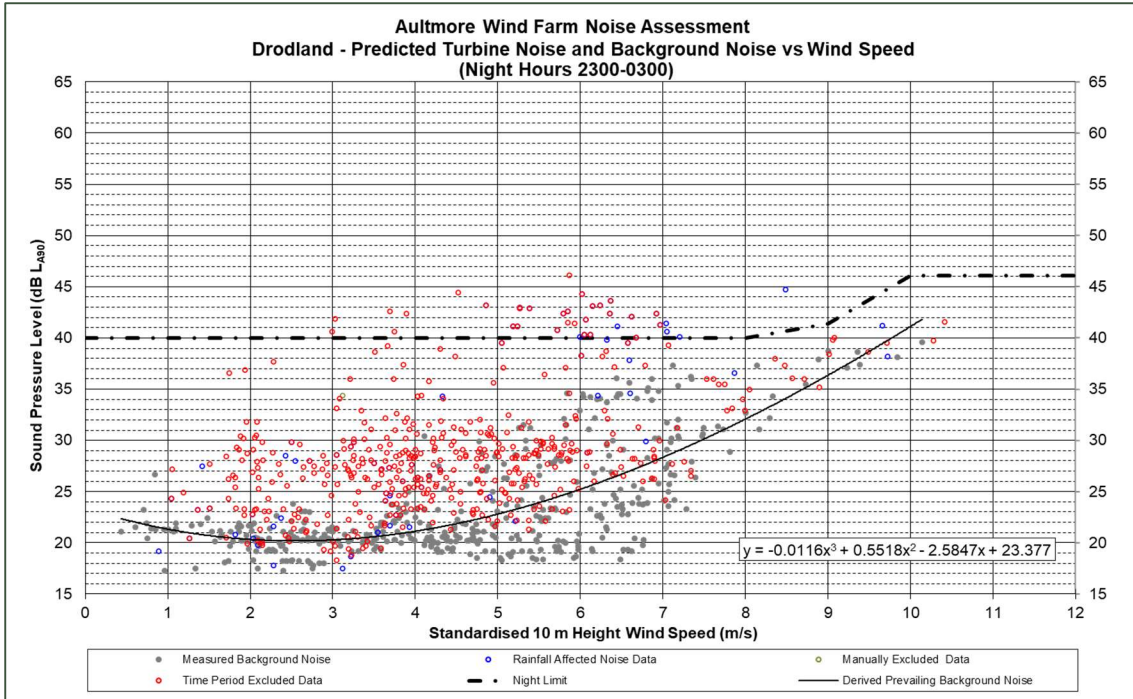


Figure 12.2.13 Baseline measurement results at Drodland; night

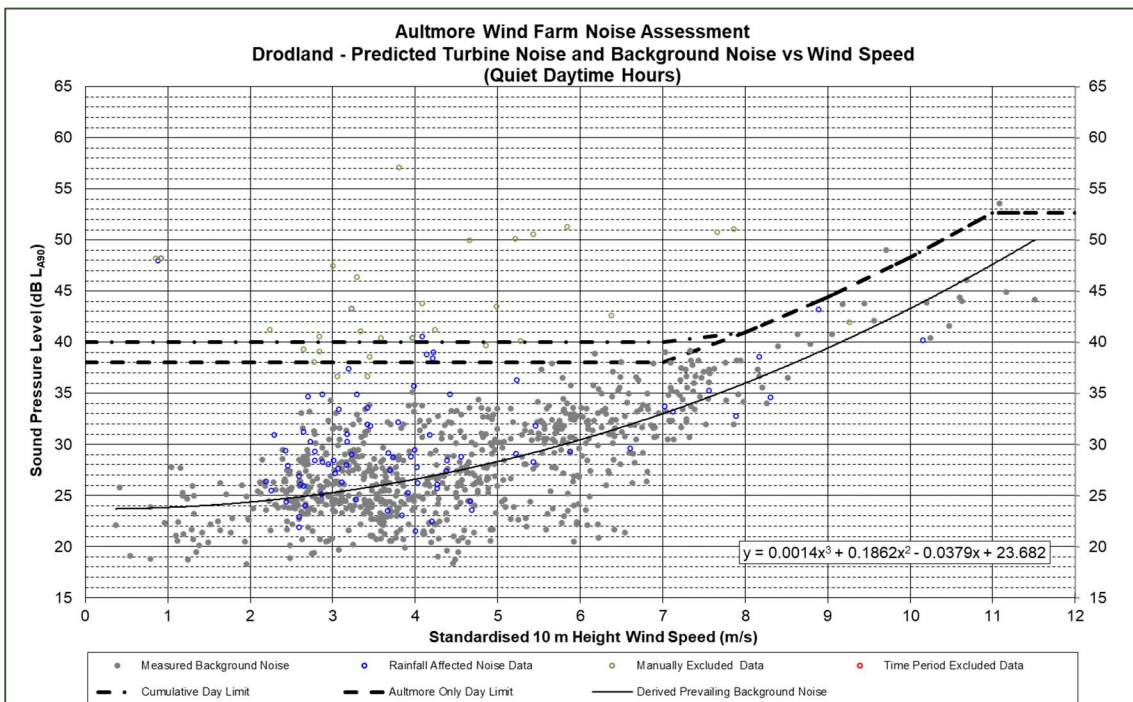


Figure 12.2.14 Baseline measurement results at Drodland; quiet daytime



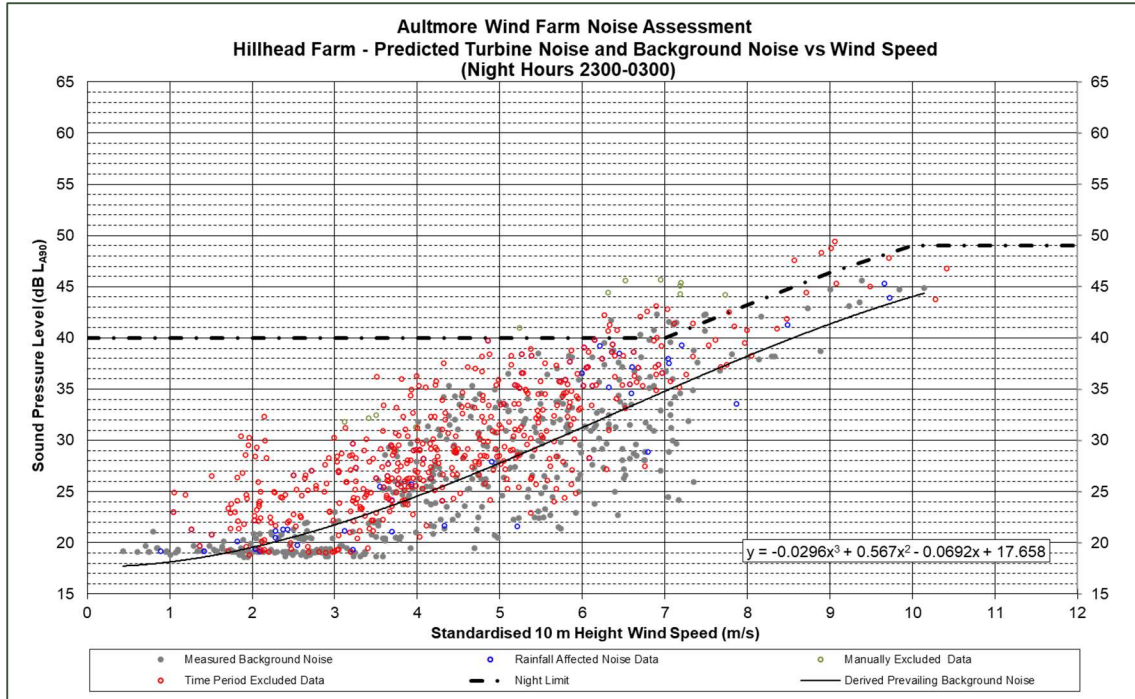


Figure 12.2.15 Baseline measurement results at Hillhead Farm; night

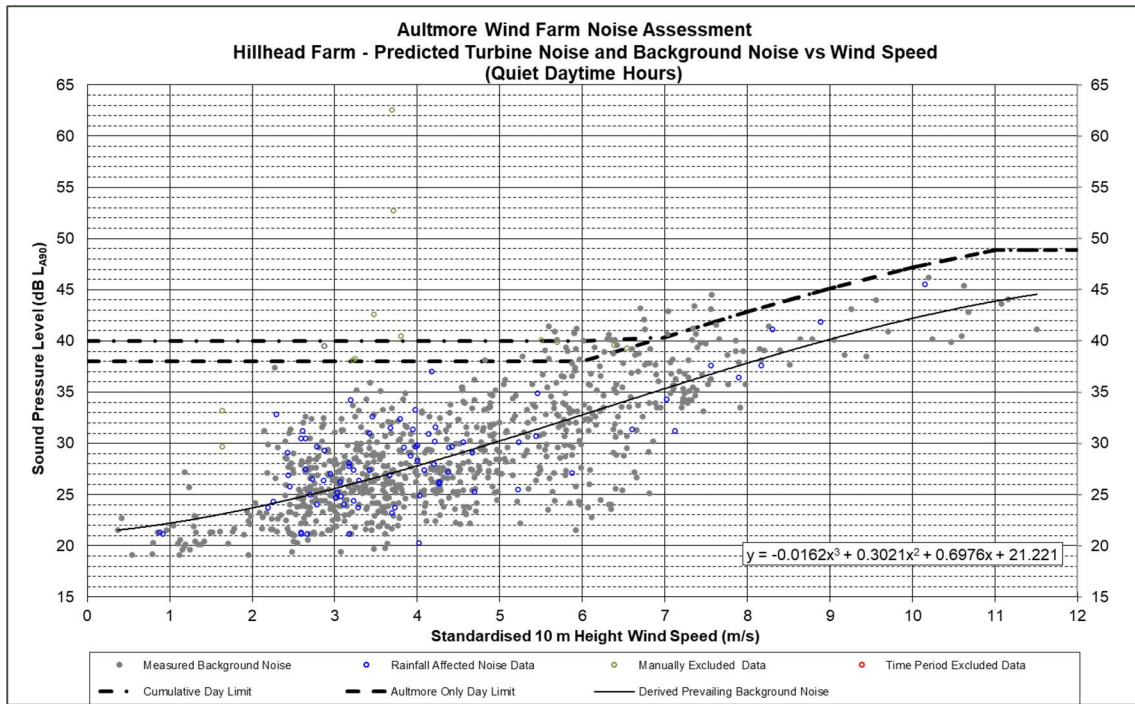


Figure 12.2.16 Baseline measurement results at Hillhead Farm; quiet daytime

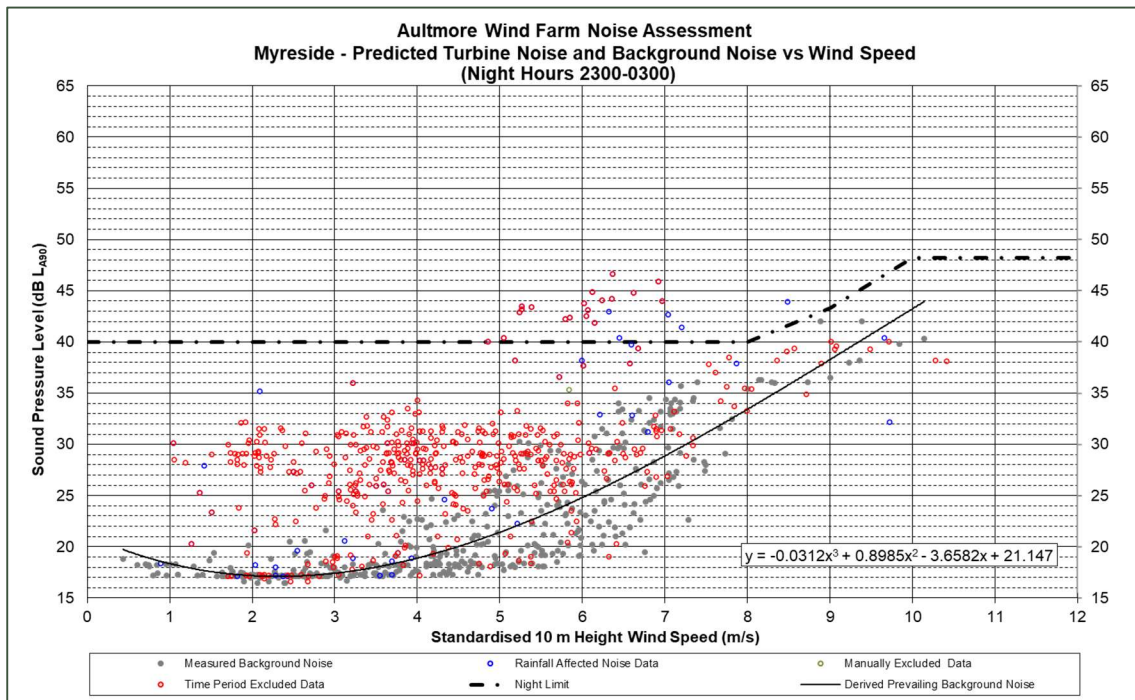


Figure 12.2.17 Baseline measurement results at Myreside; night

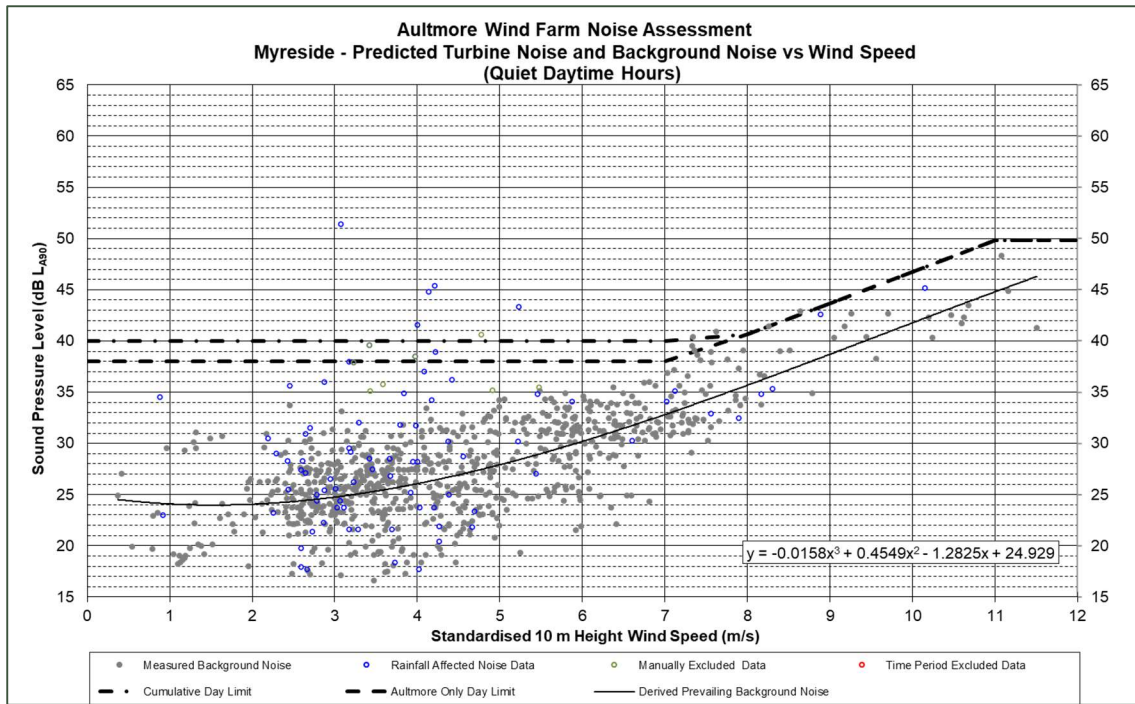


Figure 12.2.18 Baseline measurement results at Myreside; quiet daytime

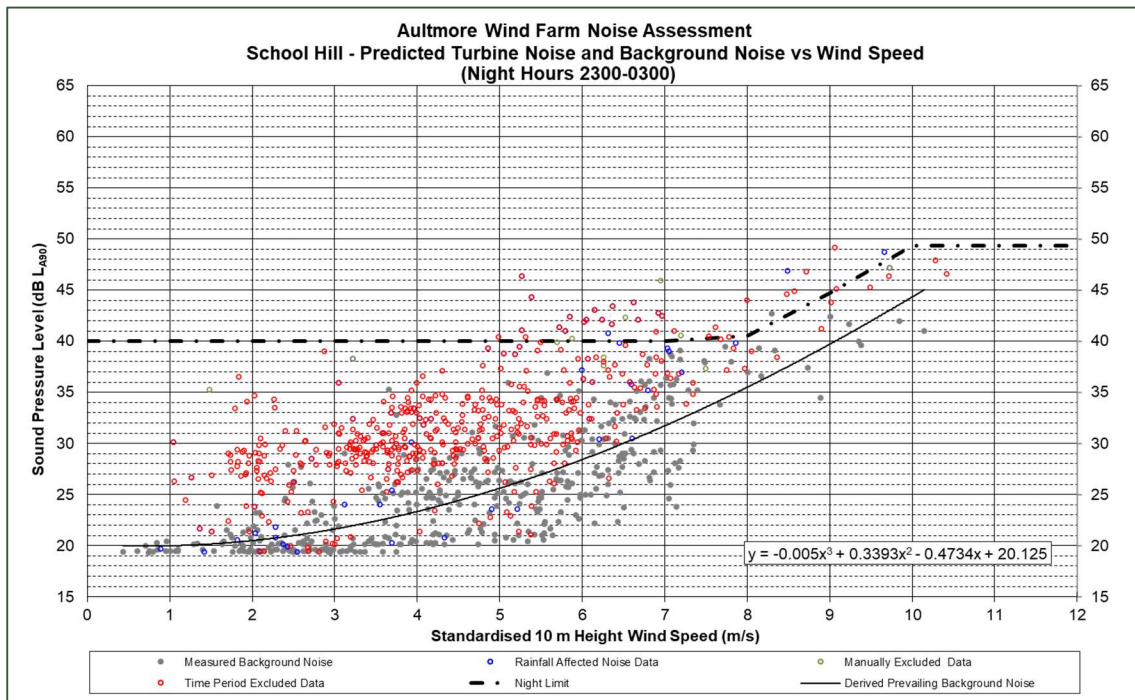


Figure 12.2.19 Baseline measurement results at School Hill; night

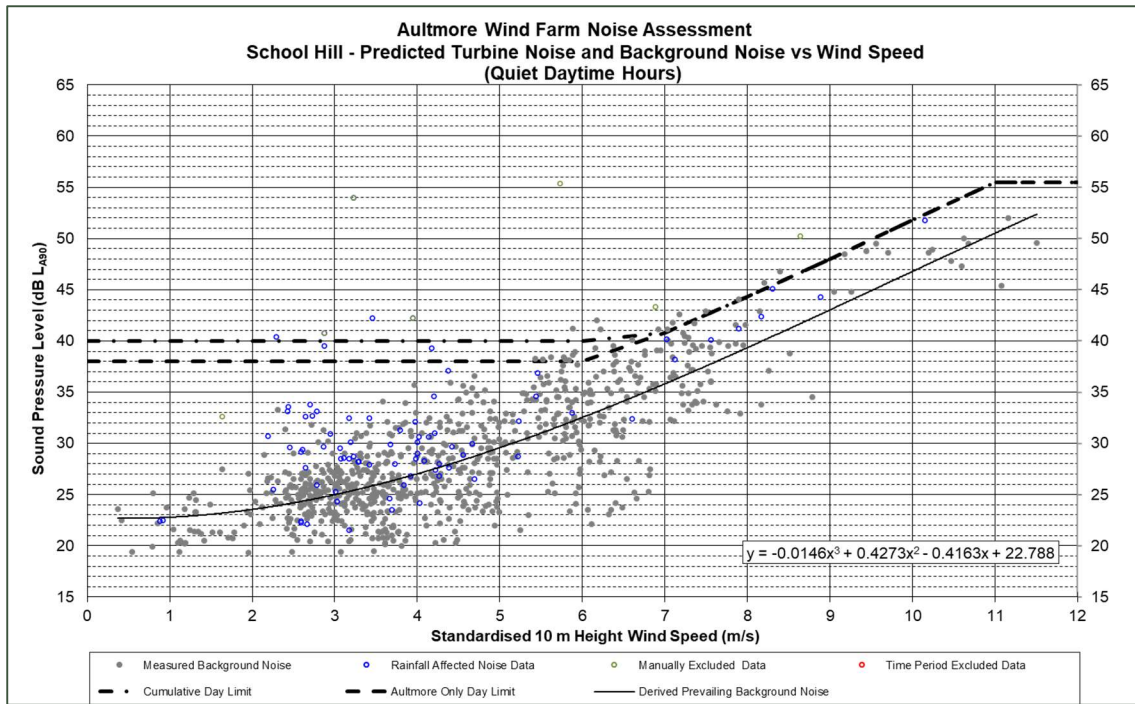


Figure 12.2.20 Baseline measurement results at School Hill; quiet daytime

