ACOUSTIC CONSULTANTS LTD

Proposed Free Range Chicken Shed
Land to North of Glanmyddyfi, Pentrefelin, Llandeilo

Noise Impact Assessment

Reference: 6994/CG/BL
October 2018

Proposed Free Range Chicken Shed
Land to North of Glanmyddyfi, Pentrefelin, Llandeilo

Noise Impact Assessment

Client:
Mr. T. Davies
Llys Y Nant
Llanfynydd
Carmarthenshire
SA32 7TG

Planning Consultant:
JCR Planning
Unit 2
Cross Hands Business Workshops
Cross Hands
Carmarthenshire
SA14 6RE

Noise and Acoustic Consultant:
Acoustic Consultants Limited
Raleigh House
Wellsway
Keynsham
Bristol
BS31 1HS

Prepared by

Blake Lucas BEng. (Hons) MIOA

Checked by:

Daniel Oldaker BSc. (Hons), MIOA

Issue Number:
Revision D

Date:
12 October 2018

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1. Introduction

Mr. T. Davies appointed Acoustic Consultants Limited to assess the noise impact from the plant associated with the proposed free range chicken shed at land north of Glanmyddyfi, Pentrefelin, Llandeilo.

The brief was to monitor existing background sound levels at locations representative of the nearest noise-sensitive receivers around the site, and to provide noise predictions and a British Standard 4142:2014 assessment to support a planning application.

The report is based upon noise data supplied by the plant manufacturers and on sound levels measured at the site.

The report addresses plant noise only. The site will also have deliveries and forklift use (less than twice a week) and cleaning (less than once a week). The local authority Environmental Protection Department have verbally agreed that due to these source occurring very occasionally, they do not require assessing.

The author of this report is Member of the Institute of Acoustics (MIOA), with ten years' experience within the field of noise and acoustics, and as such is considered suitably qualified to undertake a British Standard 4142:2014 assessment.

The report provides the results and conclusions of this exercise. This report limits itself to addressing solely on the noise aspects as included herein.

2. The Site and Proposals

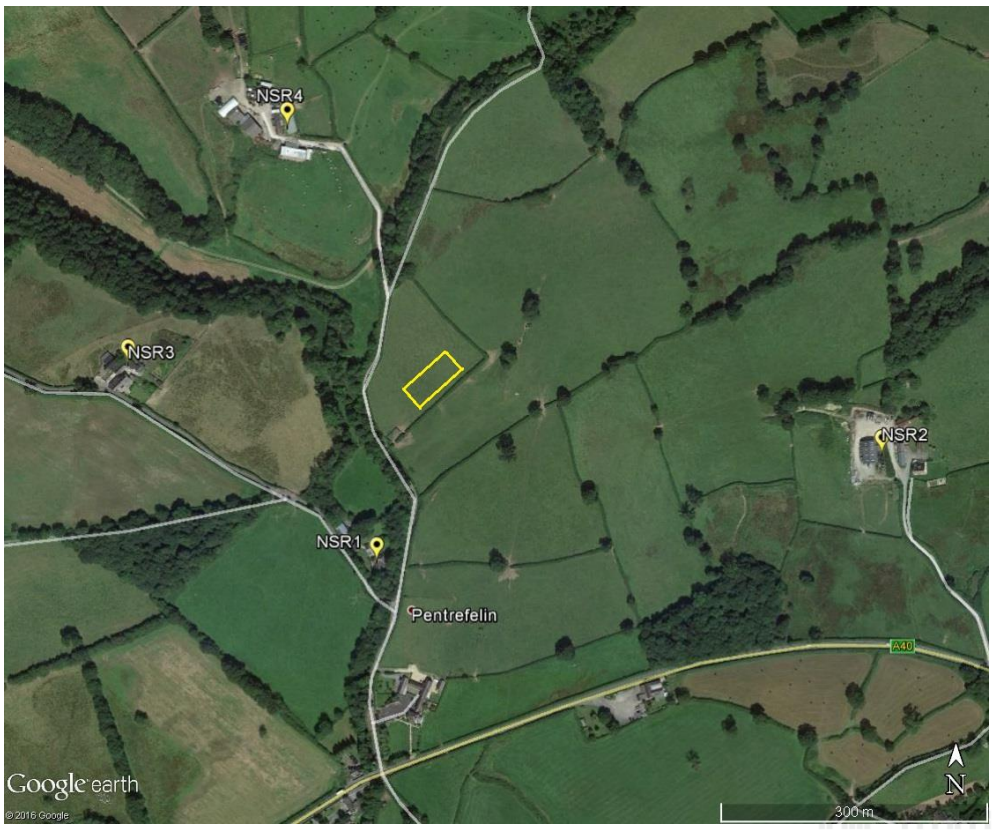
The site is located on the Client's land, situated to the north of Glanmyddyfi, Pentrefelin, near Llandeilo in Carmarthenshire. It is currently an enclosed field, laid to open pasture.

The proposals involve the erection of a 16,000-bird free range chicken unit, together with associated landscaping and highway improvement works.

The plant associated with the chicken shed includes ten ventilation fans mounted in chimneys in the roof and at the end of the building. We have been advised that the fans will operate according to demand, when the internal temperature of the shed rises above 22 degrees centigrade.

The nearest noise-sensitive receivers (NSRs) to the proposed chicken shed are shown on the following aerial view, while the approximate location of the bird house is also shown outlined in yellow. We understand that NSRs 1 and 3 are residential dwellings and NSRs 2 and 4 are working farms with accommodation. The nearest of these, NSR 1, would be at a distance of approximately 130 metres from the proposed chicken shed at its nearest point.

Figure 1: Aerial view of site and surroundings – approximate outline of proposed chicken shed shown in yellow



3. Assessment Criteria

3.1. Technical Advice Note (TAN) 11: Noise (1997)

Planning Guidance (Wales), Technical Advice Note (Wales) 11, Noise (TAN 11) was published in October 1997. The introduction states:

"This note provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business. It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources."

In relation to a noise-generating development, Paragraph 8 states that:

"8. Local planning authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance. They should also bear in mind that if subsequent intensification or change of use results in greater intrusion, consideration should be given to the use of appropriate conditions."

For noise from industrial and commercial developments, TAN 11 states:

"B17. The likelihood of complaints about noise from industrial development can be assessed, where the Standard is appropriate, using guidance in BS 4142:1990. Tonal or impulsive characteristics of the noise are likely to increase the scope for complaints and this is taken into account by the "rating level" defined in BS 4142. This "rating level" should be used when stipulating the level of noise that can be permitted. The likelihood of complaints is indicated by the difference between the noise from the new development (expressed in terms of the rating level) and the existing background noise. The Standard states that, 'A difference of around 10 dB or higher indicates that complaints are likely. A difference of around 5 dB is of marginal significance'. Since background noise levels vary throughout a 24 hour period it will usually be necessary to assess the acceptability of noise levels for separate periods (e.g. day and night) chosen to suit the hours of operation of the proposed development. Similar considerations apply to developments that will emit significant noise at the weekend as well as during the week. In addition, general guidance on acceptable noise levels within buildings can be found in BS 8233:1987."

We would consider that British Standard 4142 is the appropriate standard for assessing the noise impact from an industrial operation, such as plant noise, however it should be noted that British Standard 4142:1990 has now been superseded by both British Standard 4142:1997 and British Standard 4142:2014. The 2014 iteration differs in its methods and terminology from the 1990 version to which TAN 11 refers however would consider this the most appropriate version to use.

3.2. British Standard 4142:2014

The British Standard 4142:2014 entitled 'Method for rating and assessing industrial and commercial sound' was published on 31st October 2014.

The methods described in the British Standard use outdoor sound levels to assess the likely effects of sound upon people who might be inside or outside a dwelling or other premises used for residential purposes. The principle is that of establishing the 'difference' between the 'rating sound level' and the 'background sound level'.

The 'rating sound level' is derived from the 'specific sound level' of the source. The latter is determined over a period of 1 hour during the day (07:00 to 23:00 hours) and over a period of 15 minutes during the night (23:00 to 07:00 hours). Section 9 entitled 'Rating Level' states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level."

An acoustic character correction should be added to the 'specific sound level' if it exhibits any tonality, impulsivity, other specific characteristics and/or intermittency at the assessment location. The value of the character correction varies, dependent on the prominence of the character of the noise source at the assessment location.

In Section 11 of the Standard, 'Assessment of the Impacts', it states:

"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9), and consider the following.

a) *Typically, the greater this difference, the greater the magnitude of the impact.*
b) *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
c) *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
d) *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

As such, where the assessment difference is 0 dB or less, the impact is likely to be low, depending on the context.

4. Noise Monitoring

4.1. Equipment

Sound Pressure Levels were measured using Class 1 sound level meters with half-inch condenser microphones, using the 'fast' setting.

The equipment is checked regularly using a Quality System meeting the requirements of British Standard EN ISO/IEC 17025:2005, and in accordance with British Standard EN 10012:2003, and traceable to the National Standards.

This equipment was checked and calibrated as noted below and the certificates are available for inspection. Table 2 provides the equipment and calibration status.

Table 2: Equipment used

Equipment Description / Manufacturer / Type	Serial Number	Date of Calibration	Calibration Certification Number
Sound Level Meter, B & K Type 2250-D	2671994	23/05/16	14996
Pre-Amplifier, B & K , Type ZC0032	10385	23/05/16	14996
Microphone, B & K, Type 4189	2656141	23/05/16	14996
Sound Level Calibrator Type 4231	2665006	23/05/16	14995
Sound Level Meter, Cirrus Research, CR:171C	G071684	13/09/16	241340
Calibrator, Cirrus Research, CR:515	73217	12/09/16	107762
Microphone, Cirrus Research, MK224	606369B	12/09/16	107763
NTI XL2 Sound Level Meter	A2A-11053-E0	10/03/16	42439
NTI MA220 Pre-Amp	5871	10/03/16	42439
NTI Microphone Capsule	9276	10/03/16	42439
Larson Davis Calibrator CAL200	12605	--	--
NTI XL2 Sound Level Meter	A2A-09705-E0	30/08/16	15060
NTI MA220 Pre-Amp	5332	30/08/16	15060
NTI Microphone Capsule	8433	30/08/16	15060
Calibrator, CEL, Type 284/2	3/02716829	30/08/16	15059

A field calibration check was performed on each of the measurement systems before and after use, and a maximum drift was recorded of 0.3 dB. This drift is not significant enough to have affected the measurement results.

4.2. Monitoring Procedure

An assessment to British Standard 4142:2014 requires that the 'Background Sound Level', typical for the area, be established. Both long unattended and short-term attended noise monitoring was carried out, at several locations, each representative of different noise-sensitive receivers (NSRs).

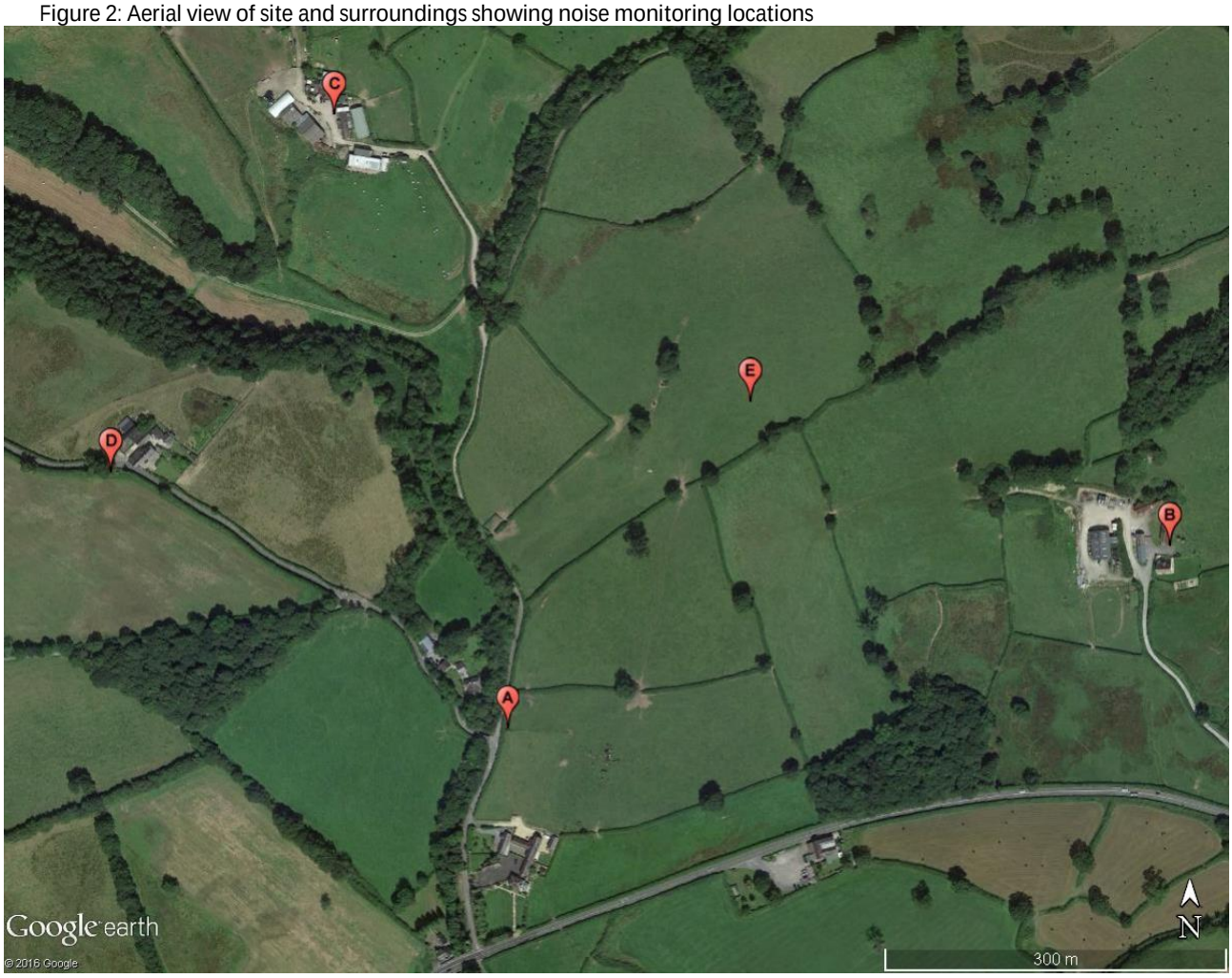
Figure 2 shows the location of the monitoring positions used. Noise monitoring was undertaken in two stages commencing on the 16th and 21st December 2016. The first stage was between 11:00 and 12:00 hours on the 16th December 2016, with measurements conducted simultaneously at locations B, C and D. These locations are representative of NSRs 2, 3 and 4.

The second stage involved long-term monitoring at location E, between 11:15 hours on the 21st December 2016 and 13:00 hours on the 22nd December 2016, together with concurrent monitoring at location A from 10:45 to 12:15 hours on the 21st December, and again from 10:45 to 13:00 hours on the 22nd December 2016.

Location E was selected as being representative of the dwellings situated to the north, east and west of the proposed site (i.e. NSRs 2,3 and 4), being as it is approximately equidistant from the A40, which is the dominant noise source in the area. This location is also free from the influence of farm-based sound sources, both of which were observed at NSR 2 and NSR 4. Measurements at location A are deemed representative of NSR 1. This is especially pertinent as the noise climate at Location A is more heavily influenced by the stream that runs alongside this position.

In all cases, the microphone was mounted on a tripod at a height of approximately 1.5 metres above local ground level, in a free-field position.

Figure 2: Aerial view of site and surroundings showing noise monitoring locations



4.3. Weather Conditions

During the measurement exercises, the weather conditions were monitored with a Davis Instruments weather station, recording data in 15-minute intervals, synchronous with those of the sound level meters. Some light precipitation occurred briefly during the monitoring, and the measurements at these times have been carefully excluded; otherwise, the weather conditions throughout all measurement periods were suitable. The full meteorological data are included in Appendix 1: Weather Data and are summarised below.

Temperature range	-2 to +9 degrees centigrade
Wind speed	0 to 4.9 metres per second
Wind direction	Variable, predominantly north-north-easterly

4.4. Measured Sound Levels

The measured noise climate in the area is determined primarily by road traffic along the A40 (which is steady and constant during the daytime), birdsong, occasional light aircraft and sporadic farm activity such as machinery.

We would consider the noise data obtained at Location E to be representative of the dwellings situated to the north, east and west of the proposed site (i.e. NSRs 2, 3 and 4).

We would consider the noise data obtained at Location A to be representative of the daytime and night-time noise climate at NSR 1 as the sound from the stream, which is a steady and constant, dominates the noise climate around this location.

The relevant measured data consist of the equivalent continuous sound pressure level, $L_{Aeq,\,T}$, and the background sound level, $L_{A90,\,T}$, in decibels (dB). From the measurement data the following representative free-field design modal average 15-minute background sound level and typical equivalent continuous sound level have been determined for the noise-sensitive receivers in the area. The full data are included in Appendix 2: Measured Sound Level Data.

Table 3: Summary of measured data

Monitoring Location	Time period	$L_{Aeq,\,T}$ (dB)	$L_{A90,\,15min}$ (dB)
E (NSRs 2-4)	Day, 0700-2300, T = 16hr	50	45
	Night, 2300-0700, T = 8hr	41	31
A (NSR 1)	Day, 0700-2300, T = 16hr	51	49
	Night, 2300-0700, T = 8hr	51	49

5. Predicted Noise Emission Levels

5.1. Proposed Plant

We have been advised there are ten ventilation fans mounted in chimneys in the roof (4of) of the proposed chicken shed, and on the north-eastern elevation (6of).

The specification of the fixed plant is as follows; this has been taken from the manufacturer's literature.

Table 4: Manufacturer's noise emission data for fixed plant

Plant Type	Manufacturer	Model	Quantity	Sound Power Level, L_{WA}
Chimney fan (extract)	Big Dutchman	FF091-6DT	6	78 dB
Chimney fan (supply)	Big Dutchman	FF091-6ET	4	77 dB

The above data has been used to form the basis of our revised assessment, we have not included for any end reflection loss. This is a worse case assumption.

5.2. Plant Operation

We have been informed by the plant supplier that the ventilation system operates according to demand, dependent on the external ambient temperature: successive fans are triggered as the temperature rises, in a linear fashion, until the system reaches its maximum duty at 27 degrees centigrade (internally).

During hot weather, it is anticipated that the ventilation system could operate at maximum duty continuously throughout the daytime assessment period (i.e. one hour).

Night-time external temperatures in this area have not exceeded 23 degrees in the last three years[1]. The plant supplier had advised us that at this temperature only two of the extract chimney fans and two of the supply fans would be running.

These daytime and night-time scenarios therefore represent the worst case and are what we have considered within our assessment.

[1] https://www.wunderground.com/history/airport/EGOP

5.3. Noise Modelling

The source data above have been used to construct a noise model in the noise modelling software CadnaA by DataKustik. This software calculates sound propagation predictions based on the method of ISO 9613-2. The model allows for the prediction of noise levels to be undertaken for a high number of receiver locations and different noise emission scenarios. The modelling software calculates noise levels based on the specified noise emission values, source and receiver locations, and primarily distance, barrier and ground attenuation. The following parameters form the basis of this noise model.

Table 5: Software modelling parameters

Parameter	Comments
Plant installation	10 fans within building, terminals 7.1 metres above ground level
Plant operating time	Daytime: Ventilation system operating continuously at maximum capacity. Night-time: 2 extract fans and 2 supply fans, operating continuously.
Topography	Taken from OS Terrain 50[2].
Dimensions of proposed building	Taken from architects' plans.
Building heights around site	6 metres.
Receiver locations	Free-field predictions at a height of 1.5 m from ground during the day and 4.5 m above ground at night.
Reflections	Third-order reflections accounted for, all buildings and roads considered reflective.
Ground Absorption	Proposed areas of hardstanding on site reflective, all other ground considered soft, i.e. absorptive.
Foliage	No foliage has been included in the model.

The following noise maps show the results of the predictions.

[2] https://www.ordnancesurvey.co.uk/business-and-government/products/terrain-50.html

Figure 3: Noise map showing predicted daytime levels across surrounding area

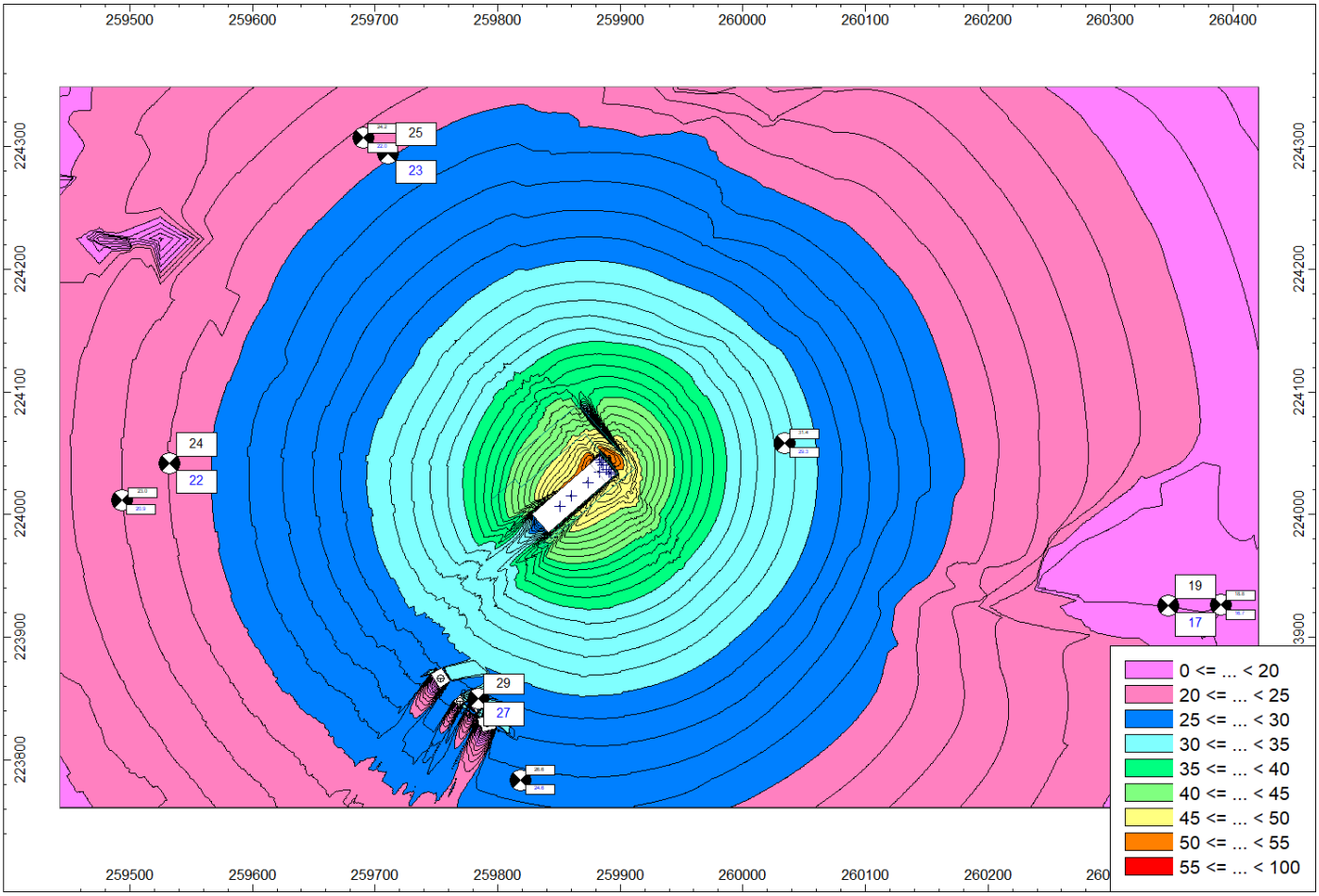
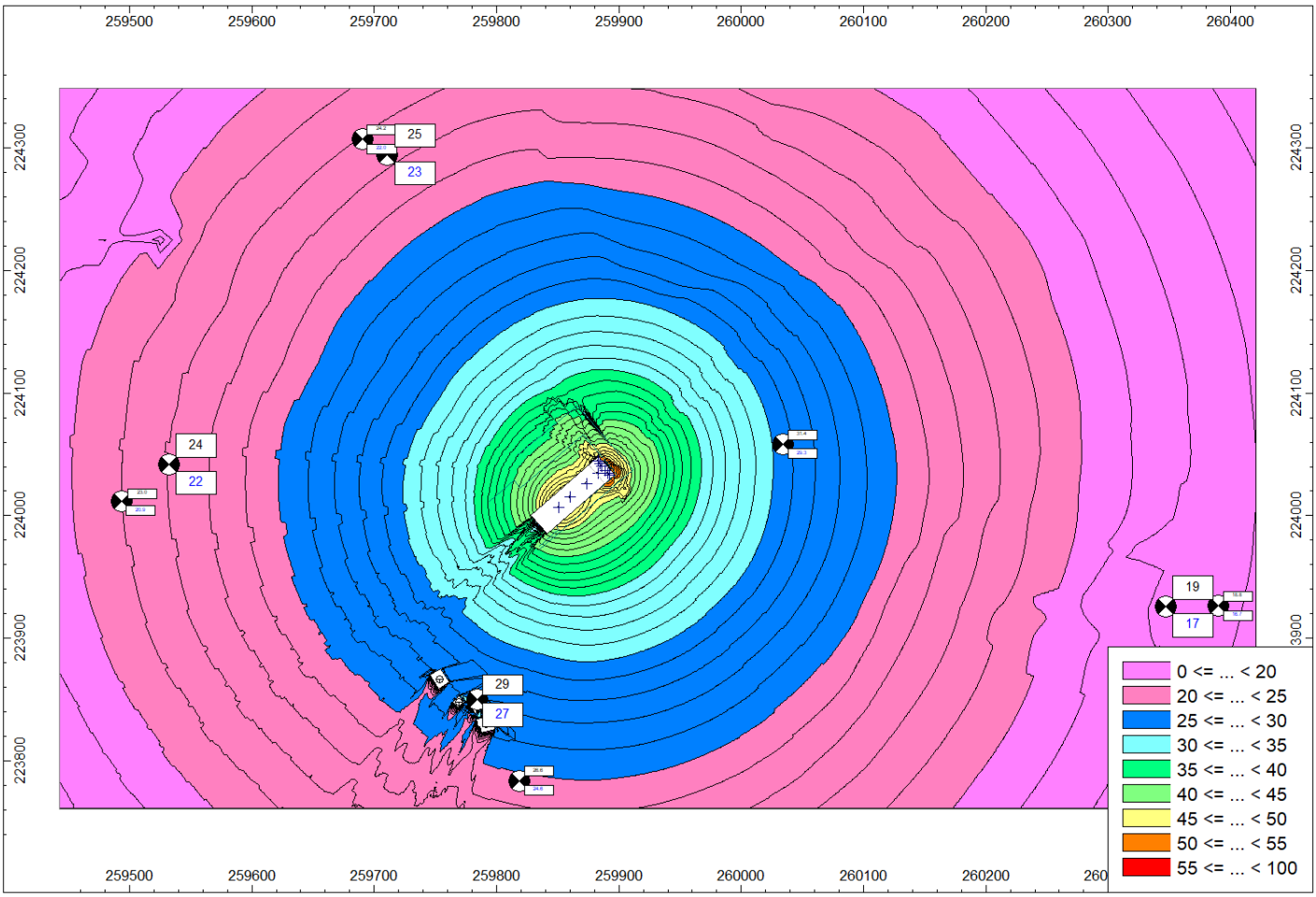


Figure 4: Noise map showing predicted night-time levels across surrounding area



In summary, the predicted specific sound levels are as follows at the noise-sensitive receivers.

Table 6: Predicted specific sound level at NSRs 1-4

Time period	NSR 1	NSR 2	NSR 3	NSR 4
Daytime, 07:00-23:00, $L_{Aeq,\,1hr}$ (dB)	29	19	24	25
Night-time, 23:00-07:00, $L_{Aeq,\,15min}$ (dB)	27	17	22	23

6. British Standard 4142:2014 Assessment

6.1. Initial Estimate

The standard requires that the difference between the 'rating level' and the 'background sound level' be determined.

Background Sound Level

The background sound level is as noted in 4.4 above.

Specific Sound Level

The rating level of the sound source is derived from the specific sound level, which is that listed in Table 8.

In accordance with the methodology of the British Standard 4142, acoustic character corrections are applied to the specific sound level to determine the rating level if the specific sound exhibits any distinguishable tonality, impulsivity, intermittency and 'other sound characteristics' at the noise sensitive locations.

Character Corrections

Tonality

It is not known whether the chosen fans would exhibit any tonal characteristics at the location of the noise-sensitive receivers. The supplier should confirm that there will be no distinguishable tonality with their fans at the noise sensitive receivers. For the purposes of this assessment, no character correction has been applied in this respect.

Intermittency

The fans are expected to operate according to demand, dependent on the internal temperature of the shed. The predicted specific sound level is below the measured background sound level, and therefore we do not expect any intermittency to be distinguishable at the nearby receivers. Thus no correction is applied.

Impulsivity

Fans are not normally impulsive, and a character correction has therefore not been applied in this respect.

Other sound characteristics

As described above under 'Intermittency', the fan noise level is very low and will not be readily distinguishable above the residual noise climate. Therefore no further correction is applied for 'other sound characteristics'.

Initial Estimate

Therefore taking into account the above the British Standard 4142:2014 initial estimate is as follows.

Table 7: British Standard 4142:2014 initial estimate

Parameter	Daytime (T = 1hr)				Night-time (T = 15min)			
	NSR 1	NSR 2	NSR 3	NSR 4	NSR 1	NSR 2	NSR 3	NSR 4
Background Level, $L_{A90,T}$	49	45	45	45	49	31	31	31
Specific Sound Level, $L_{Aeq,T}$	29	19	24	25	27	17	22	23
Acoustic Character Correction	0	0	0	0	0	0	0	0
Rating Level	29	19	24	25	27	17	22	23
Difference between rating and background level	-20	-26	-21	-20	-22	-14	-9	-8

British Standard 4142:2014 states:

"*Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*"

As such the initial estimate indicates the impact is likely to be low; however, the context also needs to be considered.

6.2. Context

In terms of context British Standard 4142:2014 states:

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration."

Examining the absolute sound levels, we consider first the situation at NSR 1. Here, the noise climate is dominated by the stream, as evidenced by the small difference between the measured residual level ($L_{Aeq,T}$) and the measured background level ($L_{A90,T}$). Where a residual level is determined by a steady and constant sound source such as this, and the predicted rating level is lower than the background sound level, this supports the finding of the initial estimate, i.e. that the impact will be low at this receiver location.

At NSRs 2 to 4, the initial estimate difference during the worst-case time (night-time) is -2 dB at worst. However, between the hours of 23:00 and 07:00, people are likely to be indoors. On the basis that a partially open window provides a sound reduction of approximately 15 dB[3], the rating level at these locations falls to 15 dB internally, which is very low.

The 'Guidelines for Community Noise', published by the World Health Organization in 1999, give the following guideline values in terms of indoor and outdoor spaces in a domestic dwelling.

Table 8: Guideline values for community noise in specific environments (reproduced from Table 1 of 'Guidelines for Community Noise', 1999)

Specific environment	Critical health effect(s)	$L_{Aeq,T}$ (dB)	Time base, *T* (hours)	L_{AFmax} (dB)
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors	Speech intelligibility & moderate annoyance, daytime & evening	35	16	-
	Sleep disturbance, night-time	30	8	45

[3] 'Guidelines for Community Noise', World Health Organization, 1999

The predicted rating levels (both indoors and outdoors) at the noise-sensitive receivers are well within these guideline values and as such we would consider the impact to be low after context is considered.

6.3. Uncertainty

The measurement procedure is considered robust, having been executed carefully throughout all stages, and carried out in accordance with the relevant standards, and the instrumentation is tested and calibrated to appropriate standards. The prediction calculations have been conducted according to established procedures and standards; these procedures have in the past produced reliable and accurate results.

Overall, therefore, the uncertainty in the assessment is not expected to affect the conclusions significantly and the impact is expected to be low.

6.4. Conclusions

Following the measurements conducted around the site, and the noise modelling exercise, the predicted difference between rating and background sound levels is -8 dB at worst.

On this basis, we consider the proposals acceptable in terms of a British Standard 4142:2014 assessment, and in terms of TAN 11.

7. Limitations

The report limits itself to addressing solely on the noise control and acoustic aspects as included herein. We provide advice only in relation to noise and acoustics. It is recommended that appropriate expert advice is sought on all the ramifications (e.g., CDM, structural, condensation, fire, legal, etc.) associated with any proposals in this report or as advised and concerning the appointment.

The report has been prepared in good faith, with all reasonable skill and care based on information provided or available at the time of its preparation and within the scope of work agreement with the Client. We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above.

The report is provided for the sole use of the named Client and is confidential to them and their professional advisors. No responsibility is accepted to other parties.

It should be noted that noise predictions are based on the current information as we understand it and on the performances noted in this report. Any modification to these parameters can alter the predicted level. All predictions are in any event subject to a degree of tolerance of normally plus or minus three decibels. If this tolerance is not acceptable, then it would be necessary to consider further measures.

8. Summary & Conclusion

Mr. T. Davies appointed Acoustic Consultants Limited to assess noise impact from the fixed plant associated with the proposed free-range chicken shed at land north of Glanmyddyfi, Pentrefelin, Llandeilo.

This report provides noise predictions and a noise impact assessment to TAN 11 and British Standard 4142:2014 for the plant installation associated with the proposed chicken shed on the nearby sensitive receivers around the site.

The significant noise-generating plant involved in the scheme is that of the supply and extract fans.

Noise monitoring exercises were conducted at locations around the site that are representative of the noise-sensitive receivers. Following this, a British Standard 4142:2014 assessment has been carried out on the basis of these measurements and relevant noise emission data.

Once all pertinent factors are taken into account, this assessment has concluded that the difference between the rating and background sound levels is -8 dB at worst and as such this represents a low impact in terms of noise emission to the dwellings in the vicinity.

We therefore consider the proposals acceptable in terms of environmental noise emission; the requirements of British Standard 4142:2014 and thus TAN 11 are met.

9. Appendix 1: Weather Data

Date	Time	Temperature, °C	Humidity, %	Wind speed, m/s	Wind direction	Pressure, mb	Rain, mm
16/12/2016	10:00	8.4	86	0.4	ESE	765.0	0.0
16/12/2016	10:15	8.6	85	0.4	ENE	765.3	0.0
16/12/2016	10:30	8.7	86	0.0	S	765.4	0.0
16/12/2016	10:45	8.8	85	0.4	ESE	765.5	0.0
16/12/2016	11:00	8.8	85	0.4	ESE	765.6	0.0
16/12/2016	11:15	8.9	85	0.4	ESE	765.6	0.0
16/12/2016	11:30	9.0	86	0.4	E	765.7	0.0
16/12/2016	11:45	9.2	85	0.4	E	766.0	0.0
21/12/2016	11:15	8.3	83	3.1	SW	759.1	0.0
21/12/2016	11:30	8.6	84	4.0	SW	759.1	0.0
21/12/2016	11:45	8.7	85	3.6	SW	759.2	0.0
21/12/2016	12:00	8.8	84	4.9	WSW	759.2	0.0
21/12/2016	12:15	7.4	79	4.0	W	759.6	0.0
21/12/2016	12:30	5.8	85	2.7	WNW	759.4	0.0
21/12/2016	12:45	5.6	88	1.3	SW	759.5	0.0
21/12/2016	13:00	5.5	89	0.9	WSW	759.8	0.4
21/12/2016	13:15	5.4	89	0.4	SSW	759.7	0.4
21/12/2016	13:30	5.5	90	0.4	SSW	759.5	0.0
21/12/2016	13:45	5.7	91	0.4	SSW	759.6	0.0
21/12/2016	14:00	6.1	90	0.4	SSW	759.7	0.0
21/12/2016	14:15	6.2	89	0.4	SSW	759.9	0.0
21/12/2016	14:30	6.3	89	0.0	WSW	760.1	0.0
21/12/2016	14:45	6.3	90	0.4	WSW	760.1	0.0
21/12/2016	15:00	6.1	90	0.4	WSW	760.2	0.0
21/12/2016	15:15	6.1	89	0.4	SSW	760.4	0.0
21/12/2016	15:30	5.9	90	0.9	NW	760.7	0.0
21/12/2016	15:45	5.6	91	0.4	NW	760.8	0.0
21/12/2016	16:00	5.3	93	0.4	NW	761.0	0.0
21/12/2016	16:15	5.2	93	0.4	NW	761.0	0.0
21/12/2016	16:30	4.6	94	1.8	NNE	761.1	0.0
21/12/2016	16:45	4.7	93	0.9	NNE	761.0	0.0
21/12/2016	17:00	4.7	94	1.3	NNE	761.1	0.0
21/12/2016	17:15	4.4	93	0.4	NNE	761.3	0.0
21/12/2016	17:30	4.0	92	0.4	ESE	761.4	0.0
21/12/2016	17:45	3.6	93	0.0	---	761.6	0.0
21/12/2016	18:00	4.3	96	0.4	ESE	761.7	0.0
21/12/2016	18:15	4.3	96	0.0	ESE	761.8	0.0
21/12/2016	18:30	3.7	94	0.0	ESE	761.9	0.0
21/12/2016	18:45	3.3	95	0.4	ESE	761.9	0.0
21/12/2016	19:00	2.1	94	1.8	NNE	762.1	0.0

Date	Time	Temperature, °C	Humidity, %	Wind speed, m/s	Wind direction	Pressure, mb	Rain, mm
21/12/2016	19:15	1.9	95	2.2	NNE	762.4	0.0
21/12/2016	19:30	1.6	96	2.7	NNE	762.3	0.0
21/12/2016	19:45	2.2	96	0.9	NNE	762.4	0.0
21/12/2016	20:00	1.6	96	0.4	NNE	762.6	0.0
21/12/2016	20:15	1.8	96	1.3	NNE	762.7	0.0
21/12/2016	20:30	0.6	95	0.4	SSE	762.6	0.0
21/12/2016	20:45	0.4	95	0.4	N	762.9	0.0
21/12/2016	21:00	1.2	96	1.3	NNE	763.1	0.0
21/12/2016	21:15	-0.1	95	0.9	NNE	763.2	0.0
21/12/2016	21:30	-0.1	96	0.4	E	763.2	0.0
21/12/2016	21:45	0.4	96	0.4	NNE	763.2	0.0
21/12/2016	22:00	-0.3	96	0.4	NNE	763.2	0.0
21/12/2016	22:15	-0.5	96	0.4	NNE	763.3	0.0
21/12/2016	22:30	-0.2	96	0.0	NNE	763.2	0.0
21/12/2016	22:45	-0.5	96	0.0	NNE	763.1	0.0
21/12/2016	23:00	-0.7	96	0.4	NNE	763.3	0.0
21/12/2016	23:15	-0.6	96	0.4	NNE	763.4	0.0
21/12/2016	23:30	-0.9	96	0.4	N	763.4	0.0
21/12/2016	23:45	-1.2	96	0.4	N	763.7	0.0
22/12/2016	00:00	-1.2	96	0.0	ENE	763.9	0.0
22/12/2016	00:15	-1.2	96	0.4	ENE	763.9	0.0
22/12/2016	00:30	-1.2	96	0.0	ENE	763.4	0.0
22/12/2016	00:45	-1.4	97	0.4	ESE	763.1	0.0
22/12/2016	01:00	-1.5	97	0.9	N	763.5	0.0
22/12/2016	01:15	-0.8	97	0.9	SSW	763.6	0.0
22/12/2016	01:30	-1.6	96	0.4	SE	763.8	0.0
22/12/2016	01:45	-1.4	97	0.4	ESE	763.9	0.0
22/12/2016	02:00	-1.3	97	0.0	ESE	763.7	0.0
22/12/2016	02:15	-1.4	97	0.0	ESE	764.0	0.2
22/12/2016	02:30	-1.7	97	0.9	ESE	764.0	0.0
22/12/2016	02:45	-1.8	97	0.4	NNE	764.1	0.0
22/12/2016	03:00	-1.8	97	0.4	ENE	764.1	0.0
22/12/2016	03:15	-1.9	97	0.4	ESE	764.2	0.0
22/12/2016	03:30	-1.8	97	0.4	S	764.2	0.0
22/12/2016	03:45	-2.1	97	0.4	S	764.2	0.0
22/12/2016	04:00	-2.2	97	0.4	S	764.2	0.0
22/12/2016	04:15	-2.3	97	0.4	ENE	764.1	0.0
22/12/2016	04:30	-1.6	97	0.9	NNE	764.1	0.0
22/12/2016	04:45	-1.9	97	0.4	ENE	764.1	0.0
22/12/2016	05:00	-0.6	97	1.8	NNE	764.2	0.0
22/12/2016	05:15	-1.2	97	0.0	ENE	764.1	0.0
22/12/2016	05:30	-1.4	97	0.4	ENE	764.1	0.0
22/12/2016	05:45	-2.1	97	0.4	N	764.3	0.0

Date	Time	Temperature, °C	Humidity, %	Wind speed, m/s	Wind direction	Pressure, mb	Rain, mm
22/12/2016	06:00	-1.9	97	0.0	N	764.2	0.0
22/12/2016	06:15	-1.6	97	0.9	NNW	764.1	0.0
22/12/2016	06:30	-2.0	97	0.4	NE	764.2	0.0
22/12/2016	06:45	-1.8	97	0.0	NE	764.3	0.0
22/12/2016	07:00	-1.8	97	0.0	NE	764.3	0.0
22/12/2016	07:15	-1.5	97	0.4	NE	764.3	0.0
22/12/2016	07:30	-1.8	97	0.0	NE	764.4	0.0
22/12/2016	07:45	-1.4	97	0.4	NE	764.5	0.0
22/12/2016	08:00	0.0	97	0.9	NNE	764.7	0.0
22/12/2016	08:15	-0.3	97	0.9	NNE	764.9	0.0
22/12/2016	08:30	-0.8	96	0.4	NE	764.9	0.0
22/12/2016	08:45	-1.2	96	0.0	NE	765.0	0.0
22/12/2016	09:00	-0.6	96	0.9	NE	765.1	0.0
22/12/2016	09:15	0.9	97	1.3	NNE	765.2	0.0
22/12/2016	09:30	1.0	96	0.9	NE	765.3	0.0
22/12/2016	09:45	1.5	97	0.4	NE	765.5	0.0
22/12/2016	10:00	1.4	96	0.4	NE	765.5	0.0
22/12/2016	10:15	2.8	95	0.9	NNE	765.6	0.0
22/12/2016	10:30	3.6	94	1.3	NNE	765.8	0.0
22/12/2016	10:45	3.6	91	0.9	NNW	765.9	0.0
22/12/2016	11:00	3.7	92	1.3	W	765.8	0.2
22/12/2016	11:15	4.3	92	0.9	W	766.0	0.0
22/12/2016	11:30	4.7	92	0.4	NNW	766.1	0.0
22/12/2016	11:45	4.8	91	0.4	WSW	766.0	0.0
22/12/2016	12:00	5.4	90	0.9	WNW	766.1	0.0
22/12/2016	12:15	5.6	92	0.4	WNW	766.1	0.0
22/12/2016	12:30	5.9	92	0.4	WNW	766.1	0.0
22/12/2016	12:45	6.7	91	0.9	WNW	766.2	0.0
22/12/2016	13:00	7.0	88	0.9	WSW	766.1	0.0

10. Appendix 2: Measured Sound Level Data

Date	Time	$L_{Aeq, 15min}$ (dB)			$L_{AF90, 15min}$ (dB)		
		B	C	D	B	C	D
16/12/2016	10:30:00			51			42
16/12/2016	10:45:00		63	54		63	44
16/12/2016	11:00:00	52	70	51	46	62	43
16/12/2016	11:15:00	52	66	50	47	55	43
16/12/2016	11:30:00	53	67	51	46	51	43
16/12/2016	11:45:00	51	64	50	44	54	42
16/12/2016	12:00:00			50			42
16/12/2016	12:15:00			51			43

Date	Time	$L_{Aeq, 15min}$ (dB)		$L_{AF90, 15min}$ (dB)	
		E	A	E	A
21/12/2016	10:45:00		54		51
21/12/2016	11:00:00		53		51
21/12/2016	11:15:00	50	53	46	51
21/12/2016	11:30:06	50	53	45	51
21/12/2016	11:45:00	49	54	45	51
21/12/2016	12:00:00	48	53	44	51
21/12/2016	12:15:00	46		43	
21/12/2016	12:30:00	47		40	
21/12/2016	12:45:00	49		46	
21/12/2016	13:00:00	48		43	
21/12/2016	13:15:00	46		43	
21/12/2016	13:30:00	47		45	
21/12/2016	13:45:00	46		43	
21/12/2016	14:00:00	48		43	
21/12/2016	14:15:00	46		42	
21/12/2016	14:30:00	46		43	
21/12/2016	14:45:00	47		43	
21/12/2016	15:00:00	47		43	
21/12/2016	15:15:00	47		41	
21/12/2016	15:30:00	49		44	
21/12/2016	15:45:00	50		45	
21/12/2016	16:00:00	51		46	
21/12/2016	16:15:00	49		44	
21/12/2016	16:30:00	49		44	
21/12/2016	16:45:00	50		45	
21/12/2016	17:00:00	51		47	
21/12/2016	17:15:00	51		47	
21/12/2016	17:30:00	51		46	
21/12/2016	17:45:00	49		44	

Date	Time	$L_{Aeq, 15min}$ (dB)		$L_{AF90, 15min}$ (dB)	
		E	A	E	A
21/12/2016	18:00:00	49		45	
21/12/2016	18:15:00	50		46	
21/12/2016	18:30:00	49		45	
21/12/2016	18:45:00	48		44	
21/12/2016	19:00:00	49		45	
21/12/2016	19:15:00	49		44	
21/12/2016	19:30:00	48		43	
21/12/2016	19:45:00	50		44	
21/12/2016	20:00:00	47		40	
21/12/2016	20:15:00	47		41	
21/12/2016	20:30:00	45		37	
21/12/2016	20:45:00	46		40	
21/12/2016	21:00:00	47		40	
21/12/2016	21:15:00	42		37	
21/12/2016	21:30:00	43		37	
21/12/2016	21:45:00	41		36	
21/12/2016	22:00:00	41		35	
21/12/2016	22:15:00	42		36	
21/12/2016	22:30:00	41		34	
21/12/2016	22:45:00	39		33	
21/12/2016	23:00:00	39		33	
21/12/2016	23:15:00	39		31	
21/12/2016	23:30:00	37		31	
21/12/2016	23:45:00	32		28	
22/12/2016	00:00:00	35		29	
22/12/2016	00:15:00	33		29	
22/12/2016	00:30:00	34		27	
22/12/2016	00:45:00	35		30	
22/12/2016	01:00:00	35		31	
22/12/2016	01:15:00	32		31	
22/12/2016	01:30:00	35		29	
22/12/2016	01:45:00	31		29	
22/12/2016	02:00:00	33		29	
22/12/2016	02:15:00	35		29	
22/12/2016	02:30:00	36		30	
22/12/2016	02:45:00	36		30	
22/12/2016	03:00:00	36		31	
22/12/2016	03:15:00	37		30	
22/12/2016	03:30:00	44		30	
22/12/2016	03:45:00	35		31	
22/12/2016	04:00:00	37		32	
22/12/2016	04:15:00	37		31	
22/12/2016	04:30:00	44		35	

Date	Time	$L_{Aeq, 15min}$ (dB)		$L_{AF90, 15min}$ (dB)	
		E	A	E	A
22/12/2016	04:45:00	41		32	
22/12/2016	05:00:00	42		32	
22/12/2016	05:15:00	45		35	
22/12/2016	05:30:00	41		31	
22/12/2016	05:45:00	44		35	
22/12/2016	06:00:00	44		33	
22/12/2016	06:15:00	48		39	
22/12/2016	06:30:00	48		41	
22/12/2016	06:45:00	47		40	
22/12/2016	07:00:00	48		41	
22/12/2016	07:15:00	50		45	
22/12/2016	07:30:00	52		47	
22/12/2016	07:45:00	52		48	
22/12/2016	08:00:00	52		47	
22/12/2016	08:15:00	53		49	
22/12/2016	08:30:00	54		50	
22/12/2016	08:45:00	53		49	
22/12/2016	09:00:00	53		49	
22/12/2016	09:15:00	55		51	
22/12/2016	09:30:00	54		50	
22/12/2016	09:45:00	53		50	
22/12/2016	10:00:00	52		49	
22/12/2016	10:15:00	51		48	
22/12/2016	10:30:00	51		46	
22/12/2016	10:45:00	53	53	48	51
22/12/2016	11:00:00	49	54	46	50
22/12/2016	11:15:00	50	52	45	50
22/12/2016	11:30:00	51	52	47	50
22/12/2016	11:45:00	50	52	44	50
22/12/2016	12:00:00	48	53	45	50
22/12/2016	12:15:00	48	52	43	50
22/12/2016	12:30:00	48	51	44	50
22/12/2016	12:45:00	47	51	43	49

ACOUSTIC CONSULTANTS LTD

Raleigh House, Wellsway, Keynsham, Bristol BS31 1HS

T: 0117 986 2956 E: mail@acoustic-ltd.co.uk www.acoustic-ltd.co.uk

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