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Environmental Noise Assessment
Relating to
Poultry Unit Development

At
Green Farm
Lyonshall
Herefordshire

For

Mr K Hern

Report No.: R18.0705/DRK
Report Date: 12th July 2015
Consultant: D.R. Kettlewell MSc MAE MIOA I.Eng

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Report prepared by:

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On behalf of:

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Report undertaken & checked by:
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Date: 12th July 2018

Summary

1. Mr K Hern is applying for planning permission to construct and operate 6 poultry houses. An environmental noise assessment is provided as supportive documentation for the EIA planning application of the proposed site, to be located at Green Farm, Lyonshall, Herefordshire.

2. The noise assessment determines the likely noise contribution from the poultry units at the nearest existing residential properties. The development includes for six poultry units, feed bins, biomass boilers, welfare facility and service yard area. The proposed units are would be accessed by a proposed access through Crump Oak Wood.

3. Noise levels have been considered and assessed during the construction and the operational phases of the proposed development. Relevant and appropriate noise guidance and standards have been referenced and where appropriate amelioration measures advised to mitigate noise sources to acceptable and reasonable absolute levels.

4. To establish typical baseline sound levels a background survey was undertaken adjacent to the nearest sensitive receptor relative to the development.

5. Appropriate noise criteria for this type of development would relate to BS4142:2014 and WHO guidance and BS8233: 2014 for sleep disturbance criteria during night-time periods at the nearest residential properties.

Conclusions

6. The report predicts the impact of noise from plant that would be used at the proposed site during the construction and operational work activities. The noise assessment concludes the following:

- During the construction phase of the development, there will be a variety of noise sources in use at different stages and their associated activities will vary from day to day. The highest noise levels relative to nearest receptors are likely to occur at the start of the construction in the particular working area during soil movements. Peak noise activities do not normally occur over long periods of time and best practical means would be employed to control the noise being generated. The noise levels generated during construction of the facility are well within noise levels deemed to be acceptable for this type of activity and not considered to represent a significant impact at the nearest receptors.

- During the operation of the site it is concluded in respect of the resultant residual impact, that with the proposed mitigation measures impact is expected to be low and during night-time periods noise levels would also be within sleep disturbance criteria according to WHO and BS8233: 2014 guidance.

- In consideration of the low number of vehicle movements likely to be generated by the development, the assessment of road traffic noise concludes that the highest likely noise generated by the additional movement of heavy goods vehicles (HGVs) or tractors is not considered significant at the nearest sensitive receptors.

- Noise amelioration measures have been proposed to meet the requirements of best available techniques (BAT).

CONTENTS

NOISE ASSESSMENT

1.1 INTRODUCTION

1.1.1 This report assesses the impact of the proposed additional poultry units with regard to noise. It describes the methods used to assess the impacts and the potentially affected noise sensitive receptors. The potential direct and indirect noise impacts arising from the proposed development are considered and the proposed mitigation measures required.

1.1.2 The assessment had the following objectives:

- establish baseline sound levels for the nearest dwellings to the Site;
- predict the noise levels during the construction stage for the nearest existing dwellings;
- predict the noise levels during the operation stage for the nearest existing dwellings;
- evaluate the significance of the effects of noise during the construction stage of the development;
- evaluate the significance of the effects of site operational noise for the nearest existing dwellings;
- evaluate the significance of the effects of road traffic movement for the nearest existing dwellings and;
- suggest appropriate mitigation for the proposed development, including the construction stage.

1.1.3 Appendix 1 provides details of technical terms within the chapter, for ease of reference. There is also a chart showing typical everyday noise levels to assist in understanding the subjective level of noise in terms of decibels.

1.1.4 The areas of new plant relevant to the planning application relates to the following equipment (as shown on Figure 2 attached):

- six poultry unit buildings;
- roof and gable end ventilation fans;
- biomass boilers;
- feed bins;
- water tank;
- service yard area and service road.
- heavy goods vehicles (HGVs).

1.1.5 The noise assessment methodology includes the following:

- identify plant equipment and its location;
- identify the nearest noise sensitive receptors or sites;
- determine likely source noise levels;
- provide predictions of resultant noise levels at the nearest sensitive receptors; and
- provide an example of amelioration measures to reduce noise and vibration for the proposed development by applying Best Available Techniques (“BAT”).

2.0 SITE DESCRIPTION

2.1 General

2.1.1 The project is to seek consent for the construction and operation of six poultry units at Green Farm, Lyonshall, Herefordshire.

2.1.2 Green Farm is situated in a rural area located south east of the village of Holme Marsh and Lyonshall on existing farmland.

2.1.3 The site is currently accessed directly off the A480 road located east of the Site via a farm track. The access is already used by farm vehicles (e.g. tractors and farm vehicles) and will be upgraded to accommodate traffic generated by the proposed poultry units.

2.2 Site Operation Hours

2.2.1 The site would operate continuously (i.e. 24 hours, 7 days per week) during the flock cycle. The total cycle length will be approximately 38 days leading to around 7.7 crops per year.

2.3 Site Layout

2.3.1 The draft design layout for the poultry units is provided in Figures 1 and 2 attached.

2.4 Nearest Receptors

2.4.1 In relation to the proposed development, the nearest receptors are isolated properties located to the west, northwest, northeast and southeast directions.

2.4.2 Figures 1 and 2 attached, shows the layout of the site and the site position relative to the nearest existing residential receptors. The site and surrounding land area is on a slightly rising landform from south east to north west and therefore receptors to the north west are on higher datum above ground.

2.4.3 Details of typical noise levels associated with the ventilation fans and biomass boilers that would be used on site is detailed in Appendix 2 of this report. The secondary noise source associated with the import and export of flock from site would relate to the occasional movement of HGVs travelling to and from the site.

2.4.4 The separation distance from the site to the nearest residential receptors is provided below in Table 2.1.

Table 2.1: Distance to Nearest Receptors

Position	Approximate Distance to poultry units (m)
1. Property west (Pennsylvania)	450
2. Property north west (Castle Farm)	640
3. Property north east off Bonds Green (Woonton Ash)	580
4. Property southeast (Stocks Cottage)	600

3.0 ASSESSMENT GUIDELINES

3.1 In order to make an assessment of the likely significance of the effects of the proposed development it is necessary to establish criteria by which the severity of a potential impact can be judged.

Assessment Guidelines: Summary of Criteria

3.2 In the context of this assessment, noise is defined as sound that is unwanted by the recipient. The effects of noise on the neighbourhood are varied and complicated, and include such things as interference with speech, communication, disturbance of work, leisure or sleep. A further complicating factor is that in any one neighbourhood some individuals will be more sensitive to noise than others.

3.3 A measure that is in general use and is recommended internationally for the description of environmental noise is the equivalent continuous noise level or LAeq (Equivalent Continuous Sound Pressure Level) parameter. Appendix 1 provides a fuller explanation of the noise terms used in this chapter.

3.4 In 2000, BRE conducted a national study of environmental noise levels for the Department of the Environment (`The National Noise Incidence Study 2000': DEFRA Feb 2002). The study found that 55 (+/- 3%) of the population of England and Wales live in dwellings exposed to day-time noise levels above the WHO level of 55dB LAeq,day. It also found that 63 (+/- 3%) of the population were exposed above the level of 45dB LAeq,night.

The National Planning Policy Framework (NPPF)

3.5 The Government has removed the existing Planning Policy Guidance (PPG) on noise, which was known as PPG24: 1994 (Ref. 3). Chapter 11 of the National Planning Policy Framework (NPPF) (Ref. 4) is concerned with the conservation and enhancement of the natural environment. It indicates at paragraph 109 that: *"…the planning system should contribute to and enhance the natural environment by:*

- *Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…"*

3.6 Paragraph 123 refers directly to the issue of noise and states that *"Planning policies and decisions should aim to:*

- *Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

The Noise Policy Statement for England (NPSE)

3.7 The Noise Policy Statement for England (NPSE) was published in March 2010 (Ref. 5). It specifies the following long-term vision in policy aims: *"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *Avoid significant adverse impacts on health and quality of life;*

- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life."*

3.8 The NPSE introduced three concepts to the assessment of noise, which includes:

NOEL – No Observed Effect Level
This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observable Adverse Effect Level
This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level
This is the level above which significant adverse effects on health and quality of life occur.

3.9 The above categories are however undefined in terms of noise levels and for the SOAEL the NPSE indicates that the noise level will vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research is therefore required to establish what may represent an SOAEL. It is acknowledged in the NPSE that not stating specific SOAEL levels provides policy flexibility until there is further evidence and guidance.

3.10 The following commentary is given on the representation of NOEL and LOAEL in relation to existing British Standards/ International guidelines:

NOEL – Inaudibility
LOAEL – The guideline values for community noise in specific environments as set out in table 1 of the WHO Guidelines for Community Noise 1999 and in tables 5 and 6 of BS8233: 1999 - Sound insulation and noise reduction for buildings - Code of Practice.

3.11 The NPSE concludes how the LOAEL and SOAEL relate to the three aims listed in paragraph 3.1.5.' above. The initial aim relates to avoiding significant adverse effects on health and quality of life, it then addresses the situation where the noise impact falls between the LOAEL and the SOAEL when:

"all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development."

3.12 The final aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development.

3.13 The Government is undertaking a review of technical guidance but currently there is no agreed methodology for noise to accompany the NPPF guidance.

3.14 The Government has recently removed the existing Planning Policy Guidance on noise, which was known as PPG24: 1994. The National Planning Policy Framework, which has recently been published states *"109. The planning system should contribute to and enhance the natural and local* environment by:

"Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability;"

Planning Practice Guidance

3.15 On March 6th 2014 the Government published the National Planning Practice Guidance ("NPPG") on noise, which provides further information in respect of new developments which may be sensitive to the prevailing noise environment.

3.16 The Guidance refers to the NPPF and NPSE documents and under the heading `How to determine the noise impact?' it states:

"Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:

- whether or not a significant adverse effect is occurring or likely to occur;
- whether or not an adverse effect is occurring or likely to occur; and
- whether or not a good standard of amenity can be achieved.

3.17 The NPPG includes a table summarising the noise exposure hierarchy, based on the likely average response. Under the heading of 'perception' the '*noticeable and not intrusive*' assessment of noise is defined as '*noise can be heard, but does not cause any change in behaviour or attitude, can slightly affect the acoustic character of the area but not such there is a perceived change in the quality of life*'. The increasing effect level under these conditions is deemed to be '*no observed adverse effect*' and 'no specific measures are required.

3.18 The guidance explains this by stating:

"*At the lowest extreme, when noise is not noticeable, there is by definition no effect. As the noise exposure increases, it will cross the no observed effect level as it becomes noticeable. However, the noise has no adverse effect as long as the exposure is such that it does not cause any change in behaviour or attitude. The noise can slightly affect the acoustic character of an area but not to the extent there is a perceived change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.*

As the exposure increases further, it crosses the lowest observed adverse effect level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise)."

BS4142: 2014 'Methods for rating and assessing industrial and commercial sound'

3.19 BS 4142: 2014 ` Methods for rating and assessing industrial and commercial sound' is based on the measurement of background sound using L_{A90} noise measurements, compared to source noise levels measured in L_{Aeq} units. The differential between the two measurements; once any corrections have been applied for source noise tonality, distinct impulses etc. (i.e. the `rating' level); determines the impact magnitude.

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.

3.20 In terms of establishing the rating level, corrections for the noise character has to be taken into consideration. These include the following factors:

"Tonality
For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible.

Impulsivity
A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible.

Other sound characteristics
Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

NOTE 2 Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion.

Intermittency
When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

3.21 The assessment of noise from the fixed and mobile plant at the nearest receptors is considered and our expert opinion is provided below:

a) In terms of tonality the proposed poultry units would be fitted with 15 roof fan units and 10 gable end fans and biomass boilers. It is our experience in dealing with this type of fan system and from on-site measurements recorded of one-third octave band frequencies on a number of poultry sites in the UK that there is unlikely to be any tonal noise issues at the receptor separation distances and proposed mitigation measures. We would therefore assume that no tonal noise issue is likely to be perceptible and no penalty required.

b) In terms of impulsivity it is our experience of dealing with this type of operation (i.e. general fan and biomass boiler operating noise) that any impulsive noise is not a character normally associated with its operation. Impulse noise penalty is therefore not deemed to be relevant or appropriate in this case.

c) In terms of intermittency the only likely intermittent regular activity on site is likely to be the noise from event noise which would only occur occasionally (e.g. loading feed bins, catching, litter loading and cleaning). The question is whether these noise sources would be distinctive in terms of intermittency and whilst the noise associated with these activities is not expected to be significant to be robust we have allowed for a +3dB penalty to the calculated noise contribution in accordance with BS4142: 2014.

3.22 In conclusion, we would add +3dB to the calculated noise contribution for intermittency during occasional event noise sources.

BS 8233: 2014 `Guidance on sound insulation and noise reduction for buildings'

3.23 The British Standard BS8233 provides additional guidance on noise levels within buildings. These are based on the WHO recommendations and the criteria given in BS8233 for unoccupied spaces within residential properties.

3.24 The guidance provided in section 7.7 of BS8233 provides recommended internal ambient noise levels for resting, dining and sleeping within residential dwellings. Table 3.2 provides detail of the levels given in the standard.

Table 3.1: BS8233: 2014 Indoor ambient noise levels for dwellings

Activity	*Location*	*07:00 to 23:00*	*23:00 to 07:00*
Resting	Living Room	35 dB $L_{Aeq,16hours}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hours}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hours}$	30 dB $L_{Aeq,8hours}$

3.25 For a partially open window the standard refers to a reduction of approximately 10-15dB. This would therefore indicate a noise level outside the window of approximately 45-50dB $L_{Aeq,16hours}$ for living rooms during daytime and 40-45dB $L_{Aeq,8\ hours}$ during night-time outside bedrooms.

World Health Organisation (WHO) Guidelines for Community Noise: April 1999

3.26 This document provides further updated information on noise and its effects on the community. Within the document for noise `*In Dwellings'* it states that `*To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35dB L_{Aeq}. To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55dB L_{Aeq} on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50dB L_{Aeq}. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development."*

World Health Organisation (2009) – Night noise guidelines for Europe

3.27 The WHO regional office for Europe set up a working group of experts to provide scientific advice to the Member States for the development of future legislation and policy action in the area of assessment and control of night noise exposure. Considering the scientific evidence on the thresholds of night noise exposure indicated by $L_{night,outside}$ as defined in the Environmental Noise Directive (2002/49/EC), an $L_{night,outside}$ of 40dB should be the target of the night noise guidance (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. $L_{night,outside}$ value of 55dB is recommended as an interim target for the countries where the NNG cannot be achieved in the short term for various reasons, and where policy-makers choose to adopt a stepwise approach.

IPPC - Technical Guidance Note IPPC H3 Part 2 – Noise Assessment & Control

3.28 Integrated Pollution Prevention and Control (IPPC) is a regulatory system that employs an integrated approach to control the environmental impacts of certain industrial activities. It involves determining the appropriate controls for industry to protect the environment through a single permitting process. To gain a Permit, Operators will have to show that they have systematically developed proposals to apply the `Best Available Techniques' (BAT) and meet certain other requirements, taking account of relevant local factors.

3.29 In terms of noise specifically, the use of BAT will have to be considered and balanced within the wider context of other releases to different media (air, land and water) and taking issues such as usage of energy and raw materials. Noise cannot therefore be considered in isolation from other impacts on the environment.

3.30 The definition of pollution includes "*emissions which may be harmful to human health or the quality of the environment, cause offence to human senses or impair or interfere with amenities and other legitimate uses of the environment*". BAT is therefore likely to be similar, in practice, to the requirements of the Statutory Nuisance legislation which requires the use of "*best practicable means*" to prevent or minimise noise nuisance. In the case of noise, "*offence of any human senses*" may be judged by the likelihood of complaints. However, the lack of complaint should not necessarily imply the absence of a noise problem. In some cases it may be possible, and desirable, to reduce noise emissions still further at reasonable costs and this may therefore be BAT for noise emissions.

3.31 Consequently, the aim of BAT should be to ensure that there is no reasonable cause for annoyance to persons beyond the installation boundary.

In summary, the aim of BAT should be to achieve the following:

- Underpinning of good practice, a basic level of which the operator should employ for the control of noise including adequate maintenance of any parts of plant or equipment whose deterioration may give rise to increases in noise. For example, this would include bearings, air handling plant, the building fabric as well as specific noise attenuation measures associated with plant, equipment or machinery;

- Noise levels should not be loud enough to give reasonable cause for annoyance for persons in the vicinity, which is a more appropriate environmental standard than that of Statutory Nuisance and is normally the aim of most planning or other conditions applied by Local Authorities;

- Prevention of "*creeping background*", which is the gradual increase in background sound levels as industry expands and areas develop.

3.32 The indicative requirements apply to both new and existing activities but it will be more difficult to justify departures from them in the case of new activities. Indeed, because the requirements for noise are likely to be strongly influenced by the local environmental conditions, new installations will be expected to meet BAT from the outset and to demonstrate that noise reduction or prevention has been built in to the process design. For most existing plant, especially where there are no existing noise limits, the focus will be on good practice (BAT) and the need to ensure that there is no reasonable cause for annoyance. In assessing any noise impact it will be more normal to monitor existing levels and apply corrections and calculations, rather than rely on predictions.

3.33 The guidance makes reference to BS4142, BS8233: 1999, PPG24: 1994 and WHO guidance for absolute levels for protection of community annoyance.

Consultation with the Local Authority - Relevant Guidance and Criteria:

3.34 Following consultation with the Local Authority EHO for other poultry units in the Hereford area we were advised that the methodology provided within BS4142: 2014 would be relevant. Additionally, in terms of night-time noise criteria it was agreed that we are only interested in ensuring the site meets sleep disturbance criteria and where background noise levels are very low (e.g. around 30dB LA90) then BS4142 is not relevant and guidance should be referenced to WHO guidelines (i.e. night noise guidelines for Europe) where an external noise limit of 40dB $L_{night,outside}$ is appropriate. The Local Authority also made reference to the Environment Agency who would be responsible for overseeing the site operation.

Road Traffic Noise

3.35 From the results of the background noise survey (see Table 8 and Appendix 2) and observations at the Site, it is clear that the noise climate in and around the vicinity of the proposed development is affected by road traffic noise emanating from local roads.

3.36 No guidance is provided in PPG on methods to assess increased traffic noise from existing roads that results from traffic generated by new developments. However, any change in noise levels along affected roads would be relevant to subsequent planning applications.

3.37 Road traffic noise is normally assessed using the LA10 statistical noise index, which is the level of noise exceeded for ten percent of the assessment period. Daytime noise is assessed using the 18-hour LA10, following the methodology given in the Department of Transport's Calculation of Road Traffic Noise (CRTN). We have assessed the impact in relation to the increase in noise level based on 18-hour averages using an LA10 index and reference to DMRB 2011 impact guidance.

3.38 For road traffic noise, the CRTN calculation method can be used to predict noise levels from the movement of traffic along adjacent roads and on-site. Post-development predicted noise levels at sensitive receptors could then be compared with and without the proposed development, to establish any likely significant increase in overall traffic noise. Traffic data for the Assessment was supplied by the transport engineers in the Development Team and comprised existing and predicted traffic data for future (refer to Traffic Impact Assessment for further detail).

3.39 Where the traffic flow volumes are very low then CRTN methodology is not accurate and reference to BS5228-1:2009+A1:2014 using the HGV haul road methodology would be used.

Construction Noise

BS5228-1:2009+A1:2014 `Code of practice for noise and vibration control on construction and open sites' Part 1: Noise

3.40 For construction noise, PPG24 refers to BS5228, Part 1. This is an approved code of practice under the Control of Pollution Act and consequently there is a legal requirement for construction noise to be controlled according to the recommendations given in BS5228. Local Authorities have statutory powers to reduce or counteract the effects of noise from construction sites via this Act and would specify maximum noise levels.

3.41 BS5228 does not give noise limits for construction sites, but emphasis is placed on ensuring that the best available practical means are adopted to control noise on site.

3.42 Noise emission levels emanating from the Site, due to construction works associated with the proposed development, will vary from day to day. The construction activities would include the movement of soils and construction of the new building and infrastructure. For the purpose of establishing the 'worst case' scenario for construction noise, the procedures set out in BS5228 have been used to estimate construction noise levels at the nearest dwellings. In order to give an indication of the probable noise levels generated by these works, the highest noise sources are considered at the closest point they would reach to the receptor.

Assessment Methodologies

3.43 Following consultation with the Local Authority on other similar development in the Herefordshire area, the following methodology has been used to assess impacts from noise:

(a) For daytime and evening periods, the application of BS4142: 2014 would be appropriate to ensure that there is no significant adverse impact arising from the operation of the development

(b) For night-time periods within rural areas, where the background noise level is very low then BS4142 is not appropriate and sleep disturbance criteria would be referenced. The latest guidance is found within the World Health Organisation document from 2009 entitled `Night noise guidelines for Europe' (i.e. <40dB $LAeq_{8hrs}$) and internal bedroom noise limits within BS8233: 2014 with open window.

(c) The baseline noise survey has been carried out in accordance with BS4142: 2014 and BS7445: 2003 `Description and Measurement of Environmental Noise'.

(d) Construction noise would be calculated using BS5228: 2009 Part 1 `Code of practice for noise and vibration control on construction and open sites'. This refers to the application of best practicable means to control noise.

(e) For the impact of road traffic noise, the increase in noise level would be calculated using the methodology found within `Calculation of Road Traffic Noise' (CRTN): 1988. Where traffic flow volumes are very low (i.e. <50 vehicles per hour) then BS5228: 2009 methodology for HGVs on haul roads would be more appropriate.

Assessment of Significance

3.44 The significance of an effect is a function of the sensitivity or importance of the receiver, or receptor, and the scale or magnitude of the effect. In this case the significance of the effect has been determined by reference to existing guidance and standards that are explained below.

Three types of receptor have been identified:

- Residents of existing houses adjacent to the site who could experience construction noise.
- Residents of existing houses adjacent to the site who could experience site operational noise.
- Residents of existing houses who could experience additional road noise from the development.

The two principal criteria to predict the significance of potential noise impacts are:

- magnitude of the impact; and
- sensitivity of the receptors.

3.45 This assessment combines the above criteria to predict the significance of the noise impacts of the proposed development.

Construction Noise

3.46 For residents of the existing houses that would be exposed to construction noise, BS5228 is considered to be the appropriate standard. This standard does not prescribe limits, but requires `best practicable means' ("BPM") to be employed to control noise generation. The criterion therefore is that BPM should be employed and conditions implemented for example to restrict construction noise to non-sensitive hours.

3.47 The construction impact semantic scale is based on the ABC method of assessment, which sets out threshold values depending upon the ambient noise at receptors, which have been defined from the baseline sound survey.

Table 3.2: Impact Magnitude Category – Construction Noise

Threshold Value LAeq dB	Time of Day	Change in total noise level above threshold dB(A) [i.e. ambient + construction noise]	Impact Magnitude
65 55 45	Daytime (0700-1900) Evening (1900-2300) or weekend Night-time (2300-0700)	0 or lower	No significant impact (negligible)
65 55 45	Daytime (0700-1900) Evening (1900-2300) or weekend Night-time (2300-0700)	+0.1 to +3.0	Slight
65 55 45	Daytime (0700-1900) Evening (1900-2300) or weekend Night-time (2300-0700)	+3.1 to +9.9	Moderate
65 55 45	Daytime (0700-1900) Evening (1900-2300) or weekend Night-time (2300-0700)	+10.0 or more	Substantial

Operational Noise

3.48 Table 3.3 below show the proposed impact magnitude methodology considering the guidance of BS4142: 2014 for fixed and mobile plant noise (e.g. fans, condensers, generators and HGV movements etc.). Table 3.4 relates the magnitude of impact relative to night-time activities to meet absolute limits to comply with sleep disturbance in accordance with WHO guidelines.

3.49 The Institute of Environmental Management and Assessment (IEMA) have provided draft 'Guidelines for Environmental Noise Impact Assessment'. Table 3.5 below provides details of the impact scales relating to this guidance.

3.50 The guidelines set out an example of how changes in noise level may be assessed in terms of residual LAeq. This assists in determining the impact of site operational noise relative to the context of the noise climate.

Table 3.3: Impact Magnitude Scale - Future Noise against Existing (Operational Phase) in accordance with BS4142: 2014

Rating level above background noise dB(A) as BS4142: 2014	Description of Effect	Impact Magnitude
-10 to 0	No discernible effect on the receptor	Negligible
+0.1 to +4.4	Non-intrusive - Noise impact can be heard but does not cause any change in behaviour or attitude. Can slightly affect the character of the area but not such that there is a perceived change in the quality of life.	Slight
+4.5 to +9.4	Intrusive - Noise impact can be heard and causes small changes in behaviour and/or attitude. Affects the character of the area such that there is a perceived change in the quality of life. Potential for non-awakening sleep disturbance.	Moderate
+9.5 to +14.4	Disruptive – Causes a material change in behaviour and/or attitude e.g. avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty getting to sleep. Quality of life diminished due to change in character of the area.	Substantial

+14.5 and above	Physically Harmful – Significant changes in behaviour and/or inability to mitigate effect of noise leading to psychological stress or physiological effects e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm	Severe

Note: The 'rating' level is the difference between the noise contribution from site and the existing background sound level allowing for any adjustments required for noise characteristics (i.e. tonal, impulsive or intermittent noise character). The Standard advises that rounding of numbers to one decimal place should relate to levels of 0.5dB or above, which is reflected in the table limits. The impact magnitude scales in Tables 12.3 to 12.5 are used in the assessment of operational noise impacts. The impact scale in relation to construction noise is slightly different as construction noise is a temporary noise source and therefore the magnitude of impact is different.

Table 3.4: Impact Magnitude Scale - Future Noise (Operational Phase) in accordance with WHO guidelines (night-time)

Site Noise Level LAeq dB 15mins	**Subjective Response**	**Impact Magnitude**
<35	Complaint highly unlikely	Negligible
35 to <40	Complaint unlikely	Slight
40 to 45	Marginal significance	Moderate
>45	Complaint Likely	Substantial
>55	Complaint highly likely	Severe

Note: The WHO night time noise guidelines aim to achieve an external noise level below 40dB LAeq to meet noise disturbance criteria. BS4142 states *"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."*

Table 3.5: Impact Magnitude Scale – General site noise

Change in sound levels LAeq dB	**Sensitivity**	**Description of Effect**	**Impact Magnitude**
< +2.9	Negligible to High	No discernible effect on the receptor	Negligible
+3.0 to +4.9	Negligible to Low	Non-intrusive - Noise impact can be heard but does not cause any change in behaviour or attitude. Can slightly affect the character of the area but not such that there is a perceived change in the quality of life.	Slight
+3.0 to +4.9 (+5 to +9.9)	Medium to High (Negligible to Low)	Intrusive - Noise impact can be heard and causes small changes in behaviour and/or attitude. Affects the character of the area such that there is a perceived change in the quality of life. Potential for non-awakening sleep disturbance.	Moderate
+5 to +9.9	Medium to High	Disruptive – Causes a material change in behaviour and/or attitude e.g. avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty getting to sleep. Quality of life diminished due to change in character of the area.	Substantial
+10 and above	Negligible to High	Physically Harmful – Significant changes in behaviour and/or inability to mitigate effect of noise leading to psychological stress or physiological effects e.g. regular sleep	Severe

		deprivation/awakening; loss of appetite, significant, medically definable harm	

3.51 In order to determine the significance of an impact, not only must the magnitude of this impact be determined but also the sensitivity of the receptors to the impact. For this assessment, the categories presented in Table 3.6 have been adopted.

Table 3.6: Receptor Sensitivity

Receptor Sensitivity	**Type of Receptor**
High	Dwellings/residential properties including houses, flats, old peoples homes, hospitals, schools, churches, caravans and open spaces/conservation areas where the existing noise level is low.
Moderate	Commercial premises including retails and offices etc.
Low	Industrial premises including warehouses and distribution etc.

3.52 Based upon the assessment of impact magnitude and the sensitivity of individual receptors, the matrix given in Table 3.7 has been developed in order to provide an indication of the possible significance of each predicted noise impact. Given that there are many factors, which may affect the significance of an impact, not least, the character of the noise and timescales over which the noise operates, the overall significance must be assessed on an individual basis using professional judgement and experience. Therefore, whilst the matrix provides a useful indication of the likely significance it cannot be rigorously applied in all situations.

Table 3.7: Significance Matrix

Impact Magnitude	**Receptor Sensitivity**		
	High	**Moderate**	**Low**
Severe	Major	Major/Moderate	Moderate/Minor
Substantial	Major/Moderate	Moderate	Minor
Moderate	Moderate	Moderate/Minor	Minor/Neutral
Slight	Minor	Minor/Neutral	Neutral
No significant impact (negligible)	Neutral	Neutral	Neutral

3.53 Where an impact is defined as Major or Major/Moderate then the impact is considered significant in EIA terms.

Road Traffic Noise

3.54 For existing residents affected by road noise from the new development (either from the roads in the development, or through increased traffic levels along the access road to the site), the limits referred to in Transport Analysis Guidance (Unit 3.3.2), would be relevant, which state: "*It should be recognised that, in many situations, relatively large changes in traffic flows are required to bring about significant changes in the response to noise levels in the longer term. For freely flowing traffic, a difference of about 3dB in noise level is required before there is a statistically significant change in the average assessment of nuisance*." [reference para. 1.15] This is to be based on an assessment against an 18-hour daytime average.

3.55 To assess any likely impact on existing residential properties from any traffic noise generated by the development site, noise calculations have been undertaken using CRTN or BS5228 methodology and traffic flow information for the proposed development.

3.56 The Design Manual for Roads and Bridges (DMRB) – May 2008 (Part 2 GD 01/08) provides information and advice principally for Trunk Road works. The guidance states, "It may also be applicable in part to other roads with similar characteristics. Where it is used for local road schemes, it is for the local highway authority to decide on the extent to which the documents in the manual are appropriate in any particular situation." Volume 11, Section 3, Part 7 (HD 213/11): November 2011 provides advice on noise and vibration. The procedure for assessing noise impacts advises the use of a LA_{10} measurement index based on an 18 hour time period (i.e. 0600 to 2400 hours). Further assessment of the impact would be required where changes of 1dB(A) or more are expected in the short-term and changes of 3dB(A) in the long term. Section 3.37 provides an example of the magnitude of impact for different changes in noise level for the short-term and long-term situation. Tables 3.1 and 3.2 within Part 7 of DMRB is provided below, represented as Table 3.8 and 3.9:

Table 3.8: Example of Magnitude of Impact for Changes in Road Traffic Noise in the short term

Noise Change, $L_{A10,18hour}$	Magnitude of Impact
0	No Change
0.1-0.9	Negligible
1-2.9	Minor
3-4.9	Moderate
5+	Major

Table 3.9: Example of Magnitude of Impact for Changes in Road Traffic Noise in the long term

Noise Change, $L_{A10,18hour}$	Magnitude of Impact
0	No Change
1.0-2.9	Negligible
3.0-4.9	Minor
5-9.9	Moderate
10+	Major

3.57 The impact magnitude scale in Table 3.3 to Table 3.5 is used in the assessment of operational impacts and for road traffic noise Tables 3.8 and 3.9.

3.58 According to DMRB Volume 11, Section 3, Part 7 (HD 213/11): November 2011 the two tables represent the situation when a new road opens and initially in the short term the smallest that is considered perceptible is a change of 1dB LA10 18hr. In the long term (typically 15 years after project opening) a 3dB LA10 18hr change is considered perceptible.

3.59 Reference to paragraph 3.38 of DMRB it states: "*Research into the response to changes in road traffic noise is largely restricted to daytime periods. Until further research is available only noise impacts in the long term is to be considered and Table 3.2 should be used to consider the magnitude of noise change at night. However, given the caution with predicting night time noise levels as traffic flow fall (see 3.24) only those sensitive receptors predicted to be subject to a Lnight,outside exceeding of 55dB should be considered. The Lnight,outside of 55dB corresponds to the Interim Target level specified in the WHO Night Noise Guidelines for Europe.*"

Note: Reference to Table 3.2 in DMRB is the same as Table 3.9 above.

Consultation with Local Authority

3.60 The Local Authority Environmental Health Officer has been formally contacted on other similar poultry farm developments in the Herefordshire area over the last few years to agree on appropriate noise survey methodology and noise criteria. It was agreed that BS4142 was the appropriate guidance and where night-time background noise levels and rating levels are low the site should aim to achieve external sleep disturbance criteria as defined by the 2009 WHO night time noise guidance for Europe (<40dB $LAeq_{8hrs}$).

4.0 BASELINE NOISE LEVELS

4.1 Description of Baseline Conditions: Noise from Construction & Road Traffic Noise

4.1.1 This section sets out the method and information used to assess:

- the noise impact of construction associated with the proposed development;
- the noise impact of site operations associated with the proposed development; and
- noise levels from local road traffic noise, that would affect existing housing.

Receptor Positions

4.1.2 The baseline monitoring positions were chosen to determine the effect of noise on existing dwellings. Background sound measurements were recorded in vicinity of the nearest residential property to the poultry farm away from the local road network.

4.1.3 Noise measurements were undertaken on Wednesday 20th to Thursday 21st June 2018 following guidance given in BS4142: 2014 and BS7745, 2003 `Description and measurement of environmental noise'. Details of the equipment used and its calibration are provided in Appendix 2. The survey employed one fixed-point measurement position away from the influence of the local road network but in the vicinity of the nearest residential receptor. An additional spot check fixed position was taken in the vicinity of the A480 road for an indication of baseline levels during daytime and night-time periods for receptors along the local road network.

4.1.4 The closest dwellings to the proposed development were identified as receptor positions because they are potentially most at risk from changes in noise levels.

4.1.5 The receptor positions are shown on Figure 2 and are summarised in Table 4.1.

Table 4.1: Description of Noise Receptor Positions (refer to Figure 2)

Receptor Position (refer to Figure 2)	Description of location	National Grid Co-ordinates
R1	1. Property west (Pennsylvania)	333898 253738
R2	2. Property north west (Castle Farm)	334010 254361
R3	3. Property north east off Bonds Green (Woonton Ash)	334802 254275
R4	4. Property southeast (Stocks Cottage)	334706 253046

4.1.6 The main source of existing noise affecting nearest potential receptor properties relates to the movement of traffic along local and distant roads and birdsong.

4.1.7 The noise monitoring exercise was carried out over a typical weekday during daytime and night-time periods. Details of the instrumentation used for the surveys are detailed in Appendix 2.

Existing Noise at the Site:

Table 4.2: Average baseline noise levels at monitoring positions

Position	Time Period	LAeq dB	LA10 dB	LA90 dB	Representative LA90 dB	LAmax dB
A: Pennsylvania	Daytime (1715-1900)	46	50	31	30	58-77
A: Pennsylvania	Evening (1900-2300)	38	37	27	23	40-64
A: Pennsylvania	Night-time (2300-0700)	37	32	25	21	41-72
B: 30m A480	Daytime (1500-1700)	56	58	41	40	74-83
B. 30m A480	Night-time (0100-0200)	45	46	34	34	72-79

5.0 CONSTRUCTION PERIOD EFFECTS

5.1 In general, the level of noise in the local environs arising from the construction of a development site will depend on a number of factors. The most significant of which are as follows:

- The sound power levels (SWL's) or sound pressure levels (SPL's) of the plant or equipment used on site;
- The periods of operation of the plant on site;
- The distance between the source noise and the receiving position;
- The presence or absence of screening effects due to barriers, or ground absorption; and,
- Any reflection effects due to the facades of buildings etc.

Calculation Methodology

5.2 The calculation method used in this study for construction noise is based upon theoretical noise propagation theory, which takes into account source position, distance, direction and frequency content in relation to the nearest residential property boundary positions. British Standard BS5228 methodology has been used to estimate construction noise levels at the nearest existing dwellings including source noise levels for construction plant.

5.3 Noise levels emanating from the Site due to construction works associated with the proposed development will vary from day to day. In order to give an indication of the probable noise levels generated by the works, a worst-case scenario has been considered for several construction activities, namely soil movement and road construction. See Appendix 4 for further information.

Predicted Noise Levels: Construction

5.4 The highest likely noise levels for the proposed development in terms of construction noise are provided below. This is based on calculations for soil movement work and general site activities at the closest approach to existing dwellings.

5.5 It is difficult to estimate how long this type of activity would last but typically in areas close to the site boundary (i.e. noisiest construction period assessed) this is normally completed in weeks rather than months.

5.6 The results of calculations for soil movement and general site activities are summarised below in Table 5.1.

Table 5.1: Noise Predictions for Highest Likely Construction Noise

Receptor Position	Distance to receptor (m)	Activity	Noise Level, dB $LAeq_{1hr}$	Typical Residual Noise $LAeq_{1hr}$ dB	Total noise (residual + construction) $LAeq_{1hr}$ dB	BS5228 Threshold Value LAeq dB (daytime)
R1. Residential property west of site	450-560	Soil Movement General site activities Infrastructure Building construction	42-44 42-43 37-41 45-47	46	47-48 47-48 47-48 49-50	65
R2. Residential property north west of site	640-880	Soil Movement General site activities Infrastructure Building Construction	37-41 37-39 32-37 40-43	46	47 47 46-47 47-48	65
R3. Residential property north east of site	580-800	Soil Movement General site activities Infrastructure Building Construction	38-42 38-40 33-40 41-44	46	47 47 46-47 47-48	65

R4. Residential property south east of site	600-850	Soil Movement General site activities Infrastructure Building construction	38-39 37-40 32-38 40-44	46	47 47 47 47-48	65

Note: Construction noise prediction levels given above do not allow for any site screening or proposed amelioration measures and highest level predicted assumes that the plant equipment is at its closest approach.

5.7 The highest construction noise levels are likely to be created during the soil movements and the construction of buildings and infrastructure. This would however, be well within the level of noise normally found to be acceptable for an activity of this type and duration. The results show that for the construction period the noise level from construction activities at the existing properties will not exceed reasonable daytime absolute noise levels and existing residual noise levels would not significantly change.

5.8 For the construction period noise generated by site activities will not exceed reasonable absolute noise criteria (i.e. 65dB(A) Leq). The results show that the threshold proposed by BS5228 would not be exceeded and therefore a **negligible** impact magnitude and **neutral** impact significance.

Mitigation of Construction Period Effects

5.9 In accordance with BS5228, best available techniques would be employed to control the noise generation (e.g. using equipment that is regularly maintained and fitted with silencers or acoustic hoods where practicable, maximising distance between noisy plant and receptors, avoiding un-necessary plant operation or revving of engines etc.).

5.10 The highest levels of construction noise would occur during short-term activities such as earth moving close to existing dwellings. To offset this short term impact the following mitigation is proposed:

- Restriction of construction hours to non-sensitive times of day would normally form part of the planning consent conditions.
- Sensible routing of the construction plant to avoid the nearest residential properties.
- Careful positioning of plant to minimise noise radiating in direction of nearest sensitive receptors.
- Applying` best practicable means' as described in BS5228 (wherever practicable).
- Use of mobile plant fitted with broadband noise type reversing alarms

Construction Period Residual Effects

5.11 The introduction of the proposed approach using `best practicable means' will provide further attenuation of site generated noise at the nearest residential properties. The effect of applying `best practicable means' has been assessed and Table 5.1 below details the resultant improvement in the highest levels predicted including the impact significance.

Table 5.1: Impact at Nearest Receptor before Amelioration Measures

Noise Source and associated receptor	Time Period	Impact Significance (before mitigation measures)	Impact Description (before mitigation measures)	Residual Significance (after mitigation measures)	Impact Description (after mitigation measures)
Construction noise affecting existing homes	Daytime only	Neutral Effect	Possible short-term noise levels of up to 47 dB $L_{Aeq\ 1hr.}$	Neutral Effect	Minimal increase in general residual noise levels at receptors and well within acceptable limits

6.0 OPERATIONAL PERIOD EFFECTS

6.1 Introduction

6.1.1 Background noise data obtained from the monitoring positions has enabled an assessment to be made of the likely impact on the existing residential areas near the development site from proposed noise sources.

6.1.2 The assessment of site operational noise due to the proposed development on existing residential areas was based on manufacturers data of fan units, which maximises the accuracy of the noise predictions. The calculation method used to assess the noise contribution from the development is based on ISO9613-2 calculation methodology. The calculations have been carried out using CadnaA noise modelling software.

6.1.3 The assessment of the predicted increase in road traffic noise due to the proposed development on existing residential areas was based on the information provided within the traffic impact assessment. The normal method of calculation for road traffic noise and assessment is the Department of Transport `Calculation of Road Traffic Noise': Where there are very low traffic flow volumes, CRTN methodology can give pessimistic results and therefore reference is made to the BS5228: 2009 prediction method. For the assessment of impact the `Design Manual for Roads and Bridges', Volume 11, Environmental Assessment: 2011 would be appropriate.

6.2 Noise Impact on Existing Residential Dwellings

Site Operational Noise Levels & Predictions

6.2.1 A measure that is in general use and is recommended internationally for the description of environmental noise is the equivalent continuous noise level or L_{Aeq} parameter.

6.2.2 In general, the level of noise in the local environs that arises from a development site will depend on a number of factors. The more significant of which are: -

(a) The sound power levels (SWL's) of the plant or equipment used on site.
(b) The periods of operation of the plant on site.
(c) The distance between the source noise and the receiving position.
(d) The presence or absence of screening effects due to barriers, or ground absorption.
(e) Any reflection effects due to the facades of buildings etc.

Key Noise Source

6.2.3 The key source of noise associated with poultry houses relates to the operation of the ventilation fans. Each poultry house has 15 ridge ventilation fans with side inlet ventilation openings and 10 gable end fans.

6.2.4 The fans do not operate continuously as they are controlled by a sophisticated temperature-controlled automatic system. During high daytime ambient temperatures the gable end fans and the roof fans would be in operation to establish the highest likely noise levels and it has been assumed that all roof fans would operate at night.

6.2.5 The air inlet to the poultry houses is formed by ventilation openings mounted in the side walls of the building and at roof level. These ventilation openings also incorporate a baffle or cowling fitted over the inlet opening, which reduces noise `break-out'.

6.2.6 The results of the site noise measurements of the ventilation fans in operation are provided below in Table 6.1.

Table 6.1: Ventilation Fan Noise for Poultry House

Fan Type	Sound Pressure Level LAeq dB	Sound power level dB(A)
Ridge mounted roof	52 @ 10m	80
Gable End Fans	53 @ 10m	81

6.2.7 The number of fans that can operate at any one time will vary and is determined by the specific fan control system setting for each poultry house. The fans provide ventilation to control the temperature within the poultry houses for animal welfare.

6.2.8 When the birds are young it may only be necessary for a few fans to be operating in each poultry house.

6.2.9 During summer months, if the external temperature was relatively high and the birds were mature, then it may be necessary for all the roof fans and gable end but not working together. However, the ventilation system is designed to handle an extreme maximum temperature that is rarely likely to occur. Any extreme temperatures would in any case occur during the daytime operating hours rather than at night. Additionally, the probability of the maximum ventilation being required by all the poultry houses simultaneously is even less likely. For night-time periods the maximum number of fans is likely to be with all roof fans operating.

Intermittent Noise Sources

6.2.10 During the daytime, there are likely to be some additional intermittent sources of noise associated with the operation of the poultry houses. Empirical noise data obtained from similar sites would indicate typical levels at 10 metres distance to be as follows:

Table 6.2: Intermittent Noise Source Levels

Activity	Noise Level at 10m LAeq dB	Comment
Loading the Feed Hoppers	83	Steady noise level from lorry pump. It will take around 20 minutes to complete a load and the 1 hour Leq would be around 5dB lower.
Catching	59	Based on 1 HGV arrival and departure in an hour.
Litter Loading	74	Steady noise level from loading shovel and tractor.
Cleaning	78	Steady noise from tractor-powered diesel pump being used to clean poultry houses.
Heating Gas Delivery	78	Steady noise level from lorry mounted pump.

Calculation Methodology

6.2.11 The calculation method used in this study for site operations is based upon ISO9613: 2, which takes into account source distance, screening effects, operating time and direction in relation to the nearest sensitive receptor.

Results of Noise Predictions

Fixed Noise Sources

6.2.12 We have used the manufacturers fan data for the new fan units and noise measurements to calculate the expected resultant noise contribution at the nearest property boundary locations during different fan operational conditions.

6.2.13 The calculations allow for distance attenuation and the maximum number of roof fans operating relative to the residential receptor positions. The results of the prediction calculations with and without the noise mitigation measures are provided in Table 6.3 and 6.4.

Table 6.3: Predicted Noise Contribution from All Roof Ventilation Fans & Biomass Boilers with and without noise mitigation measures (maximum capacity night-time). Refer to Noise map 1

Receptor (refer to Figure 3)	**Approx. Distance to poultry houses (m)**	**Estimated Highest Noise Level from Roof Fan System* (excluding mitigation measures) [dB L_{Aeq}]**	**Estimated Highest Noise Level from Roof Fan System* (including mitigation measures) [dB L_{Aeq}]**
R1. Residential property west	450	**32**	**22**
R2. Residential property north west	640	**28**	**19**
R3. Residential property north east	580	**27**	**19**
R4. Residential property south east	600	**28**	**19**

*Noise predictions include noise associated with Biomass Boiler operations

Table 6.4: Predicted Noise Contribution from the Roof & Gable End Fans & Biomass Boilers with and without noise mitigation measures (maximum capacity daytime). Refer to Noise map 2

Receptor (refer to Figure 3)	**Approx. Distance to poultry houses (m)**	**Estimated Highest Noise Level from Gable End Fan System* (excluding mitigation measures) [dB L_{Aeq}]**	**Estimated Highest Noise Level from Gable End Fan System *(including mitigation measures) [dB L_{Aeq}]**
R1. Residential property west	450	**37**	**28**
R2. Residential property north west	640	**32**	**25**
R3. Residential property north east	580	**28**	**21**
R4. Residential property south east	600	**28**	**22**

*Noise predictions include noise associated with Biomass Boiler operations

BS4142: 2014 Assessment:

6.2.14 BS4142 is used as guidance in the determination of the likely impact from an industrial or commercial noise source.

6.2.15 To consider the worst-case noise impacts we have carried out a BS4142: 2014 assessment at receptor R1 west of the site with the introduction of noise mitigation measures.

6.2.16 The Biomass Boilers are located in an enclosed building that is located at the front of the poultry units and noise levels assumed are based on empirical noise data from several poultry sites in the UK.

Table 6.5: BS4142 Roof Fan & Boiler Noise at Position 1 (west of site) (mitigated) Night-time

Results		Relevant clause	Commentary
Calculated Specific sound level	$L_{Aeq(1hr)}$ = 22dB	7.3.6	Specific sound source calculated using ISO9613-2
Background sound level	$L_{A90(night\text{-}time)}$ = 21dB	**8.1.3 8.2**	Measured over night-time period deemed to be representative of the background sound.
Assessment during the night-time, reference time interval is 15mins		**7.2**	
Acoustic feature correction	0dB	**9.2**	The specific sound is not expected to be tonal, impulsive or distinctive in terms of intermittency. The residual acoustic environment is much higher than the predicted noise (LAeq 37dB)
Rating level	(22 + 0) dB = 22dB	**9.2**	No significant perceptible noise character predicted
Background sound level	$L_{A90(night\text{-}time)}$ = 21dB	**8**	Modal value determined using night-time period for background sound (2300-0700)
Excess of rating over background sound level	(22 – 21) dB = +1dB	**11**	
Assessment indicates below adverse impact		**11**	
Uncertainty of the assessment	Not significant	**10**	The excess of the rating level over the background sound level under highest noise conditions is just positive. Residual levels are much higher and absolute noise level is well below sleep disturbance criteria. Appropriate standards used for the calculation and baseline sound survey undertaken covering the appropriate period. All instruments used Type 1, calibrated and in calibration limits.

6.2.17 The above table shows that predicted noise levels from the development with noise mitigation measures would result in a **slight impact** magnitude and **minor significance**.

Table 6.6: BS4142 Roof & Gable End Fan Noise at Position 1 (west of site) Highest (mitigated) Daytime

Results		Relevant clause	Commentary
Calculated Specific sound level	$L_{Aeq(1hr)}$ = 28dB	7.3.6	Specific sound source calculated using ISO9613-2
Background sound level	$L_{A90(daytime)}$ = 30dB	**8.1.3 8.2**	Measured over daytime period deemed to be representative of the background sound.
Assessment during the daytime, reference time interval is 1 hour		**7.2**	
Acoustic feature correction	0dB	**9.2**	The specific sound is not expected to be tonal, impulsive or distinctive in terms of intermittency. The residual acoustic environment is much higher than the predicted noise (LAeq 46dB)
Rating level	(28 + 0) dB = 28dB	**9.2**	No significant perceptible noise character predicted
Background sound level	$L_{A90(daytime)}$ = 30dB	**8**	Modal value determined using daytime period for background sound (2300-0700)
Excess of rating over background sound level	(28 – 30) dB = -2dB	**11**	
Assessment indicates low-impact		**11**	
Uncertainty of the assessment	Not significant	**10**	The excess of the rating level over the background sound level under highest noise conditions is negative. Residual levels are much higher and absolute noise level is well below reasonable amenity levels (i.e. 50dB LAeq). Appropriate standards used for the calculation and baseline sound survey undertaken covering the appropriate period. All instruments used Type 1, calibrated and in calibration limits.

6.2.18 The above table shows that predicted noise levels from the development with noise mitigation measures would result in a **negligible impact** magnitude and **neutral significance**.

Event Noise Sources

Intermittent & Occasional Noise Sources

6.2.19 During the daytime periods occasionally there are likely to be some additional intermittent `event' sources of noise associated with the operation of the poultry houses (as detailed in Table 6.2). For night-time periods the only event likely to occur would be for the collection of birds, which would sometimes take place during the day and night-time. The results of noise predictions relative to intermittent noise sources are provided below in Tables 6.7 to 6.10.

6.2.20 In terms of occasional and intermittent noise sources, if we consider these in relation to BS4142: 2014, and apply a +3dB penalty for intermittency the following results are shown:

A) Feed hopper filling:

6.2.21 Predicted noise from this occasional operation with the proposed noise mitigation measures (see noise map 3 in Appendix 5).

Table 6.7: Feed Hoppers on site with noise control measures in place. (Refer to Noise map 4)

Receptor (refer to Figure 3)	Background sound level LA90 dB [LAeq dB]	Predicted rating* level from feed hopper filling [dB L_{Aeq}] daytime	Predicted rating* level from feed hopper filling & all fans & boilers [dB L_{Aeq}] daytime	Level difference between rating level and background sound LAeq dB	Change in noise levels in terms of LAeq dB
R1. Residential property west	30 [46] day	**23-27**	**32-33**	**-7 to +3**	**0**
R2. Residential property north west	30 [46] day	**22-27**	**29-31**	**-8 to +1**	**0**
R3. Residential property north east	40 [56] day	**39**	**39**	**-1**	**0**
R4. Residential property south east	30 [46] day	**29-31**	**30-32**	**-1 to +2**	**0**

*****Note: Rating level allows for +3dB for occasional intermittent noise character in relation to BS4142: 2014. Column 6 is calculated by logarithmic addition of the figure in the [ ] of column 2 and column 4 (-3dB) and then subtracting column 2 [ ].

6.2.22 The above assessment shows that the rating level relative to background sound according to BS4142 suggests a **negligible to slight** impact. However, during this period whilst the background sound levels are relatively low, the residual sound is significantly higher and in context the noise level is also not deemed to be significant. This is a temporary and occasional noise source, which would not give rise to significant impacts.

6.2.23 The above assessment shows that impact levels would be low when considering the noise contribution relative to the residual noise (i.e. the absolute noise level in context is not significant). According to the semantic scales the impact magnitude relative to residual sound levels shows **negligible** impact magnitude (i.e. in terms of changes in Leq according to the IEMA scale, refer to Tables 3.3 and 3.5).

Noise mitigation measures:

(i) Feed hopper fill alarm via text or telephone calls from central control, no audible alarms.

(ii) Where practicable HGV feed pump to be located on the bin feed side of vehicle so that vehicle body provides some screening to receptors to northeast to southeast.
(iii) Wherever possible plan feed deliveries during the daytime hours (0700-1900 hours).

B) Litter Loading

6.2.24 Predicted noise from this occasional operation is provided below in Table 6.8 (see noise map 5 in Appendix 5). This would occur for a few hours in each shed at end of crop cycle.

Table 6.8: Litter Loading on site (Refer to noise map 5) during daytime periods

Receptor (refer to Figure 3)	Background sound level LA90 dB [LAeq dB]	Predicted rating* level from litter loading [dB L_{Aeq}] daytime	Predicted rating* level from litter loading & all fans & boilers [dB L_{Aeq}] daytime	Level difference between rating level and background sound LAeq dB	Change in noise levels in terms of LAeq dB
R1. Residential property west	30 [46] day	**20**	**31**	**-10 to +1**	**0**
R2. Residential property north west	30 [46] day	**23-24**	**29-30**	**-7 to 0**	**0**
R3. Residential property north east	40 [56] day	**31-32**	**32-33**	**-9 to -7**	**0**
R4. Residential property south east	30 [46] day	**29-30**	**30-31**	**-1 to +1**	**0**

*****Note: Rating level allows for +3dB for occasional intermittent noise character in relation to BS4142: 2014
Column 6 is calculated by logarithmic addition of the figure in the [ ] of column 2 and column 4 (-3dB) and then subtracting column 2 [ ].

6.2.25 The above assessment shows no significant impact relative to background sound levels. The rating level relative to the residual sound is also relatively low and therefore in context with the noise general noise climate (in terms of Leq) is not significant. According to the semantic impact scales the magnitude of impact is **negligible to slight** (refer to Table 3.3).

6.2.26 According to the semantic scales the impact magnitude relative to residual sound levels shows this to be **negligible** (i.e. in terms of changes in Leq according to the IEMA scale, refer to Table 3.5).

Noise mitigation measures:

6.2.27 Avoid loading litter during night-time periods.

C) Cleaning

6.2.28 Predicted noise from cleaning operations is provided below in Table 6.9 (see noise map 6 in Appendix 5).

Table 6.9: Cleaning of Poultry Units on site

Receptor (refer to Figure 3)	Background sound level LA90 dB [LAeq dB]	Predicted rating* level from cleaning [dB L_{Aeq}] daytime	Predicted rating* level from cleaning & all fans & boilers [dB L_{Aeq}] daytime	Level difference between rating level and background sound LAeq dB	Change in noise levels in terms of LAeq dB
R1. Residential property west	30 [46] day	**14**	**31**	**-16 to +1**	**0**

R2. Residential property north west	30 [46] day	**11-13**	**28**	**-21 to -2**	**0**
R3. Residential property north east	40 [56] day	**40-41**	**40-41**	**-1 to +1**	**0**
R4. Residential property south east	30 [46] day	**38**	**38**	**+8**	**0**

*****Note: Rating level allows for +3dB for occasional intermittent noise character in relation to BS4142: 2014
Column 6 is calculated by logarithmic addition of the figure in the [ ] of column 2 and column 4 (-3dB) and then subtracting column 2 [ ].

6.2.29 The above assessment shows **negligible to moderate** impact relative to background sound levels and **neutral to moderate significance**, which would occur once in 7 to 8 weeks. The predicted level (i.e. predicted noise excluding +3dB penalty) relative to the residual sound shows no change and therefore in context with the general noise climate (in terms of Leq) shows a **negligible** impact (refer to Table 3.5).

Noise mitigation measures:

(i) Tractor powered diesel pump positioned with pump on side of vehicle so that vehicle body provides screen to receptor to the southeast. If individual jet wash used place power unit inside the building.
(ii) Wherever practicable carry out cleaning during less-sensitive hours of the day (i.e. between 0800 to 1700 hours).

D) Catching

6.2.30 Predicted noise from catching operations is provided below in Table 6.10 (see noise map 7 in Appendix 5).

Table 6.10: Catching of Poultry on site during daytime and night-time periods

Receptor (refer to Figure 3)	Background sound level LA90 dB [LAeq dB]	Predicted rating* level from catching [dB L_{Aeq}]	Predicted rating* level from catching & maximum fans & boilers [dB L_{Aeq}]	Level difference between rating level and background sound LAeq dB	Level difference between rating level and ambient LAeq dB
R1. Residential property west	30 [46] day 21 [37] night	**14-15** **14-15**	**31-32** **25**	**-16 to +2** **-7 to +4**	**0** **0**
R2. Residential property north west	30 [46] day 21 [37] night	**16** **16**	**28-29** **23**	**-14 to -1** **-5 to +2**	**0** **0**
R3. Residential property north east	40 [56] day 34 [45] night	**27-28** **27-28**	**29-30** **28-29**	**-13 to -10** **-7 to -5**	**0** **0**
R4. Residential property south east	30 [46] day 21 [37] night	**26-29** **26-29**	**29-30** **28-30**	**-4 to 0** **+5 to +9**	**0** **0**

*****Note: Rating level allows for +3dB for occasional intermittent noise character in relation to BS4142: 2014
Column 6 is calculated by logarithmic addition of the figure in the [ ] of column 2 and column 4 (-3dB) and then subtracting column 2 level in brackets. During night-time all roof fans are assumed to be operating.

6.2.31 The above assessment shows no significant impact relative to background sound levels. The rating level relative to the residual sound is also relatively low and therefore in context with the noise general noise climate (in terms of Leq) is not shown to be significant. According to the semantic impact scales the magnitude of impact is **negligible** (refer to Tables 3.4 and 3.5).

6.2.32 In terms of BS4142: 2014 the impact shows a **negligible to moderate** impact relative to the catching event. When considering a cumulative assessment under **worst** case fan operating noise conditions together with a catching event a **moderate** impact would be concluded. However, the context of the noise level relative to absolute noise level needs to be

considered and the fact that this is an occasional event, which means this pessimistic assessment of noise is unlikely to produce any significant impacts.

6.2.33 The above results show that with the site operating under the highest cumulative noise conditions with this event noise, the site noise contribution would be within the WHO guidelines for sleep disturbance. Typical conditions would not normally involve the use of all roof fans. The reference to maximum fan operations assumes that all relevant roof and gable end fans are operating during daytime and all roof fans operating during night-time. The total number of roof fans on the poultry units would be 15 on each and 10 gable end fans on each unit. Night-time noise levels would also be within recommended internal noise levels for bedrooms according to BS8233: 2014.

Noise mitigation measures:

(i) Wherever practicable carry out catching during daytime and evening periods (i.e. between 0700 to 2300 hours).

(ii) If catching takes place during night-time periods then minimise the number of ventilation fans in operation during this event subject to maintaining regulatory requirements for bird welfare.

E) Heating Gas Delivery

6.2.34 Predicted noise from heating gas delivery operations is provided below in Table 6.11 (see noise map 8 in Appendix 5).

Table 6.11: Heating Gas Delivery on site

Receptor (refer to Figure 3)	Background sound level LA90 dB [LAeq dB]	Predicted rating* level from heating gas delivery [dB L_{Aeq}] daytime	Predicted rating* level from heating gas delivery & all fans & boilers [dB L_{Aeq}] daytime	Level difference between rating level and background sound LAeq dB	Change in noise levels in terms of LAeq dB
R1. Residential property west	30 [46] day	**27**	**33**	**-3 to +3**	**0**
R2. Residential property north west	30 [46] day	**29**	**32**	**-1 to +2**	**0**
R3. Residential property north east	40 [56] day	**40**	**40**	**0**	**0**
R4. Residential property south east	30 [46] day	**38**	**38**	**+8**	**0**

*****Note: Rating level allows for +3dB for occasional intermittent noise character in relation to BS4142: 2014
Column 6 is calculated by logarithmic addition of the figure in the [ ] of column 2 and column 4 (-3dB) and then subtracting column 2 [ ].

6.2.35 The above assessment shows **negligible to slight** impact relative to background sound levels and **neutral to minor significance**, which would occur once in 7 to 8 weeks. The predicted level (i.e. predicted noise excluding +3dB penalty) relative to the residual sound shows no change and therefore in context with the general noise climate (in terms of Leq) is of **negligible** impact magnitude (refer to Table 3.5).

F) Delivery of Birds

6.2.36 Predicted noise from delivery of bird operations is provided below in Table 6.12 (see noise map 9 in Appendix 5).

Table 6.12: Bird Delivery on site (0600-0700)

Receptor (refer to Figure 3)	Background sound level LA90 dB [LAeq dB]	Predicted rating* level from heating gas delivery [dB L_{Aeq}] daytime	Predicted rating* level from heating gas delivery & all fans & boilers [dB L_{Aeq}] daytime	Level difference between rating level and background sound LAeq dB	Change in noise levels in terms of LAeq dB
R1. Residential property west	34 [40] day	**17-18**	**26**	**-17 to -8**	**0**
R2. Residential property north west	34 [40] day	**19**	**24**	**-15 to -10**	**0**
R3. Residential property north east	40 [56] day	**29-32**	**32**	**-11 to -8**	**0**
R4. Residential property south east	34 [40] day	**30-31**	**32**	**-4 to -2**	**0**

*****Note: Rating level allows for +3dB for occasional intermittent noise character in relation to BS4142: 2014
Column 6 is calculated by logarithmic addition of the figure in the [ ] of column 2 and column 4 (-3dB) and then subtracting column 2 [ ].

6.2.37 The above assessment shows **negligible** impact relative to background sound levels (ref. Table 3.3) and **neutral significance**, which would occur once in 7 to 8 weeks. The predicted level (i.e. predicted noise excluding +3dB penalty) relative to the residual sound shows no change and therefore in context with the general noise climate (in terms of Leq) is of **negligible** impact magnitude (refer to Table 3.5).

Road Traffic Noise Predictions

6.2.38 The proposed development includes for a new access route and junction via the A480 road located east of the development. The HGVs could either enter or exit to the north or south at the new junction. It is therefore necessary to establish the likely impact as a result of this increased traffic flow, on existing residential receptors. The impact assessment assesses the potential increase in noise due to increased traffic flows based on the traffic demand for the development as detailed in the Transport Statement.

6.2.39 For the assessment of road traffic impacts onto the local road network we have used the BS5228-1:2009+A1:2014 `haul road' calculation methodology (due to low traffic volumes) and DMRB impact scales (as per Tables 3.8 and 3.9) to assess the increase in noise and the impact magnitude. The measured noise levels at 30m from the A480 has been used as the baseline and the noise level at the nearest residential locations calculated, based on the above methodology. The results of these calculations are detailed in Table 6.11.

6.2.40 The peak hour daytime and night-time site traffic demand flow for vehicle movements relative to the Site have been used to show the change in noise climate at the nearest existing dwellings (Table 6.11).

6.2.41 The Transport Statement indicates that the road traffic movements for site will relate to an average of 3 HGV movements per day. During a peak hour period when broilers are taken away for processing the transport statement gives 49 vehicles arriving at site, which would occur typically over a 24-hour period (i.e. circa 2-3 HGVs per hour, 4 to 6 movements).

Table 6.13: Predicted Road Traffic noise increase on local road network during daytime and night-time periods based on bird collection event

Location	**`Do nothing' (i.e. without development) (daytime) LAeq dB_{1hour} ($LA10_{1hr}$)**	**Noise contribution from HGV movements LAeq dB_{18hour} ($LA10_{18hr}$)**	**Resultant noise level with development LAeq dB_{18hour} ($LA10_{18hr}$)**	**Change in noise levels (daytime) LAeq dB_{18hour} ($LA10_{18hr}$)**
A480	56 (58)*	38-39(40-41)	56.1 (58.1)	+0.1
Location	**`Do nothing' (i.e. without development) (night-time) LAeq dB_{6hour} ($LA10_{6hr}$)**	**Noise contribution from HGV movements LAeq dB_{6hour} ($LA10_{6hr}$)**	**Resultant noise level with development LAeq dB_{6hour} ($LA10_{6hr}$)**	**Change in noise levels (daytime) LAeq dB_{6hour} ($LA10_{6hr}$)**
A480	45 (46)*	38-39 (40-41)	38.8-40 (40.8-40)	+0.8 to +1.0

Note: The daytime and night-time scenario is based on 4 to 6 HGVs movements per hour

6.2.42 The impact due to the bird collection event, which would only occur 7 to 8 times per year, shows that for the daytime scenario a **negligible** magnitude of impact in the short-term and **no change** in the long-term at the existing properties along the A480 road and is therefore not deemed to be significant. For the night-time scenario the impact according to the short-term semantic table (i.e. Table 3.8) indicates a **negligible to minor** impact and for the long-term scenario a **negligible** impact (ref. Table 3.9).

7.0 MITIGATION & RESIDUAL EFFECTS

7.1 *Site Generated Noise affecting existing dwellings*

7.1.1 The results of the assessment have shown that the impact of any site-generated noise from the operation of the poultry units is insignificant. This assumes that the following measures are included in the design:

(i) Roof mounted fans having a sound power level of 71dB(A) or lower.

(ii) Gable end fans positioned on end of unit facing west and sound power level not to exceed a sound power level of 81dB(A).

(iii) Gable end fans fitted with a baffle on western end of poultry units to reduce noise levels (see attached detail).

(iv) Feed hopper fill alarm via text or telephone calls from central control, no audible alarms.

(v) Where practicable HGVs at feed bins positioned with HGV feed pump on bin side of vehicle so that vehicle body and poultry building provide screen to receptors.

(vi) Feed deliveries to take place during daytime hours.

(vii) Tractor powered diesel pump wash units positioned with pump on side of vehicle so that vehicle body provides screen to receptors or jet wash power units inside unit or covered area.

(viii) Wherever practicable carry out cleaning during less-sensitive hours of the day (i.e. between 0800 to 1700 hours).

(ix) Wherever practicable minimise number of fans in operation during catching events providing this complies with bird welfare requirements.

7.2 *Site Generated Road Traffic Noise affecting existing dwellings*

7.2.1 The results of the assessment have shown that the impact of any site-generated noise relative to HGV movements along the local road network is not significant due to low vehicle numbers.

7.3 Residual Effects and their Significance

7.3.1 The methodology adopted for establishing the significance of the impact associated with the development is detailed in section 3.0.

7.3.2 Table 7.1 indicates the effect of the mitigation measures on the unmitigated effect. The introduction of the proposed mitigation detailed in the mitigation section ensures that the development would not give rise to any unacceptable noise impact.

Table 7.1: Impact at Nearest Receptor Before and after Mitigation Measures

Noise Source and associated receptor	Time Period	Impact Significance (before mitigation measures)	Impact Description (before mitigation measures)	Residual Significance (after mitigation measures)	Impact Description (after mitigation measures)
Construction noise affecting existing receptors	Daytime only	Neutral Significance	Possible short-term noise levels of up to 47 dB $L_{Aeq\ 1hr.}$	Neutral Significance	Minimal increase in general residual noise levels at receptors and well within acceptable limits
Road traffic noise affecting existing receptors	Daytime & Night-time	Neutral to Minor Significance	No significant increase	Neutral to Minor Significance	Noise level increase not significant and minor impact only occurs occasionally due to bird collection events during night-time.
Effect of new development on existing receptors (**fan** noise)	Daytime	Minor to Major/ Moderate Significance	During maximum fan noise, levels exceed guidance & standards	Neutral Significance	Noise levels not significant & within guidance and standards
Effect of new development on existing receptors (**fan** noise)	Night-time	Minor to Major/Moderate Significance	During maximum fan noise, levels exceed guidance & standards	Neutral Significance in general with maximum noise reaching Minor impact significance	Noise levels not significant and well within night sleep disturbance criteria and no adverse impact concluded.
Effect of new development on existing receptors (**event** noise)	Daytime	Occasional impacts range from Neutral to Moderate relative to background but in context with residual sound has a Neutral impact at sensitive receptors	Noise exceeds background sound levels but in context with residual sound and absolute levels is not significant	Occasional events Neutral to Moderate relative to background but in context with residual sound all have a Neutral impact at sensitive receptors.	Absolute noise levels not significant and within relevant standards and guidance. Events only occur occasionally
Effect of new development on existing receptors (**event** noise)	Night-time	Events only occur once approx. every 7-8 weeks. Neutral to Moderate Significance relative to background but in context with residual sound is Neutral and Neutral in absolute terms.	Noise levels not significant in context with absolute guidelines.	Neutral to Moderate Significance relative to background but in context with residual sound all have a Neutral effect at sensitive receptors.	Complies with sleep disturbance criteria and these are short term occasional events.

REFERENCES

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2. National Planning Policy Framework – March 2012
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5. Guidelines for Community Noise – World Health Organisation: April 1999
6. Community Noise – World Health Organisation: 1995
7. BS 7445: 2003, Description and measurement of environmental noise.
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9. Calculation of Road Traffic Noise: Department of Transport 1988
10. The National Noise Incidence Study 2000': DEFRA Feb 2002
11. The Building Regulations 2000 – Proposals for Amending Part E: Resistance to the Passage of Sound
12. BS8233: 2014 `Guidance on sound insulation and noise reduction for buildings'
13. ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors: General method of calculation
14. Design Manual for Roads and Bridges (DMRB) – May 2008 (Part 2 GD 01/08)
15. Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7 (HD 213/11): November 2011
16. IPPC - Technical Guidance Note IPPC H3 Part 2 – Noise Assessment & Control

FIGURES

FIGURE 1: PRE-LIMINARY LAYOUT

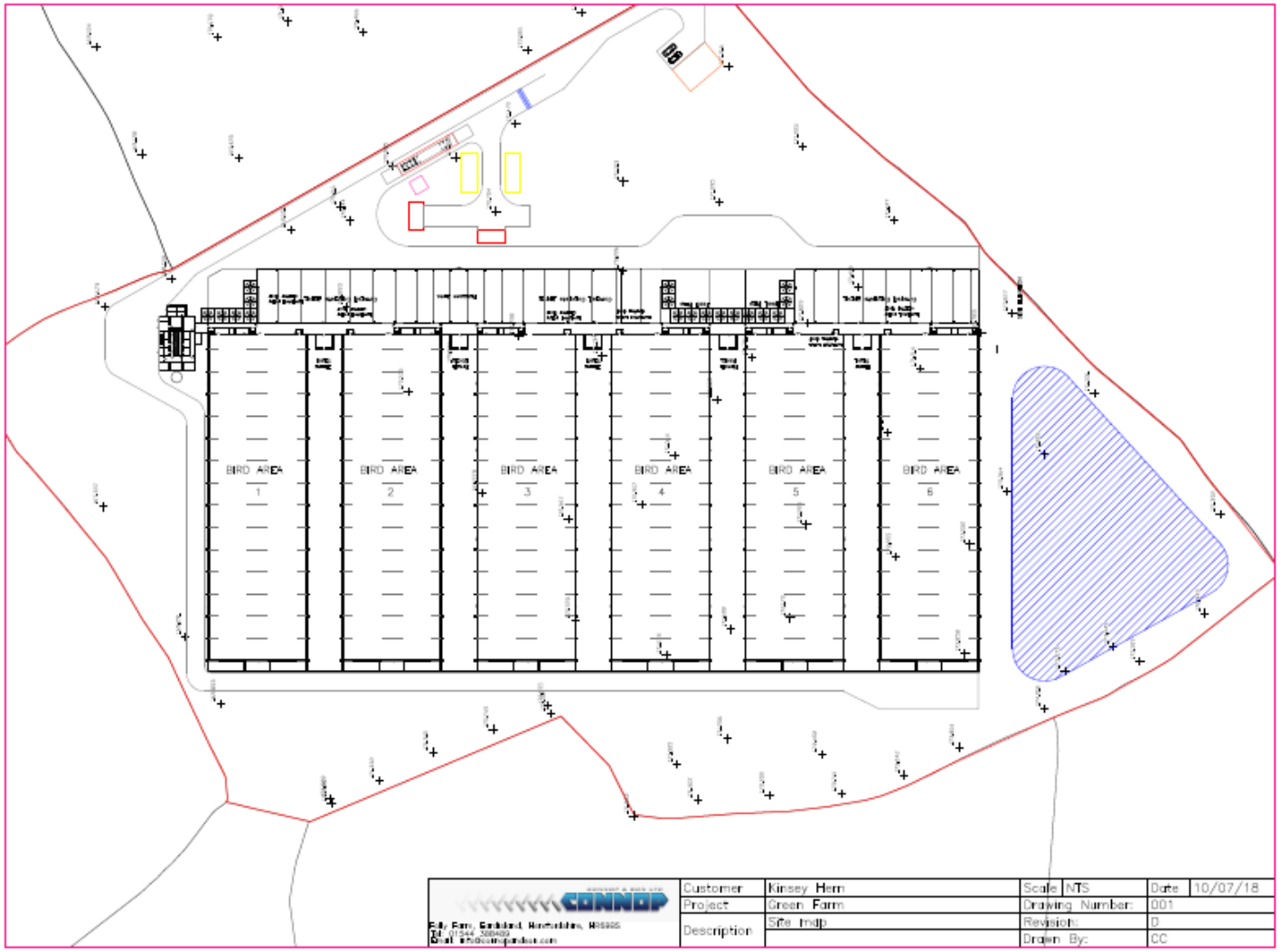
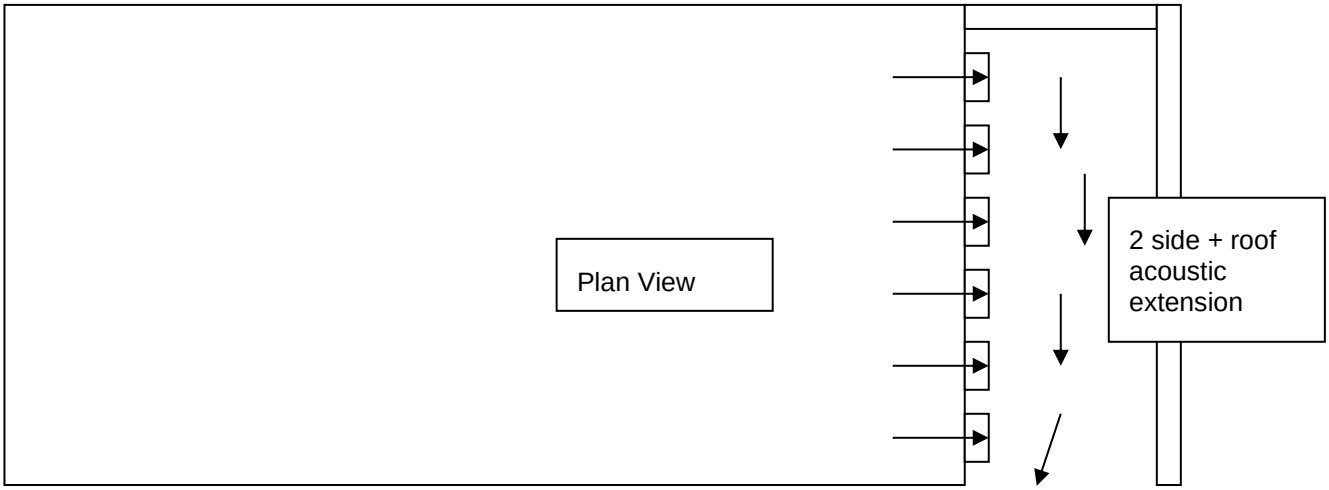
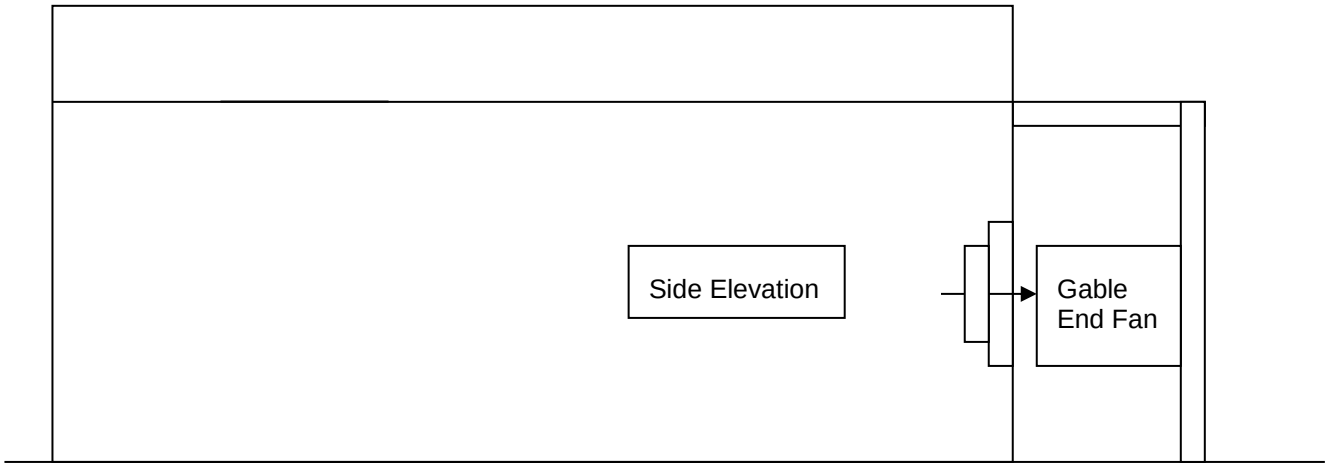


FIGURE 2: SITE LOCATION, NOISE MONITORING POSITIONS & RECEPTORS

FIGURE 3: ACOUSTIC BAFFLE AT GABLE END FANS





APPENDIX 1

BASIC ACOUSTIC TERMINOLOGY

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air.

Sound Pressure Level is a measurement of the size of these pressure fluctuations. It is expressed in decibels (dB) on a logarithmic scale. Each 3 dB increase in sound pressure level represents a doubling of the sound energy. The threshold of hearing is approximately 0 dB.

The rate at which the pressure fluctuations occur determines the pitch or frequency of the sound. The frequency is expressed in Hertz (Hz), that is, cycles per second. The human ear is sensitive to sounds from about 20 Hz to 20,000 Hz. Although sound can be of one discrete frequency - a 'pure tone' - most noises are made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same 'subjective' way. This is the basis of the A-weighted sound level dB(A), normally used to assess the effect of noise on people. The dB(A) weighting emphasis's or reduces the importance of certain frequencies within the audible range.

Noise Measurement

The measurement of sound pressure level is only really meaningful where the level of noise is constant. In the typical industrial environment noise levels can vary widely and sometimes short duration high levels of noise are interspersed with periods of relative quiet. The most widely used means of 'averaging' the noise over a period of time is the Equivalent Continuous Sound Level. Normally written as L_{Aeq} this value takes into account both the level of noise and the length of time over which it occurs. There are many meters available which are capable of measuring L_{Aeq} by electronic integration over the measurement period.

The L_{Aeq} or A-weighted equivalent continuous noise level is a measure of the total noise energy over a stated time period and includes all the varying noise levels and re-expresses as an 'average', allowing for the length of time for which each noise level was presented.

The L_{An} parameters are defined as the noise levels which are exceeded for n% of the monitoring period, thus, for example, the L_{A90} parameter is the noise level exceeded for 90% of the 15 minute period, i.e. 13.5 minutes. The L_{A50} parameter is the noise level exceeded for 50% of the hourly period, i.e. 30 minutes, etc. The L_{max} parameter is the maximum RMS A-weighted noise level occurring during the measurement period.

The definition in layman's terms is given below for terminology used in the measurement and results obtained during the survey work.

A-weighting: Normal hearing covers the frequency (pitch) range from about 20Hz to 20,000 Hz but sensitivity of the ear is greatest between about 500Hz and 5000Hz. The "A-weighting" is an electrical circuit built into noise meters to mimic this characteristic of the human ear.

Ambient noise: The totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.

Attenuation: Noise reduction

Background noise: The general quiet periods of ambient noise when the noise source under investigation is not there.

Decibel (dB): The unit of measurement for sound based on a logarithmic scale. 0dB is the threshold of normal hearing; 140dB is the threshold of pain. A change of 1dB is only detectable under controlled laboratory conditions.

dB(A) [decibel A weighted]: Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) serves to distinguish sounds of different frequency (or pitch) in a similar way to how the human ear responds. Measurements in dB(A) broadly agree with an individual's assessment of loudness. A change of 3dB(A) is the minimum perceptible under normal everyday conditions, and a change of 10dB(A) corresponds roughly to doubling or halving the loudness of sound.

dB(C): [decibel C weighted]: Frequency weighting which does not alter low frequency octave band levels by very much compared to `A' weighting. Similar to linear reading (i.e. linear does not alter frequency spectra at all)

Frequency (Hz): The number of sound waves to pass a point in one second.

L_{Aeq}: This is a noise index used to describe the "average" level of a noise that varies with time (T). It allows for the different sensitivities of the human ear to different frequencies (pitch), and averages fluctuating noise levels in a manner, which correlates well with human perceptions of loudness.

$L_{A10,T}$: This noise index gives an indication of the upper limit or peak levels of the fluctuating noise. It is the "A weighted" noise level exceeded for 10 per cent of the specified measurement period (T). e.g. If the measurement period was over 10 hours and the L_{A10} reading was say 60dB, then this means that for 1 hour out of 10 the level went above 60dB.

$L_{A90,T}$: This noise index gives an indication of the lower limit or levels of the fluctuating noise. It is the "A weighted" noise level exceeded for 90 per cent of the specified measurement period (T). e.g. If the measurement period was over 10 hours and the L_{A90} reading was say 50dB, then this means that for 9 hours out of 10 the level went above 50dB.

L_{Amax}: This is the highest `A' weighted noise level recorded during a noise measurement period.

Residual noise: The ambient noise remaining at a given position in a given situation when the noise source under investigation is not there.

Specific noise: The noise source under investigation for assessing the likelihood of complaints

Examples of typical noise levels:

Source/Activity	Indicative noise level [dB(A)]
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom	35
Wind farm at 350m	35-45
Busy road at 5km	35-45
Car at 65km/h at 100m	55
Busy general office	60
Conversation	60
Truck at 50km/h at 100m	65
City Traffic at 5m	75-85
Pneumatic drill at 7m	95
Jet aircraft at 250m	105
Threshold of pain	140

APPENDIX 2

BASELINE NOISE LEVELS

Instrumentation and Fieldwork Details

Background noise measurements were undertaken at the nearest residential property boundary to identify typical noise levels when the site is not operational. The monitoring of residual and background noise was carried out during a 14 hour period from afternoon through to early morning, such that range of typical and lowest background noise levels could be determined for the assessment.

Instrumentation:

Manufacturer	*Description*	*Type*	*Calibration Due date*	*Serial No.*
Norsonic	Real Time Analyser	118	June 2019	31992
Cirrus	Real Time Analyser	171A	February 2019	G066350
Cirrus	Electronic Calibrator	CR: 513A	June 2019	031523

The noise meters used during the survey is a precision grade type 1 meter to IEC 651 standard and accuracy.

Calibration Setting: 94dB @ 1 kHz
Meter Setting: Fast Response

Fieldwork Details:

Site: Green Farm, Lyonshall, Herefordshire
Date of test: Wednesday 20th – Thursday 21st June 2018
Start Time: 1715 hours (14-hour monitoring period)
Calibration: Before and after: 94dB at 1kHz

Survey Description and Procedure:

The noise meter was calibrated prior to and after measurements to ensure accuracy of results.

Background noise measurements were taken in proximity to the nearest residential property away from the influence of local road traffic during a period when there were no significant farm activities. Refer to Figure 1 for monitoring locations.

Background noise readings were taken at a height of 1.5m from the ground. Readings of LAeq, LA10, LA90 and LAmax were recorded over 15 minute intervals.

Calibration

The noise meter was calibrated with the electronic calibrator prior to commencement and on completion of the survey. No significant drift in calibration was observed.

Meteorological Conditions

Weather details were recorded during the period of the survey and are detailed below:

Wednesday 20th to Thursday 21st June 2018

Daytime: Dry, mostly cloudy, light vaiable winds (3-4m/s), temp. 10-19degC
Night-time: Dry, variable cloud, light variable winds (3-4m/s), temp. 9-11degC

The above climatic conditions were suitable for monitoring environmental noise levels in accordance with advice given in BS7445: 2003 `Description and measurement of environmental noise'

Baseline Noise Measurement Results at Fixed Locations

Noise Survey Results

Date: Wednesday 20th June 2018 **TABLE 1**
Location: Green Farm, Lyonshall, Herefordshire
Client: Mr K Hern
Project: Poultry Units
Data: **Background Sound Survey: Position A - Pennsylvania**
Instrumentation: Cirrus 171A Real Time Precision Analyser (G061253)
Weather Conditions: Dry, mostly cloudy, light vaiable winds (3-4m/s), temp. 15-19degC
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
17:15	15:00	52.2	44.8	29.9	77.0	
17:30	15:00	49.5	52.7	30.6	68.0	
17:45	15:00	38.7	38.6	29.5	60.6	
18:00	15:00	35.7	36.5	29.0	57.7	
18:15	15:00	39.1	41.4	30.7	63.0	
18:30	15:00	40.6	42.4	33.0	58.6	
18:45	15:00	39.5	42.1	33.1	59.1	
Average 1715-1900		46.2	49.8	30.8	58-77	

Noise Survey Results

Date: Wednesday 20th June 2018 **TABLE 2**
Location: Green Farm, Lyonshall, Herefordshire
Client: Mr K Hern
Project: Poultry Units
Data: **Background Sound Survey: Position A - Pennsylvania**
Instrumentation: Cirrus 171A Real Time Precision Analyser (G061253)
Weather Conditions: Dry, mostly cloudy, light variable winds (3-4m/s), temp. 10-15degC.
Calibration: 94dB

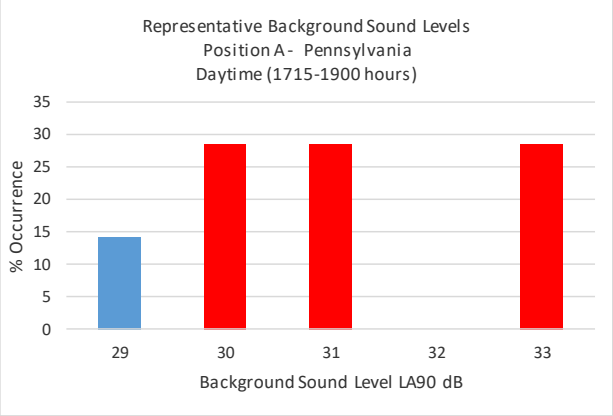
Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
19:00	15:00	36.5	38.6	32.0	56.9	
19:15	15:00	38.0	41.0	32.2	50.6	
19:30	15:00	38.4	40.1	32.3	61.5	
19:45	15:00	42.2	45.5	30.6	59.4	
20:00	15:00	38.7	37.8	28.6	59.1	
20:15	15:00	35.3	36.4	29.3	56.9	
20:30	15:00	39.2	39.1	28.1	57.4	
20:45	15:00	38.5	39.4	29.4	58.6	
21:00	15:00	43.4	46.6	28.4	64.4	
21:15	15:00	37.9	36.6	25.6	60.8	
21:30	15:00	31.9	34.1	25.3	51.4	
21:45	15:00	31.8	32.7	24.0	59.8	
22:00	15:00	28.5	31.5	23.0	40.6	
22:15	15:00	27.7	30.2	23.2	39.8	
22:30	15:00	28.4	31.3	22.7	45.2	
22:45	15:00	26.6	29.1	22.1	39.7	
Average 1900-2300		37.6	36.9	27.3	40-64	

Noise Survey Results

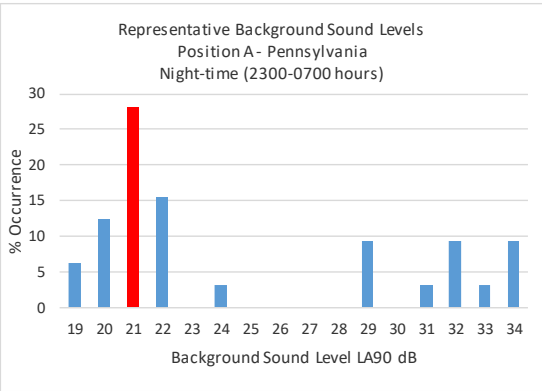
Date: Wednesday 20th - Thursday 21st June 2018
Site: Green Farm, Lyonshall, Herefordshire **TABLE 3**
Client: Mr K Hern
Project: Poultry Units
Data: **Background Sound Survey: Position A - Pennsylvania**
Instrumentation: Cirrus 171A Real Time Precision Analyser (G061253)
Weather Conditions: Dry, variable cloud, light variable winds (3-4m/s), temp. 9-11degC
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
23:00	15:00	26.2	29.0	21.8	39.0	
23:15	15:00	24.8	26.7	21.2	41.8	
23:30	15:00	26.8	29.3	21.5	40.4	
23:45	15:00	27.5	29.6	22.0	44.1	
00:00	15:00	23.3	24.7	20.6	35.6	
00:15	15:00	27.7	30.2	22.3	44.5	
00:30	15:00	27.0	30.2	20.5	39.9	
00:45	15:00	22.6	23.9	19.6	36.2	
01:00	15:00	23.2	24.7	20.5	35.7	
01:15	15:00	22.9	24.5	20.6	34.9	
01:30	15:00	25.1	27.0	21.6	36.6	
01:45	15:00	25.8	28.2	20.9	39.5	
02:00	15:00	23.3	24.6	21.0	34.7	
02:15	15:00	22.8	24.6	19.9	37.7	
02:30	15:00	21.8	22.9	19.3	33.9	
02:45	15:00	22.1	23.6	19.4	37.4	
03:00	15:00	22.1	23.1	20.3	38.6	
03:15	15:00	24.5	26.4	20.5	40.8	
03:30	15:00	22.9	24.7	19.7	38.7	
03:45	15:00	24.0	25.3	21.1	40.5	
04:00	15:00	41.7	39.7	23.6	66.5	
04:15	15:00	35.4	38.3	29.1	48.2	
04:30	15:00	37.6	40.1	28.7	55.1	
04:45	15:00	41.7	42.9	32.9	57.8	
05:00	15:00	45.0	46.7	31.5	65.8	
05:15	15:00	38.0	40.5	31.6	60.0	
05:30	15:00	40.2	39.3	29.4	66.8	
05:45	15:00	38.3	41.4	30.6	55.2	
06:00	15:00	40.5	42.8	32.3	59.9	
06:15	15:00	40.6	43.8	34.1	55.1	
06:30	15:00	41.7	43.3	34.0	67.0	
06:45	15:00	38.6	41.2	33.5	54.6	
Average 2300-0700		36.5	32.0	24.6	41-72	
Average 1230-2300		44.2	44.3	29.3	41-79	
Average 0600-0700		40.4	42.8	33.5	55-67	

LA90	% occurence
29	14.3
30	**28.6**
31	28.6
32	0
33	28.6



LA90	% occurence
19	6.3
20	12.5
21	**28.1**
22	15.6
23	0
24	3.1
25	0
26	0
27	0
28	0
29	9.4
30	0
31	3.1
32	9.4
33	3.1
34	9.4



Noise Survey Results

Date: Wednesday 20th - Thursday 21st June 2018 **TABLE 4**

Location: Green Farm, Lyonshall, Herefordshire

Client: Mr K Hern

Project: Poultry Units

Data: **Background Sound Survey: Position B - 30m A480**

Instrumentation: Norsonic 118 real time analyser

Weather Conditions: Dry, mostly cloudy, light vaiable winds (3-4m/s), temp. 9-19degC

Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
15:00	15:00	55.4	57.3	40.4	76.7	Local road traffic
15:15	15:00	57.4	58.4	41.4	77.8	Local road traffic
15:30	15:00	56.5	58.9	40.4	82.7	Local road traffic
15:45	15:00	53.2	56.1	40.4	73.8	Local road traffic
16:00	15:00	57.8	59.2	41.4	76.5	Local road traffic
16:15	15:00	55.4	56.8	40.3	77.1	Local road traffic
16:30	15:00	56.2	57.8	42.2	75.3	Local road traffic
16:45	15:00	56.0	58.2	41.5	77.1	Local road traffic
1500-1700		56.1	57.8	41.0	74-83	
01:00	15:00	45.6	46.3	34.5	72.4	Occasional road traffic
01:15	15:00	44.3	45.7	34.3	73.6	Occasional road traffic
01:30	15:00	46.2	47.1	34.8	78.8	Occasional road traffic
01:45	15:00	43.4	44.8	34.1	75.6	Occasional road traffic
Average 2300-0700		45.0	46.0	34.4	72-79	

APPENDIX 3

Assumed Noise Levels

Plant Type	Sound Pressure Level LAeq dB	Sound Power Level
HGV movements	75 @ 10m	103
Forklift movements	67 @ 10m	95
Biomass	50-55 @ 1m	69-76
Roof Fans	43 @ 10m	71
Gable End Fans	53 @10m	81

APPENDIX 4

Construction Plant Inventory

Construction Plant Inventory

Soil Movements:

Plant Type	Sound Power Level	% Operating Time	Distance Ratio
Excavatator/Loader	108	100	0.8
Lorry	106	10	0.8

General Site Noisy Activities:

Plant Type	Sound Power Level	% Operating Time	Distance Ratio
JCB	108	100	0.8
Dumper	95	100	0.8
Lorry	106	10	0.8
Compressor	90-100	100	1.0
Generator	105	100	1.0

Infrastructure Construction:

Plant Type	Sound Power Level	% Operating Time	Distance Ratio
Asphalt Melter	103	100	0.8
Asphalt Spreader	110	100	0.8
Road Roller	96	100	0.8
Lorry	103	100	0.8
Concrete activities	92-107	100	0.8
Poker Vibrator	106	100	1.0
Water pump	102	100	1.0

Building Construction:

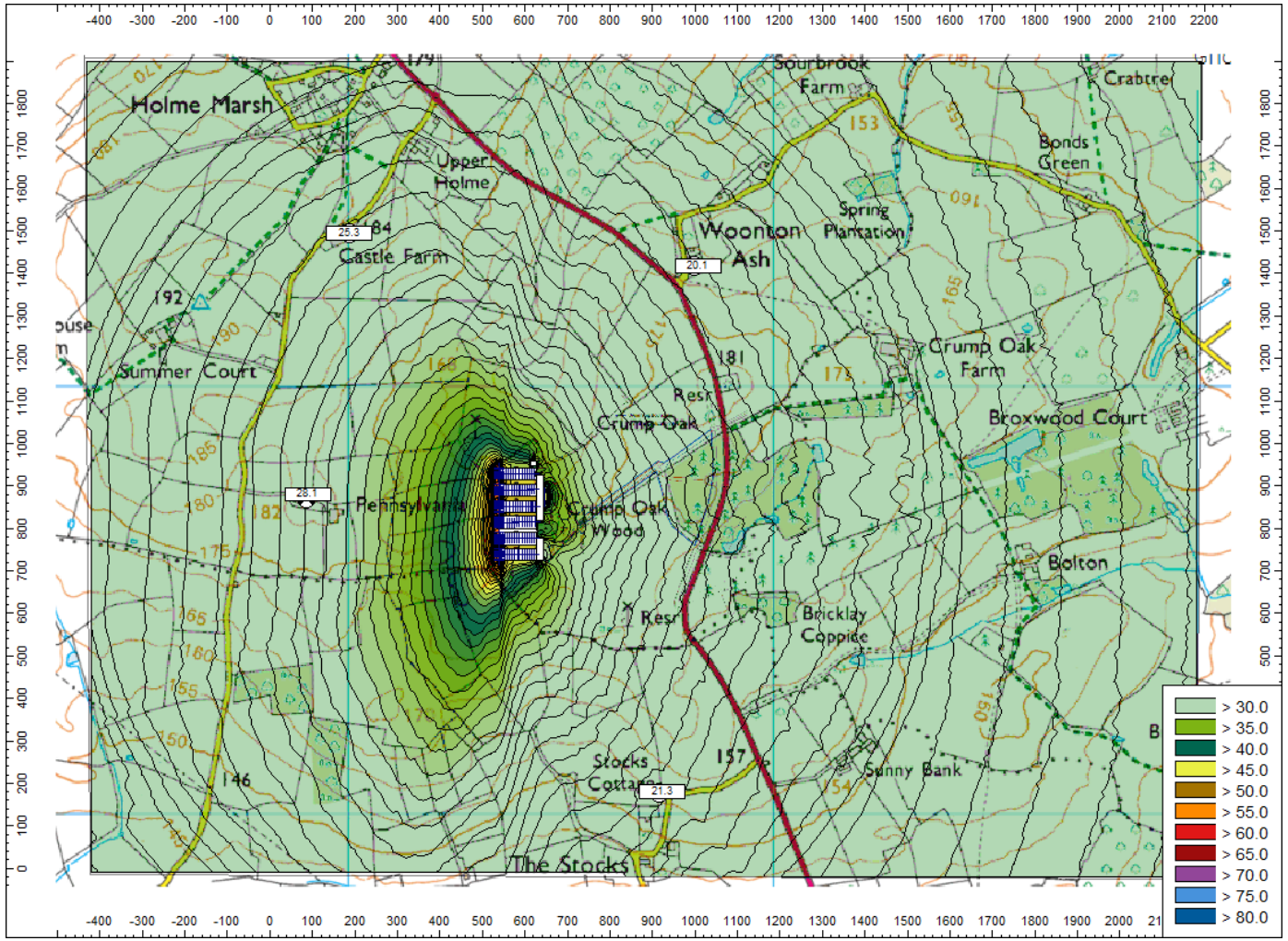
Plant Type	Sound Power Level	% Operating Time	Distance Ratio
Steelwork Erection	108	100	1.0
Concrete Pump	103	100	1.0
HGV	103	20	0.8
Cutting/Grinding	107	100	1.0
Hydraulic Pump	106	100	1.0

APPENDIX 5

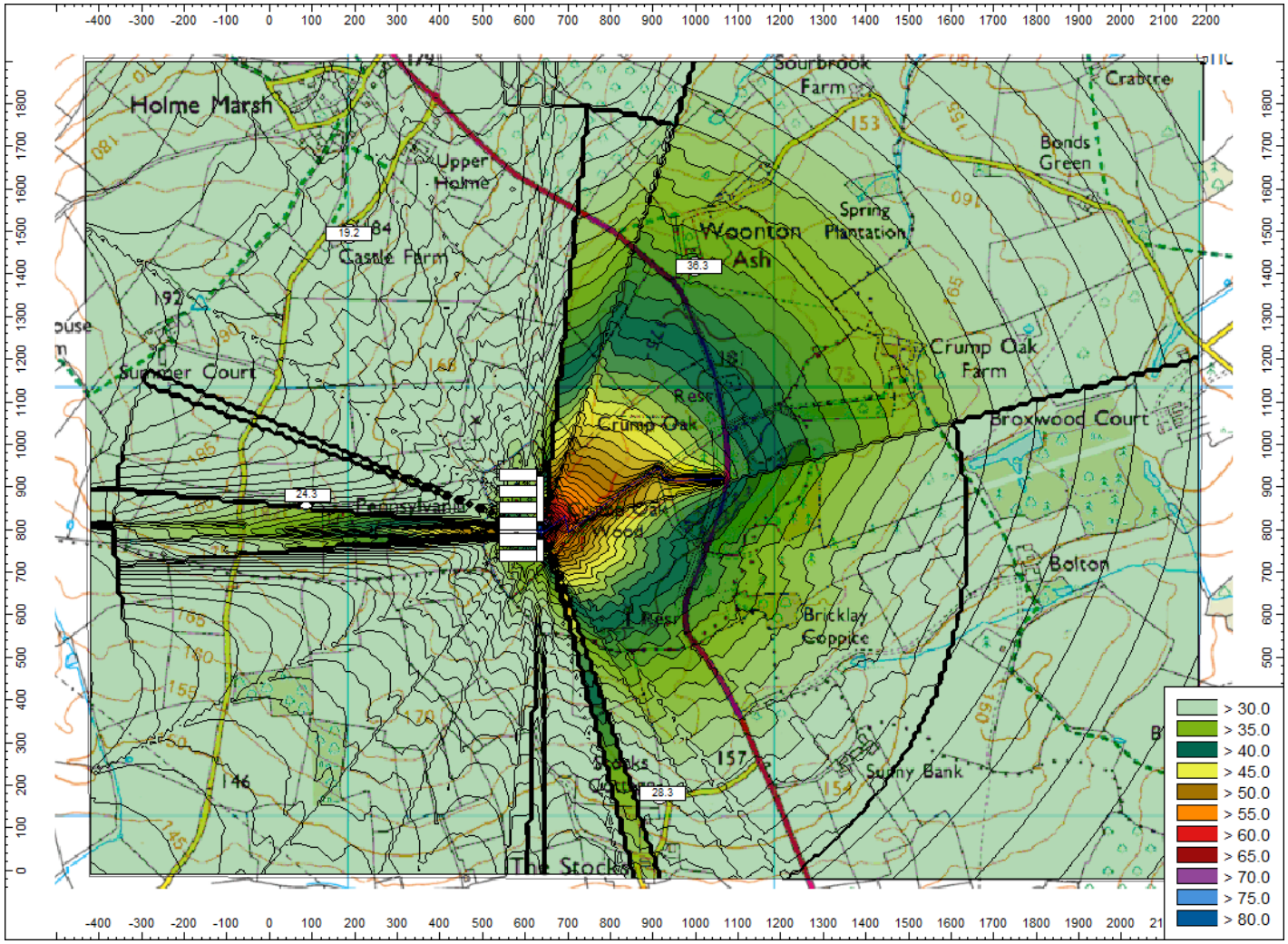
Noise Contour Maps

Noise Map 1 : All Roof Fans & Biomass Boilers (mitigated)

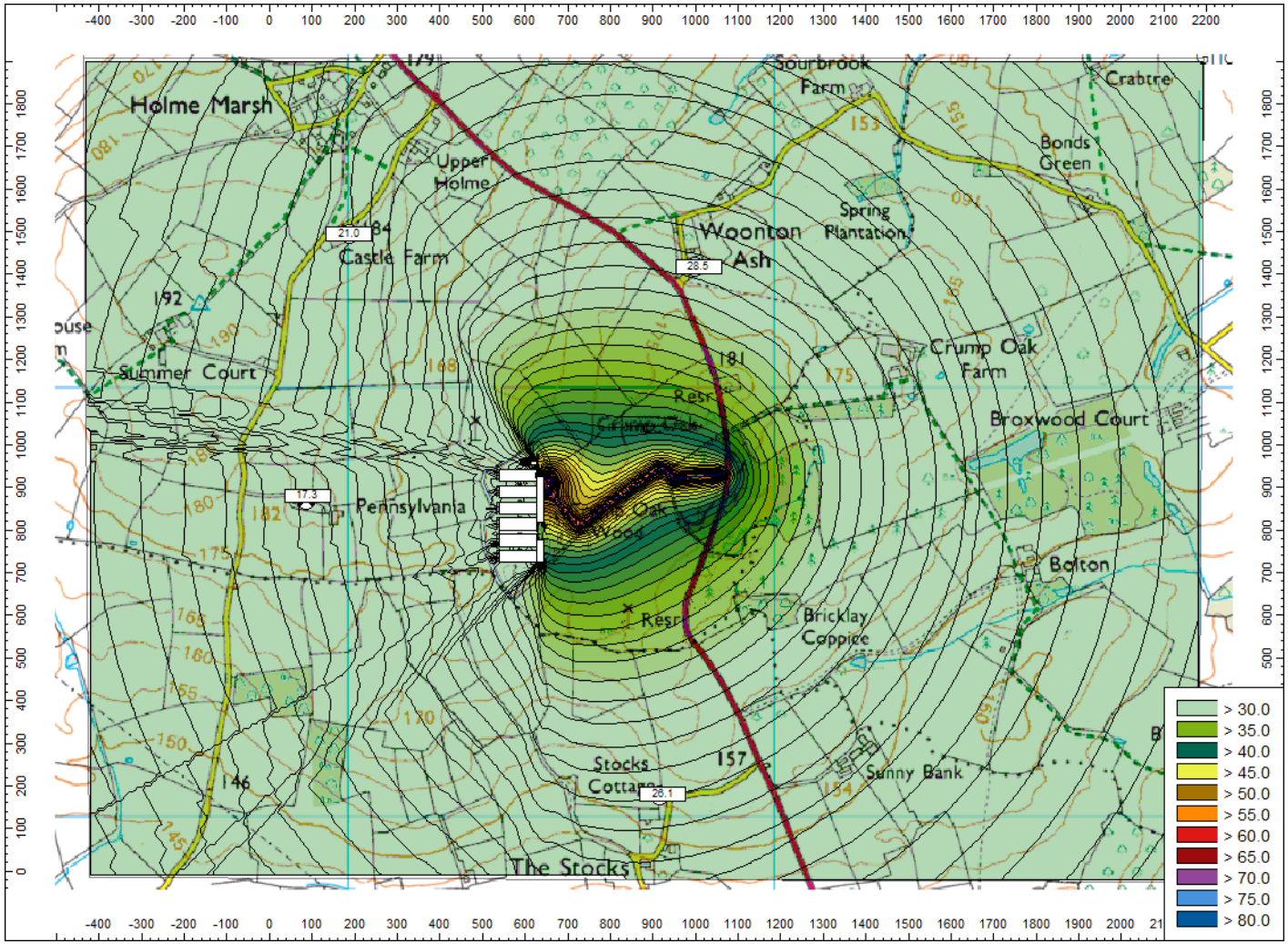
Noise Map 2 : All Roof Fans and Gable End Fans & Biomass Boilers (mitigated)



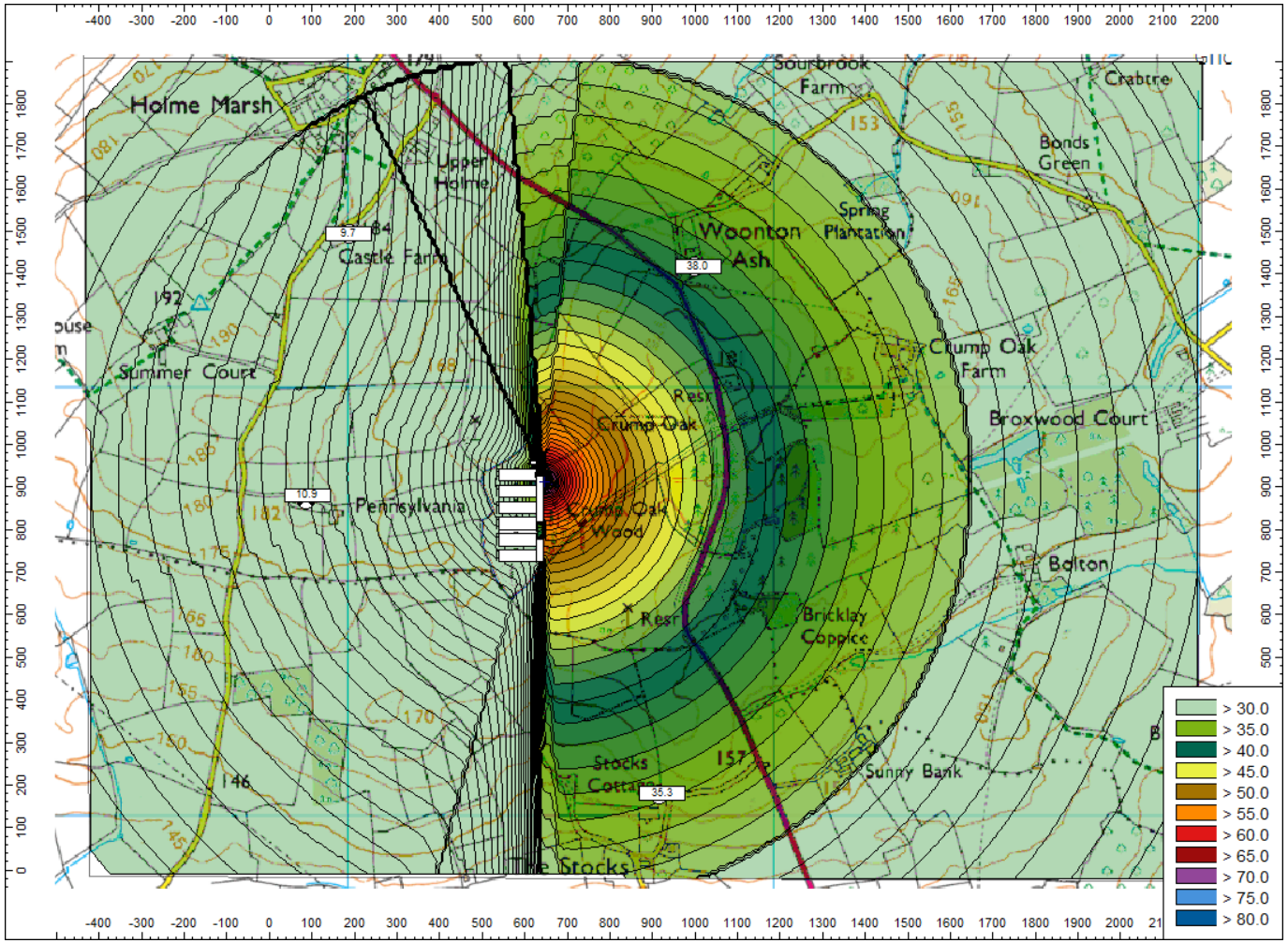
Noise Map 3: Feed Hopper Filling



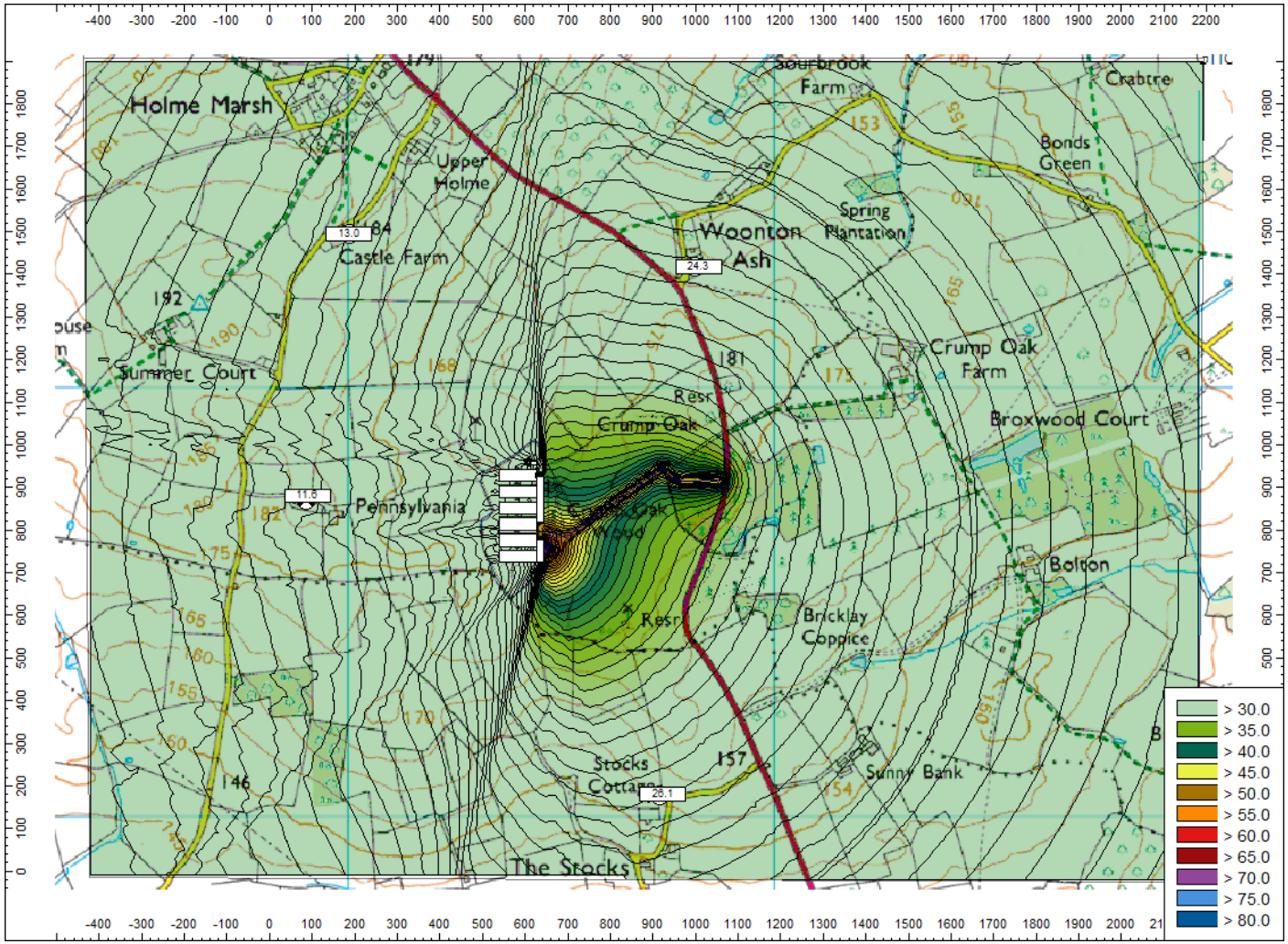
Noise Map 4: Litter Loading



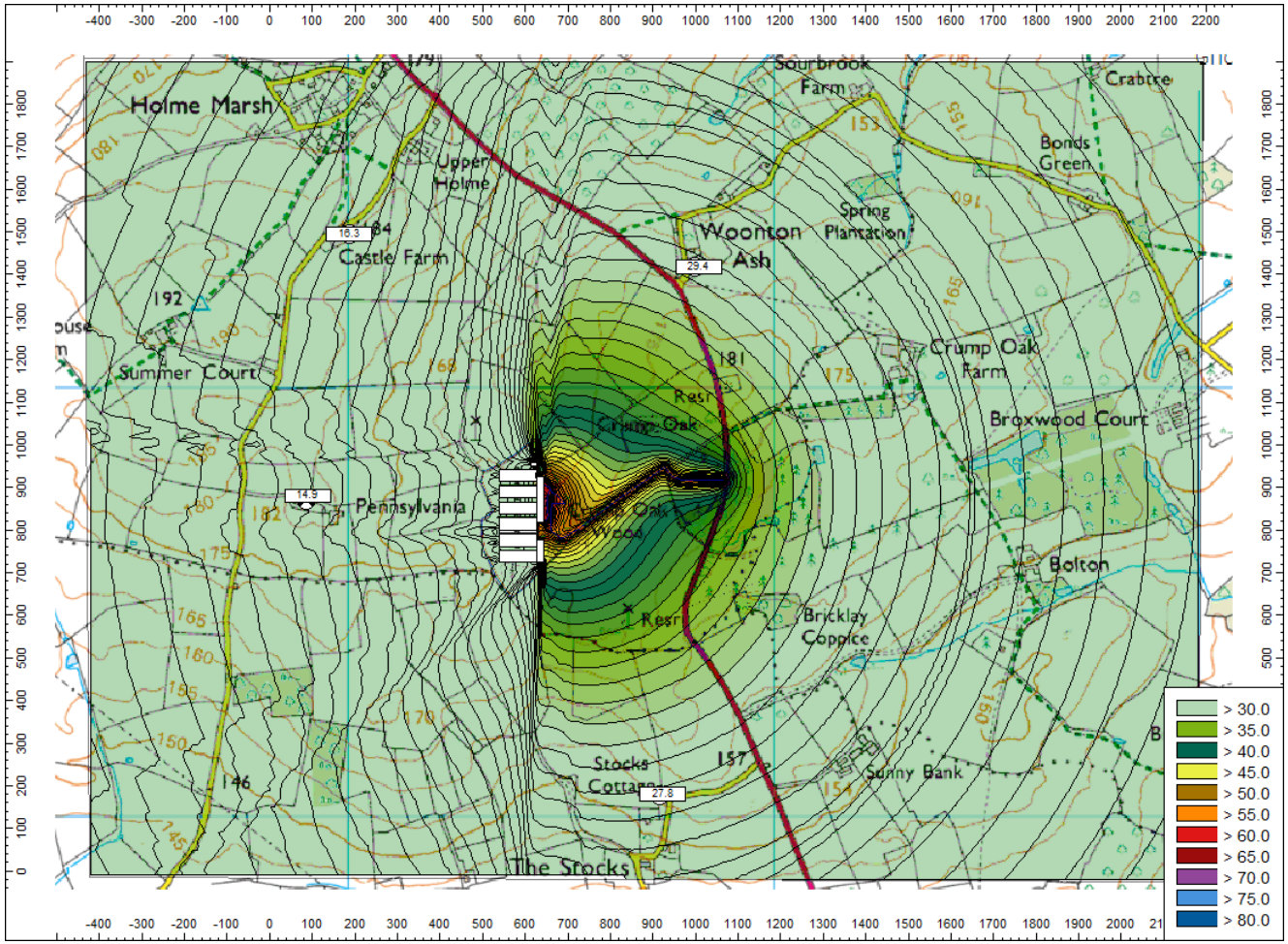
Noise Map 5 : Cleaning of Poultry Units



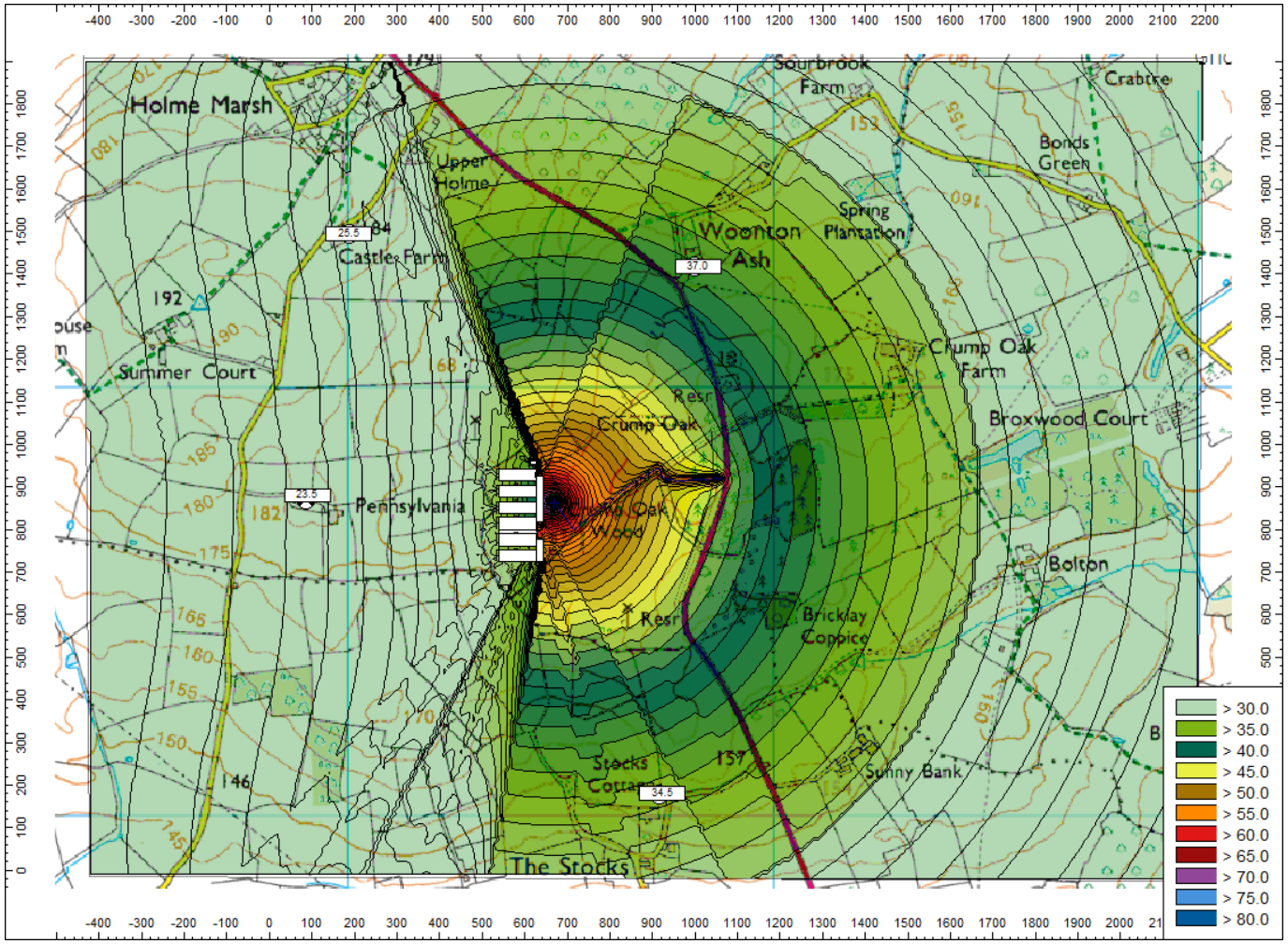
Noise Map 6: Catching



Noise Map 7: Bird Delivery



Noise Map 8 : Fuel Delivery



APPENDIX 6

Consultants Experience & Qualifications

Consultants Experience & Qualifications

Dean Robert Kettlewell - MSc MIOA MAE I.Eng
(Managing Director – Principal Acoustic Consultant)

Précis

As Managing Director and Principal Acoustic Consultant with Noise & Vibration Consultants Ltd, Dean has over 35 years background experience in a wide range of issues relating to environmental, industrial and commercial noise and vibration assessment. He currently manages corporate and unit specific contracts for:

- Assessment of Environmental & Industrial Noise
- Environmental Noise Impact Assessments
- Integrated Pollution Prevention and Control (IPPC) Applications
- Industrial Noise Assessment and Control
- Planning Issues for Residential and Commercial Development
- Noise at Work Regulations Assessments
- Building Acoustics and Sound Insulation Tests
- Wind Farm Noise Impact Assessments
- Entertainment Noise Assessment and Control
- Architectural Acoustics
- Expert Witness representation for Deafness and `Vibration White Finger' Claims
- Specialist knowledge in the Design of Noise Control Systems
- Ground borne vibration measurement and assessment
- Project Management of Noise Control Systems
- Hand-arm Vibration Assessments

Relevant Work Experience

Director & Principal Consultant - Noise & Vibration Consultants Ltd	2001- to date
Senior Acoustic Consultant - Vibrock Limited	1998 - 2001
Associate & Principal Acoustic Consultant - John Savidge & Associates	1994 - 1998
Technical Manager – LBJ Limited (Noise Control Division)	1990 - 1994
Technical Engineer/ Technical Manager (1988) - Vibac (Noise Control) Ltd	1982 - 1990

Qualifications and Education

M.Sc. Applied Acoustics (Derby University – Distinction)
HNC Electrical & Electronic Engineering
IOA Diploma in Acoustics & Noise Control
IOA Certificate in Law and Administration
Certificate of Competence in Workplace Noise Assessment
Certificate of Competence in Ground Vibration Monitoring

Affiliations:

Member of Institute of Acoustics (MIOA)
Member of Academy of Experts (MAE)
Member of Association of Noise Consultants (ANC)
Incorporated Engineer