base10acoustics

Glanmeheli Poultry

Acoustic Assessment

Report Ref: 18-10002-R01r1

Report Date: 27 February 2019

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Quality Assurance

Report Title:	Acoustic Assessment Proposed Development of a poultry broiler unit at Glanmeheli Farm, Newtown, Powys.
Report Ref:	18-10002-R01r1
Report Date:	27 February 2019
Report for:	G & A Powell Glanmeheli Farm Newtown Powys SY16 4LN
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Executive Summary

Base10 Acoustics Ltd was appointed by G & A Powell to undertake an acoustic assessment in relation to the proposed development of a poultry broiler at Glanmeheli Farm in Newtown, Powys.

The proposed development will house approximately 200,000 birds at any one time (50,000 birds in each of three new and one existing sheds), and will operate under a seven week crop cycle. When in operation, the proposed development has the potential to generate sound as a result of the operation of the ventilation system, as well as various items of fixed and mobile plant associated with intermittent activities such as poultry catching and loading, feed deliveries, manure collections etc.

An assessment of the potential impacts of the proposed development during its operational lifetime, and throughout each crop cycle was completed in the context of all relevant national and local policy/guidance. In particular, the assessment adheres to the guidance of BS 4142:2014 'Methods for rating and assessment industrial and commercial sound'.

In summary, it was determined that operation of the proposed development would have, in general, a low impact at all nearby noise sensitive receptors. Any exceptions to this as a result of, for example, intermittent operations undertaken at night or particularly loud operations undertaken during the day, would be of limited duration and frequency, and still within acceptable limits.

The assessment has assumed that a range of mitigation measures would be incorporated into the design (as outlined in Section 7), and additionally proposes a range of best-practice measures to further reduce sound emissions.

In summary operation of the proposed development during the daytime and night-time is unlikely to give rise to adverse or significant adverse impacts on amenity for any residents living in the local area, or in proximity to the main haul routes on the A489.

It is therefore recommended that the proposed development be consented with no restrictions or conditions on operation further to those assumed in the development description or mitigation sections of this report.

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1 Introduction

1.1 Background

1.1.1 Base10 Acoustics Ltd was appointed by G & A Powell to undertake an acoustic assessment in relation to the proposed development of a poultry broiler at Glanmeheli Farm in Newtown, Powys (see Figure 1).

1.1.2 The proposal entails the conversion of an existing free range poultry shed to a broiler unit, and the erection of a further three. broiler units, along with new areas of hard-standing and ancillary plant.

1.1.3 The operational poultry broiler will house approximately 50,000 birds per shed at any one time (i.e. approximately 200,000 in total), and hence falls under Schedule 1 of the *Town and Country Planning (Environmental Impact Assessment) Regulations 2017*.

1.1.4 This acoustic assessment considers the potential effects of sound arising due to the operation of the proposed development upon existing, noise-sensitive receptors (NSRs) in the local area. It has been prepared to support preparation of the relevant ES chapter by Berrys (Shrewsbury), and is suitable for submission to Shropshire County Council (SCC) as an Appendix to the ES.

1.2 Scope

1.2.1 In order to assess the potential effects of sound due to operation of the proposed development, the following scope of work was devised:

- Establish the relevant policy and legislative context for the development, and additionally identify any relevant national or international guidance documents (Section 2).
- Review the environmental context of the proposal, identify key noise-sensitive receptors (NSRs) and establish baseline sound levels by means of an environmental sound survey (Section 3).
- Review the development proposals to identify key activities and items of fixed/mobile plant with the potential to generate sound at the selected NSRs (Section 4).
- Develop an acoustic model of the proposed development, including all significant, sound-generating sources of fixed/ mobile plant (Section 5).

- Assess the predicted sound levels at the NSRs with respect to all relevant national and local policy, legislation and guidance (Section 6).
- Consider mitigation measures, where required, and update the acoustic models and assessments to reflect measures incorporated into the scheme (Section 7).
- Consider the potential for uncertainty in the measurements and/or calculations, and provide details of reasonable steps undertaken to reduce and minimise uncertainty (Section 8).
- Provide the assessment conclusions and make final recommendations to the decision maker (Section 0).

1.3 Limitations

1.3.1 This document has been prepared with all reasonable skill, care and diligence, and taking account of the manpower, timescales and resources devoted to it by agreement with G&A Powell (the Client) as part or all of the services it has been appointed carry out. It is subject to the terms and conditions of that appointment.

1.3.2 Base10 Acoustics Ltd. Shall not be liable for the use of or reliance on any information, advice, recommendations and opinions in this document for any purpose by any person other the Client.

1.3.3 Information reported herein may be based on the interpretation of data held in the public domain by Base10 Acoustics Ltd. and/or information supplied by the Client or its advisors and associates. These data have been acceptable in good faith as being accurate and complete.

1.3.4 The copyright and intellectual property in all drawings, reports, specifications, bills of quantities, calculations and other information set out in this report remain vested in Base10 Acoustics Ltd. unless the terms of appointment state otherwise.

1.3.5 This document may contain information of a specialized and/or highly technical nature and the Client is advised to seek clarification on any elements which may be unclear.

1.3.6 Information, advice, recommendations and opinions in this document should be relied upon in the context of the whole document and any documents referenced explicitly herein and should then only be used within the context of the appointment.

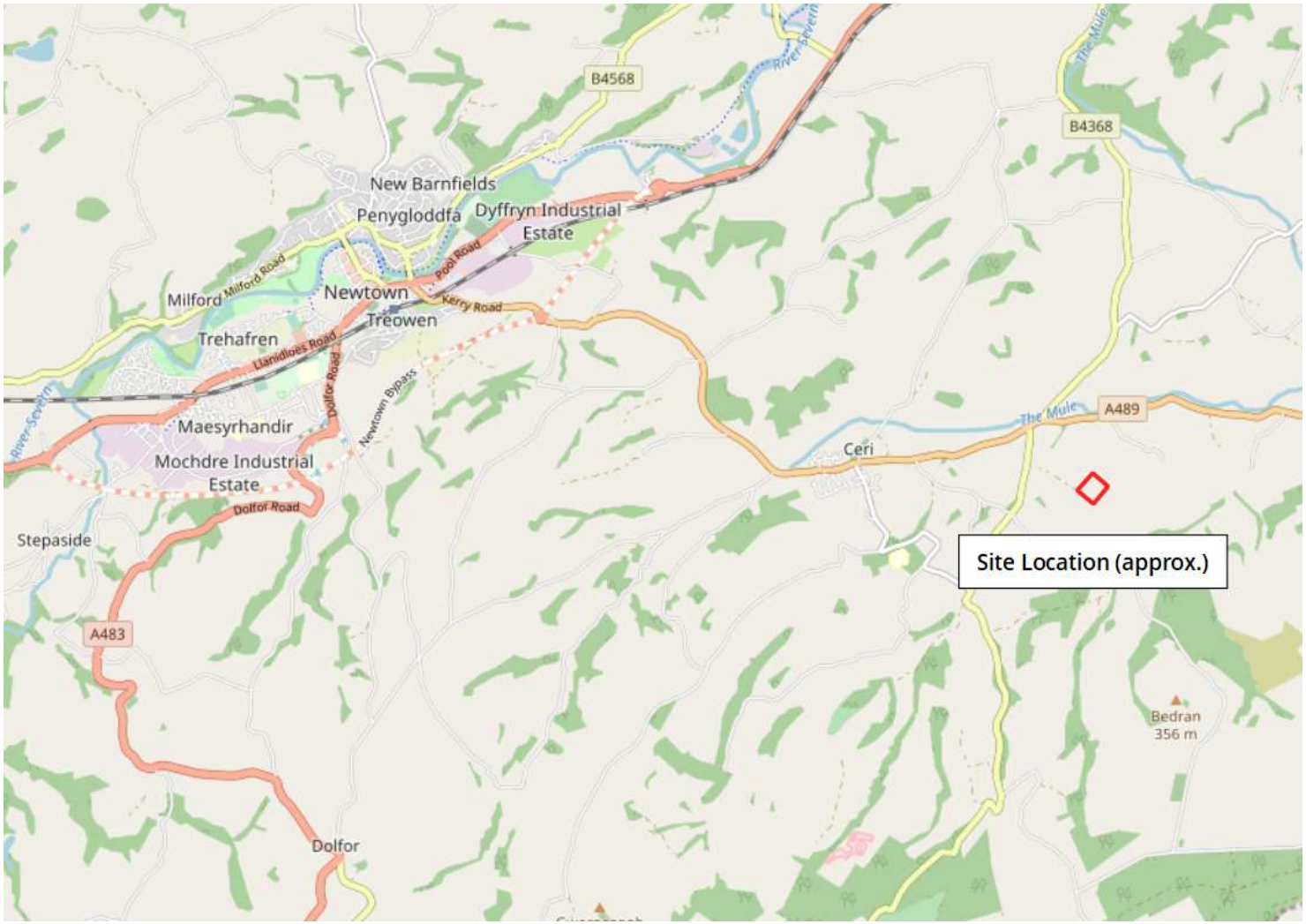


Figure 1 Site Location

2 Policy and Legislative Context

2.1 National Policy

Planning Policy Wales, Edition 9 (2016)

2.1.1 Planning Policy Wales (PPW) Edition 9, revised in November 2016, sets out the land use planning policies of the Welsh Government, and its commitment to sustainable development.

2.1.2 Chapter 13 of PPW, entitled *'Minimising and Managing Environmental Risks and Pollution'*, sets out the Welsh Government's objectives with regards to avoiding or minimizing the adverse effects of any environmental risks on present or future land use. These objectives are to:

> *"...maximise environmental protection for people, natural and cultural resources, property and infrastructure"; and*
>
> *"prevent or manage pollution and promote good environmental practice."*

2.1.3 Paragraph 13.13.1 of the PPW states that:

> *"Noise can affect people's health and well-being and have a direct impact on...local amenity...The objective of a policy for noise is to minimise emissions and reduce ambient noise levels to an acceptable standard."*

2.1.4 Meanwhile, Paragraph 13.15.1 of the PPW states that:

> *"Noise can be a material planning consideration, for example...where a proposed new development is likely to generate noise."*

2.1.5 Both of the above also refer to the Welsh Government's *'Noise Action Plan for Wales'* (2013), whilst Chapter 1 of the PPW refers to the supplemental Technical Advice Notes (TANs), e.g. TAN11: Noise.

Planning Guidance (Wales) Technical Advice Note 11 (1997)

2.1.6 Technical Advice Note 11: Noise (TAN11), published by the Welsh Government in 1997, provides guidance on how the planning system can be used to:

> *"...minimise the adverse impact of noise without placing unreasonable restrictions on development, or adding unduly to the costs and administrative burdens of business."*

2.1.7 In addition, TAN11 outlines:

> *"…some of the main considerations which local planning authorities should take into account in drawing up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources.*

2.1.8 In specific relation to noise generating development, Paragraphs 8 and 9 of TAN11 provide the following guidance:

> *"8. Local planning authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance. They should also bear in mind that if subsequent intensification or change of use results in greater intrusion, consideration should be given to the use of appropriate conditions.*
>
> *9. Noise characteristics and levels can vary substantially according to their source and the type of activity involved. In the case of industrial development, for example, the character of the noise should be taken into account as well as its level."*

2.1.9 Additional advice on assessing noise and on factors to consider in relation industrial development are provided in Paragraph B17 of Annex B, as follows:

> *"B17. The likelihood of complaints about noise from industrial development can be assessing…using guidance in BS 4142: 1990. Tonal or impulsive characteristics of the noise are likely to increase the scope for complaints and this is taken into account by the "rating level" defined in BS 4142…The likelihood of complaints is indicated by the difference between the noise from the new development…and the existing background level.*
>
> *…In addition, general guidance on acceptable noise levels within buildings can be found in BS 8233: 1987."*

2.1.10 Both standards referred to in Paragraph B17 (i.e. BS 4142 and BS 8233) have been revised since the publication of TAN11, and summaries of the new documents are provided below. This assessment is based upon the most recent versions of the standards.

2.1.11 With regards to measures to mitigate the impact of noise, Paragraph 11 of TAN11 advises that:

> *"11. Measures introduced to control the source of, or limit exposure to, noise should be proportionate and reasonable, and may include:*

i. engineering – reduction of noise at point of generation (e.g. using quiet machines and/or quiet methods of working); containment of noise generated (e.g. insulating buildings which house machinery and/or providing purpose -built barriers around sites); protection of surrounding noise-sensitive buildings (e.g. improving sound insulation in these buildings and/or screening them by purpose-built barriers);

ii. lay-out – adequate distance between noise source and noise-sensitive building or area; screening by natural barriers, other buildings, or non-critical rooms in a building;

iii. administrative: limited operating time of noise source restricting activities allowed on the site; specifying an acceptable noise limit."

2.1.12 Paragraph 12 further advises that:

"12. Early consultation with the applicant about the possible use of such measures is desirable and may enable them to be incorporated into the design before a proposal is formally submitted…Alternatively, a local planning authority may impose conditions."

2.1.13 Whilst it is acknowledged that noise should always be considered in the determination of planning applications, Paragraph 13 states that there may be:

"…circumstances when it is acceptable, or even desirable in order to meet other planning objectives, to allow noise generating activities on land near or adjoining a noise-sensitive development. In such cases, local planning authorities should consider the use of conditions or planning obligations to safeguard local amenity."

2.2 Local Policy

Powys Local Development Plan (2011-2026)

2.2.1 The Powys Local Development Plan (LDP) was adopted by Powys County Council on 17 April 2018 and sets out the Council's policies for the development and use of land in Powys.

2.2.2 Section 3.1 of the LDP sets out the plan's Vision and Objectives, i.e. that land-use planning in Powys should:

> *"Protect and enhance the County's outstanding physical, social and cultural environment."*

2.2.3 Policy DM13 – Design and Resources of the LDP states that development proposals must be able to demonstrate a good quality design, and shall have regard to the qualities and amenity of the surrounding area, and that:

> *"…11. The amenities enjoyed by the occupants or users of nearby or proposed properties shall not be unacceptably affected by levels of noise…"*

2.3 Guidance

BS 4142: 2014 Methods for Rating and Assessing Industrial and Commercial Sound

2.3.1 This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

a) sound from industrial and manufacturing processes;

b) sound from fixed installations which comprise mechanical and electrical plant and equipment;

c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and

d) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

2.3.2 It is further stated *that "sound of an industrial and/or commercial nature does not include sound from the passage of vehicles on public roads and railway systems"*, and hence lies outside the scope of the standard.

2.3.3 An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating sound level (specific noise plus character corrections, see Appendix A for definitions). The following should be considered:

a) Typically, the greater the differences, 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.

2.3.4 Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following:

1) The absolute level of the sound, e.g. where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating levels exceed the background.

2) The character and level of the residual sound compared to the character and level of the specific sound.

3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

i. façade insulation treatment;

ii. ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and

iii. acoustic screening.

2.3.5 The standard also requires that the level of uncertainty in the data and associated calculations be considered, and that reasonably practicable steps be taken to reduce the level of uncertainty.

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

2.3.6 This British Standard provides guidance for the control of noise in and around buildings. Section 7.7 contains guidance on noise levels appropriate within dwellings, as summarised in Table 1.

Table 1 Indoor ambient noise levels for dwellings (from BS 8233:2014, p. 24)

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

2.3.7 However, it should be noted that these levels refer to noise sources without specific character (previously termed "anonymous noise"), such as that from transportation sources (roads, railways etc.), and that:

> *"Occupants are usually more tolerant of noise without a specific character than, for example, that from neighbours which can trigger complex emotional reactions."*

World Health Organisation (WHO) Guidelines for Community Noise (2009)

2.3.8 The WHO guidelines for community noise include a set of recommendations for noise levels within dwellings to avoid adverse effects such as sleep disturbance, annoyance and speech interference.

2.3.9 Indoor guideline values for bedrooms are 30 dB L_{Aeq} for continuous noise, and 45 dB L_{Amax} for single sound events. However, it is noted that lower levels may be disturbing, depending on the nature of the noise source. Noise levels outside (1m from façade) should not exceed 45 dB L_{Aeq}, so that people can sleep with their windows open[1].

2.3.10 To enable casual conversation indoors during the daytime, the sound level of interfering noise should not exceed 35 dB L_{Aeq}.

2.3.11 To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB L_{Aeq} on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed, the outdoor sound level should not exceed 50 dB L_{Aeq}.

[1] This assumes that the sound reduction provided by an open window is 15 dB.

2.3.12 However it should be noted that the guidelines for community noise focus on the impacts of noise from sources without specific character (roads, railways etc.).

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

2.3.13 The WHO night noise guidelines for Europe report on the findings of a working group set up by the Regional Office for Europe to provide scientific advice to the Member States for the development of future legislation and policy action in the area of assessment of control of night noise exposure.

2.3.14 Considering the scientific evidence on the threshold of night noise exposure indicated by $L_{night, outside}$ as defined in the Environmental Noise Directive (2002/49/EC), an $L_{night, outside}$ of 40 dB was considered an appropriate Night Noise Guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. An $L_{night, outside}$ value of 55 dB was recommended as an interim target for countries where the NNG cannot be achieved in the short term, for various reasons.

2.3.15 Again, it should be noted that the night noise guidelines focus on the impacts of noise from noise sources without specific character (roads, railways etc.).

Institute of Environmental Management and Assessment (IEMA) Guidelines on Environmental Noise Impact Assessment (2014)

2.3.16 The IEMA guidelines on environmental noise impact assessment set out key principles and advice on how to effectively integrate noise impacts and effects into the consenting process for all types of development, from EIA to smaller scale projects.

2.3.17 The guidelines presents a number of examples of how the potential effects of development proposals upon ambient noise levels may be assessed. Table 2 reproduces an example given in specific relation to the potential effects of traffic generated onto the highway network.

Table 2 Impact of change in noise level (from IEMA guidelines, p. 51)

Descriptor	Level Change
Very Substantial	Greater than 10 dB L_{Aeq} change in sound level perceived at a receptor of great sensitivity to noise.
Substantial	Greater than 5 dB L_{Aeq} change in sound level at a noise sensitive receptor, or a 5 to 9.9 dB L_{Aeq} change in sound level at a receptor of great sensitivity to noise.
Moderate	A 3 to 4.9 dB L_{Aeq} change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5 dB L_{Aeq} change in sound level at a receptor of some sensitivity.
Slight	A 3 to 4.9 dB L_{Aeq} change in sound level at a receptor of some sensitivity.
None/Not Significant	Less than 2.9 dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals.

2.3.18 The values presented in Table 2 above represent the key benchmarks that relate to the human perception of sound. For example, a change of 3 dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10dB(A) change in noise represents a doubling or halving of the perceived noise level.

3 Baseline

3.1 Environmental Context

3.1.1 The site is located in a rural area, approximately 5km ESE of Newtown. Existing, local land-use is predominantly for arable and livestock farming, with few sources of existing sound that contribute to the baseline acoustic climate.

3.1.2 The A489, to the north, is a moderately trafficked road which can be heard most of the time during the day, but only intermittently at night, whilst the B4368, to the west, carries traffic only infrequently.

3.1.3 Other sound sources in the area include farming machinery and operations (tractor movements, land rovers etc.) and livestock. Wind in local vegetation may also provide some masking sound of the proposed development during moderate to high winds (e.g. >5m/s) at some receptors, although this assessment does not rely on this effect.

3.2 Noise Sensitive Receptors

3.2.1 A range of existing, potentially noise-sensitive residential properties have been identified in the vicinity of the proposed development. Of these, representative Noise Sensitive Receptor (NSR) locations have been selected for the assessment, as summarised in Table 3.

Table 3 Noise Sensitive Receptors (NSRs)

		Position, UK National Grid (OSGB36)	
Reference	**Name**	**Easting**	**Northing**
R1	Borfa-wen	316229	289376
R2	Snowfields	317063	289723
R3	Plasgwyn	317125	290074
R4	Ridgeway	316471	290357
R5	The Old Coach House	315864	289639

3.2.2 The NSRs can be viewed in relation to the proposed development site on Figure 2.

3.3 Acoustic Survey

3.3.1 A baseline acoustic survey was undertaken to determine representative, existing sound levels in the vicinity of the proposed development site. Sound levels were recorded at a total of three Sound Monitoring Positions (SMPs) (see Figure 2), for the following periods (complete hours only):

- P1: 13:00 h 23 October – 07:00 h 25 October 2018.
- P2: 14:00 h 23 October – 07:00 h 25 October 2018.
- P3: 13:00 h 30 October – 07:00 h 02 November 2018.

3.3.2 The baseline acoustic survey was completed in full accordance with the guidance contained in chapters 5 and 6 of BS 4142:2014, i.e.:

- All instrumentation used in the survey, including microphones, cables, windscreens and sound level meters, conform to BS EN 61672-1:2013 'Electroacoustics. Sound Level Meters. Specifications' Class 1 for free-field application.
- All field calibrators used in the survey conform to BS EN 60942:2018 'Electroacoustics. Sound calibrators' Class 1.
- All instrumentation used in the survey was laboratory calibrated within the last 2 years, and calibrators within the last 1 year.
- All sound level meters were field calibrated at the beginning and end of each measurement session, with no significant calibration drift recorded.
- Measurement locations were chosen to provide results that would be representative of the ambient sound and background sound at the assessment locations(s), at a height of 1.5m above ground and at least 3.5m from any reflecting surface other than the ground.
- Precautions were taken to minimize the potential influence of all sources of electrical and electromagnetic interference by locating the sound level meters away from these sources.
- Weather conditions during the survey were obtained from a series of local weather stations, and data excluded where:
    - wind speeds exceeded 5 m/s (18kph), average or gust;
    - during periods of significant rainfall; or

- for 2 hours following any periods of significant rainfall.

3.3.3 Calibration details for the equipment used in the baseline acoustics survey are summarized in Table 4.

Table 4 Calibration details – baseline acoustic survey

Acoustic Monitoring Position	Equipment	Model	Serial No.	Date of Calibration	Certificate No.
P1 / P3	Sound Level Meter	NTi XL2	08116	27 Jun 2018	2018-0659
	Microphone	NTi MC230	7632	28 Jun 2018	2018-0663
	Pre-amp	NTi MA220	3327	27 Jun 2018	2018-0661
	Calibrator	Nor 1251	24322	8 Feb 2018	2018-0187
P2	Sound Level Meter	NTi XL2	14017	2 May 2018	2018-0501
	Microphone	NTi MC230	8445	2 May 2018	2018-0503
	Pre-amp	NTi MA220	5330	2 May 2018	2018-0502
	Calibrator	Nor 1251	24322	8 Feb 2018	2018-0187

3.4 Results

Sound Levels

3.4.1 A summary of acoustic monitoring results for each of the three AMPs is shown in Table 5. Full results are presented in Appendix B.

Table 5 Acoustic monitoring results, P1-P3

			Sound Level (dB)			
Marker	**Start Date and Time**	**Duration**	**L_{AFmax}**	**L_{Aeq}**	**L_{A10}**	**L_{A90}**
P1						
Daytime(2)		**1:1:43:00**	**80.0**	**44.8**	**43.6**	**28.1**
Daytime	23/10/2018 12:58	9:43:00	80.0	46.8		
Daytime	24/10/2018 07:00	16:00:00	77.9	43.0		
Night-time (2)		**15:59:10**	**70.7**	**32.1**	**31.2**	**23.2**
Night-time	23/10/2018 23:00	8:00:00	64.2	30.2		
Night-time	24/10/2018 23:00	7:59:10	70.7	33.5		
P2						
Daytime(2)		**1:1:00:00**	**78.9**	**43.7**	**46.5**	**28.8**
Daytime	23/10/2018 13:43	9:00:00	73.1	45.8		
Daytime	24/10/2018 07:00	16:00:00	78.9	41.8		
Night-time (2)		**15:54:57**	**60.3**	**30.5**	**33.6**	**24.0**
Night-time	23/10/2018 23:00	8:00:00	57.5	30.9		
Night-time	24/10/2018 23:00	7:54:57	60.3	30.0		
P3						
Daytime (2)		**1:2:49:23**	**89.1**	**64.1**	**68.5**	**35.2**
Daytime	30/10/2018 12:09	10:49:23	86.7	64		
Daytime	31/10/2018 07:00	16:00:00	89.1	64.2		
Night-time (2)		**16:00:00**	**86.2**	**56.1**	**45.6**	**28.5**
Night-time	30/10/2018 23:00	8:00:00	86.2	56.5		
Night-time	31/10/2018 23:00	8:00:00	84.5	55.7		

Observations

3.4.2 On site observations with respect to the prevailing acoustic climate a teach location were made on deployment and on collection of the acoustic monitoring equipment. A summary of these observations is presented in Table 6.

Table 6 On-site observations (P1-P3)

Position	Date/Time	Observations
P1	23/10/18 13:00	Ambient sound at this location was of a low level. Road traffic sound from the A489 presented semi regularly as background traffic hum. Very occasional vehicle passes were noted on the lane immediately to the south. Livestock (sheep) could occasionally be heard in adjacent fields. There was some sound from wind in trees intermittently during breezier periods.
	25/10/18 07:00	As above, but no sound from wind in trees.
P2	23/10/18 14:00	Ambient sound at this location was of a low level. Road traffic sound from the A489 presented semi regularly as background traffic hum. Livestock (sheep) could occasionally be heard in the same field. There was some sound from wind in trees intermittently during breezier periods.
	25/10/18 07:00	As above, but no sound from wind in trees.
P3	30/10/18 12:00	Road traffic on the A489 was the dominant sound source at this location, with moderatley frequent passes by light and heavy vehicles. No other notable sound sources were observed.
	01/11/18 07:00	As above, no change.

Weather

3.4.3 Weather conditions during the survey have been extrapolated using data from a nearby, personal weather station[2] (PWS). A full summary of weather conditions is presented in Appendix B..

3.4.4 The weather conditions encountered during the baseline survey are considered to have been suitable for acoustic monitoring, and specifically to obtain

[2] INEWTOWN21, 23-25 October 2018 & 30 October – 01 November 2018. Source: www.wunderground.com

representative baseline acoustic data for the selected NSRs. The following were observed:

- Weather conditions during both survey periods were overcast, but dry, with only very occasional, light winds.
- Temperatures during the survey 23-25 October 2018 and 01 November 2018 were typically in the order of 10-15°C during the day, and 5-10°C at night. Temperatures during the survey on 30 October – 31 October 2018 were cooler, at 0-10°C during the day, and 2-5°C below freezing at night.
- There was no precipitation during either of the survey periods.

3.4.5 No data have been excluded from the acoustic survey results for the purposes of determining baseline sound levels.

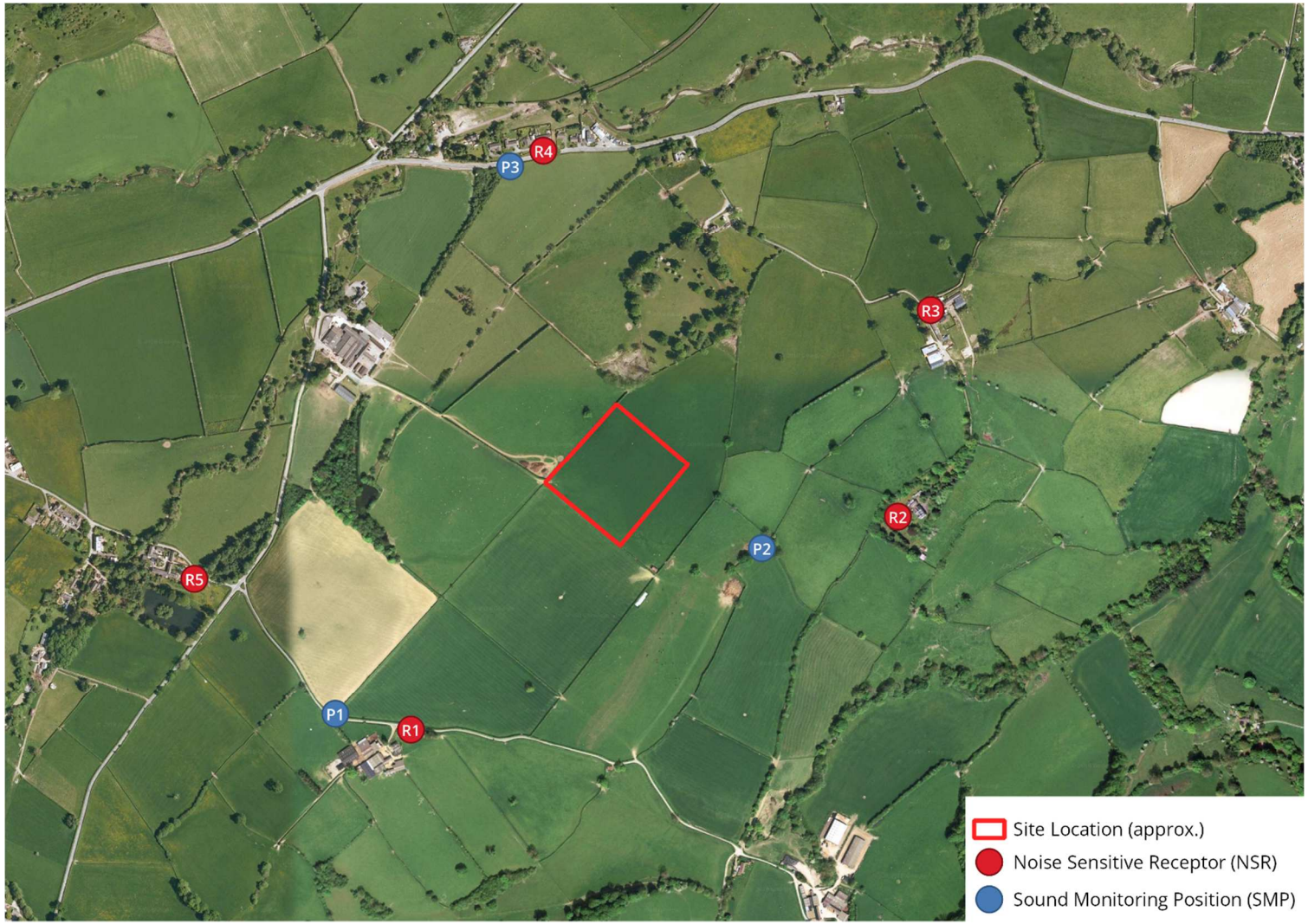


Figure 2 Baseline Survey: 23-25 October & 30 October - 02 November 2018, Positions P1 - P3

4 Development Description

4.1 Overview

4.1.1 As outlined in Section 1.1, the proposal entails the conversion of an existing free-range poultry shed to a broiler unit, and the erection of a further 3 no. broiler units, along with new areas of hard-standing and ancillary plant.

4.1.2 The new broiler units will be sited to the north of the existing free-range shed, and will be accessed via the existing access track to the B4368. Each of the new sheds will consist of:

- A portal frame construction (approximately 98 x 24 m) with insulated box profile metal sheeting on the external walls, covering 100 mm fiberglass insulation between timber purlins.
- Roofs will be of box metal profile construction over a minimum of 140 mm fiberglass insulation between timber purlins.

4.1.3 The existing/converted shed will be similarly insulated., and hence is expected to deliver similar levels of sound insulation.

4.1.4 Each of the new and existing units will be designed to house 50,000 birds on a seven week (42 day) crop cycle, with one thinning on day 32, and clearings on days 37-39.

4.2 Sound Sources

Ventilation

4.2.1 The three new poultry units will be fitted with a computer controlled mechanical tunnel ventilation system, comprising:

- 6 no. Fancom ridge fans (e.g. 3480P or similar);
- 3 no. Fancom plate fans (e.g. 3680 or similar); and
- 14 no. Fancom gable end fans (e.g. 34125W or similar).

4.2.2 The plate fans and gable fans will be mounted on the end gable wall of each shed, and protected by a dust baffle (approximately 2.5m in height), which will provide a measure of sound reduction.

4.2.3 The existing poultry shed will be retrofitted with a similar system, but its ventilation will comprise:

- 12 no. ridge fans; and

- 6 no. gable end fans.

4.2.4 The fans will operate at a variable rate dependent upon the age of the birds, and the ambient temperature with respect to the target temperature within the broiler units.

4.2.5 For most of the year the units will run on ridge fans only, with the plate fans coming on only occasionally in hotter weather. The gable mounted fans would only operate in extreme heat situations.

4.2.6 A summary of ventilation rates for when birds are brooding (at night) and for when temperatures are at or below the target temperature are detailed in Table 7.

Table 7 Minimum ventilation rates – number of fans and % on-time (180 second cycle)

Crop Age	Ridge Fans	Plate Fans	Gable Fans
New Sheds			
Day 7	1 no. (47%)	Not operating	Not operating
Day 39	6 no. (100%)	Not operating	Not operating
Converted Shed			
Day 7	2 no. (47%)	Not operating	Not operating
Day 39	12 no. (100%)	Not operating	Not operating

4.2.7 The ventilation rate when temperatures exceed the target temperature by 3°C or more on day 7, or by 4°C or more on day 39, is detailed in Table 8. This ventilation rate would rarely be required, and would only occur during the daytime, between 08:00 and 22:00 h.

Table 8 Maximum ventilation rates – number of fans and % on-time (180 second cycle)

Crop Age	Ridge Fans	Plate Fans	Gable Fans
New Sheds			
Day 7	6 no. (100%)	3 no. (100%)	4 no. (100%)
Day 39	6 no. (100%)	3 no. (100%)	7 no. (100%)
Converted Shed			
Day 7	12 no. (100%)	None proposed	3 no. (100%)
Day 39	12 no. (100%)	None proposed	6 no. (100%)

Intermittent Activities

4.2.8 Intermittent activities occurring on site during each crop cycle with the potential to generate sound include:

- bedding deliveries - delivery of bedding materials by specialist bulk blower vehicles, blowing of bedding into broiler houses;
- chick deliveries - delivery of chick trays by HGV, unloading of crates and transfer to broiler houses by fork-lift;
- feed deliveries - delivery of feed by specialist feed delivery vehicles, blowing of feed into feed bins;
- mortality collections - collection of mortality trays by LDV, loading by forklift;
- poultry collections (thinning and clearing) -bird catching within the broiler houses, loading of pallets to HGVs by forklift.
- manure collections - loading of manure to HGV by wheeled loading shovel at the front gable entrances;
- cleaning - washing walls/floors within the broiler units using a mobile, high-pressure washing unit.

4.2.9 All such activities would occur during the day, typically between 08:00 h and 16:00 h, with the exception of the catching and loading of poultry (thinning and clearing). These would usually occur at night, typically after 02:00 h (for welfare reasons), and into the early morning.

4.2.10 Many of the above activities would be of a similar nature, using similar items of fixed and mobile plant. The following activities are likely to represent a worst-case for sound emissions during daytime and night-time periods, and are therefore selected for further consideration:

- feed deliveries (daytime only);
- manure collections (daytime only);
- poultry collections (night-time only).

4.2.11 It is expected that both the existing and proposed sheds would provide at least 20dB of sound reduction from inside to outside, and preliminary calculations indicate that no activities occurring within the sheds would be audible off site.

4.2.12 It is assumed that the activities listed in Table 9 would occur in sequence through the crop cycle, and hence would not typically coincide.

HGV Movements

4.2.13 The total volume of traffic movements per crop and the associated peak hourly movements, is summarised in Table 9.

Table 9 Summary of operational HGV movements

Activity	Total Movements per crop	Peak movements per hour
Bedding delivery	4	3
Chick delivery	4	2
Feed delivery	47	3
Mortality collection	8	3
Fuel delivery	6	3
Poultry collection	56	3
Manure	40	3

4.2.14 It is assumed that all HGV traffic would be routed west onto the A489 towards Newtown, and through the town of Kerry. The A489 is a moderately trafficked trunk road carrying both light and heavy vehicles throughout daytime and night-time periods.

4.2.15 HGV movements to and from the site will not be readily distinguishable from the baseline road traffic when travelling on the A489, and hence sound from these movements can be considered anonymous, and of no discernable character.

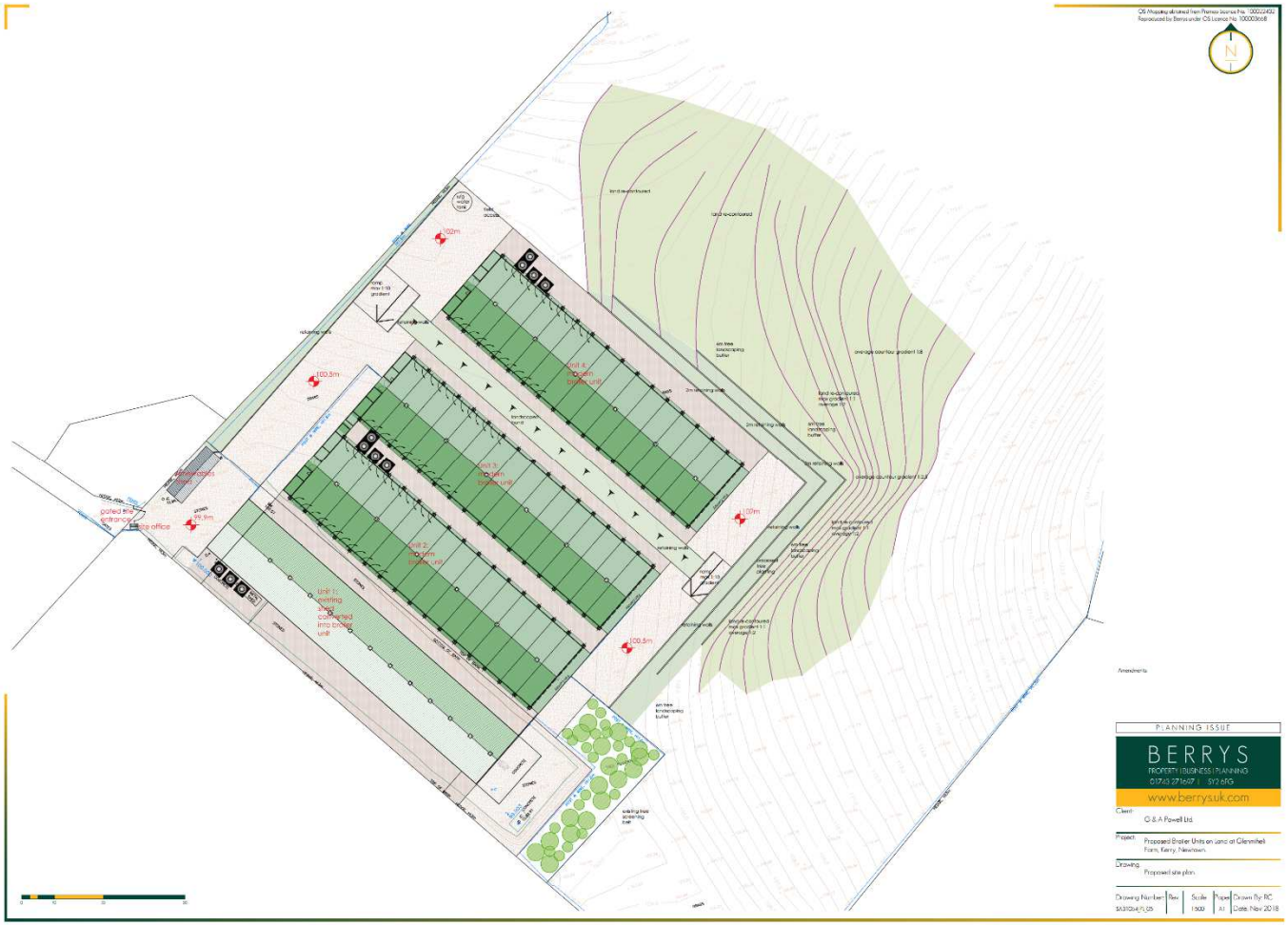


Figure 3 Development layout

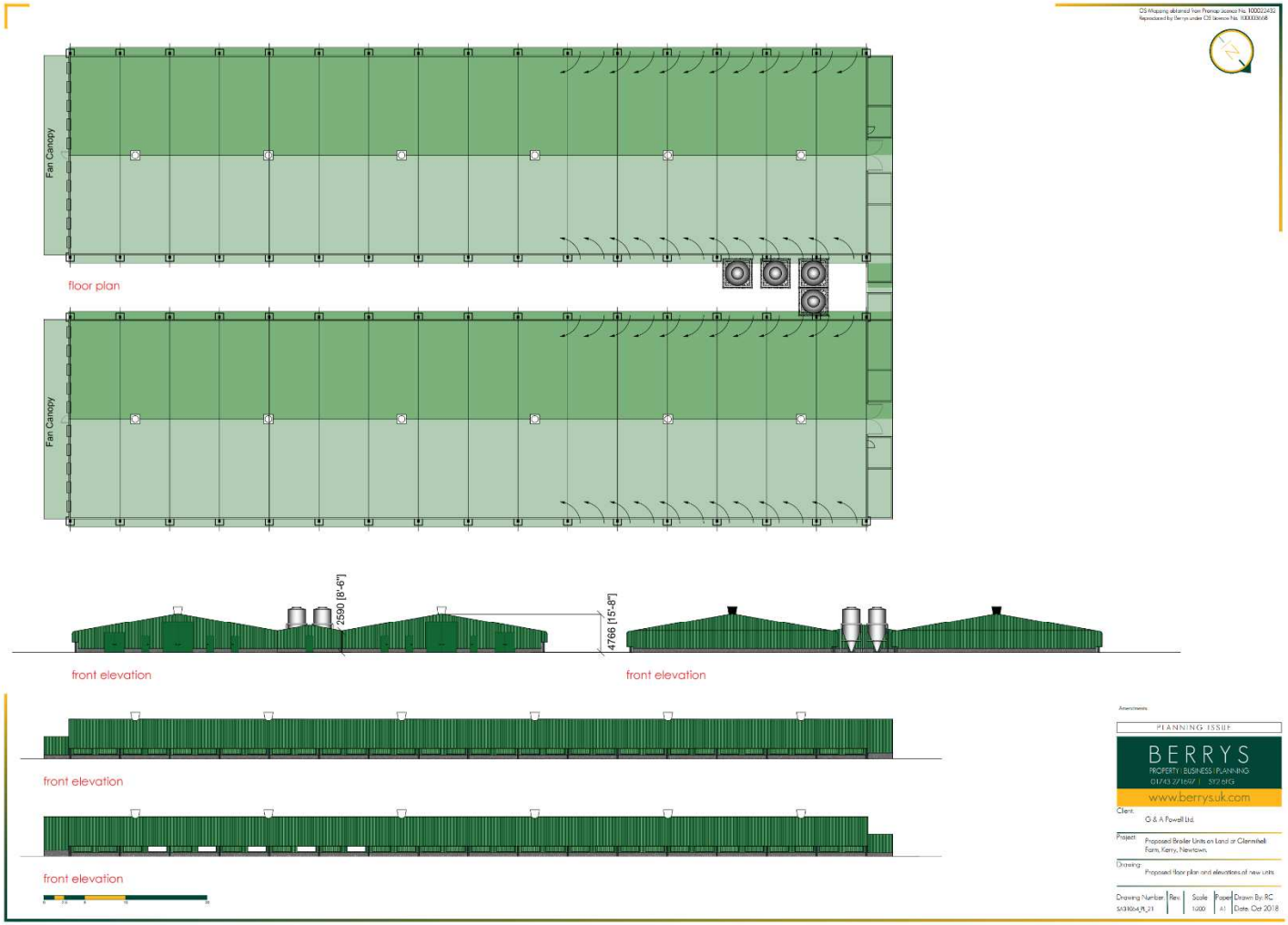


Figure 4 Elevations - new poultry sheds

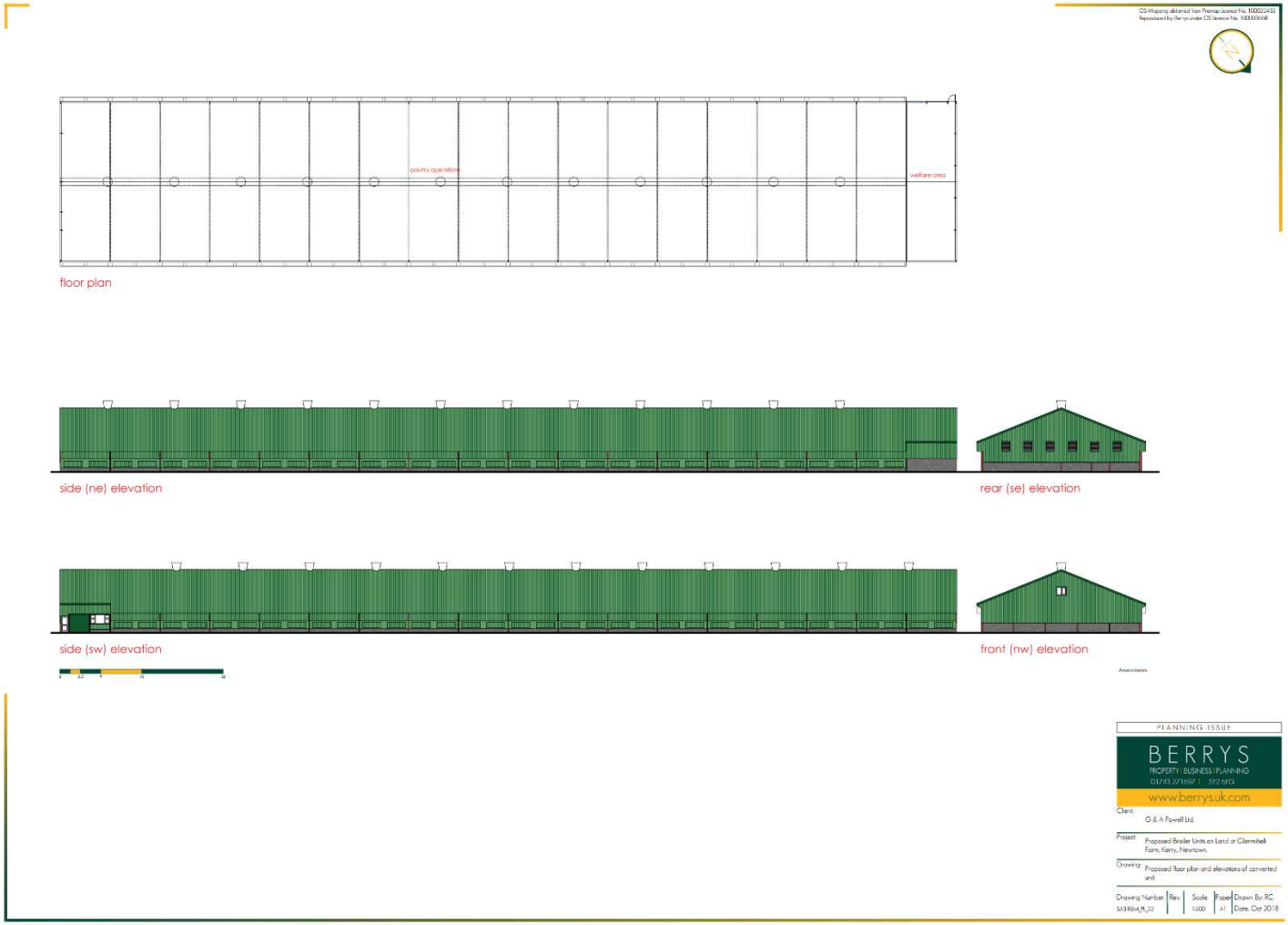


Figure 5 Elevations - existing poultry shed (converted)

5 Acoustic Modelling

5.1 Methodology

5.1.1 An acoustic model of the proposed development and receiving environment was constructed using SoundPLAN version 8.1 (64 bit), an industry standard acoustic modelling software.

5.1.2 SoundPLAN version 8.1 implements in full the sound propagation methodology of ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation'.

5.1.3 The acousticmodel was developed using the Ordnance Survey National Grid reference system (OSGB36), with key input data and settings/assumptions as summarised in Table 10 and Table 11.

Table 10 Acoustic modelling input data.

Item	Source
Ground contours	2m DTM LiDAR (grid squares SO18 & SO19), from www.lle.gov.wales. Converted to 1m contour lines using QGIS version 3.4.2.
Development layout and on-site contours	Berrys application drawings: • SA31064_PL_05 'Proposed Site Plan.' (Nov 2018) • SA31064_PL_21 'Proposed floor plan and elevation of new units.' (Oct 2018) • SA31064_PL_22 'Proposed floor plan and elevation of converted unit.' (Oct 2018) The above were provided in .DWG format, and geo-referenced to OSGB36 using QGIS version 3.4.2.
Receptor locations	Defined by cross-referencing of Google Maps (satellite) aerial data and OS MasterMap. Set to nearest part of property potentially affected by noise (see also Figure 2
Plant locations (all items of fixed and mobile plant)	Defined using one of the following methods: a) import from Berrys application drawings PL_21 / 22 (poultry sheds, ridge fans and feed bins); b) locations estimated from Berrys application drawings PL_21 / 22 (plate fans, gable end fans); or

Item	Source
	c) locus of operation estimated from aerial data / development layout, using professional judgement (HGVS and fork lifts).

Table 11 Acoustic modelling – settings/assumptions

Item	Setting/assumption
Percentage (%) soft ground between sources and receptors	100%, i.e. G = 1.0
Order of reflections	3
Receptor heights	1.5m (Ground) 4.0m (First Floor)

5.2 Source Data

Ventilation

5.2.1 Sound level data for the ventilation system were provided by the manufacturer (Fancom BV), as summarised in Table 12.

Table 12 Source data (L_{wA}), ventilation

Item	Model No.	Sound Power Level, L_w (dB(A))	Source
Ridge Fan	3480P	85	Fancom BV
Plate Fan	3680	79	Fancom BV
Gable Fan	34125W	90	Fancom BV

5.2.2 Additionally, the spectrum shown in Table 13 has been applied to all ventilation sources as typical of that from an axial flow fan.

Table 13 Typical spectrum (A-weighted) – axial flow fan

	Correction from $L_{wA,}$ octave bands							
Type	63	125	250	500	1k	2k	4k	8k
Axial flow fan	-7	-9	-7	-7	-8	-11	-16	-18
Source: https://www.engineeringtoolbox.com/fan-noise-d_61.html								

Intermittent Operations

5.2.3 Sound level data for intermittent operations are taken from a variety of sources, including BS 5528-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise', and SoundPLAN's own database of source levels. A summary is provided in Table 14.

Table 14 Source data (L_{wA}), ventilation

Item	Example	Sound Power Level, L_w (dB(A))	Source
Compact loader (diesel)	CAT 262D	101	Manufacturer
Feed delivery lorry	n/a	107	IPPC SRG 6.02 (Farmiing)

Table 15 Typical spectra (A-weighted)

	Correction from $L_{wA,}$ octave bands							
Type	63	125	250	500	1k	2k	4k	8k
Compact loader (diesel)	-10	-11	-10	-9	-5	-6	-12	n/a
Feed pump	Not available – assumed centre frequency of 500Hz							

HGV Movements

5.2.4 Sound level data for HGVs are taken from BS 5528-1:2009+A1:2014. The following assumptions have been made in relation to sound emissions from road going HGVs:

- A-weighted sound power level of 105 dB Lw;
- frequency spectrum as shown in Table 13;
- speed on site not exceeding 10mph (16kph) including travel between site entrance and the A489; and
- speed on the A489 not exceeding 30mph (48kph).

Table 16 Typical spectrum – lorry, 32t (from BS 5228-1:2009+A1:2014 Table C.11, Item #10)

	L_{wz} (dB), octave bands							
Type	63	125	250	500	1k	2k	4k	8k
Lorry	91	79	77	74	71	69	64	61

5.3 Modelled Scenarios

Ventilation

5.3.1 In order to provide a robust assessment of the likely impacts of the proposed development during both daytime and night-time periods over the course of a typical crop cycle, sound levels for the following ventilation operations have been determined:

- Minimum ventilation, day 7.
- Minimum ventilation, day 39.
- Maximum ventilation, day 39.

Intermittent Operations

5.3.2 Similar to the above, sound levels for the following intermittent operations have been determined:

- Feed deliveries (daytime only).
- Manure collections (daytime only).
- Catching and loading poultry (night-time only).

5.3.3 Both feed deliveries and poultry collections would occur concurrently with operation of the ventilation system. Therefore sound levels for the following cumulative scenarios have also been determined:

- Minimum ventilation, day 7 + feed deliveries.
- Maximum ventilation, day 39 + feed deliveries.
- Minimum ventilation, day 39 + catching and loading.

HGV Movements

5.3.4 With the exception of movements to and from the site on the A489, all HGV movements to and from the site are considered part of the overall site emissions and hence have been included in the scenarios for intermittent operations outlined above.

5.3.5 The potential effects of HGV movements to and from the site on the A489 are considered separately in Section 6.2. These have been modelled using the estimated peak hourly HGV movements shown in Table 9.

5.4 Results

Fixed Plant Operations

5.4.1 Acoustic modelling results for all fixed plant operations are presented in Table 17 (Ground Floor, 1.5m) and Table 18 (First Floor, 4.0m). In accordance with BS 4141:2014, the result are rounded to the nearest whole decibel.

Table 17 Acoustic modelling results (ISO 9613-2), fixed plant $L_{Aeq,\,T}$ (dB) Ground Floor (day)

	Noise Sensitive Receptor (NSR)				
Scenario	**R1**	**R2**	**R3**	**R4**	**R5**
Minimum ventilation, day 7	22	19	18	190	17
Minimum ventilation, day 39	31	27	26	27	25
Maximum ventilation, day 39	33	31	30	27	26

Table 18 Acoustic modelling results (ISO 9613-2), fixed plant $L_{Aeq,\,T}$ (dB) First Floor (night)

	Noise Sensitive Receptor (NSR)				
Scenario	**R1**	**R2**	**R3**	**R4**	**R5**
Minimum ventilation, day 7	23	19	19	20	19
Minimum ventilation, day 39	32	27	26	27	26

Intermittent Operations (including HGV movements on site)

5.4.2 Acoustic modelling results for all intermittent operations are presented in Table 19(Ground Floor, 1.5m) and Table 20 (First Floor, 4.0m), along with the results for cumulative scenarios. Again all results are rounded to the nearest whole decibel.

Table 19 Acoustic modelling results (ISO 9613-2), intermittent operations $L_{Aeq,\,T}$ (dB) Ground Floor (day)

	Noise Sensitive Receptor (NSR)				
Scenario	**R1**	**R2**	**R3**	**R4**	**R5**
Feed deliveries	38	22	29	33	33
Feed deliveries + min. ventilation, day 7	38	23	29	33	33
Feed deliveries + max. ventilation, day 39	39	29	31	34	34
Manure collections	28	18	19	27	26

Table 20 Acoustic modelling results (ISO 9613-2), intermittent operations $L_{Aeq,T}$ (dB) – First Floor (night)

	Noise Sensitive Receptor (NSR)				
Scenario	**R1**	**R2**	**R3**	**R4**	**R5**
Catching and loading	29	19	20	29	28
Catching and loading + min. ventilation, day 39	33	29	27	31	30

HGV Movements

5.4.3 The results of modelling for HGV movements off site (i.e. to and from the site on the A489) are presented in Table 32 and Table 33 (Section 6.2), along with an assessment of the likely impacts during daytime and night-time periods (respectively).

6 Assessment

6.1 Fixed and Mobile Plant on Site

Daytime (07:00 – 23:00 h)

6.1.1 Assessments in accordance with BS 4142:2014 of development related sound levels during the specified daytime scenarios are presented in Table 21 – Table 26Table 27, with a summary presented in Table 27.

6.1.2 As shown in Table 27, the assessment outcome for all daytime scenarios is that a low impact would occur at all NSRs, except during worst-case activities (feed deliveries) at R1.This is based on consideration of the absolute level of specific sound (context, see Paragraph 2.3.4), which in all scenarios would be lower than 35 dB within outdoor living areas, and lower than 23 dB within living rooms with open windows during the day[3].

6.1.3 This compares favorably with a criterion of 50 dB $L_{Aeq, 8hr}$ (WHO Guidelines for Community Noise, see Paragraph 2.3.11) to avoid moderate annoyance in outdoor living areas, and 35 dB $L_{Aeq, 8hr}$ (BS 8233:2014, see Table 1) for ambient noise within living rooms during the day. Rating levels are also at least 10 dB lower than existing ambient levels (see Table 5).

6.1.4 A limited adverse impact is predicted at R1 (Borfa-wen) during feed deliveries, which would occur up to four times per week throughout the crop cycle. In this scenario, the specific level of 39 dB $L_{Aeq, 1hr}$ (27 dB $L_{Aeq, 1hr}$ inside living rooms) still compares favorably with the WHO / BS 8233 criteria, and is also at least 5 dB lower than the existing ambient sound level (see Table 5).

6.1.5 Any residual effects would occur only rarely, and under certain worst-case conditions. The following additional contextual factors may also be taken into account:

- Significant masking sound is likely to be generated by vegetation at all NSRs during windy periods during the day.
- Feed deliveries would only occur for short periods (<20 minutes), and always between 08:00 and 16:00 h.

6.1.6 In summary operation of the proposed development during the day is unlikely to give rise to adverse or significant adverse impacts on amenity at any of the selected NSRs.

[3] Assuming that the attenuation provided by an open window is at least 12 dB (including +3 dB façade correction).

Night-time (23:00 h – 07:00 h)

6.1.7 Assessments in accordance with BS 4142:2014 of development related sound levels during the specified night-time scenarios are presented in Table 28 - Table 30, with a summary presented in Table 31.

6.1.8 As shown in Table 31, the assessment outcome for all night-time scenarios is that a low impact would occur at all NSRs. This is based on consideration of the absolute level of specific sound (context, see Paragraph 2.3.4), which in all scenarios would be lower than 21 dB at night within bedrooms with open windows. This compares favorably with a criterion of 30 dB $L_{Aeq, 8hr}$ (BS 8233:2014, see Table 1) for ambient noise within bedrooms at night.

6.1.9 Any residual effects would occur only rarely, and under certain worst-case conditions. The following additional contextual factors may also be taken into account:

- The occupants of the NSRs are unlikely to have their windows open at night throughout the whole year, and a minimum of 10 dB of additional attenuation would be provided by closed windows.
- Significant masking sound is likely to be generated by vegetation at all NSRs during windy periods at night.
- Catching and handling would only occur for four nights in every seven week cycle.

6.1.10 In summary operation of the proposed development at night is unlikely to give rise to adverse or significant adverse impacts on amenity at any of the selected NSRs.

Daytime (07:00 – 23:00 h)

Table 21 BS4142 assessment (daytime) – minimum ventilation, day 7

	NSR						
Results	**R1**	**R2**	**R3**	**R4**	**R5**	**Relevant Clause**	**Commentary**
Predicted Sound Level (L_{Aeq})	22	19	18	19	17	7.3.6	Predicted as per Section 4, see Table 17. .
Reference Time Interval	1 hour					7.2	Daytime – 1 hour
On-time correction	-3	-3	-3	-3	-3	7.3.14	On-time = 47% (see Table 12).
Specific Sound Level (L_{Aeq})	19	16	15	16	14	7.3	Predicted sound level, corrected to the reference time interval.
Acoustic Feature Correction	3	3	3	3	3	9.2	Intermittent (+3 dB). No tonality or impulsivity.
Rating Level (L_{Ar})	22	19	18	19	17	9.2	
Background Sound Level (L_{A90})	28	29	29	35	28	8	Measured as per Section 3, see Table 5..
Excess of Rating over Background sound level	-6	-10	-11	-16	-11	11	
Initial estimate of impact*	L	L	L	L	L	11	Rating level is lower than background level by at least 6 dB at all NSRs.
Assessment outcome, including context*	L	L	L	L	L	11	See above.
Uncertainty						10	See Section 8.
* L = Low Impact; A = Adverse Impact; SA = Significant Adverse Impact							

Table 22 BS4142 assessment (daytime) – minimum ventilation, day 39

	NSR						
Results	**R1**	**R2**	**R3**	**R4**	**R5**	**Relevant Clause**	**Commentary**
Predicted Sound Level (L_{Aeq})	31	27	26	27	25	7.3.6	Predicted as per Section 4, see Table 17. .
Reference Time Interval	1 hour					7.2	Daytime – 1 hour
On-time correction	0	0	0	0	-0	7.3.14	On-time = 100% (see Table 12).
Specific Sound Level (L_{Aeq})	31	27	26	27	25	7.3	Predicted sound level, corrected to the reference time interval.
Acoustic Feature Correction	0	0	0	0	0	9.2	No intermittency. No tonality or impulsivity.
Rating Level (L_{Ar})	31	27	26	27	25	9.2	
Background Sound Level (L_{A90})	28	29	29	35	28	8	Measured as per Section 3, see Table 5..
Excess of Rating over Background sound level	+3	-2	-3	-8	-3	11	
Initial estimate of impact*	A	L	L	L	L	11	Rating level is +3 dB above background (R1), or less than background by at least 2 dB (R2 – R5).
Assessment outcome, including context*	L	L	L	L	L	11	Both the background levels and rating levels are very low. Specific levels within outdoor living areas would be <35 dB and at least 10 dB lower than existing ambient levels (see Table 5).
Uncertainty						10	See Section 8.
* L = Low Impact; A = Adverse Impact; SA = Significant Adverse Impact							

Table 23 BS4142 assessment (daytime) – maximum ventilation, day 39

	NSR						
Results	**R1**	**R2**	**R3**	**R4**	**R5**	**Relevant Clause**	**Commentary**
Predicted Sound Level (L_{Aeq})	33	31	30	27	26	7.3.6	Predicted as per Section 4, see Table 17. .
Reference Time Interval	1 hour					7.2	Daytime – 1 hour
On-time correction	0	0	0	0	0	7.3.14	On-time = 100% (see Table 12).
Specific Sound Level (L_{Aeq})	33	31	30	27	26	7.3	Predicted sound level, corrected to the reference time interval.
Acoustic Feature Correction	0	0	0	0	0	9.2	No intermittency (on-time = 100%). No tonality or impulsivity.
Rating Level (L_{Ar})	33	31	30	27	26	9.2	
Background Sound Level (L_{A90})	28	29	29	35	28	8	Measured as per Section 3, see Table 5..
Excess of Rating over Background sound level	+5	+2	+1	-7	+2	11	
Initial estimate of impact*	A	A	A	L	A	11	Rating level exceeds the background sound level by up to 5 dB (R1, R2, R3 and R5), or does not exceed background sound level (R4).
Assessment outcome, including context*	L	L	L	L	L	11	Both the background levels and rating levels are very low. Specific levels within outdoor living areas would be <35 dB and at least 10 dB lower than existing ambient levels (see Table 5).
Uncertainty						10	See Section 8.
* L = Low Impact; A = Adverse Impact; SA = Significant Adverse Impact							

Table 24 BS4142 assessment (daytime) – minimum ventilation, day 7 + feed deliveries

	NSR						
Results	**R1**	**R2**	**R3**	**R4**	**R5**	**Relevant Clause**	**Commentary**
Predicted Sound Level (L_{Aeq})	38	22	29	33	33	7.3.6	Predicted as per Section 4, see Table 19.
Reference Time Interval	1 hour					7.2	Daytime – 1 hour
On-time correction	0	0	0	0	0	7.3.14	On time corrections applied in calculation.
Specific Sound Level (L_{Aeq})	38	22	29	33	33	7.3	Predicted Sound Level, corrected to the Reference Time Interval.
Acoustic Feature Correction	0	0	0	0	0	9.2	No intermittency. No tonality or impulsivity.
Rating Level (L_{Ar})	38	22	29	33	33	9.2	
Background Sound Level (L_{A90})	28	29	29	35	28	8	Measured as per Section 3, see Table 5..
Excess of Rating over Background sound level	+10	-7	+0	-2	+5	11	
Initial estimate of impact*	SA	L	L	L	A	11	Rating level exceeds background level by +10 dB (R1), +5 dB (R2), or does not exceed background level (R2 – R4).
Assessment outcome, including context*	A	L	L	L	L	11	Excepting at R1 both the background levels and rating levels are very low. At R1 there is likely to be a limited, adverse impact occurring for 20 minutes, up to four times per week.
Uncertainty						10	See Section 8.
* L = Low Impact; A = Adverse Impact; SA = Significant Adverse Impact							

Table 25 BS4142 assessment (daytime) – maximum ventilation, day 39 + feed deliveries

	NSR						
Results	**R1**	**R2**	**R3**	**R4**	**R5**	**Relevant Clause**	**Commentary**
Predicted Sound Level (L_{Aeq})	39	29	31	34	34	7.3.6	Predicted as per Section 4, see Table 19.
Reference Time Interval	1 hour					7.2	Daytime – 1 hour
On-time correction	0	0	0	0	0	7.3.14	On time corrections applied in calculation.
Specific Sound Level (L_{Aeq})	39	29	31	34	34	7.3	Predicted Sound Level, corrected to the Reference Time Interval.
Acoustic Feature Correction	0	0	0	0	0	9.2	No intermittency. No tonality or impulsivity.
Rating Level (L_{Ar})	39	29	31	34	34	9.2	
Background Sound Level (L_{A90})	28	29	29	35	28	8	Measured as per Section 3, see Table 5..
Excess of Rating over Background sound level	+11	+0	+2	+1	+6	11	
Initial estimate of impact*	SA	L	L	L	A	11	Rating level exceeds background level by +11 dB (R1), +6 dB (R2), or is similar to background level (R2 – R4).
Assessment outcome, including context*	A	L	L	L	L	11	Excepting at R1 both the background levels and rating levels are very low. At R1 there is likely to be a limited, adverse impact occurring for 20 minutes, up to four times per week.
Uncertainty						10	See Section 8.
* L = Low Impact; A = Adverse Impact; SA = Significant Adverse Impact							

Table 26 BS4142 assessment (daytime) – manure collections

	NSR						
Results	**R1**	**R2**	**R3**	**R4**	**R5**	**Relevant Clause**	**Commentary**
Predicted Sound Level (L_{Aeq})	28	18	19	27	26	7.3.6	Predicted as per Section 4, see Table 19.
Reference Time Interval	1 hour					7.2	Daytime – 1 hour
On-time correction	28	18	19	27	26	7.3.14	On time corrections applied in calculation.
Specific Sound Level (L_{Aeq})	28	18	19	27	26	7.3	Predicted Sound Level, corrected to the Reference Time Interval.
Acoustic Feature Correction	+3	+3	+3	+3	+3	9.2	Intermittent (+3 dB). No tonality or impulsivity.
Rating Level (L_{Ar})	31	21	22	30	29	9.2	
Background Sound Level (L_{A90})	28	29	29	35	28	8	Measured as per Section 3, see Table 5..
Excess of Rating over Background sound level	+3	-9	-8	-5	+1	11	
Initial estimate of impact*	A	L	L	L	A	11	Rating level exceeds background level by +3 dB (R1), is less than background level (R2 – R4) or is similar to background level (R5).
Assessment outcome, including context*	L	L	L	L	L	11	Both the background levels and rating levels are very low. Specific levels within outdoor living areas would be <35 dB and at least 10 dB lower than existing ambient sound levels (see Table 5).
Uncertainty						10	See Section 8.
* L = Low Impact; A = Adverse Impact; SA = Significant Adverse Impact							

Table 27 Assessment summary table (BS 4142:2014), daytime

Scenario	Initial Estimate of Impact*					Assessment Outcome, Including Context*					Commentary
Minimum ventilation, day 7	L	L	L	L	L	L	L	L	L	L	Rating level is lower than background level by at least 6 dB at all NSRs.
Minimum ventilation, day 39	A	L	L	L	L	L	L	L	L	L	Both the background levels and rating levels are very low. Specific levels within outdoor living areas would be <35 dB and at least 10 dB lower than existing ambient sound levels (see Table 5).
Maximum ventilation, day 39	A	A	A	L	A	L	L	L	L	L	Both the background levels and rating levels are very low. Specific levels within outdoor living areas would be <35 dB and at least 10 dB lower than existing ambient sound levels (see Table 5).
Minimum ventilation, day 7 + feed deliveries	SA	L	L	L	A	A	L	L	L	L	Excepting at R1 both the background levels and rating levels are very low. At R1 there is likely to be a limited, adverse impact occurring for 20 minutes, up to four times per week.
Maximum ventilation, day 39 + feed deliveries	SA	L	L	L	A	A	L	L	L	L	See above.
Manure collections	A	L	L	L	A	L	L	L	L	L	Both the backgroundlevels and rating levels are very low. Specifc levels within outdoor living areas would be <35 dB and at least 10 dB lower than existing ambient sound levels (see Table 5).
* L = Low Impact; A = Adverse Impact; SA = Significant Adverse Impact											

Night-time (23:00 h – 07:00 h)

Table 28 BS4142 assessment (night-time) – minimum ventilation, day 7

	NSR						
Results	**R1**	**R2**	**R3**	**R4**	**R5**	**Relevant Clause**	**Commentary**
Predicted Sound Level (L_{Aeq})	23	19	19	20	19	7.3.6	Predicted as per Section 4, see Table 18.
Reference Time Interval	15mins					7.2	Night-time = 15 mins.
On-time correction	-3	-3	-3	-3	-3	7.3.14	On-time = 47% (see Table 12).
Specific Sound Level (L_{Aeq})	20	16	16	17	16	7.3	Predicted sound level, corrected to the reference time interval.
Acoustic Feature Correction	+3	+3	+3	+3	+3	9.2	Intermittent fan operation (+3 dB). No tonality or impulsivity.
Rating Level (L_{Ar})	23	19	19	20	19	9.2	
Background Sound Level (L_{A90})	23	24	24	29	23	8	Measured as per Section 3, see Table 5.
Excess of Rating over Background sound level	+0	-5	-5	-9	-4	11	
Initial estimate of impact*	L	L	L	L	L	11	Rating level is below background level at all NSRs.
Assessment outcome, including context*	L	L	L	L	L	11	See above.
Uncertainty						10	See Section 8.

* L = Low Impact; A = Adverse Impact; SA = Significant Adverse Impact

† Assuming that the attenuation provided by an open window is at least 12 dB (including +3 dB façade correction).

Table 29 BS4142 assessment (night-time) – minimum ventilation, day 39

	NSR						
Results	**R1**	**R2**	**R3**	**R4**	**R5**	**Relevant Clause**	**Commentary**
Predicted Sound Level (L_{Aeq})	32	27	26	27	26	7.3.6	Predicted as per Section 4, see Table 18.
Reference Time Interval	15mins					7.2	Night-time = 15 mins.
On-time correction	0	0	0	0	0	7.3.14	On-time = 100% (see Table 12).
Specific Sound Level (L_{Aeq})	32	27	26	27	26	7.3	Predicted sound level, corrected to the reference time interval.
Acoustic Feature Correction	0	0	0	0	0	9.2	No intermittency (on-time = 100%). No tonality or impulsivity.
Rating Level (L_{Ar})	32	27	26	27	26	9.2	
Background Sound Level (L_{A90})	23	24	24	29	23	8	Measured as per Section 3, see Table 5.
Excess of Rating over Background sound level	+9	+3	+2	+0	+3	11	
Initial estimate of impact*	SA	A	A	L	A	11	Rating level exceeds background level by +9 dB (R1), by 2-3 dB (R2, R3, R5) or does not exceed background level (R4).
Assessment outcome, including context*	L	L	L	L	L	11	Both the background levels and rating levels are very low. Specific levels within bedrooms with open windows are likely to be <20 dB[†].
Uncertainty						10	See Section 8.

* L = Low Impact; A = Adverse Impact; SA = Significant Adverse Impact

[†] Assuming that the attenuation provided by an open window is at least 12 dB (including +3 dB façade correction).

Table 30 BS4142 assessment (night-time) – catching and loading + minimum ventilation, day 39

	NSR						
Results	**R1**	**R2**	**R3**	**R4**	**R5**	**Relevant Clause**	**Commentary**
Predicted Sound Level (L_{Aeq})	33	29	27	31	30	7.3.6	Predicted as per Section 4, see Table 20.
Reference Time Interval	15mins					7.2	Night-time = 15 mins.
On-time correction	0	0	0	0	0	7.3.14	On-times already applied.
Specific Sound Level (L_{Aeq})	33	29	27	31	30	7.3	Predicted Sound Level, corrected to the Reference Time Interval.
Acoustic Feature Correction	3	3	3	3	3	9.2	Intermittent operations. No tonality or impulsivity.
Rating Level (L_{Ar})	36	32	30	34	33	9.2	
Background Sound Level (L_{A90})	23	24	24	29	23	8	Measured as per Section 3, see Table 5.
Excess of Rating over Background sound level	+13	+8	+6	+5	+10	11	
Initial estimate of impact*	SA	SA	A	A	SA	11	Rating level exceeds background level by up to +13 dB.
Assessment outcome, including context*	L	L	L	L	L	11	Both the background levels and rating levels are very low. Specific levels within bedrooms are likely to be <20 dB† (excepting R1 @ 21 dB). Would occur infrequently (max. 4 nights per 7 weeks).
Uncertainty						10	See Section 8.

* L = Low Impact; A = Adverse Impact; SA = Significant Adverse Impact

† Assuming that the attenuation provided by an open window is at least 12 dB (including +3 dB façade correction).

Table 31 Assessment summary table (BS 4142:2014), night-time

Scenario	Initial Estimate of Impact*					Assessment Outcome, Including Context*					Commentary
Minimum ventilation, day 7	L	L	L	L	L	L	L	L	L	L	Rating level is below background level at all NSRs.
Minimum ventilation, day 39	SA	A	A	L	A	L	L	L	L	L	Both the background levels and rating levels are very low. Specific sound levels within bedrooms with open windows are likely to be <20 dB[†].
Catching and loading + min. ventilation, day 39	SA	SA	A	A	SA	L	L	L	L	L	Both the background levels and rating levels are very low. Specific levels within bedrooms are likely to be <20 dB[†] (excepting R1 @ 21 dB). Would occur infrequently (max. 4 nights per 7 weeks).

* L = Low Impact; A = Adverse Impact; SA = Significant Adverse Impact

[†] Assuming that the attenuation provided by an open window is at least 12 dB (including +3 dB façade correction).

6.2 Road Traffic

6.2.1 Baseline road traffic sound levels in the vicinity of the A489 are available from the baseline acoustic survey data at P3, at a distance of 5m to the carriageway edge. The likely contribution of development related, road going HGVs is presented in Table 32 and Table 33 ,along with an assessment of the likely impacts during daytime and night-time periods (respectively).

6.2.2 As shown in Table 32, the contribution of development related traffic would not increase daytime hourly road traffic sound levels from the A489 by more than 0.1 dB. Therefore there would be no impact as a result of these additional movements.

6.2.3 During the night-time, as shown in Table 33, baseline road traffic sound levels are relatively low. The contribution of development related traffic between 02:00 and 04:00 h may increase hourly road traffic sound levels from the A489 by up to 3.9 dB, resulting in a slight impact at some residences.

6.2.4 It should be noted that sound from vehicles travelling to and from the site would not be distinguishable from existing HGV movements on the route, and that existing adaptations by residents (sleeping with windows closed etc.) would be equally effective for controlled sound from development-related traffic.

6.2.5 In summary operation of the proposed development during the daytime and night-time is unlikely to give rise to adverse or significant adverse impacts on amenity at any residential property located at or close to the A489.

Table 32 Road traffic impacts – daytime / change in hourly ambient sound $L_{Aeq,T}$ (dB)

Time	Measured Ambient Sound Level (min.)	Peak HGV Movements (Development)	Predicted Contribution to Ambient Level	Total Ambient Sound Level, With Development	Change	Impact
07:00 - 08:00	65.3	0	0	65.3	0.0	None
08:00 - 09:00	65.8	0	0	65.8	0.0	None
09:00 - 10:00	64.8	3	48	64.9	0.1	None
10:00 - 11:00	64	3	48	64.1	0.1	None
11:00 - 12:00	64.1	3	48	64.2	0.1	None
12:00 - 13:00	63.8	3	48	63.9	0.1	None
13:00 - 14:00	64.4	3	48	64.5	0.1	None
14:00 - 15:00	64.7	3	48	64.8	0.1	None
15:00 - 16:00	65.2	3	48	65.3	0.1	None
16:00 - 17:00	66.3	0	0	66.3	0.0	None
17:00 - 18:00	65.9	0	0	65.9	0.0	None
18:00 - 19:00	63.1	0	0	63.1	0.0	None
19:00 - 20:00	62.2	0	0	62.2	0.0	None
20:00 - 21:00	59.9	0	0	59.9	0.0	None
21:00 - 22:00	59.6	0	0	59.6	0.0	None
22:00 - 23:00	58.2	0	0	58.2	0.0	None

Table 33 Road traffic impacts – night-time / change in hourly ambient sound $L_{Aeq,T}$ (dB)

Time	Measured Ambient Sound Level (min.)	Peak HGV Movements (Development)	Predicted Contribution to Ambient Level	Total Ambient Sound Level, With Development	Change	Impact
23:00 - 00:00	52.7	0	0	52.7	0.0	None
00:00 - 01:00	48.5	0	0	48.5	0.0	None
01:00 - 02:00	44.6	0	0	44.6	0.0	None
02:00 - 03:00	46.5	3	48	50.4	3.9	Slight
03:00 - 04:00	48.3	3	48	51.2	2.9	Slight
04:00 - 05:00	53.7	3	48	54.8	1.1	None
05:00 - 06:00	57.2	3	48	57.7	0.5	None
06:00 - 07:00	61.7	3	48	61.9	0.2	None

7 Mitigation

7.1.1 The assessment outlined in Section 6 shows that the impact of any site-generated sound from the operation of the proposed broiler unit is insignificant, or that limited adverse impacts may occur at specific times. These conclusions are based on the following mitigation measures being included in the design:

- Ridge mounted fans on the new and existing poultry sheds having a sound power level of 85 dB(A) or lower.
- Plate fans on the new poultry sheds having a sound power level of 79 dB(A) or lower.
- Gable end fans on the new and existing poultry sheds having a sound power level of 90 dB(A) or lower.
- Feed hopper fill alarms via text or telephone calls from central control only – no audible alarms on site.
- Broadband reversing alarms only during the day for HGVs and skid loaders. No alarms at night (catching and loading).
- With the exception of catching and loading, all deliveries to and collections from the site to be undertaken during daytime hours.

7.1.2 In addition, the following best practice measures may be considered:

- Use full electric skid loaders for all loader and handling operations, which would reduce sound emissions considerably with respect to diesel powered units.
- Ensure that all equipment and plant is well maintained.
- Consider the positioning and working areas of all mobile plant to maximise the screening provided by buildings to the worst affected receptors.
- Position HGV feed pump on bin side of vehicle so that vehicle body provides screening to worst affected receptors during feed deliveries.

8 Uncertainty

8.1.1 In accordance with Section 10 of BS 4142:2014 the level of uncertainty in the data and calculations used in this assessment has been considered, and all reasonable steps to reduce that uncertainty have been applied.

8.1.2 BS 4142:2014 provides a series of examples of potential sources of uncertainty in both measurements and calculations undertaken in accordance with the standard. These are reproduced in Table 34 and Table 35, respectively, along with a summary of steps taken to manage and reduce levels of uncertainty from these sources.

Table 34 Management of uncertainty in measurements

Source of uncertainty	Steps taken to reduce and minimise
The complexity of the sound source and the level of variability in sound emission from the source.	n/a – all sound levels from the development are predicted (see Table 35).
The complexity and level of variability of the residual acoustic environment.	Baseline measurements were completed over the course of a minimum of two full days and nights during typical operating conditions for sound sources in the baseline.
The level of residual sound in the presence of the specific sound at the measurement location.	n/a – all sound levels from the development are predicted (see Table 35).
The location(s) selected for taking the measurements.	Baseline measurements were completed at the closest available locations to the NSRs, and are considered representative.
The distance between sources of sound and the measurement location and intervening ground conditions.	Baseline measurements were undertaken at representative locations of similar distance to the key sound sources in the baseline (primarily, the A489).
The number of measurements taken.	See above (complexity and level of variability of residual acoustic environment).
The measurement time intervals.	Baseline sound levels were logged in 1s periods and averaged to appropriate reference time intervals (1 h day, 15 mins night).
The range of times when the measures have been taken.	See above (complexity and level of variability of residual acoustic environment).
The range of suitable weather conditions during which measurements have been taken.	The baseline survey was undertaken during calm and dry conditions, with no adverse wind vectors or other adverse meteorological effects.

Source of uncertainty	Steps taken to reduce and minimise
The measurement method and variability between different practitioners in the way the method is applied.	Measurements were undertaken in accordance with BS 4142:2014.
The level of rounding of each measurement recorded.	All levels rounded to nearest whole decibel, in accordance with BS 4142:2014.
The instrumentation used.	All measurements of the residual acoustic environment completed using Class 1 instrumentation.

Table 35 Management of uncertainty in calculations

Source of uncertainty	Steps taken to reduce and minimise
The measured sound levels.	See above (Table 35).
The operation or sound emission characteristics of the specific sound source and any assumed sound power levels.	The sound emission characteristics of all operations, in terms of their duration, frequency content and other factors such as intermittency have been considered in detail. All sound power levels used have been derived from reliable sources in consultation with project suppliers and the Client.
The calculation method used.	All calculations were undertaken in accordance with ISO 9613-2, an internationally recognized standard for calculation sound propagation, and prescribed by BS 4142:2014.
Simplifying the real situation to “fit” the model (user influence on modelling).	Whilst an element of professional judgement is inevitable, care has been taken to ensure that the model represents the worst-case potential effects of the operation.
Error in the calculation process.	SoundPLAN 8.1 produces a full output of all calculations and corrections applied in determining sound propagation. These were reviewed in full to ensure that the software is functioning correctly with respect to the ISO 9613-2 methodology.

9 Conclusions

9.1 Summary

9.1.1 In relation to sound generated by operation of the proposed development (fixed and mobile plant on site), an assessment undertaken in the context of all relevant national and local policy/guidance, and in particular based on the guidance of BS 4142:2014 concluded that:

- operation of the proposed development during the day is unlikely to give rise to adverse or significant adverse impacts on amenity at any of the selected NSRs; and
- operation of the proposed development at night is unlikely to give rise to adverse or significant adverse impacts on amenity at any of the selected NSRs.

9.1.2 In relation to the additional traffic movements likely to be generated on the A489 during the daytime and night-time as a result of operation of the proposed development, it is concluded that this is unlikely to give rise to significant adverse impacts on amenity at any residential property located at or close to the A489.

9.2 Recommendations

9.2.1 It is recommended that the proposed development be consented with no restrictions or conditions on operation further to those assumed in the development description or mitigation sections of this report (Section 4 and Section 7), respectively.

Appendix A - Acoustic Terminology

General

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel (dB) scale is used. The decibel scale typically ranges from 0dB (the threshold of hearing) to over 140dB (the threshold of pain). An indication of the range of sound levels commonly found in the environment is given in following table.

Sound Level	Location
0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 40 dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a car
60 to 70 dB(A)	Typical high street
70 to 90 dB(A)	Inside factory
100 to 110 dB(A)	Burglar alarm at 1m away
110 to 130 dB(A)	Jet aircraft on take off
140 dB(A)	Threshold of pain

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of perceived loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. The most widely used weighting mechanism, that best corresponds to the response of the human ear, is the 'A-weighting' scale. This is widely used for environmental noise measurements, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

Acoustic Terminology

A-weighting

the most commonly used of a family of curves defined in BS EN 61672 to account for the relative loudness perceived by the human ear of sound at different frequencies

acoustic environment

sound from all sound sources as modified by the environment

ambient sound

totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far

NOTE: The ambient sound comprises the residual sound and the specific sound when present.

ambient sound level, $L_A = L_{Aeq, T}$

equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T

NOTE: The ambient sound level is a measure of the residual sound and the specific sound when present.

background sound level, $L_{A90, T}$

A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels

decibel (dB)

a unit of measurement used to express the ratio of one value of a physical property to another on a logarithmic scale

equivalent continuous A-weighted sound pressure level, $L_{Aeq,\,T}$

value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, T = $t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

$$L_{Aeq,T} = 10 \log_{10} \left\{ (1/T) \int_{t_1}^{t_2} [p_A(t)^2 / {p_0}^2] \, dt \right\}$$

where:

p_0 is the reference sound pressure level (20 μPa); and

$p_A(t)$ is the instantaneous A-weighted sound pressure level at time t

NOTE: The equivalent continuous A-weighted sound pressure level is quoted to the nearest whole number of decibels.

maximum sound level, $L_{Amax,\,T}$

the highest A-weighted sound pressure level that is exceeded over a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels

measurement time interval, T_m

total time over which measurements are taken

NOTE: This may consist of the sum of a number of non-contiguous, short-term measurement time intervals.

rating level, $L_{Ar,\,Tr}$

specific sound level plus any adjustment for the characteristic features of the sound

reference time interval, T_r

specified interval over which the specific sound level is determined

NOTE: This is 1 h during the day from 07:00 h to 23:00 h and a shorter period of 15 min at night from 23:00 h to 07:00 h.

residual sound

ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound

residual sound level, $L_r = L_{Aeq, T}$

equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T

road traffic sound level, $L_{A10, T}$

A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 10% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels

sound pressure

the local pressure deviation from the ambient (average or equilibrium) atmospheric pressure, caused by a sound wave

sound pressure level, L_p

a logarithmic measure of the effective pressure of a sound relative to a reference value p_0 (normally atmospheric pressure, i.e. 2×10^{-5} Pa)

specific sound level, $L_s = L_{Aeq, T}$

equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r

specific sound source

sound source being assessed

BS 4142:2014 Rating Level

Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. BS 4142:2014 provides a range of methodologies for determining appropriate corrections, with the most commonly used being known as the 'subjective method'.

Where appropriate, a rating penalty for the sound is established based on a subjective assessment of its characteristics. This would be appropriate where a new sound source cannot be measured because it is only proposed at that time.

The specific sound level is corrected if a tone, impulse or other characteristic occurs, or is expected to be present. The subjective prominence of the character of the specific sound at the noise-sensitive locations is considered, along with the extent to which such acoustically distinguishing characteristics will attract attention.

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, 4 dB where 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 environmental, a penalty of 3 dB can be applied.

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

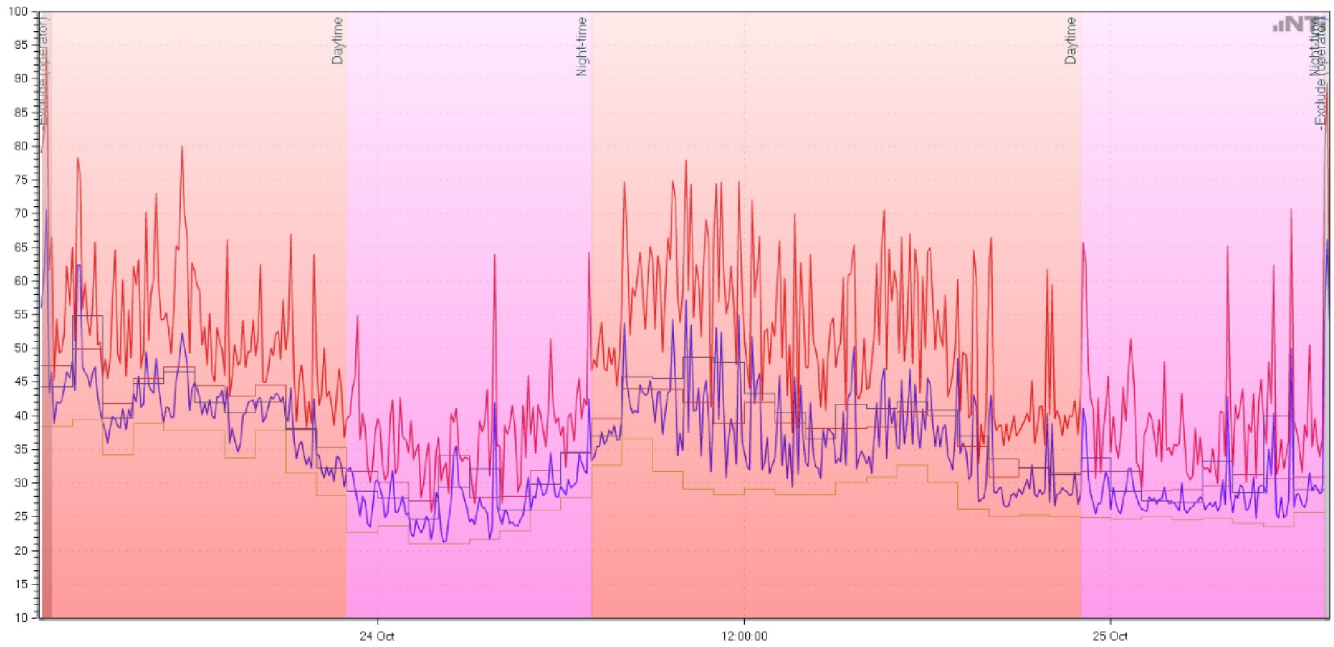
combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Appendix B - Baseline Survey

Noise Monitoring Data (P1), 23-25 October 2018

Start: 2018-10-23 12:58:46

End: 2018-10-25 07:05:03



LAFmax_dt LAeq_dt LAeq_60' L 10.0 % L 90.0 %

Configuration

Device Info:	XL2, SNo. A2A-08116-E0, FW3.11 Type Approved
Mic Type:	NTi Audio M2230, SNo. 3327, User calibrated 2018-10-23 12:55
Mic Sensitivity:	43.5 mV/Pa
Range:	0 - 100 dB
Ln based on:	LAeq_dt

Results

Type	Start Date and Time	Duration	LAFmax [dB]	LAeq [dB]	L 10.0 % [dB]	L 90.0 % [dB]
Recorded		**1 18:06:17**	**94.5**	**47.3**		
-Exclude (operator) (2)		**00:24:07**	**94.5**	**65.6**	**66.5**	**39.6**
-Exclude (operator)	2018-10-23 12:58:46	00:18:14	94.5	65.6		
-Exclude (operator)	2018-10-25 06:59:10	00:05:53	89.3	65.8		
Project Result		**1 17:42:10**	**80.0**	**42.9**	**41.7**	**24.8**

Markers

Type	Start Date and Time	Duration	LAFmax [dB]	LAeq [dB]	L 10.0 % [dB]	L 90.0 % [dB]
Daytime (2)		**1 01:43:00**	**80.0**	**44.8**	**43.6**	**28.1**
Daytime	2018-10-23 12:58:46	09:43:00	80.0	46.8		
Daytime	2018-10-24 07:00:00	16:00:00	77.9	43.0		
Night-time (2)		**15:59:10**	**70.7**	**32.1**	**31.2**	**23.2**
Night-time	2018-10-23 23:00:00	08:00:00	64.2	30.2		
Night-time	2018-10-24 23:00:00	07:59:10	70.7	33.5		

Audit Intervals

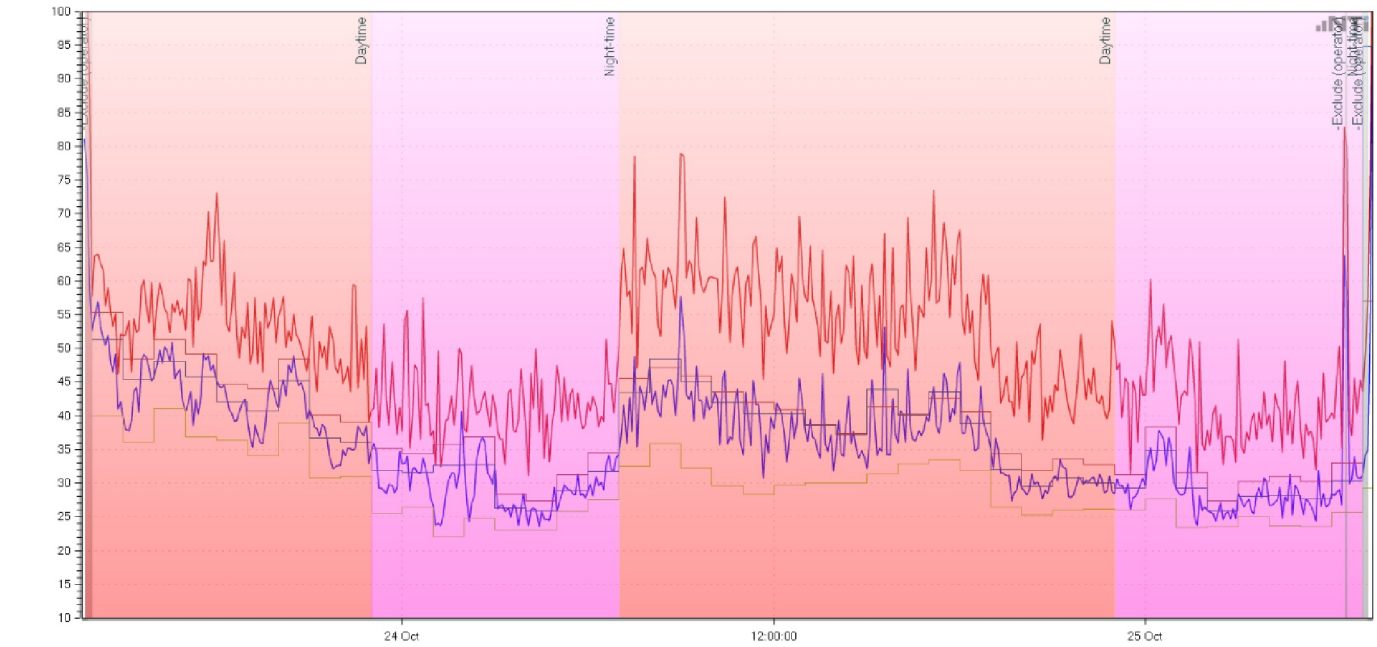
Type	Start Date and Time	Duration	LAFmax [dB]	LAeq [dB]	L 10.0 % [dB]	L 90.0 % [dB]
60'	**2018-10-23 12:00:00**	**00:00:00**	**---**	**---**	**---**	**---**
60'	**2018-10-23 13:00:00**	**00:43:00**	**65.0**	**44.3**	**47.4**	**38.5**
60'	**2018-10-23 14:00:00**	**01:00:00**	**78.3**	**54.9**	**49.9**	**39.4**
60'	**2018-10-23 15:00:00**	**01:00:00**	**64.6**	**39.7**	**41.8**	**34.3**
60'	**2018-10-23 16:00:00**	**01:00:00**	**73.0**	**44.8**	**45.6**	**38.8**
60'	**2018-10-23 17:00:00**	**01:00:00**	**80.0**	**46.5**	**47.3**	**37.8**
60'	**2018-10-23 18:00:00**	**01:00:00**	**59.4**	**42.0**	**44.4**	**37.9**
60'	**2018-10-23 19:00:00**	**01:00:00**	**66.1**	**40.4**	**42.9**	**33.8**
60'	**2018-10-23 20:00:00**	**01:00:00**	**62.4**	**42.0**	**44.6**	**37.9**
60'	**2018-10-23 21:00:00**	**01:00:00**	**66.9**	**38.1**	**38.0**	**31.5**
60'	**2018-10-23 22:00:00**	**01:00:00**	**50.1**	**32.2**	**35.4**	**28.2**
60'	**2018-10-23 23:00:00**	**01:00:00**	**54.9**	**28.8**	**31.7**	**22.7**
60'	**2018-10-24 00:00:00**	**01:00:00**	**42.7**	**27.7**	**30.2**	**23.7**
60'	**2018-10-24 01:00:00**	**01:00:00**	**39.3**	**24.7**	**27.4**	**21.1**
60'	**2018-10-24 02:00:00**	**01:00:00**	**41.1**	**29.4**	**34.1**	**21.1**
60'	**2018-10-24 03:00:00**	**01:00:00**	**63.9**	**32.1**	**27.9**	**21.7**
60'	**2018-10-24 04:00:00**	**01:00:00**	**46.0**	**26.1**	**28.0**	**22.9**
60'	**2018-10-24 05:00:00**	**01:00:00**	**51.4**	**29.9**	**31.9**	**26.0**
60'	**2018-10-24 06:00:00**	**01:00:00**	**64.2**	**34.4**	**34.6**	**27.9**
60'	**2018-10-24 07:00:00**	**01:00:00**	**56.2**	**37.0**	**39.6**	**32.6**
60'	**2018-10-24 08:00:00**	**01:00:00**	**74.7**	**45.8**	**44.1**	**36.6**
60'	**2018-10-24 09:00:00**	**01:00:00**	**74.9**	**45.5**	**43.9**	**31.7**
60'	**2018-10-24 10:00:00**	**01:00:00**	**77.9**	**48.7**	**42.0**	**29.1**

60'	2018-10-24 11:00:00	01:00:00	74.8	47.9	38.8	28.3
60'	2018-10-24 12:00:00	01:00:00	72.0	43.3	42.0	29.1
60'	2018-10-24 13:00:00	01:00:00	69.9	40.5	39.0	28.3
60'	2018-10-24 14:00:00	01:00:00	63.9	36.5	38.1	28.3
60'	2018-10-24 15:00:00	01:00:00	65.3	41.7	38.1	30.2
60'	2018-10-24 16:00:00	01:00:00	70.5	41.1	38.4	30.9
60'	2018-10-24 17:00:00	01:00:00	67.0	42.1	40.6	32.6
60'	2018-10-24 18:00:00	01:00:00	64.9	40.9	39.9	30.2
60'	2018-10-24 19:00:00	01:00:00	64.6	36.9	35.5	26.1
60'	2018-10-24 20:00:00	01:00:00	66.4	33.6	30.9	25.0
60'	2018-10-24 21:00:00	01:00:00	61.7	32.3	32.4	25.3
60'	2018-10-24 22:00:00	01:00:00	59.5	31.2	31.5	25.1
60'	2018-10-24 23:00:00	01:00:00	65.7	33.7	31.8	24.9
60'	2018-10-25 00:00:00	01:00:00	51.4	28.8	31.7	24.7
60'	2018-10-25 01:00:00	01:00:00	48.0	27.4	28.9	25.1
60'	2018-10-25 02:00:00	01:00:00	43.3	27.1	29.0	24.6
60'	2018-10-25 03:00:00	01:00:00	65.2	33.2	29.7	24.8
60'	2018-10-25 04:00:00	01:00:00	45.4	28.6	31.2	24.0
60'	2018-10-25 05:00:00	01:00:00	70.7	40.0	30.6	23.5
60'	2018-10-25 06:00:00	00:59:10	50.5	29.0	30.9	25.7
60'	2018-10-25 07:00:00	00:00:00	---	---	---	---

Noise Monitoring Results (P2), 23-25 October 2018

Start: 2018-10-23 13:43:42

End: 2018-10-25 07:16:30



Configuration

Device Info:	XL2, SNo. A2A-14017-E0, FW3.11 Type Approved
Mic Type:	NTi Audio M2230, SNo. 5330, User calibrated 2018-10-23 13:40
Mic Sensitivity:	42.9 mV/Pa
Range:	0 - 100 dB
Ln based on:	LAeq_dt

Results

Type	Start Date and Time	Duration	LAFmax [dB]	LAeq [dB]	L 10.0 % [dB]	L 90.0 % [dB]
Recorded		**1 17:32:48**	**110.3**	**71.4**		
-Exclude (operator) (3)		**00:26:24**	**105.1**	**71.5**	**60.5**	**27.5**
Project Result		**1 17:06:24**	**110.3**	**71.4**	**43.8**	**25.4**

Markers

Type	Start Date and Time	Duration	LAFmax [dB]	LAeq [dB]	L 10.0 % [dB]	L 90.0 % [dB]
Daytime (2)		**1 01:00:00**	**78.9**	**43.7**	**46.5**	**28.8**
Daytime	2018-10-23 13:43:42	09:00:00	73.1	45.8		
Daytime	2018-10-24 07:00:00	16:00:00	78.9	41.8		
Night-time (2)		**15:54:57**	**60.3**	**30.5**	**33.6**	**24.0**
Night-time	2018-10-23 23:00:00	08:00:00	57.5	30.9		
Night-time	2018-10-24 23:00:00	07:54:57	60.3	30.0		

Audit Intervals

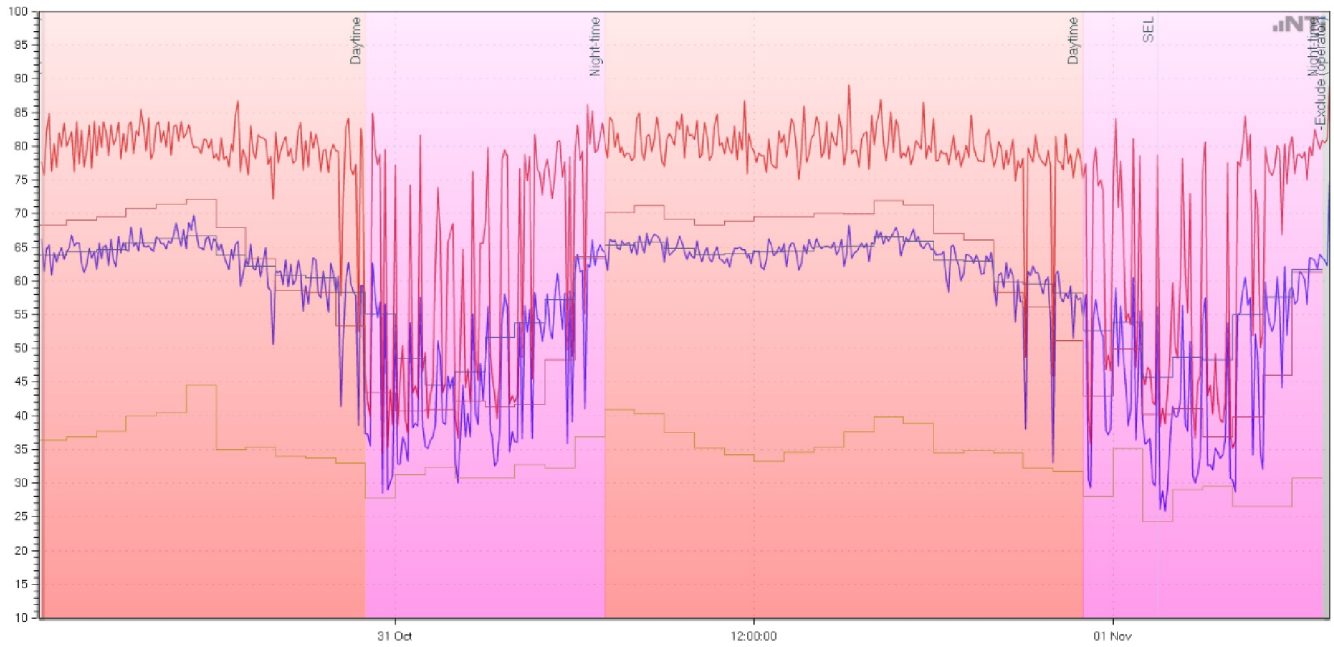
Type	Start Date and Time	Duration	LAFmax [dB]	LAeq [dB]	L 10.0 % [dB]	L 90.0 % [dB]
60'	**2018-10-23 13:00:00**	**00:00:00**	**---**	**---**	**---**	**---**
60'	**2018-10-23 14:00:00**	**01:00:00**	**64.0**	**51.3**	**55.4**	**40.0**
60'	**2018-10-23 15:00:00**	**01:00:00**	**60.1**	**45.5**	**48.4**	**36.1**
60'	**2018-10-23 16:00:00**	**01:00:00**	**59.7**	**48.0**	**51.3**	**41.1**
60'	**2018-10-23 17:00:00**	**01:00:00**	**73.1**	**45.8**	**49.1**	**36.9**
60'	**2018-10-23 18:00:00**	**01:00:00**	**66.2**	**42.1**	**44.7**	**36.3**
60'	**2018-10-23 19:00:00**	**01:00:00**	**57.5**	**40.6**	**44.1**	**34.1**
60'	**2018-10-23 20:00:00**	**01:00:00**	**57.7**	**45.2**	**48.4**	**39.0**
60'	**2018-10-23 21:00:00**	**01:00:00**	**54.8**	**36.7**	**40.1**	**30.8**
60'	**2018-10-23 22:00:00**	**01:00:00**	**59.5**	**36.1**	**39.1**	**31.0**
60'	**2018-10-23 23:00:00**	**01:00:00**	**53.6**	**31.8**	**35.1**	**25.6**
60'	**2018-10-24 00:00:00**	**01:00:00**	**57.5**	**31.7**	**34.4**	**26.4**
60'	**2018-10-24 01:00:00**	**01:00:00**	**50.0**	**32.6**	**35.7**	**22.1**
60'	**2018-10-24 02:00:00**	**01:00:00**	**47.5**	**32.7**	**36.8**	**24.8**
60'	**2018-10-24 03:00:00**	**01:00:00**	**46.9**	**26.3**	**28.4**	**23.1**
60'	**2018-10-24 04:00:00**	**01:00:00**	**49.9**	**25.9**	**27.4**	**23.1**
60'	**2018-10-24 05:00:00**	**01:00:00**	**45.7**	**28.8**	**31.2**	**25.8**
60'	**2018-10-24 06:00:00**	**01:00:00**	**51.3**	**31.8**	**34.5**	**27.5**
60'	**2018-10-24 07:00:00**	**01:00:00**	**78.5**	**43.5**	**45.5**	**32.5**
60'	**2018-10-24 08:00:00**	**01:00:00**	**78.9**	**48.4**	**47.2**	**35.8**
60'	**2018-10-24 09:00:00**	**01:00:00**	**78.5**	**45.0**	**45.9**	**32.3**
60'	**2018-10-24 10:00:00**	**01:00:00**	**72.4**	**41.9**	**43.6**	**29.6**
60'	**2018-10-24 11:00:00**	**01:00:00**	**66.6**	**40.3**	**41.9**	**28.4**
60'	**2018-10-24 12:00:00**	**01:00:00**	**69.6**	**40.3**	**41.0**	**29.8**
60'	**2018-10-24 13:00:00**	**01:00:00**	**65.2**	**38.6**	**38.7**	**30.0**

60'	2018-10-24 14:00:00	01:00:00	63.7	37.3	37.4	30.0
60'	2018-10-24 15:00:00	01:00:00	67.0	43.9	41.3	31.4
60'	2018-10-24 16:00:00	01:00:00	69.4	40.2	40.1	32.9
60'	2018-10-24 17:00:00	01:00:00	73.4	43.6	42.6	33.5
60'	2018-10-24 18:00:00	01:00:00	61.0	38.9	40.6	31.9
60'	2018-10-24 19:00:00	01:00:00	51.0	32.0	34.4	26.4
60'	2018-10-24 20:00:00	01:00:00	53.6	29.5	31.9	25.3
60'	2018-10-24 21:00:00	01:00:00	52.1	30.7	33.6	26.0
60'	2018-10-24 22:00:00	01:00:00	54.1	30.1	32.7	26.1
60'	2018-10-24 23:00:00	01:00:00	47.8	29.3	31.3	26.0
60'	2018-10-25 00:00:00	01:00:00	60.3	34.9	38.4	27.6
60'	2018-10-25 01:00:00	01:00:00	51.4	29.2	31.6	23.4
60'	2018-10-25 02:00:00	01:00:00	51.3	25.9	27.4	23.6
60'	2018-10-25 03:00:00	01:00:00	43.5	28.1	30.3	25.0
60'	2018-10-25 04:00:00	01:00:00	48.1	28.2	31.0	23.7
60'	2018-10-25 05:00:00	01:00:00	46.3	27.6	30.3	23.5
60'	2018-10-25 06:00:00	00:54:57	50.3	30.3	33.0	25.7
60'	2018-10-25 07:00:00	00:11:27	110.3	94.7	57.0	29.3

Noise Monitoring Results (P3), 30 Oct - 1 Nov 2018

Start: 2018-10-30 12:09:14

End: 2018-11-01 07:10:34



LAFmax_dt LAeq_dt LAeq_60' L 10.0 % L 90.0 %

Configuration

Device Info:	XL2, SNo. A2A-08116-E0, FW3.11 Type Approved
Mic Type:	NTi Audio M2230, SNo. 3327, User calibrated 2018-10-30 11:59
Mic Sensitivity:	43.4 mV/Pa
Range:	20 - 120 dB
Ln based on:	LAeq_dt

Results

Type	Start Date and Time	Duration	LAFmax [dB]	LAeq [dB]	L 10.0 % [dB]	L 90.0 % [dB]
Recorded		**1 19:01:20**	**89.1**	**62.5**		
-Exclude (operator) (2)		**00:11:57**	**89.0**	**65.2**	**68.5**	**36.6**
Project Result		**1 18:49:23**	**89.1**	**62.5**	**64.7**	**31.4**

Markers

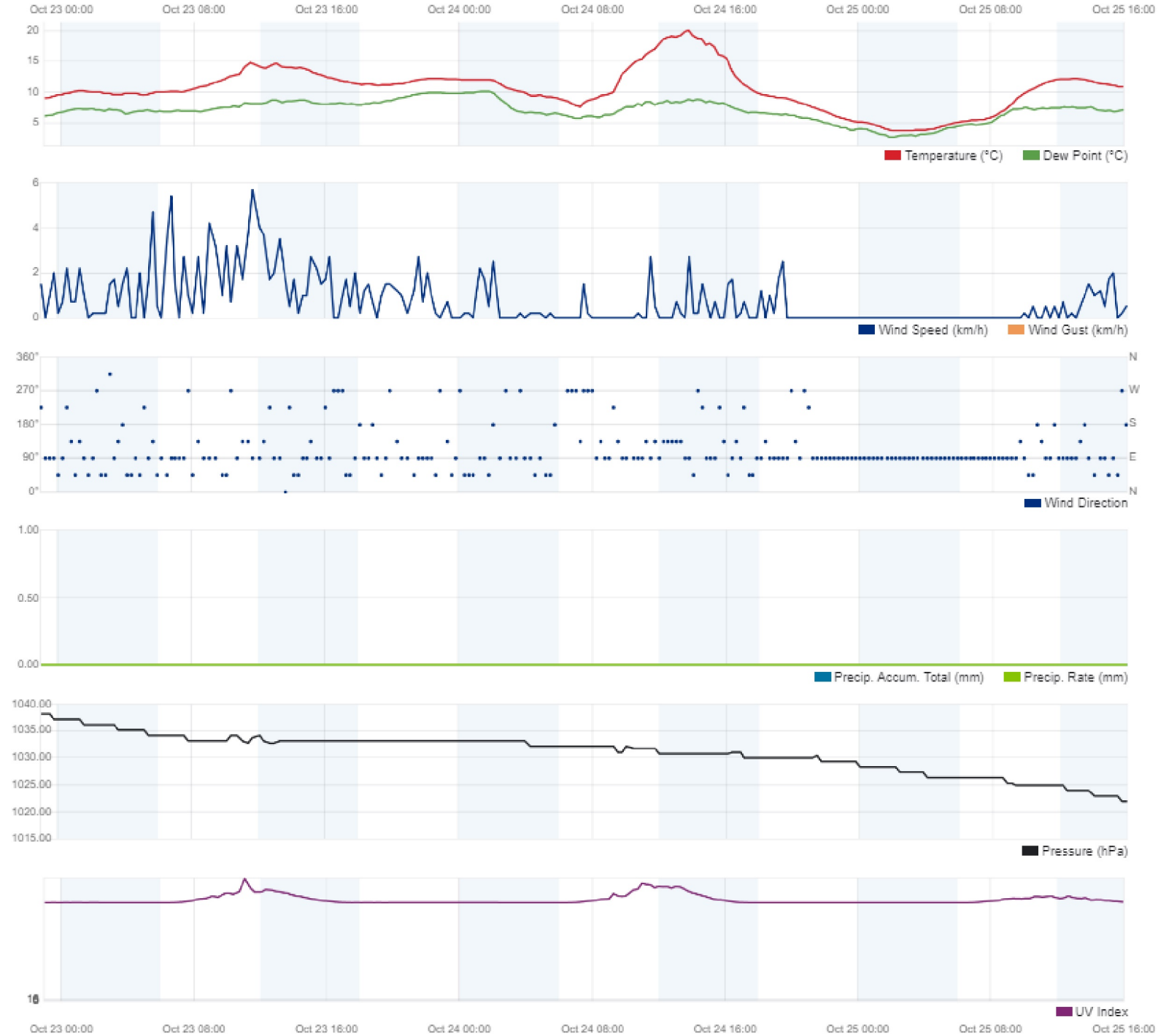
Type	Start Date and Time	Duration	LAFmax [dB]	LAeq [dB]	L 10.0 % [dB]	L 90.0 % [dB]
Daytime (2)		**1 02:49:23**	**89.1**	**64.1**	**68.5**	**35.2**
Daytime	2018-10-30 12:09:14	10:49:23	86.7	64.0		
Daytime	2018-10-31 07:00:00	16:00:00	89.1	64.2		
Night-time (2)		**16:00:00**	**86.2**	**56.1**	**45.6**	**28.5**
Night-time	2018-10-30 23:00:00	08:00:00	86.2	56.5		
Night-time	2018-10-31 23:00:00	08:00:00	84.5	55.7		
SEL (1)		**00:02:00**	**78.7**	**60.2**	**53.4**	**25.4**
SEL	2018-11-01 01:27:20	00:02:00	78.7	60.2		

Audit Intervals

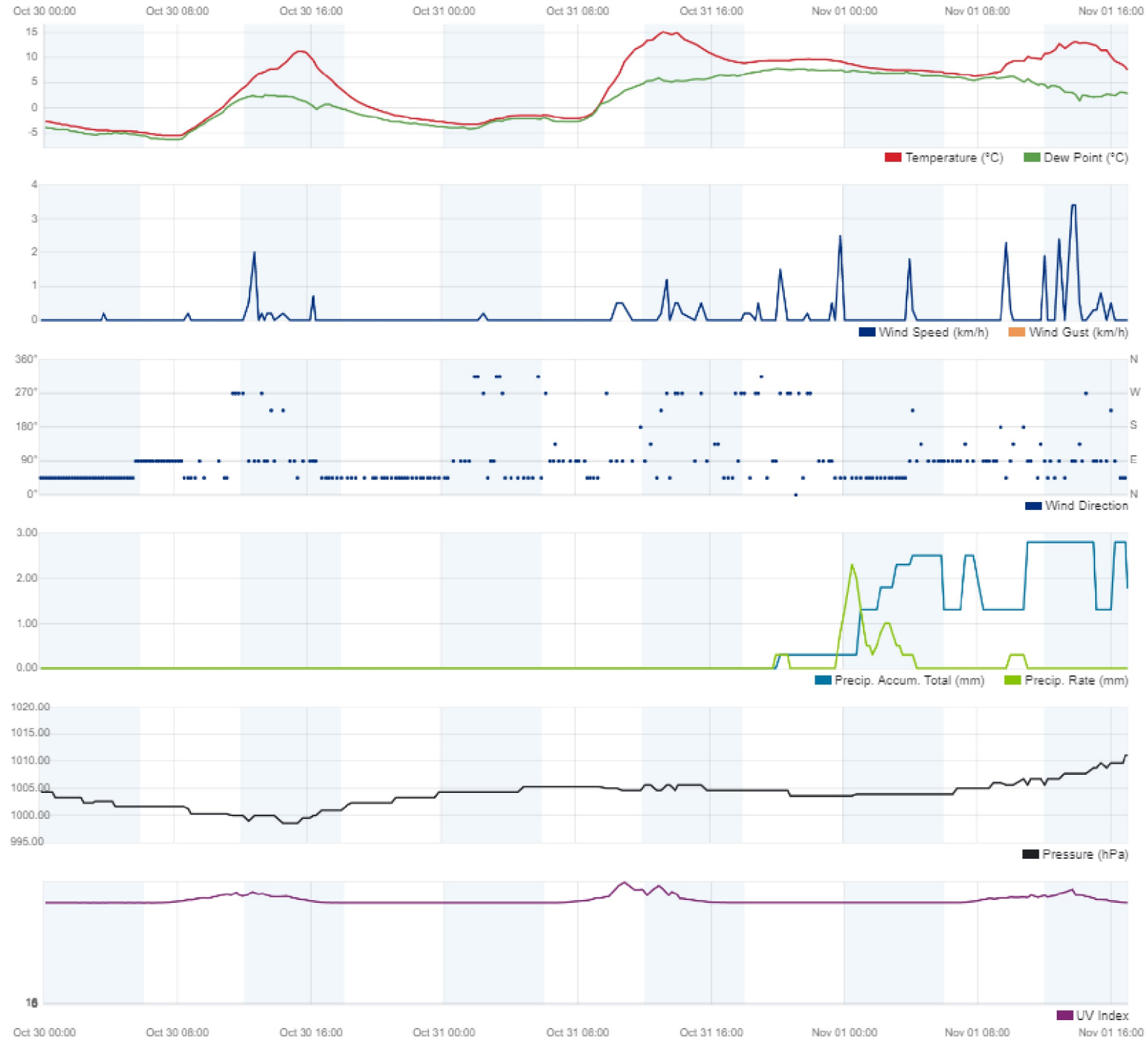
Type	Start Date and Time	Duration	LAFmax [dB]	LAeq [dB]	L 10.0 % [dB]	L 90.0 % [dB]
60'	**2018-10-30 12:00:00**	**00:49:23**	**84.9**	**63.8**	**68.3**	**36.3**
60'	**2018-10-30 13:00:00**	**01:00:00**	**83.7**	**64.4**	**69.0**	**36.8**
60'	**2018-10-30 14:00:00**	**01:00:00**	**83.6**	**64.7**	**69.6**	**37.7**
60'	**2018-10-30 15:00:00**	**01:00:00**	**85.5**	**65.7**	**70.8**	**39.9**
60'	**2018-10-30 16:00:00**	**01:00:00**	**83.7**	**66.3**	**71.4**	**40.4**
60'	**2018-10-30 17:00:00**	**01:00:00**	**83.2**	**66.7**	**72.2**	**44.5**
60'	**2018-10-30 18:00:00**	**01:00:00**	**86.7**	**63.8**	**67.9**	**35.0**
60'	**2018-10-30 19:00:00**	**01:00:00**	**83.1**	**62.2**	**63.3**	**35.4**
60'	**2018-10-30 20:00:00**	**01:00:00**	**83.5**	**60.9**	**58.6**	**34.0**
60'	**2018-10-30 21:00:00**	**01:00:00**	**82.1**	**60.4**	**58.4**	**33.7**
60'	**2018-10-30 22:00:00**	**01:00:00**	**84.1**	**58.3**	**53.4**	**33.0**
60'	**2018-10-30 23:00:00**	**01:00:00**	**84.9**	**55.1**	**43.5**	**27.8**
60'	**2018-10-31 00:00:00**	**01:00:00**	**81.6**	**48.5**	**40.7**	**31.2**
60'	**2018-10-31 01:00:00**	**01:00:00**	**73.9**	**44.6**	**41.0**	**32.4**
60'	**2018-10-31 02:00:00**	**01:00:00**	**76.2**	**46.5**	**42.2**	**30.8**
60'	**2018-10-31 03:00:00**	**01:00:00**	**79.8**	**51.7**	**41.3**	**30.8**
60'	**2018-10-31 04:00:00**	**01:00:00**	**81.7**	**53.7**	**41.7**	**32.8**
60'	**2018-10-31 05:00:00**	**01:00:00**	**80.8**	**57.2**	**48.3**	**32.3**
60'	**2018-10-31 06:00:00**	**01:00:00**	**86.2**	**63.4**	**63.6**	**36.8**
60'	**2018-10-31 07:00:00**	**01:00:00**	**84.3**	**65.3**	**70.2**	**41.0**
60'	**2018-10-31 08:00:00**	**01:00:00**	**85.0**	**65.8**	**71.1**	**40.3**
60'	**2018-10-31 09:00:00**	**01:00:00**	**84.7**	**64.8**	**69.2**	**37.5**
60'	**2018-10-31 10:00:00**	**01:00:00**	**84.7**	**64.0**	**68.3**	**35.2**

60'	2018-10-31 11:00:00	01:00:00	86.7	64.1	68.9	34.2
60'	2018-10-31 12:00:00	01:00:00	82.2	64.4	69.6	33.3
60'	2018-10-31 13:00:00	01:00:00	85.9	64.5	69.5	34.6
60'	2018-10-31 14:00:00	01:00:00	84.7	65.1	70.0	35.4
60'	2018-10-31 15:00:00	01:00:00	89.1	65.2	69.9	37.6
60'	2018-10-31 16:00:00	01:00:00	86.9	66.5	71.9	39.8
60'	2018-10-31 17:00:00	01:00:00	86.5	65.9	71.3	38.8
60'	2018-10-31 18:00:00	01:00:00	81.6	63.1	67.0	34.5
60'	2018-10-31 19:00:00	01:00:00	84.6	63.0	66.1	34.8
60'	2018-10-31 20:00:00	01:00:00	81.0	59.9	58.3	34.5
60'	2018-10-31 21:00:00	01:00:00	81.7	59.6	56.1	32.2
60'	2018-10-31 22:00:00	01:00:00	81.8	58.2	51.2	31.8
60'	2018-10-31 23:00:00	01:00:00	79.8	52.7	43.0	28.0
60'	2018-11-01 00:00:00	01:00:00	84.1	53.8	49.9	35.1
60'	2018-11-01 01:00:00	01:00:00	78.7	45.7	40.2	24.3
60'	2018-11-01 02:00:00	01:00:00	78.2	48.7	41.1	29.0
60'	2018-11-01 03:00:00	01:00:00	80.6	48.3	36.8	29.5
60'	2018-11-01 04:00:00	01:00:00	84.5	55.0	39.8	26.5
60'	2018-11-01 05:00:00	01:00:00	81.4	57.6	46.0	26.5
60'	2018-11-01 06:00:00	01:00:00	82.5	61.7	61.3	30.8
60'	2018-11-01 07:00:00	00:00:00	---	---	---	---

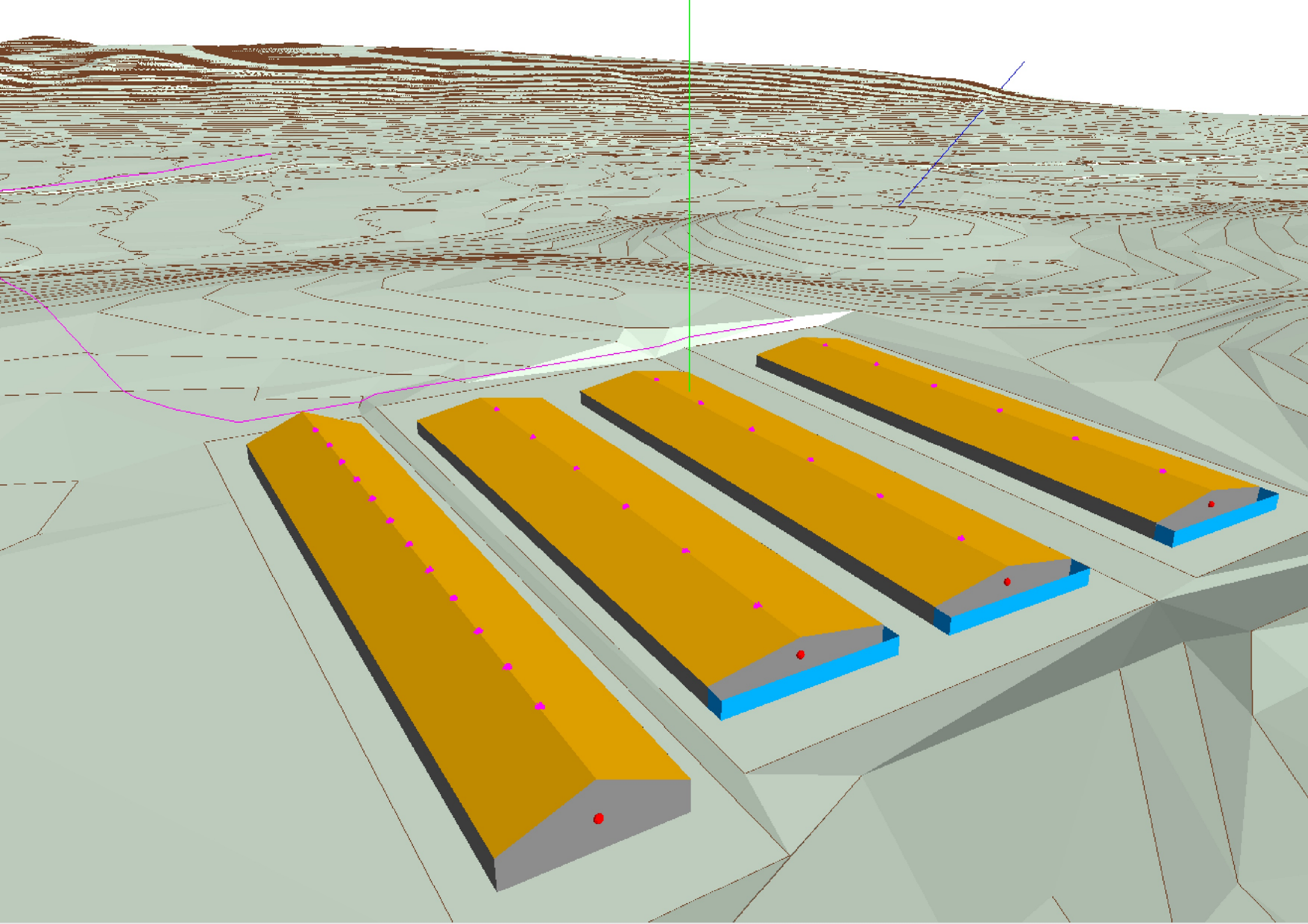
Weather History Graph
October 23, 2018 - October 25, 2018



Weather History Graph
October 30, 2018 - November 1, 2018



Appendix C - Noise Modelling



Fan 3480P C 400-415V 50Hz **34302034**
Fan 3480P M 400-415V 50Hz **34322164**

Images

34302034

34322164

Technical data

Voltage:	**400 – 415**	[⅄ V ac] +/-10%
Phase:	**3**	
Frequency:	**50**	[Hz]
Max. current:	**5,04**	[A]
Current (at 50 Pa and 50Hz):	**4,58**	[A]
Input power (at 50 Pa and 50Hz):	**2268**	[W]
Shaft power (at 50 Pa and 50Hz):	**1792**	[W]
Max. input power:	**2621**	[W]
Max. air volume:	**28650**	[m^3/h]
Max. pressure:	**268**	[pa]
Max. rotations:	**1437**	[RPM]
Poles:	**4**	
Cos phi:	**0,75**	
Controllable:	**F**	Frequency
Insulation class:	**F**	
Protection class:	**IP 66**	
Sound production (calculated):	**77 (66)**	[dB(A)]
Impeller:	**789** / **5** / **35** / **22**	D / n / ° / shaft diameter
Weight 34302034 (excl. pack.):	**36,4** / **80,2**	[Kg] / [lbs]
Weight 34322164 (excl. pack.):	**31,1** / **68,5**	[Kg] / [lbs]

- Air density 1,2 kg/m3, 1 Pa (Pascal) = 1N/m2 ~ 0,102 mm wk. (20°C).
- Sound production is calculated at 0 Pa and at a distance of 2 meter (the value between brackets is calculated at a distance of 7 meter).
- Measurement without protection grid.
- According to AMCA 210 / ISO 5801.
- Images may differ slightly from reality.

Fan 3680 C 400-415V 50Hz **34302013**
Fan 3680 M 400-415V 50Hz **34322143**

Images

34302013

34322143

Technical data

Voltage:	**400 – 415**	[⅄ V ac] +/-10%
Phase:	**3**	
Frequency:	**50**	[Hz]
Max. current:	**2,12**	[A]
Current (at 50 Pa and 50Hz):	**2,03**	[A]
Input power (at 50 Pa and 50Hz):	**1047**	[W]
Shaft power (at 50 Pa and 50Hz):	**806**	[W]
Max. input power:	**1110**	[W]
Max. air volume:	**22220**	[m^3/h]
Max. pressure:	**122**	[pa]
Max. rotations:	**949**	[RPM]
Poles:	**6**	
Cos phi:	**0,76**	
Controllable:	**F**	Frequency
Insulation class:	**F**	
Protection class:	**IP 66**	
Sound production (calculated):	**70 (59)**	[dB(A)]
Impeller:	**789** / **5** / **40** / **22**	D / n / ° / shaft diameter
Weight 34302013 (excl. pack.):	**31,7** / **69,7**	[Kg] / [lbs]
Weight 34322143 (excl. pack.):	**27,4** / **60,4**	[Kg] / [lbs]

- Air density 1,2 kg/m3, 1 Pa (Pascal) = 1N/m2 ~ 0,102 mm wk. (20°C).
- Sound production is calculated at 0 Pa and at a distance of 2 meter (the value between brackets is calculated at a distance of 7 meter).
- Measurement without protection grid.
- According to AMCA 210 / ISO 5801.
- Images may differ slightly from reality.

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Voor elke situatie de juiste oplossing

TYPE	Revolutions RPM	Voltage V	Motor current* A	Power** W	Axis power W	Noise level*** dB(A)	Control****	Airflow in m³/h – Pressure in Pa (Pascal) 0	30	50	100	150	200	250	300	max. airflow / max.pres
IF35	1400	200-240	1.2	231	109	57 (46)	A+IO	3,540	3,180	2,820						2 630 / 60
IF40	1400	200-240	1.4	288	185	60 (49)	A+IO	5 240	4,810	4,410						3 900 / 72
IF45	1400	200-240	1.7	359	275	63 (52)	A+IO	6,820	6,390	6,110	5,420					4 860 / 95
IF50	1400	200-240	2.3	470	375	63 (52)	A+IO	8,820	8,120	7,790	6,670					6.510 / 105
IF50P	1400	200-240	3.2	683	589	72 (61)	A+IO	10,190	9,740	9,490	8,470					7.550 / 122
IF58	1400	200-240	3.0	653	612	72 (61)	A+IO	12,300	11,630	11,070	9,730					8.380 / 134
IF63	1400	200-240	3.1	672	644	69 (58)	A+IO	14,370	13,030	12,120	9,520					9,140 / 106
IF80	900	200-240	4.0	911	737	68 (55)	A+IO	20,800	19,100	17,940	14,300					13 650 / 108
IF92	900	200-240	4.0	908	765	66 (55)	A+IO	23,510	21,260	19,570	14,040					13.910 / 101
1435	1367	200-240	0.9	216	103	57 (46)	T, E	3,660	3,320	3,000						2 540 / 75
1440	1347	200-240	1.2	273	165	60 (49)	T, E	5,040	4,630	4,250						3 300 / 92
1445	1326	200-240	1.6	372	236	63 (52)	T, E	6,690	6,140	5,760	4,400					4 310 / 102
1450	1317	200-240	2.1	474	314	63 (52)	T, E	8,550	7,800	7,300	5,780					5 710 / 102
1450P	1381	200-240	3.0	720	568	71 (61)	T, E	9,720	9,250	8,970	7,950					6.900 / 128
1456	1366	200-240	3.2	741	579	72 (61)	T, E	12,060	11,260	10,830	9,250					8 520 / 113
1656	951	200-240	2.6	545	303	64 (53)	T, E	10,010	9,000	8,120						7 160 / 65
1463	1381	200-240	3.1	721	585	69 (58)	T, E	14,600	13,200	12,380	9,070					8.980 / 101
1671	907	200-240	3.9	908	659	65 (54)	T, E	16,880	15,530	14,440	10,660					10.590 / 101
1680	903	200-240	4.6	1091	747	66 (55)	T, E	20,750	19,050	17,820	14,160					13 020 / 113
1692	905	200-240	4.5	1058	765	66 (55)	T, E	24,400	21,840	19,940	13,767					13.340 / 103
3435	1426	Y400 D230	0.3	157	116	57 (46)	F	3,710	3,400	3,140						2.520 / 66
3440	1376	Y400 D230	0.4	227	175	60 (49)	F	6,120	4,750	4,370	3,430					3 430 / 96
3445	1297	Y400 D230	0.6	312	220	63 (52)	F	6,540	5,910	5,470	4,020					4 020 / 99
3450	1304	Y400 D230	0.7	414	305	63 (52)	F	8,240	7,630	7,010	5,440					5 240 / 105
3456	1364	Y400 D230	1.2	657	567	72 (61)	F	11,830	10,920	10,260	8,490					7.700 / 120
3656	936	Y400 D230	1.2	442	290	64 (53)	F	9,950	8,870	7,980						7 140 / 63
3663	931	Y400 D230	1.4	587	536	64 (53)	F	14,180	12,920	12,060	9,000					9 000 / 97
3671	929	Y400 D230	1.7	874	709	64 (53)	F	18,090	16,440	15,290	11,933					11 780 / 102
3680	941	Y400 D230	2.0	1047	850	65 (54)	F	22,220	20,555	19,380	15,910					14 070 / 122
3480P	1429	Y400 D230	4.6**	2268	2157	71 (60)	F	28,650	27,582	26,670	25,290	23,580	21,225	18,655		17.440 / 268
3480D	1436	Y400 D230	4.3**	1981	1525	67 (56)	F	21,610	21,130	20,810	19,990	19,050	17,920	16,495	14,770	11 010 / 380
3692	936	Y400 D230	2.1	1033	940	66 (55)	F	24,870	22,570	20,840	16 470					14 110 / 110
3692P	929	Y400 D230	3.6	1850	1324	73 (62)	F	28,080	26,600	25,560	22,810	17,820				15.200 / 167
Belt driven fans								0	10	20	30	40	50			
3492W	600	Y400	1.8	920	550	(63)	F	20,300	19,600	18,800	17,900	16,900	15,700			15.700 / 50
34125W	470	Y400	3.3	1740	1100	(65)	F	40,800	39,300	37,800	36,200	34,600	32,900			32 900 / 50

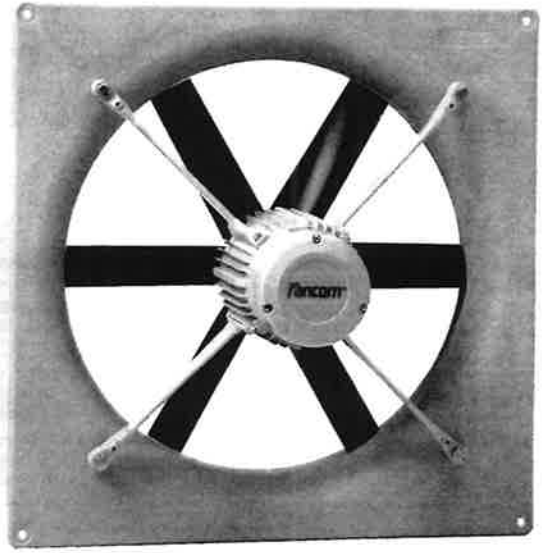
Fans in 50Hz version
Air density 1,2 kg/m3. 1 Pa (Pascal) = 1 N/m2 ~ 0,102 mm wk
Measurements without protection grid

* Motor current at 50Pa, except for 3480P and 3480D at 250Pa
** Motor power at 50 Pa
*** Noise production measured at an angle of 45° with the fan axle on 0Pa at a distance of 2m/6.6ft (the values between brackets are measured at a distance of 7m/23ft)
**** Control by trafo (T), triac (E), frequency driver (F), Analog 0-10/10-0V (A), digital Fancom IO net (IO)

UW DISTRIBUTEUR:

Fancom®

CLIMATE CONTROL
FACT SHEET



STALVENTILATOREN

- **Duurzaam, IP66 classificatie**
- **Energiezuinig**
- **Geluidsarm**

TOP CONDITIONS THROUGH COMPLETE CONTROL