



Environmental Noise Survey, Noise Break-in Assessment & Sound Insulation Scheme

Client: Blueprint

Client Address: Office 3K4, Redwither Tower, Redwither Business Park, Wrexham, LL13 9XT

Site Address: Cae Brymer Farm, Bowling Bank, Wrexham, LL13 9RL

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Executive Summary

An environmental noise survey and noise impact assessment have been undertaken to assess the suitability of the site on Cae Brymer Farm, Bowling Bank, Wrexham, LL13 9RL for residential development. The measured ambient sound levels have allowed a BS8233:2014 noise assessment to be carried out.

A sound insulation scheme has been provided in Sections 4.0 and 5.0, including glazing and an alternative ventilation strategy. In order to ensure the amenity of future residents is fully protected against any commercial noise in the area, the façade sound reduction has been calculated based on the highest 1-hour measurements as opposed to the average 16-hour and 8-hour measurements specified in BS8233:2014. These recommendations should be sufficient to achieve appropriate internal noise levels for the proposed development according to the BS8233:2014 criteria.

An overview of all recommendations can be found in the table below:

Recommendations and Mitigation Overview

- Appropriate glazing specifications can be found in Table 4.0.
- Appropriate alternative ventilation is discussed in Section 4.0 and specifications can be found in Table 5.0.
- Should the mitigation measures specified within Section 5.0 be adhered to, the external noise levels in the centre of the garden are predicted to be within the BS8233:2014 criteria.

The findings of this report will require written approval from the Local Authority prior to work commencing.

1. Introduction

Overview

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for a residential development ('the Proposed Development') on Cae Brymer Farm, Bowling Bank, Wrexham, LL13 9RL ('the Site').

The applicant has received conditional planning approval, P/2021/0623 – '*Conversion of agricultural building to dwelling*' from Wrexham County Borough Council. The following planning Condition 12 requires discharging:

"12.) No part of the development shall commence until a noise survey in order to determine noise levels for both day and night has been carried out, and a detailed report of the survey findings together with a detailed scheme of noise attenuation and/or noise insulation measures has been submitted to and approved in writing by the Local planning Authority. The measures as are approved shall be fully implemented prior to the first occupation / use of the development.

Reason: To protect the amenities of the occupiers of nearby properties in accordance with Policy GDP1 of the Wrexham Unitary Development Plan."

The following technical noise assessment has been prepared to discharge Condition 12 imposed by Wrexham County Borough Council. The report details the ambient sound climate at the proposed development site and provides a sound insulation scheme to protect the amenity of the occupant(s) of the proposed residential dwelling.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

Scope & Objectives

The scope of the noise assessment can be summarised as follows:

- Ambient sound monitoring survey to evaluate the prevailing ambient and maximum sound levels incident on the proposed development;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the surrounding noise sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Policy Framework (2021), Noise Policy Statement for England (2010), British Standard BS8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings', and the Association of Noise Consultants 'Acoustics Ventilation Overheating: Residential Design Guide 2020' (AVO). Further information on the legislation and the latest Entertainment Noise Legislation can be found in Appendix B.

Local Authority Policies and Guidance

The Welsh Government published a document entitled "Noise and soundscape action plan: 2018-2023". This document directs developers and specialists towards achieving compliance with the criteria and guidance provided in BS8233:2014.

2. Environmental Noise Survey

Measurement Methodology

In order to characterise the sound profile of the area at the proposed development, an environmental sound survey was carried out from 07/03/22 to 09/03/22. For the long-term monitoring, a sound level meter was attached to a post in line with the front façade of the existing barn to be converted (MP1) with the microphone positioned approximately 3.5m above the ground. The monitoring position was chosen in order to collect representative sound levels at the proposed development during the day time and night time periods. The monitoring location is shown in Figure 1.0 and 2.0 below.

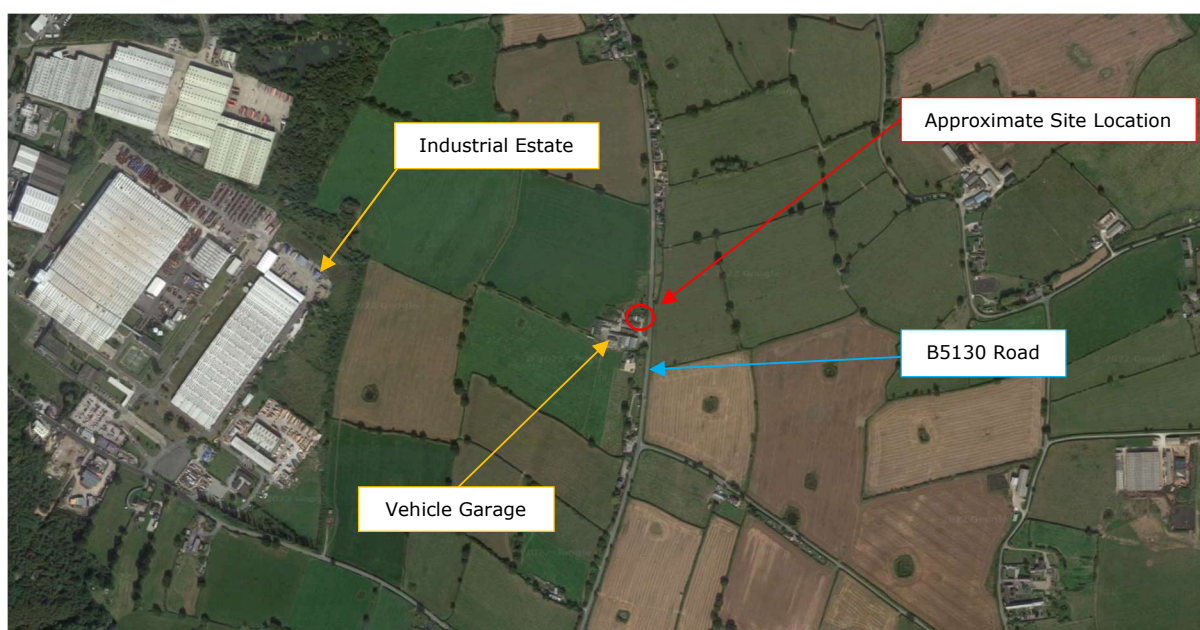


Figure 1.0 – Indicative Site Surroundings

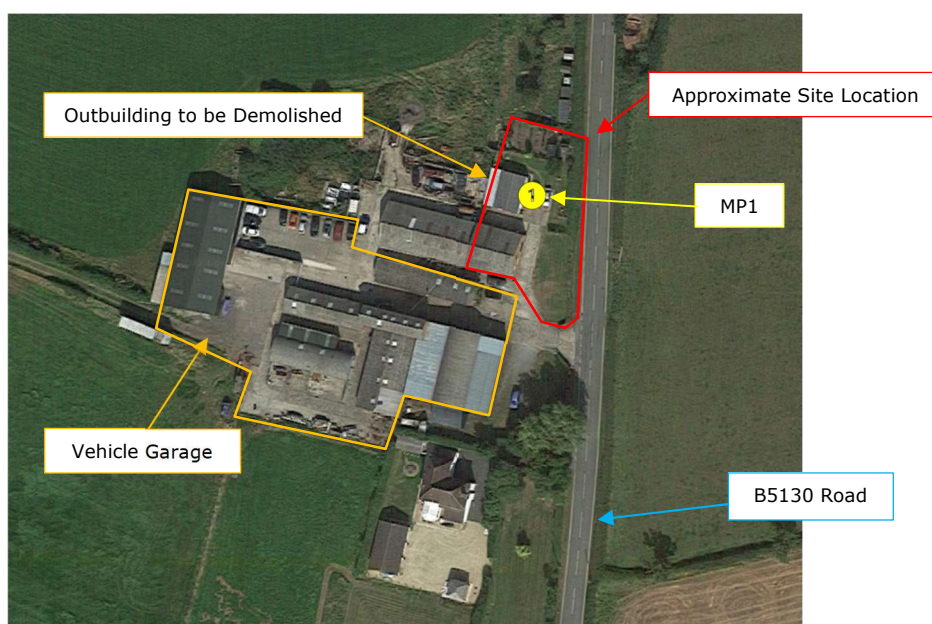


Figure 2.0 – Indicative Site Layout

Context & Subjective Impression

The proposal is for the conversion of an existing barn into 1 No. residential dwelling. The area surrounding the site consists primarily of arable farmland with a vehicle garage that neighbours the development site.

The noise profile of the area is dominated by intermittent noise emissions from the neighbouring vehicle garage. Operating times for the vehicle garage could not be obtained, consequently it has been assumed that the garage may operate at any point during the day and night time periods as it also appears to service agricultural mobile plant. Secondary in nature were the road traffic noise emissions from the B5130 which were found to be infrequent and low in level.

Environmental Noise Survey Results

Long-Term Results

The following table outlines the highest octave band $L_{eq,1hr}$ sound levels measured during the day time and night time periods that will be used in the noise break in assessment. A full summary of all results can be found in Appendix D.

Measurement Position MP1							
Measurement Period ('t')	Octave Band $L_{eq,t}$ (Hz, dB)						$L_{Aeq,t}$ (dB)
	125	250	500	1k	2k	4k	
Highest $L_{eq,1hr}$ (Day)	64.0	59.0	56.0	57.0	52.0	48.0	60.0
Highest $L_{eq,1hr}$ (Night)	63.0	59.0	56.0	53.0	51.0	47.0	58.0

Table 1.0 – Long-Term Sound Levels During Day & Night

In the following section, the maximum noise level events are assessed. ProPG states:

"...in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night."

The following table shows a summary of the maximum sound level results.

Measurement Position MP1			
Measurement Period ('t')	$L_{AFMax,15min}$	*SMR $L_{AFMax,15min}$	No. of Exceedances of 78 dB $L_{AFMax,15min}$
Night 1	86.0	77.0	5
Night 2	80.0	74.0	1

Table 2.0 – Maximum Sound Level Summary Results

*Statistically Most Repeated

Discussion

The measured noise levels shown above are thought to be a fair representation of the existing acoustic environment and are considered typical of this type of location. Furthermore, all surrounding businesses were fully operational for the duration of the environmental sound survey.

3. Internal and External Noise Design Criteria

This section highlights the guidance outlined in BS8233:2014 and the criteria used in to achieve appropriate internal noise levels.

BS8233:2014 'Guidance on Sound insulation and noise reduction for buildings'

BS8233 provides guidance on noise levels from sources without specific character in the built environment, based on the recommendations of the World Health Organization; specifically, 'WHO Guidelines on Community Noise, 1999'. The Guidelines on Community Noise (1999) document defines community noise to include noise from "industries" and "construction". The desirable criteria levels of steady state, "anonymous" noise in unoccupied spaces within dwellings, from sources such as road traffic, mechanical services and other continuously running plant, are tabulated below:

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living Room	35 dB LAeq,16hour	--
Dining	Dining Room/Area	40 dB LAeq,16hour	--
Sleeping (daytime resting)	Bedroom	35 dB LAeq,16hour	30 dB LAeq,8hour

Table 3.0 – BS8233:2014 Internal Noise Level Criteria

It should be noted that the WHO Guidelines should be considered as aspirational. Furthermore, BS8233:2014 states that where development is considered necessary or desirable, despite external noise levels that are above WHO guidelines, the target levels may be relaxed by up to 5 dB.

It is stated that the desirable internal and external noise criteria outlined in Table 4.0 of BS8233, are based on anonymous steady state sources and where there are normal diurnal fluctuations in external noise. Where the external noise climate comprises of dominant non-anonymous sources or does not follow normal diurnal fluctuations an alternative assessment period may be appropriate.

Discussions and Chosen Criteria

Wrexham County Borough Council have raised concerns over the noise emissions produced by the nearby industrial estate that may impact upon the amenity of future occupants. Further to this, NOVA Acoustics Ltd notes that although the proposed development is to be associated with the adjacent vehicle garage, this business has the capacity to impact the amenity of future occupants and should be accounted for.

In order to fully protect the amenity of future occupants from the commercial noise emissions produced by the nearby industrial estate and adjacent vehicle garage, the façade sound reduction shall be specified using loudest 1-hour measurement periods as opposed to the average 16-hour (day time) and 8-hour (night time) periods recommended in BS8233:2014. It is thought this will protect future occupants from commercial noise emissions that are louder for shorter periods.

4. Noise Break-in Assessment & Sound Insulation Scheme

Noise Break-in Assessment

In the following section the ambient sound levels incident on the development are compared with the internal noise level criteria presented within BS8233:2014.

In order to fully protect the amenity of future occupants from the transport and commercial noise, the noise break-in assessment has been conducted based on the following:

- The highest $L_{eq,1hr}$ measurements during the day and night time periods recorded at all measurement positions.
- The $L_{AFmax,15min}$ exceeded fewer than 10 times during the night time recorded at all measurement positions.

The façade sound reduction and predicted internal noise levels are calculated assuming the following criteria:

- The calculation method for façade sound reduction is in accordance with BS8233:2014 and the principles of BS EN 12354-3. Further details of the calculations can be found in Appendix E.
- The reverberation time is typically 0.5 seconds across the relevant frequency range for a furnished living room in the UK. This value is used for both living rooms and bedrooms.
- The room and window dimensions are taken from the architect's plans and elevations. The calculations are undertaken for those rooms most exposed to noise ingress as a worst-case scenario. It is thought that if these have sufficient sound insulation to meet the appropriate internal noise criteria, noise levels in less exposed but similarly protected rooms will be lower and therefore also comply with the appropriate internal noise criteria. The most exposed rooms are those with the largest ratio of window area to room volume, as well as those closest and most exposed to the noise sources. Further details can be found in Appendix C.
- The most exposed rooms are those with the largest ratio of window area to room volume, as well as those closest and most exposed to the noise sources.
- The acoustic performance of the glazing systems is taken from the Pilkington glazing catalogue and calculations undertaken in INSUL 9.0 Sound Insulation Software.
- The acoustic performance of the alternative ventilation systems is taken from the Greenwoods catalogue. Each ventilator has an Equivalent Area of 2500mm² and as per the requirements of Approved Document F, a total of Equivalent Area of 5000mm² has been used in the calculations, which equates to 2 No. trickle vents.

Sound Insulation Scheme – Glazing Specification

Windows can be considered the weakest point of a façade in terms of reduction of external noise. The glazing unit shown in the following table provides a suitable sound reduction, however any other window capable of providing this attenuation will be suitable provided the glazing suppliers can provide an acoustic test report in accordance with BS EN ISO 10140-2:2010 or an evidence-based calculation. The performance is specified for the whole window unit, including frame and other design features.

All Façades – Living Rooms & Bedrooms - Glazing Configuration								
<i>Double Glazing</i>								
6mm Glass – 16mm Argon Cavity – 6.8mm Optiphon Glass								
Description	Octave Band Sound Reduction (Hz, R, dB)						R _w (dB)	R _w + C _{tr} (dB)
	125	250	500	1k	2k	4k		
Double Glazing	21.0	28.0	37.0	48.0	48.0	54.0	40.0	34.0

Table 4.0 – Glazing Specification – All Façades – Living Rooms & Bedrooms

Sound Insulation Scheme – Open Window Assessment and Ventilation Strategy

In the following section, the ventilation requirements for the proposed development are assessed.

In the absence of any guidance on the requirement for open windows in change of use developments, the ANC's 'Acoustics Ventilation and Overheating Guide' (AVO Guide) is deemed appropriate, although it should be noted that this document is intended specifically for new developments.

According to the 'Acoustics Ventilation and Overheating Guide' (AVO Guide), considering the noise levels measured on site, it is possible that using opening windows as a primary means of mitigating overheating could cause adverse effects. Further to this, in order for opening windows to be relied upon exclusively, internal noise levels should be within the BS8233:2014 criteria with windows partially open. To predict the levels of sound reduction provided by a partially open window, figures have been taken from a report titled: 'Sound Insulation through Ventilated Domestic Windows' compiled for Napier University. The calculations show that the internal noise levels are predicted to be significantly above the criteria, and as such, it is recommended that secondary ventilation is also employed.

It is stated in BS8233:2014 that:

"The Building Regulations' supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice. Alternatively, acoustic ventilation units are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans."

An alternative ventilation system should be installed within habitable rooms to fully protect the amenity of future residents. As stated in BS8233:2014 section 5.4.4, having complete enclosure of the noise source or receiver is the most effective barrier of sound. An alternative ventilation strategy allows for maximum sound insulation from the noise source whilst still maintaining a sufficient level of ventilation. It is recommended that the alternative ventilation should provide the same resistance to sound as the glazed elements. Considering this, ventilation systems are shown in the table below that meet the above recommendations.

All Façades – Living Rooms and Bedrooms								
Trickle Ventilation								
Description	Octave Band $D_{n,e}$ (Hz, dB)						$D_{n,e,w}$	$D_{n,e,w} + C_{tr}$
	125	250	500	1k	2k	4k		
Titon Standard Vent + C75	38.0	36.0	35.0	42.0	39.0	42.0	35.0	34.0

Table 5.0 – Ventilation Specification – All Façades – Living Rooms & Bedrooms

If mechanical ventilation is opted for, the background trickle ventilation option is not required to be installed. The mechanical ventilation system specified in the table below is capable of achieving the appropriate internal ambient noise levels.

Through Wall Ventilation (not purge)		
Façade Location	Model	Attenuation (dB)
All Façades – All Rooms	Titon Sonair F+ Mechanical Input Ventilator with G3 filter and DV100F duct ¹	56.0 dB D _{n,e,w}

Table 6.0 – Mechanical Ventilation Specification

¹ The self-generated noise from the Titon Sonair F+ when measured at the maximum ventilation capacity of 60m³/h emits 23.5dB L_{PA:10m2} which is below the required internal noise criteria from BS8233:2014.

The following table outlines recommended noise levels from mechanical ventilation in dwellings.

Ventilation Condition	Possible System	Desirable Internal Ambient Noise Levels from Mechanical Services, L _{Aeq} (dB)		
		Bedrooms	Living Rooms	Bathrooms / Kitchens
Whole dwelling ventilation	Continuous MEV ¹ at low ventilation rates	≤ 26.0	≤ 30.0	--
	Continuous MVHR ² at minimum ventilation rates			
Extract ventilation	Intermittent Extract Fans	≤ 26.0	≤ 35.0	≤ 45.0
	Continuous MEV at high ventilation rates			

Table 7.0 – Recommended Internal Noise Levels from Mechanical Ventilation

The ventilation suppliers are required to demonstrate the acoustic performance of their proposed system either by providing an acoustic test report in accordance with BS EN ISO 10140-2:2010 or an evidence-based calculation.

Sound Insulation Scheme – Structural Façade and Roof Elements

The noise levels within the proposed dwellings will be dictated by the configuration, materials, and elements of the façade. The non-glazed elements of the facade will contribute significantly to the reduction of ambient noise levels.

The following section outlines the required sound insulation that should be provided by the non-glazed elements of the façade to protect the amenity of the future residents. The sound insulation scheme should be installed prior to occupation and be retained thereafter.

a) Façade Construction

The façade construction for lightweight or heavyweight constructions is likely to provide ample levels of sound insulation, and for the purposes of this report it is assumed the façade provides a minimum sound reduction of 50.0 dB R_w .

b) Roof Construction

If the development has rooms within the roof space the roof system will require additional sound insulation to achieve appropriate internal noise levels. Where the roof, is being utilised as a voided loft space with thermal insulation the following detailing is not required. Where rooms are within the roof, the ceilings should consist of standard roofing slates, 100mm 45kg/m³ insulation fitted tightly between the 200mm roof joists and 1 No. 15mm SoundBloc plasterboard fixed to British Gypsum RB1 resilient bars to achieve a minimum sound reduction of 50.0 dB R_w . Any other configuration of roof that would achieve at least 50.0 dB R_w would also be suitable for the development.

Predicted Internal Noise Levels

A summary of the predicted internal noise levels for the most exposed rooms of the Proposed Development is outlined in the tables below. Where octave band sound levels have been assessed these have been compared to the appropriate Noise Rating Curves (NR Curves).

All Facade Noise Ingress									
Location / Time Period	Description	Octave Band $L_{eq,t}$ (Hz, dB)						Overall (dBA)	$L_{Amax,t}$ (dB)
		125	250	500	1k	2k	4k		
Living Room – Day Time	Façade Noise Ingress	44.0	33.0	26.0	20.0	17.0	10.0	31.0	--
	NR30 Curve	48.1	39.9	34.0	30.0	26.9	24.7	35.0	--
	Exceedance of NR30 Curve	-4.0	-6.0	-8.0	-10.0	-9.0	-14.0	-4.0	--
Bedroom – Day Time	Façade Noise Ingress	40.0	31.0	26.0	19.0	17.0	10.0	29.0	--
	NR30 Curve	48.1	39.9	34.0	30.0	26.9	24.7	35.0	--
	Exceedance of NR30 Curve	-8.0	-8.0	-8.0	-11.0	-9.0	-14.0	-6.0	--
Bedroom – Night Time	Façade Noise Ingress	39.0	31.0	26.0	15.0	16.0	9.0	28.0	44.0
	NR25 Curve	43.7	35.2	29.2	25.0	21.9	19.5	30.0	45.0
	Exceedance of NR25 Curve	-4.0	-4.0	-3.0	-10.0	-5.0	-10.0	-2.0	-1.0

Table 8.0 – Internal Noise Levels – All Facades

Discussion

As can be seen in the tables above, provided the specified models of glazing and ventilation are installed, the internal noise levels are predicted within the BS8233:2014 criteria in all octave band frequencies. Furthermore, this has been calculated considering the highest 1-hour measurements which we consider to be a robust integration period and assessment methodology considering the acoustic environment.

5. External Noise Level Assessment

The following section analyses the predicted noise levels within the centre of the external amenity areas of the Proposed Development. The garden noise levels have been predicted using the long-term measurement taken at MP1.

The table below shows the external amenity noise assessment for the garden of the Proposed Development considering the highest measured 16-hour (day time) measurement.

Location	Time Period	Noise Level	BS8233 Criteria	Min. Attenuation Required (dB)
MP1	Day Time	58.0	50 - 55 dB $L_{Aeq,16\text{hour}}$	3.0

Table 9.0 – External Noise Level Assessment

Discussion

As can be seen in the table above, the external noise levels within the gardens at the rear of the Proposed Development have exceeded the criteria by 3.0 dB. It should be noted that MP1 was located at first-floor height where noise levels are 'typically' at the highest.

It is advised that a 1.8m tall timber fence be located around the perimeter of the garden. The fence should be of close-board construction, contain no holes or gaps and have a minimum surface mass of 10 kg/m². When considering a noise monitoring position of 1.5m above the ground (as per BS8233:2014 guidance) the fence is expected to provide up to a 10.0 dB reduction in the noise levels experienced within the centre of the garden, resulting in a noise level of up to 48.0 dBA which complies with the BS8233:2014 criteria.

Figure 2.0 below outlines the proposed location of the timber fence.

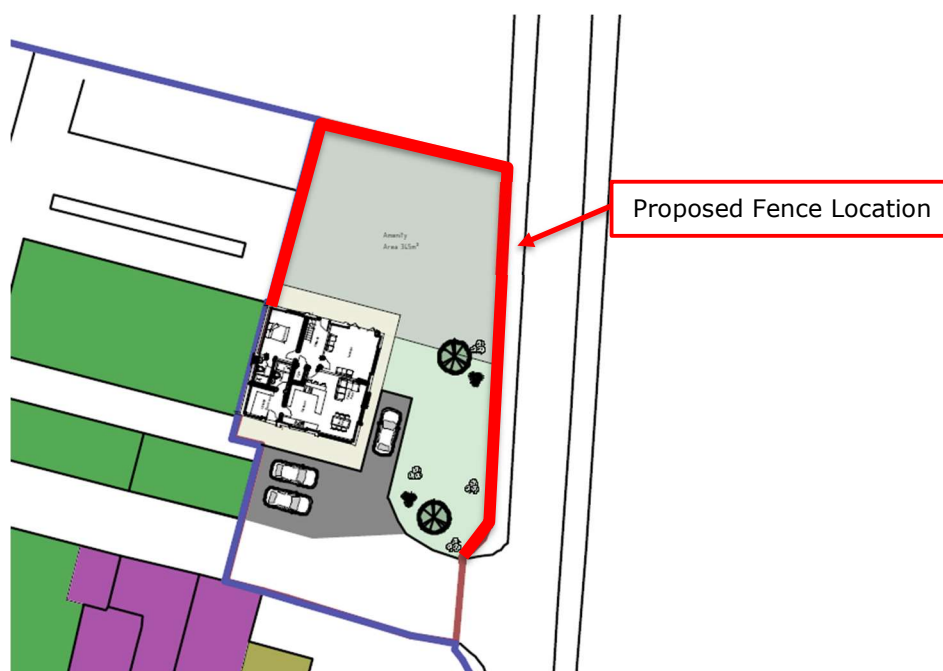


Figure 3.0 – Proposed Fence Location

Appendix A – Acoustic Terminology

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10 ⁻⁶ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log ₁₀ (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
L _{eq,T}	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
L _{max,T}	A noise level index defined as the maximum noise level during the period T. L _{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L _{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L _{90,T}	A noise level index. The noise level exceeded for 90% of the time over the period T. L ₉₀ can be considered to be the "average minimum" noise level and is often used to describe the background noise.
L _{10,T}	A noise level index. The noise level exceeded for 10% of the time over the period T. L ₁₀ can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided. 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, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

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

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source. A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10} , the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the

time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq} .

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound. To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS4142:2014 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1\text{hour}}$ dB and $L_{A90,15\text{mins}}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125ms.

Appendix B – Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance.

B.1 – National Planning Policy Framework (2021)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2021. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 174e, it states:

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

Paragraph 185 states:

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

B.2 – Noise Policy Statement for England (2010)

Paragraph 185 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision to:

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

To achieve this vision the Statement identifies the following three aims:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

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

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that “significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development”.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: “all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.”

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise. This can be related to the third aim above, which seeks: “where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

B.3 – BS8233:2014 ‘Guidance on sound insulation and noise reduction for buildings’

The British Standard BS 8233: 2014, Guidance on Sound insulation and noise reduction for buildings provides additional guidance on noise levels from sources without specific character in the built environment, based on the recommendations of the World Health Organization; specifically, WHO Guidelines on Community Noise, 1999. The criteria desirable levels of steady state, “anonymous” noise in unoccupied spaces within dwellings, from sources such as road traffic, mechanical services and other continuously running plant, are tabulated below:

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living Room	35 dB $L_{Aeq,16hour}$	--
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	--
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Table 10.0 – BS8233:2014 Internal Noise Level Criteria

It is noted, however that where development is considered necessary or desirable, despite external noise level above WHO guidelines, the above target levels may be relaxed by up to 5 dB.

The standard also recommends that for traditional external amenity areas, such as gardens, it is desirable that external noise levels do not exceed 50 dB $L_{Aeq,T}$, and that 55 dB $L_{Aeq,T}$ would be acceptable in noisier environments. However, it is recognised that these values may not be achievable in all areas where development is desirable and in such locations, development should be designed to achieve the lowest practicable levels.

General recommendations for mitigation to enable these targets to be achieved are provided, including the use of bunds and barriers to reduce external noise and space planning and sound insulation for the control of internal noise levels.

For this assessment, the above criteria are considered to be the LOAEL as defined in the NPSE above.

Appendix D – Environmental Survey

D.1 – Tabulated Summary Noise Data

Measurement Position MP1								
Measurement Period ('t')	Octave Band $L_{eq,t}$ (Hz, dB)						$L_{Aeq,t}$ (dB)	$L_{Amax,t}$ (dB)
	125	250	500	1k	2k	4k		
Day 1 – 07/03/22: 14:00 – 23:00	59.0	56.0	53.0	54.0	49.0	44.0	57.0	83.0
Night 1 – 07/03/22: 23:00 – 07:00	60.0	57.0	54.0	51.0	48.0	45.0	56.0	86.0
Day 2 – 08/03/22: 07:00 – 23:00	60.0	57.0	55.0	55.0	49.0	45.0	58.0	83.0
Night 2 – 08/03/22: 23:00 – 07:00	54.0	51.0	48.0	47.0	45.0	41.0	52.0	80.0
Day 3 – 09/03/22: 07:00 – 16:00	62.0	58.0	56.0	55.0	51.0	47.0	59.0	84.0

Table 11.0 – Sound Survey Summary Results – MP1

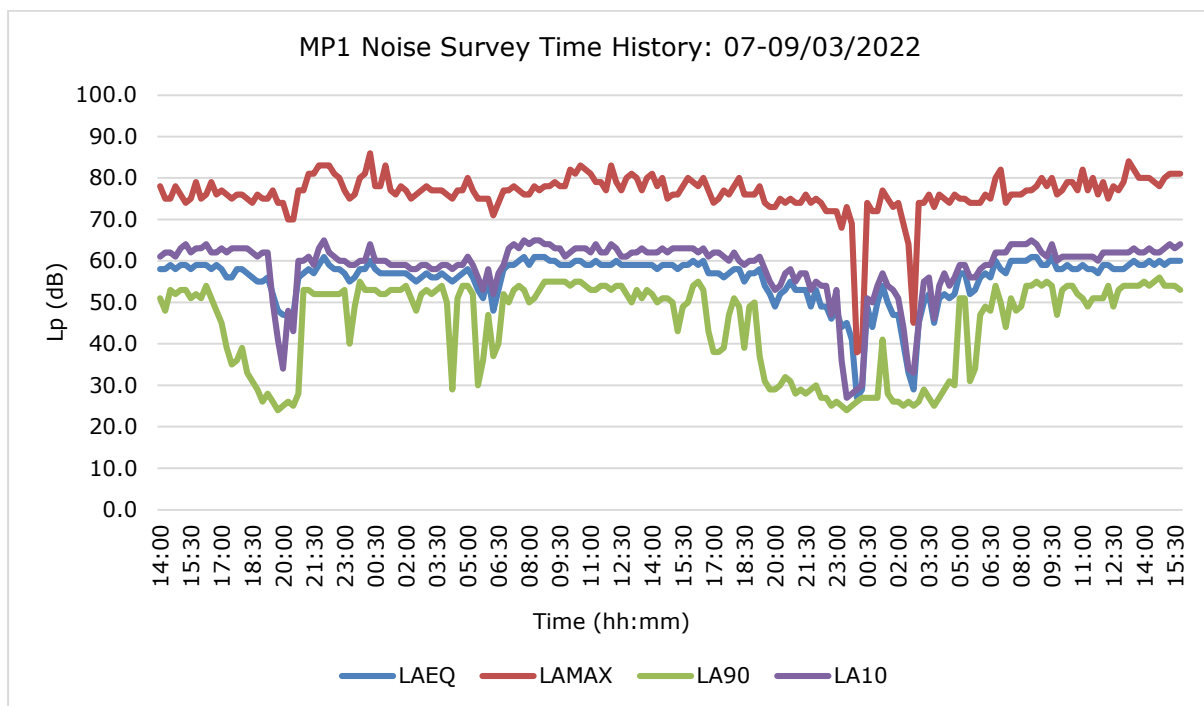


Figure 4.0 – MP1 Noise Survey Time History

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
CESVA SC420 Class 1 Sound Level Meter	T246458	≤0.5
CESVA CB006 Class 1 Calibrator	901927	

Table 12.0 – Measurement Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤0.5 dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

D.3 – Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localised records of weather conditions were taken. However, all measurements have been compared with met office weather data of the area, specifically the closest weather station, and the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather Conditions – Cranberry Lane (Approx. 9.4km SW of Site)				
Time Period	Air Temp (°C)	Rainfall (mm/h)	Prevailing Wind Direction	Wind Speed (m/s)
07/03/22: 00:00 – 23:59	-2.1 – 8.0	0.0	E	0.0 – 3.5
08/03/22: 00:00 – 23:59	-0.5 – 10.1	0.0	SSE	0.4 – 3.2
09/03/22: 00:00 – 23:59	5.7 – 12.3	0.0	S	0.3 – 3.7

Table 13.0 – Weather Summary

It should be noted that during both the setup and collection of the equipment the weather conditions were favourable with no rain fall and wind speeds of less than 2.5 m/s.

Appendix E – Façade Sound Reduction Calculations

E.1 – All Façades

Measurement Position MP1	
Living Room	
Volume m ³ (V)	50
Window Area m ² (S)	9.5
T60 s (T)	0.5
No. of vents required	2

Master Bedroom	
Volume m ³ (V)	55
Window Area m ² (S)	4.4
T60 s (T)	0.5
No. of vents required	2

Living Room Day Time, 07:00 - 23:00								
Description	Sound Pressure Level Leq (dB)						Overall (dBA)	
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz		
Daytime Free-Field Noise Level	64.0	59.0	56.0	57.0	52.0	48.0	60.0	
Rw of Glazing	21.0	28.0	37.0	48.0	48.0	54.0	34.0	
Façade Noise Ingress (Glazing)	44.0	32.0	20.0	10.0	5.0	-5.0	30.0	
Dne,w of Ventilation	38.0	36.0	35.0	42.0	39.0	42.0	34.0	
Façade Noise Ingress (Ventilation)	30.0	27.0	25.0	19.0	17.0	10.0	26.0	
Total Ingress	44.0	33.0	26.0	20.0	17.0	10.0	31.0	
NR30	48.1	39.9	34.0	30.0	26.9	24.7	35.0	
Exceedance of Criteria	-4.0	-6.0	-8.0	-10.0	-9.0	-14.0	-4.0	

Bedroom Day Time, 07:00 - 23:00								
Description	Sound Pressure Level Leq (dB)						Overall (dBA)	
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz		
Daytime Free-Field Noise Level	64.0	59.0	56.0	57.0	52.0	48.0	60.0	
Rw of Glazing	21.0	28.0	37.0	48.0	48.0	54.0	34.0	
Façade Noise Ingress (Glazing)	40.0	28.0	16.0	6.0	1.0	-9.0	26.0	
Dne,w of Ventilation	38.0	36.0	35.0	42.0	39.0	42.0	34.0	
Façade Noise Ingress (Ventilation)	30.0	27.0	25.0	19.0	17.0	10.0	26.0	
Total Ingress	40.0	31.0	26.0	19.0	17.0	10.0	29.0	
NR30	48.1	39.9	34.0	30.0	26.9	24.7	35.0	
Exceedance of Criteria	-8.0	-8.0	-8.0	-11.0	-9.0	-14.0	-6.0	

Bedroom Night Time, 23:00 - 07:00								
Description	Sound Pressure Level Leq (dB)						Overall (dBA)	L _{Amax}
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz		
Night Time Free-Field Noise Level	63.0	59.0	56.0	53.0	51.0	47.0	58.0	78.0
Rw of Glazing	21.0	28.0	37.0	48.0	48.0	54.0	34.0	40.0
Façade Noise Ingress (Glazing)	39.0	28.0	16.0	2.0	0.0	-10.0	25.0	38.0
Dne,w of Ventilation	38.0	36.0	35.0	42.0	39.0	42.0	34.0	35.0
Façade Noise Ingress (Ventilation)	29.0	27.0	25.0	15.0	16.0	9.0	25.0	43.0
Total Ingress	39.0	31.0	26.0	15.0	16.0	9.0	28.0	44.0
NR25	43.7	35.2	29.2	25.0	21.9	19.5	30.0	45.0
Exceedance of Criteria	-4.0	-4.0	-3.0	-10.0	-5.0	-10.0	-2.0	-1.0

Appendix F – AVO Guide Level 1 Site Risk Assessment

Risk category for Level 1 assessment ^[Note 5]	Potential Effect without Mitigation	Recommendation for Level 2 assessment
$L_{Aeq, T}$ ^[Note 3] during 07:00 - 23:00 $L_{Aeq, 8hr}$ during 23:00 - 07:00 65 dB High 60 dB Medium 55 dB Low 50 dB Negligible 45 dB	Increasing risk of adverse effect	Recommended Optional
	Use of opening windows as primary means of mitigating overheating is not likely to result in adverse effect	Not required