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NOISE IMPACT ASSESSMENT

BS8233:2014

October 2022

Site Address

749 New Hey Road,
Outlane, Huddersfield,
HD3 3YL

Prepared For

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Executive Summary

An environmental noise survey and noise impact assessment have been undertaken to assess the suitability of the site at 749 New Hey Road, Outlane, Huddersfield, HD3 3YL 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 Section 4.0, including glazing and an alternative ventilation strategy. Provided the recommendations specified within this report are implemented, internal noise levels are expected to be within 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 7.0. - Appropriate alternative ventilation can be found in Table 8.0. - It is recommended that a close-board timber fencing is installed around the external amenity areas. The fencing should have no holes or gaps and must have a minimum surface mass of 10 kg/m^2. The proposed locations for the fencing can be found in Figure 7.0.

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') at 749 New Hey Road, Outlane, Huddersfield, HD3 3YL ('the Site').

The applicant is preparing a planning application ('the Application') to be submitted to Kirklees Metropolitan Council.

The following technical noise assessment has been prepared to support the planning application to Kirklees Metropolitan 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 occupants of the proposed residential dwellings.

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.

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 30/09/22 to 03/10/22. For the long-term monitoring, two sound level meters were used: one was attached to the roof a barn structure adjacent to the M62 Motorway (MP1) and another was one was attached to a post fronting New Hay Road. Both microphones were positioned at 1st floor level approximately 2.5 – 3.5m from the ground. The monitoring positions were chosen in order to collect representative sound levels at the proposed development during the daytime and night-time periods. The monitoring locations are shown in Figure 1.0 below.

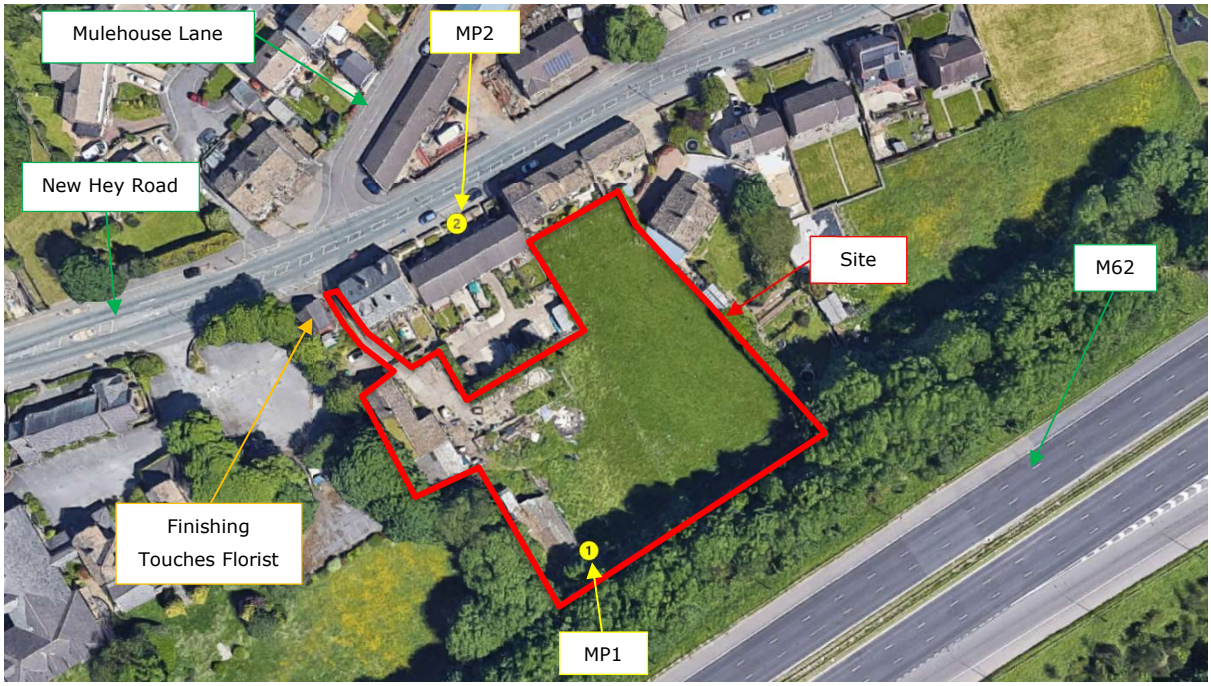


Figure 1.0 – Indicative Site Layout

Context & Subjective Impression

The proposal is for the change of use of the existing buildings from farmhouse and associated barns to 3no. residential dwellings.

The area surrounding the site is primarily residential in nature with limited commercial properties in the vicinity. The noise profile is typical for this type of area and is dominated by road traffic noise emissions from M62 motorway and New Hey Road. Buses frequently pass by the entrance to the property and 'Finishing Touches Florist' is located at the entrance to site. Due to the nature of the business, it is not a cause for concern and no external fixed plant was noted during the site visit.

Environmental Noise Survey Results

The following table outlines the highest octave band $L_{eq,16hr}$ and $L_{eq,8hr}$ sound levels measured during the daytime and night-time periods. The $L_{Aeq,t}$ measurements will be used to calibrate the noise model. 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 $L_{eq,16hr}$ (Day)	61.0	61.0	63.0	64.0	60.0	54.0	67.0
Highest $L_{eq,8hr}$ (Night)	57.0	57.0	58.0	59.0	55.0	49.0	62.0
Measurement Position MP2							
Measurement Period ('t')	**Octave Band $L_{eq,t}$ (Hz, dB)**						**$L_{Aeq,t}$ (dB)**
	125	**250**	**500**	**1k**	**2k**	**4k**	
Highest $L_{eq,16hr}$ (Day)	65.0	65.0	67.0	70.0	67.0	61.0	73.0
Highest $L_{eq,8hr}$ (Night)	58.0	58.0	60.0	62.0	58.0	48.0	65.0

Table 1.0 – Long-Term Monitoring Results – MP1 and MP2

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 69 dB $L_{AFMax,15min}$**
Night 1	71.0	69.0	7
Night 2	71.0	68.0	4
Night 3	73.0	67.0	10
Measurement Position MP2			
Measurement Period ('t')	**$L_{AFMax,15min}$**	***SMR $L_{AFMax,15min}$**	**No. of Exceedances of 82 dB $L_{AFMax,15min}$**
Night 1	91.0	79.0	9
Night 2	87.0	82.0	9
Night 3	86.0	82.0	10

Table 2.0 – Maximum Sound Level Summary Results – MP1 and MP2

**Statistically Most Repeated*

3. Internal 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 $L_{Aeq,16hour}$	--
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	--
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Table 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.

4. Noise Break-in Assessment and Sound Modelling

Ambient and Maximum Noise Level Maps

The ambient and maximum sound levels incident on the Proposed Development have been predicted using Sound Plan 8.2 software, which undertakes its calculations in accordance with the guidance given in IS09613 – 1:1993 and ISO9613 – 2:1996. The following assumptions have been made within the calculation software:

- To accurately model the land surrounding the development the topographical data has been taken from Google Maps, it is assumed this has an accuracy within the last 3 years.
- The ground between the source and receiver is considered to be a mixture of acoustically 'hard' and 'soft' surfaces.

The following parameters have been used to calibrate the sound model:

- The highest measured $L_{Aeq,16hr}$ and $L_{Aeq,8hr}$ recorded during the daytime and night-time periods respectively.
- The $L_{Amax,15min}$ values exceeded fewer than 10 times during the night-time.
- The grid heights of the maps have been set to 1.5m.

The sound map showing the daytime $L_{Aeq,16hour}$ sound levels incident on the Proposed Development can be seen below in Figure 2.0 below.

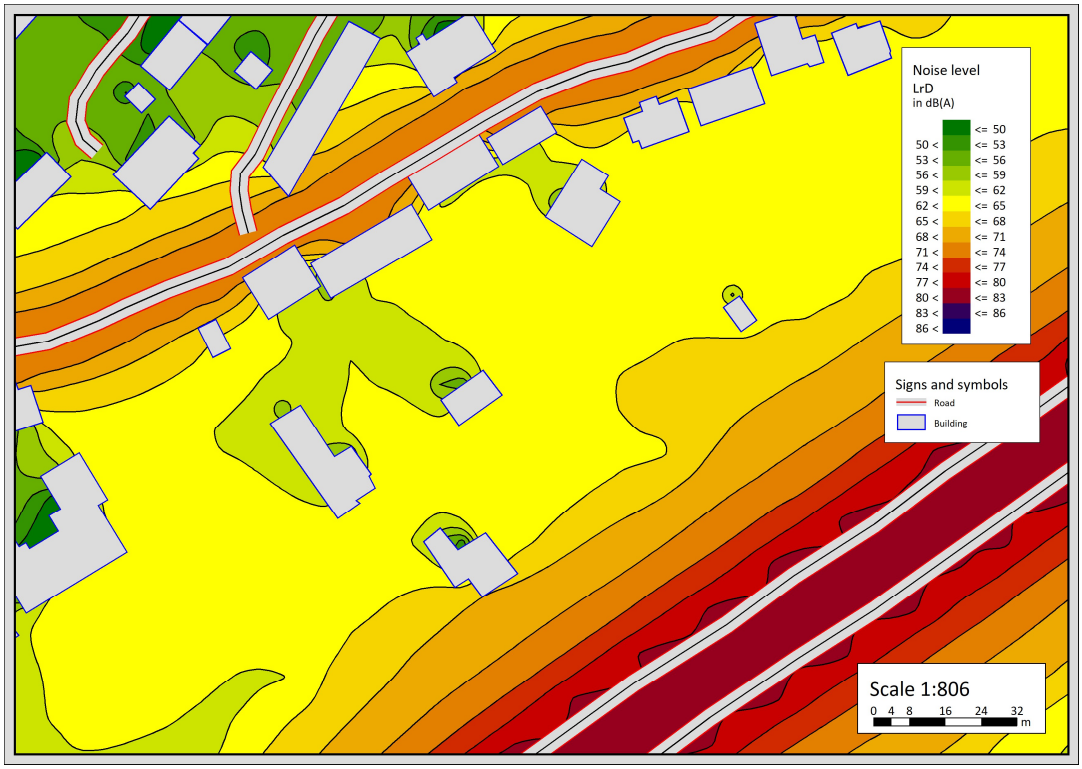


Figure 2.0 – Daytime Noise Map – $L_{Aeq,16hour}$

The sound map showing the night-time $L_{Aeq,8hour}$ sound levels incident on the Proposed Development can be seen below in Figure 3.0.

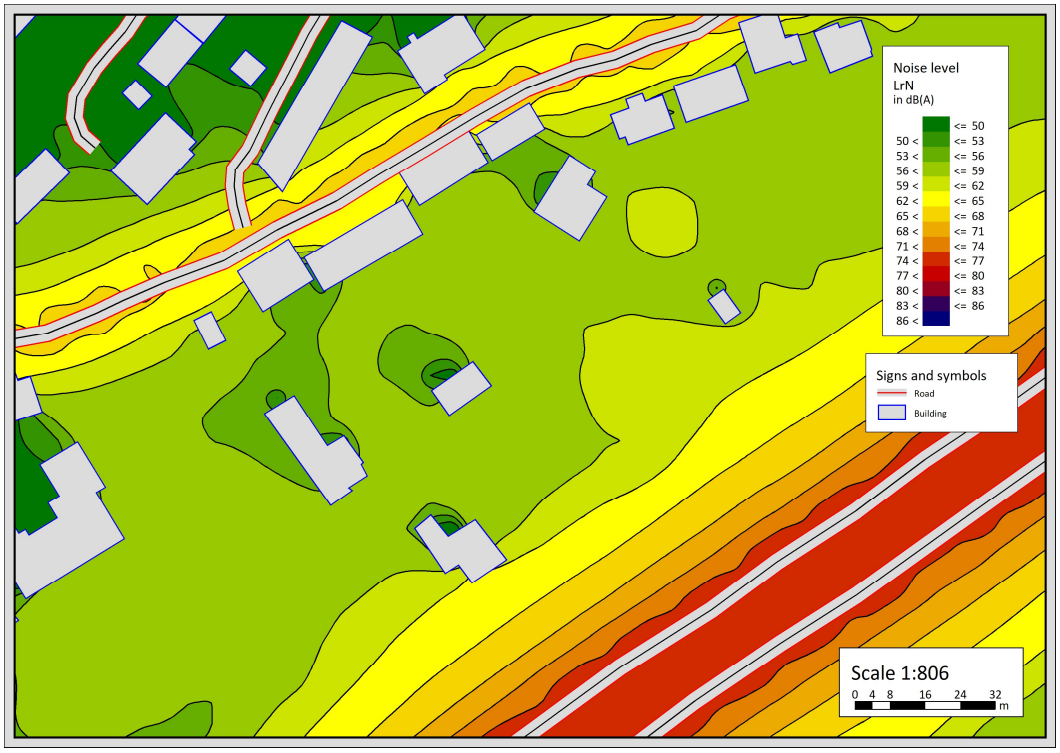


Figure 3.0 – Night-time Noise Map – $L_{Aeq,8hour}$

The sound map showing the L_{AFmax} sound levels incident on the Proposed Development can be seen below in Figure 4.0.

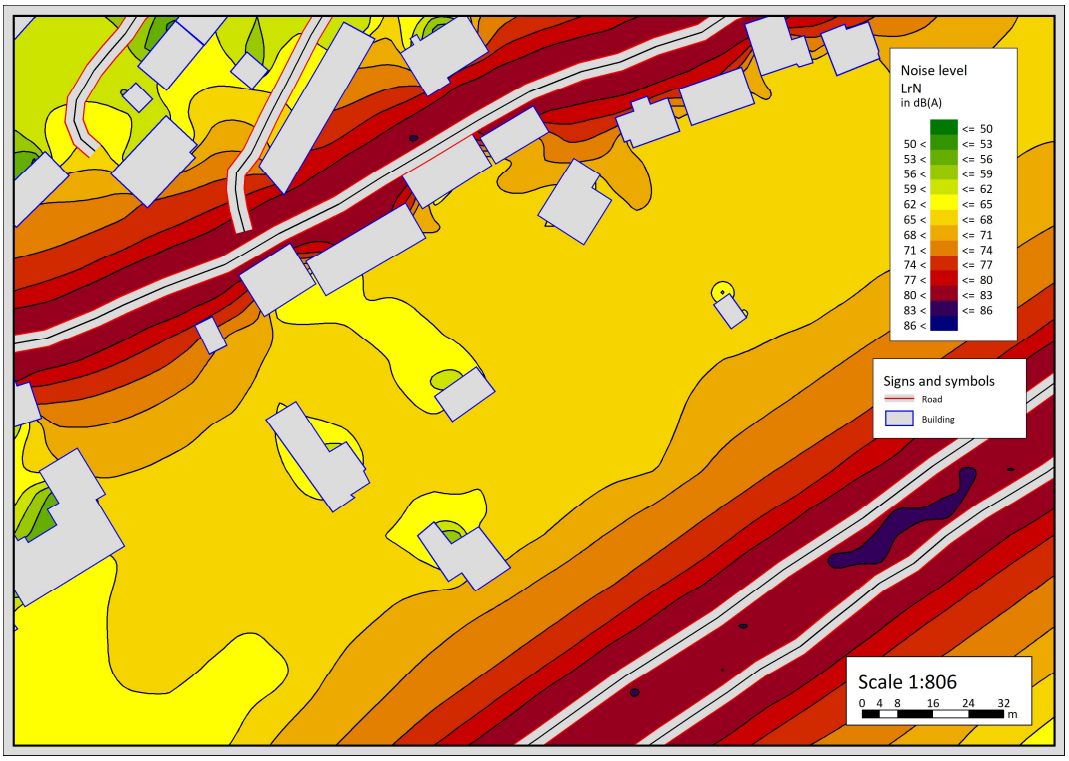


Figure 4.0 – Night-time Noise Map – $L_{Amax,8hour}$

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.

The sound levels incident on the façades of the Proposed Development vary significantly. In order to accurately specify the required sound reduction for the development, the façades have been divided into three colour groups: red, amber and green. These colours correspond with the sound reduction values shown in Table 4.0.

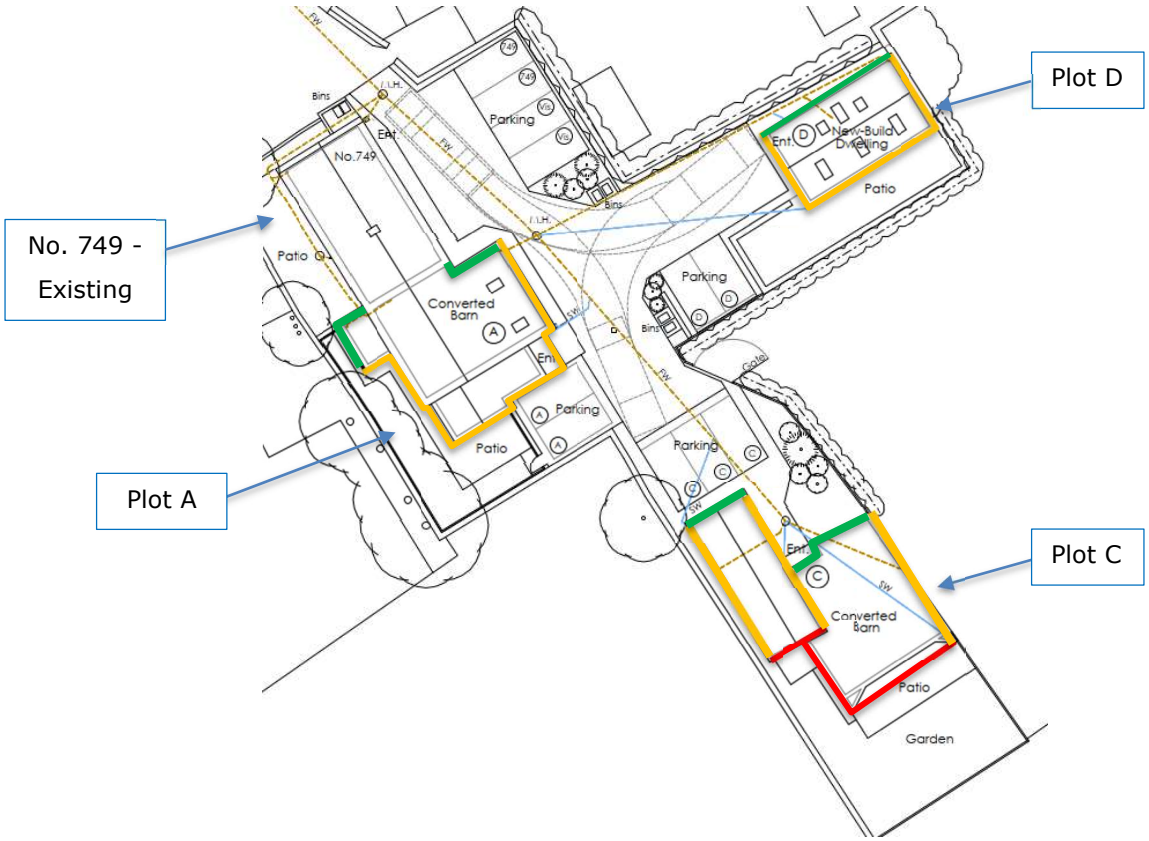


Figure 5.0 – Façade Allocation

The following table outlines the minimum sound reduction required of the building envelope in order to achieve appropriate internal noise levels.

Façade	Location	Time Period	Façade Noise Level (dB)	Internal Noise Criteria (dB)	Min. SRI Required (dB)
Red Façades	Bedroom / Living Room	Day	70.0	35.0 dB $L_{Aeq,16hour}$	35.0 R_W + C_{tr}
	Bedroom	Night	65.0	30.0 dB $L_{Aeq,8hour}$	35.0 R_W + C_{tr}
	Bedroom	Night	73.0	45.0 dB $L_{Amax,8hour}$	28.0 R_W
Amber Façades	Bedroom / Living Room	Day	67.0	35.0 dB $L_{Aeq,16hour}$	32.0 R_W + C_{tr}
	Bedroom	Night	62.0	30.0 dB $L_{Aeq,8hour}$	32.0 R_W + C_{tr}
	Bedroom	Night	69.0	45.0 dB $L_{Amax,8hour}$	24.0 R_W
Green Façades	Bedroom / Living Room	Day	63.0	35.0 dB $L_{Aeq,16hour}$	28.0 R_W + C_{tr}
	Bedroom	Night	58.0	30.0 dB $L_{Aeq,8hour}$	28.0 R_W + C_{tr}
	Bedroom	Night	68.0	45.0 dB $L_{Amax,8hour}$	23.0 R_W

Table 4.0 – Internal Noise Level Analysis

External Noise Assessment

The proposed locations of the external amenity areas can be seen in the figure below.

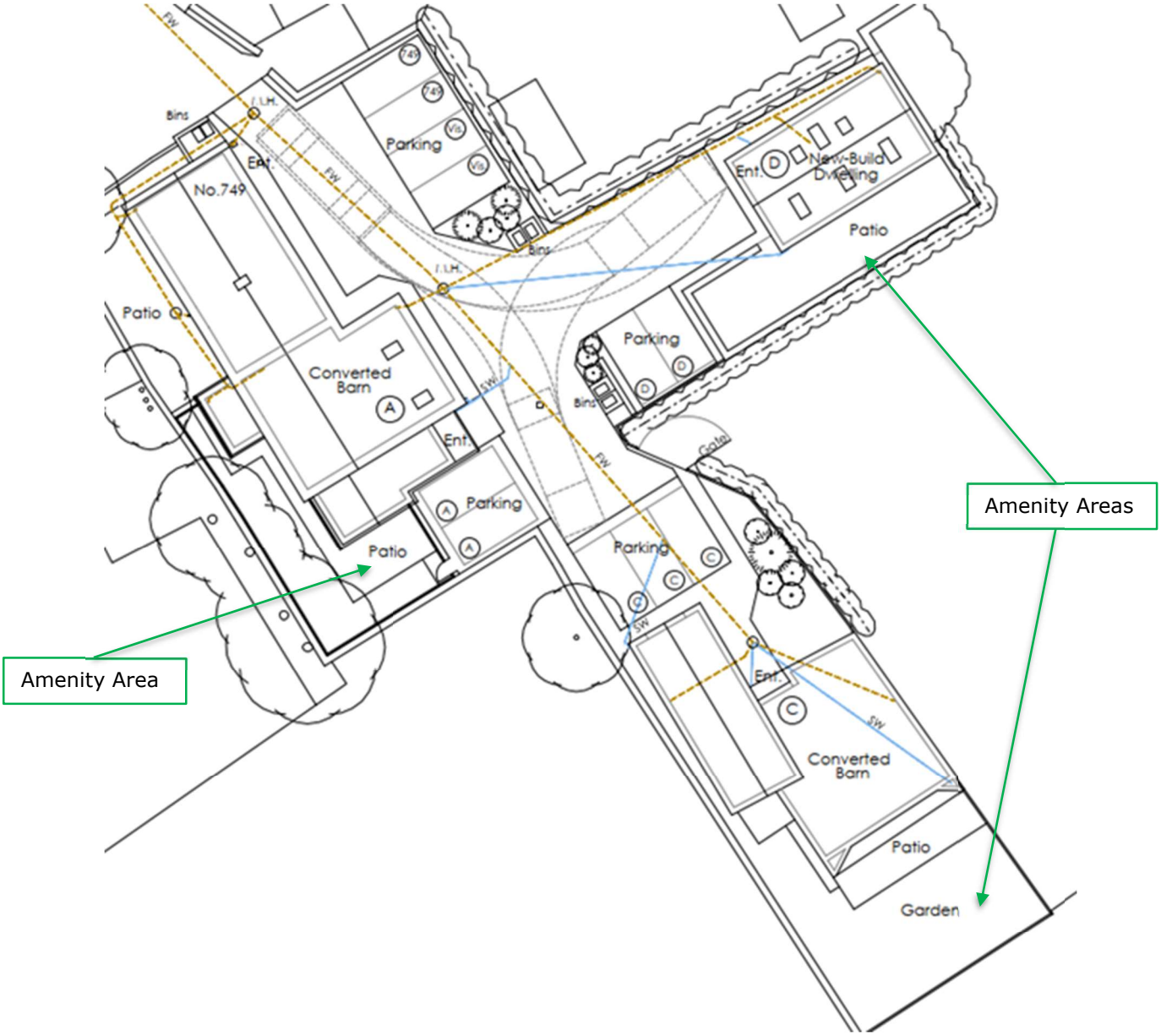


Figure 6.0 – External Amenity Areas

The following table shows the predicted noise levels in the centre of the external amenity areas compared with the BS8233:2014 criteria.

Plot Number	Garden Noise Levels (dB $L_{Aeq,16hour}$)	BS8233:2014 Criteria (dB $L_{Aeq,16hour}$)	Level Above Criteria (dB)
Plot A	64.0	≤55.0	+9.0
Plot C	69.0	≤55.0	+14.0
Plot D	63.0	≤55.0	+8.0

Table 5.0 – External Noise Level Analysis

Discussion

As can be seen in the table above, the noise levels are predicted to be up to 14.0 dB above the criteria in the external amenity areas. In order to reduce noise levels as much as practicable, it is recommended that 2.5m and 3m tall close-board timber fencing is installed around the garden / patio areas. The fencing should have no holes or gaps and must have a minimum surface mass of 10 kg/m^2. An example product that achieves the criteria is Jacksons '12k Envirofence'.

The proposed location of the fencing is shown in the figure below.

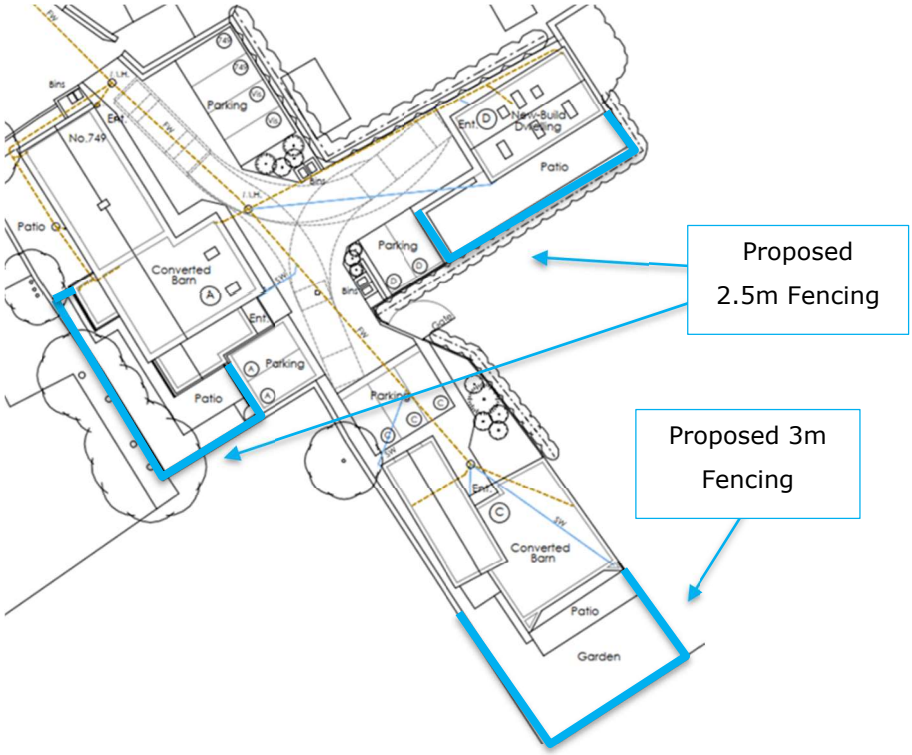


Figure 7.0 – External Amenity Areas – Proposed Fencing Locations

The effects of the fencing are shown in the table below.

Plot Number	Garden Noise Levels (dB $L_{Aeq,16hour}$)	BS8233:2014 Criteria (dB $L_{Aeq,16hour}$)	Level Above Criteria (dB)
Plot A	59.0	≤55.0	+4.0
Plot C	62.0	≤55.0	+7.0
Plot D	59.0	≤55.0	+4.0

Table 6.0 – External Noise Level Analysis – with Fencing

As can be seen in the table above, noise levels in the external amenity areas are predicted to be a maximum of 7 dB above the criteria. However, it is thought that achieving the criteria is an unrealistic expectation considering the proximity of the development site to the M62 Motorway.

Regarding this, the following is stated in BS8233:2014:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."

Further to this, it is also stated in BS8233:2014 that *"Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."*

It is thought it is reasonable to apply this relaxation to noise levels in external areas also, given the proximity to a major transport link. Considering the relaxation, appropriate external levels can be achieved with 2.5m tall fencing in the gardens of plots A and D. The relaxed criteria are exceeded in the garden of plot C with a 3m fence; however, it is thought it would be unnecessarily onerous and expensive to expect the applicant to install fencing that is taller than this as a 2 dB exceedance is likely to be inaudible.

Further to this, it is also thought that future occupants will be aware of the dominance of road noise in the area, and as such are likely to be less sensitive to road noise.

5. Sound Insulation Scheme

The noise levels within the proposed dwellings will be dictated by the configuration, materials, and elements of the façade. The glazed and 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 glazed and 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/m^3 insulation fitted tightly between the 200mm roof joists and 1no. 15mm SoundBloc plasterboard fixed to British Gypsum RB1 resilient bars to achieve a minimum sound reduction of 50dB R_w. Any other configuration of roof that would achieve at least 50dB R_W would also be suitable for the development.

c) Glazing Specification

Windows can be considered the weakest point of a façade in terms of noise reduction from external noise. The glazing units shown in the following tables provide 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.

Façade Colour	Location	Glazing Configuration	Attenuation (dB)
Red	Living Rooms / Bedrooms	*Double Glazing* 6 mm Glass / 16mm Argon Cavity / 8.8 mm Optiphon Glass	35.0 R_W + C_{tr} 41.0 R_W
Amber	Living Rooms / Bedrooms	*Double Glazing* 6mm Glass / 16mm Argon Cavity / 6.8mm Optiphon Glass	34.0 R_W + C_{tr} 40.0 R_W
Green	Living Rooms / Bedrooms	*Double Glazing* 6mm Glass / 16mm Air Cavity / 4mm Glass	28.0 R_W + C_{tr} 32.0 R_W

Table 7.0 – Glazing Specification

a) Open Window Assessment and Ventilation Strategy

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

According to the 'Acoustics Ventilation and Overheating Guide' (AVO Guide), considering the noise levels measured on site, "the use of opening windows as a primary means of mitigating overheating may result in 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 though Ventilated Domestic Windows' compiled for Napier University. The calculations show that the internal noise levels are predicted to be above the criteria, and as such, it is recommended that secondary ventilation is also employed.

Considering this, ventilation systems are shown in the table below that meets the above recommendations.

Façade Colour	Model	Attenuation (dB)
Red – Living Rooms & Bedrooms	Greenwoods 2500EA.AC2	42.0 dB $D_{n,e,w}$ + C_{tr}
Amber - Living Rooms & Bedrooms	Greenwoods 2500EA.AC1	40.0 dB $D_{n,e,w}$ + C_{tr}
Green – Living Rooms & Bedrooms	Titon V25 + C25	34.0 dB $D_{n,e,w}$ + C_{tr}
OR:		
Through Wall Ventilation (not purge)		
Model		**Attenuation (dB)**
Titon Sonair F+ Mechanical Input Ventilator with G3 filter and DV100F duct [1]		56.0 dB $D_{n,e,w}$

Table 8.0 – Ventilation Specification

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.

If mechanical ventilation is to be installed within the dwellings, internal noise levels should not exceed those shown in the following table.

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 Continuous MVHR[2] at minimum ventilation rates	≤ 26.0	≤ 30.0	--
Extract ventilation	Intermittent Extract Fans Continuous MEV at high ventilation rates	≤ 26.0	≤ 35.0	≤ 45.0

Table 9.0 – 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.

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 log10 (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. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq 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. L90 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. L10 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 be 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 $L_{A90,1hour}$ dB and $L_{A90,15mins}$ 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

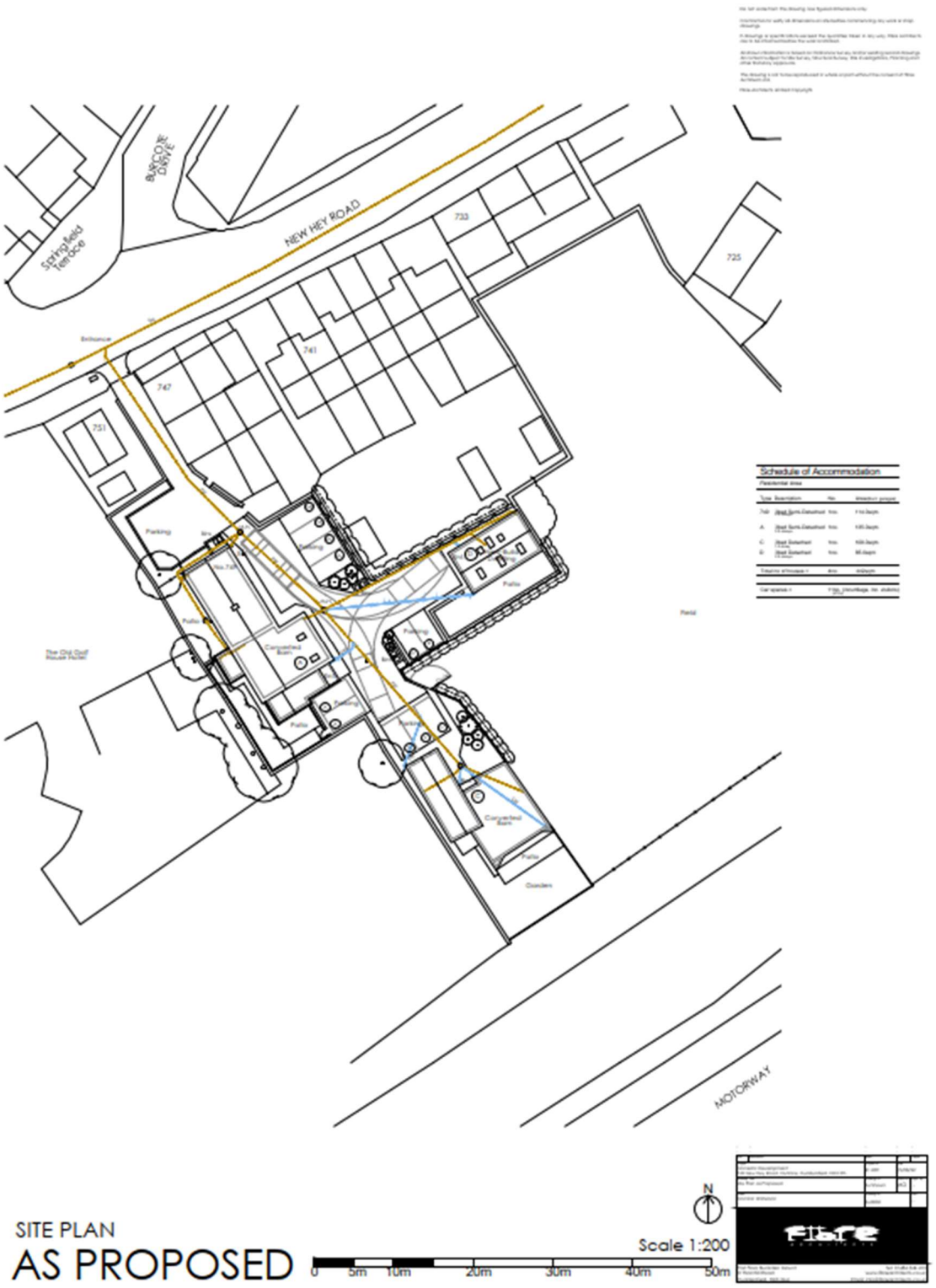
It is noted, however that where development is considered necessary or desirable, despite external noise level above WHO guidelines, the above target levels may be relaxed by up to 5 dB.

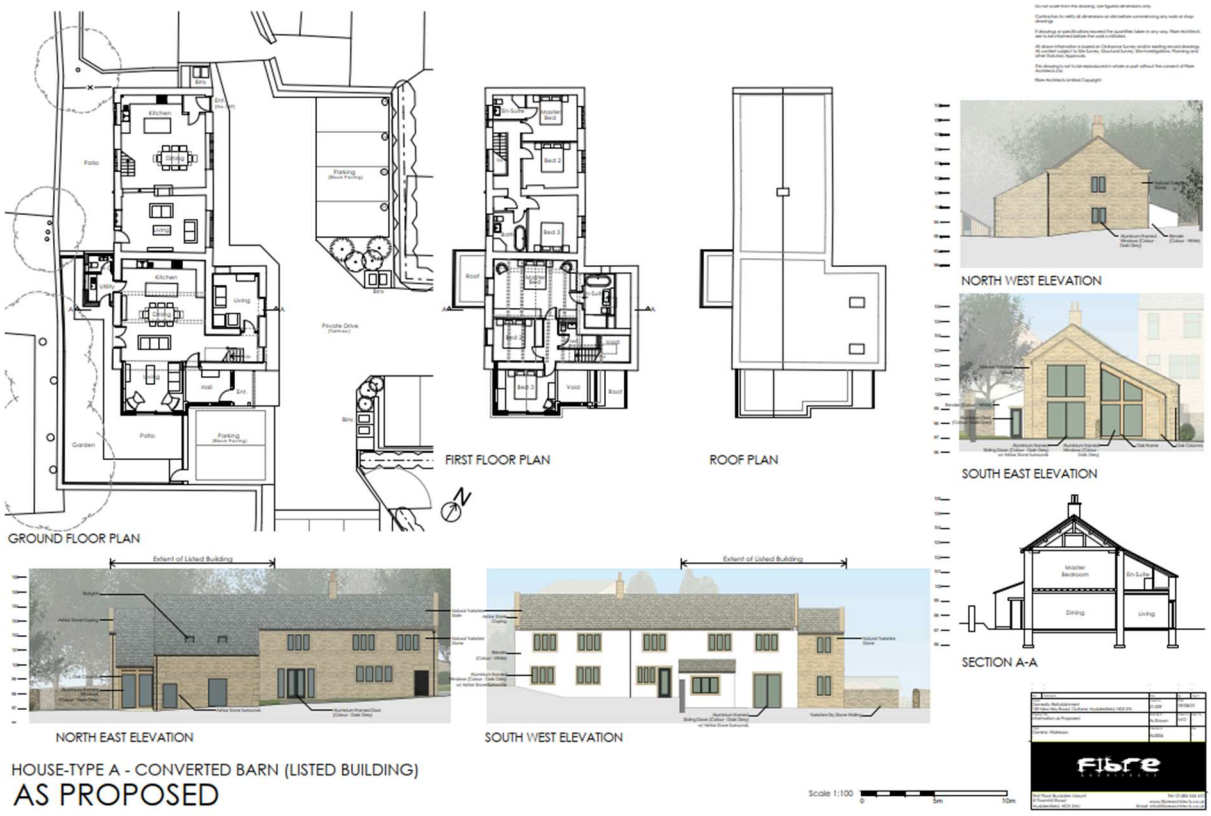
The standard also recommends that for traditional external amenity areas, such as gardens, it is desirable that external noise levels do not exceed 50 dB $L_{Aeq,T}$, and that 55 dB $L_{Aeq,T}$ would be acceptable in noisier environments. However, it is recognised that these values may not be achievable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

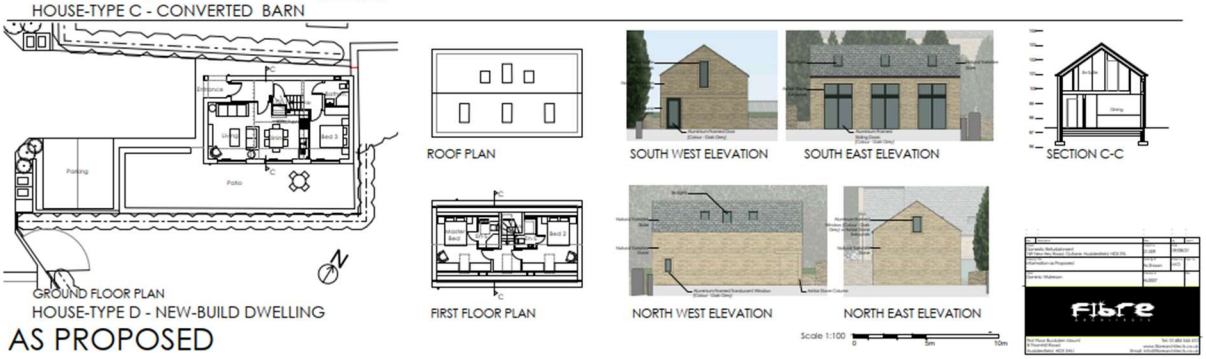
For this assessment, the above criteria are considered to be the LOAEL as defined in the NPSE above.

Appendix C – Location and Site Plans




GROUND FLOOR PLAN
FIRST FLOOR PLAN
ROOF PLAN
NORTH WEST ELEVATION
SOUTH EAST ELEVATION
SECTION A-A
NORTH EAST ELEVATION
SOUTH WEST ELEVATION
HOUSE-TYPE A - CONVERTED BARN (LISTED BUILDING)
AS PROPOSED
Scale 1:100

NORTH WEST ELEVATION
SOUTH EAST ELEVATION
NORTH EAST ELEVATION
SOUTH WEST ELEVATION
SECTION B-B
GROUND FLOOR PLAN
ROOF PLAN
HOUSE-TYPE C - CONVERTED BARN


ROOF PLAN
SOUTH WEST ELEVATION
SOUTH EAST ELEVATION
SECTION C-C
GROUND FLOOR PLAN
HOUSE-TYPE D - NEW-BUILD DWELLING
AS PROPOSED
FIRST FLOOR PLAN
NORTH WEST ELEVATION
NORTH EAST ELEVATION
Scale 1:100

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 – 30/09/22: 10:00 – 23:00	61.0	60.0	62.0	64.0	60.0	54.0	67.0	76.0
Night 1 – 30/09/22: 23:00 – 07:00	56.0	55.0	57.0	58.0	55.0	49.0	62.0	71.0
Day 2 – 01/10/22: 07:00 – 23:00	60.0	59.0	59.0	63.0	59.0	51.0	66.0	80.0
Night 2 – 01/10/22: 23:00 – 07:00	55.0	55.0	55.0	58.0	55.0	47.0	61.0	71.0
Day 3 – 02/10/22: 07:00 – 23:00	59.0	58.0	57.0	61.0	57.0	46.0	63.0	82.0
Night 3 – 02/10/22: 23:00 – 07:00	57.0	57.0	58.0	59.0	53.0	42.0	61.0	73.0
Day 4 – 03/10/22: 07:00 –09:00	61.0	61.0	63.0	64.0	58.0	47.0	66.0	72.0

Table 11.0 – Sound Survey Summary Results – MP1

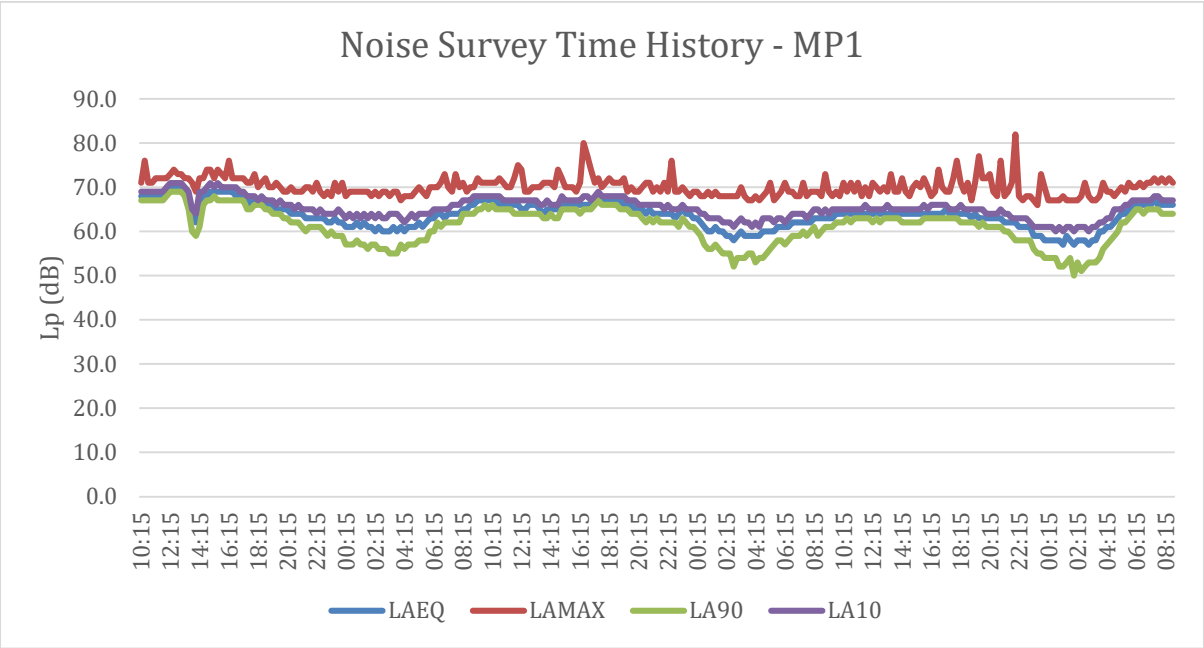


Table 12.0 – Noise Survey Time History – MP1

Measurement Position MP2								
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 – 30/09/22: 10:00 – 23:00	65.0	65.0	67.0	70.0	67.0	61.0	73.0	96.0
Night 1 – 30/09/22: 23:00 – 07:00	58.0	57.0	58.0	61.0	58.0	48.0	64.0	91.0
Day 2 – 01/10/22: 07:00 – 23:00	63.0	63.0	65.0	68.0	65.0	56.0	71.0	93.0
Night 2 – 01/10/22: 23:00 – 07:00	54.0	54.0	57.0	60.0	57.0	45.0	63.0	87.0
Day 3 – 02/10/22: 07:00 – 23:00	65.0	64.0	64.0	67.0	63.0	52.0	70.0	100.0
Night 3 – 02/10/22: 23:00 – 07:00	57.0	58.0	60.0	62.0	58.0	45.0	65.0	86.0
Day 4 – 03/10/22: 07:00 – 09:30	65.0	65.0	67.0	69.0	65.0	53.0	72.0	87.0

Table 13.0 – Sound Survey Summary Results – MP2

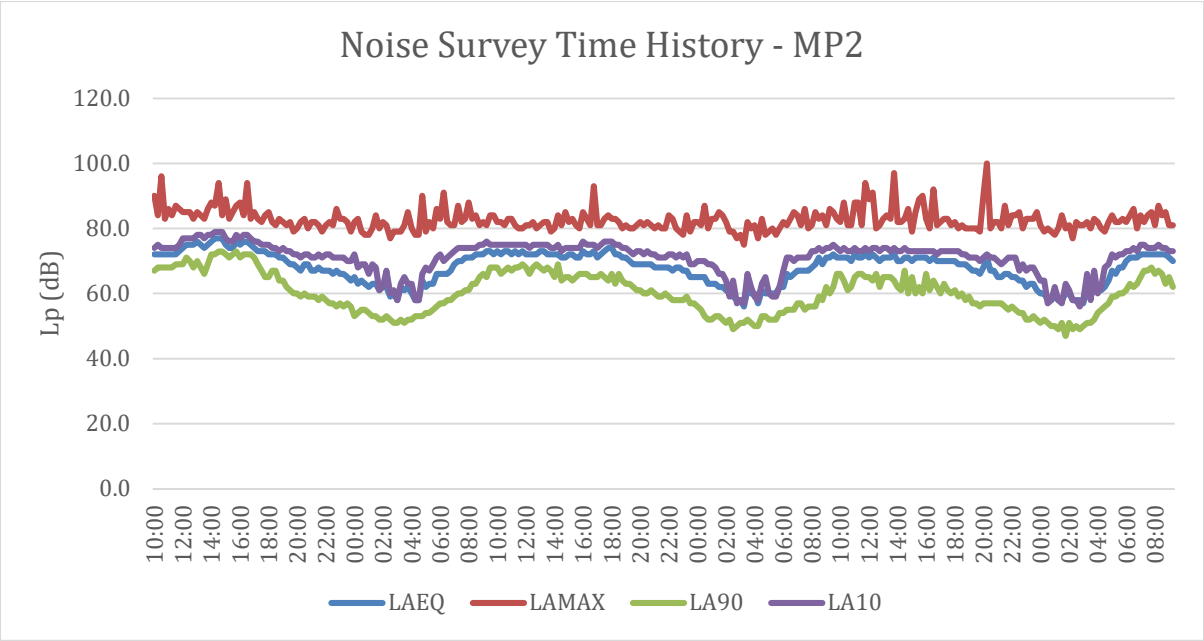


Table 14.0 – Noise Survey Time History – MP2

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
CESVA SC250 Class 1 Sound Level Meter	T252915	≤0.5
CESVA CB011 Class 1 Calibrator	T251945	
CESVA SC250 Class 1 Sound Level Meter	T252860	≤0.5
CESVA CB011 Class 1 Calibrator	T253524	

Table 15.0 – 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 – Reinwood (Approx. 3km South-East of Site)				
Time Period	**Air Temp (^{0}C)**	**Rainfall (mm/h)**	**Prevailing Wind Direction**	**Wind Speed (m/s)**
30/09/22: 00:00 – 23:59	5.9 – 12.4	0.0 – 8.6	NNE	0.0 – 2.9
01/10/22: 00:00 – 23:59	10.7 – 15.0	0.0 – 5.8	NE	0.5 – 2.2
02/10/22: 00:00 – 23:59	8.9 – 15.5	0.0	NE	0.0 – 0.9
03/10/22: 00:00 – 23:59	8.6 – 15.8	0.0	NNE	0.0 – 1.3

Table 16.0 – Weather Summary

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 High: 65 dB / 55 dB Medium: 60 dB / 50 dB Low: 55 dB / 45 dB Negligible: 50 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