RSK Acoustics

Land south of Burford Road, Minster Lovell

Noise Assessment Report

Report Ref. 2061152-RSK-RP-001(00)

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Catesby Strategic Land Limited

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Revision	Description	Date	Prepared	Approved
00	Final issue	19 October 2022	Jonathan Mart, MIOA	Federico Gottardo, MIOA

Noise Assessment Report

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1 Introduction

1.1 Instruction

RSK Acoustics Ltd has been instructed by Catesby Strategic Land Limited (the applicant) to undertake a noise assessment to accompany an outline planning submission for a proposed residential led development on land south of Burford Road, Minster Lovell.

This report describes the assessment methodology, the baseline conditions currently prevailing across the application site and the effect of the noise levels on the proposed residential development.

Mitigation measures have been identified where necessary and practicable to achieve appropriate acoustic standards.

1.2 Objectives

The objectives of the assessment are to:

- Identify sources of noise that may impact upon the residents of the proposed development;
- Quantify and report the noise climate across the site to determine the suitability of the site for the proposed residential use;
- Assess the suitability of the site against the design targets within local and national guidelines/policies; and
- Specify the level of noise mitigation that would be required to reduce the potential for disturbance at future sensitive receptors.

1.3 Exclusions

Levels of vibration from typical free-flowing traffic would be imperceptible at nearest proposed residential locations and therefore an assessment of traffic induced vibration has been discounted.

2 Regulatory Framework

2.1 National Planning Policy Framework (NPPF): 2021

Since its publication by the Department for Environment, Food and Rural Affairs in 2010 the Noise Policy Statement for England (NPSE) has been the Central Government noise policy that has been available to inform the consideration of environmental noise in relation to the consenting of everything from small scale residential development to national infrastructure. The National Policy Planning Framework (NPPF), as updated by the Ministry of Housing, Communities and Local Government in 2021, has noise aims that are consistent with NPSE.

The noise policy aims as stated in NPSE are:

Noise Policy Aims

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

- **avoid significant adverse impacts on health and quality of life;**
- **mitigate and minimise adverse impacts on health and quality of life; and**
- **where possible, contribute to the improvement of health and quality of life**.

In order to translate these aims into practical guidance the NPSE uses the same terminology as used by the World Health Organisation (WHO), in the Night Noise Guidelines for Europe, 2009 by referring to the Lowest Observed Adverse Effect Level (LOAEL). The NPSE extends this concept to define the level above which significant adverse effects on health and quality of life can be detected, hence the Significant Observed Adverse Effect Level (SOAEL).

The NPSE notes, *"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times"*. The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.

Not having quantified effect thresholds in the NPSE means that relevant standards and guidance are used to put forward values for the LOAEL and SOAEL for the proposed development under consideration.

The suitability of internal noise levels within a development for its intended uses can be determined with reference to BS 8233: 2014.

2.2 Noise Policy Statement for England (NPSE): 2010

The Noise Policy Statement for England is published by the Department for Environment, Food and Rural Affairs (Defra) and sets out the approach to noise within the Government's sustainable development strategy.

The significance of impacts from noise within the NPSE are defined as follows:

There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

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.

LOAEL – Lowest Observed Adverse Effect Level

- This is the level above which adverse effects on health and quality of life can be detected.

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

- This is the level above which significant adverse effects on health and quality of life occur.

The three aims of the NPSE are stated as:

- *Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*
- *Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*
- *Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*

2.3 Noise Planning Practice Guidance (NPPG): 2019

The National Planning Practice Guidance (NPPG) is written in support of the NPPF and provides an increased level of specific planning guidance. NPPG states that noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. NPPG also states that, where practicable, there may be opportunities to consider improvements to the acoustic environment and that noise can over-ride other planning concerns but should not be considered in isolation, separately from the economic, social and other environmental dimensions of proposed development. NPPG reflects the overall aim of NPSE and expands on many of its concepts, in particular NOEL, LOAEL and SOAEL.

2.4 British Standard 7445-1:2003 'Description and measurement of environmental noise. Guide to quantities and procedures'

The three-part standard BS 7445 provides the framework within which environmental noise should be quantified. Part 1 provides a guide to quantities and procedures and Part 2 provides a guide to the acquisition of data pertinent to land use. Part 3 provides a guide to the application of noise limits.

BS 7445 also refers to a further standard, BS EN 61672, which prescribes the equipment necessary for such measurements. Whilst BS 7445 does not prescribe the meteorological conditions under which noise measurements should or should not be taken, it does (part 2, paragraph 5.4.3.3) recommend that in order

"…to facilitate the comparison of results (measurements of noise from different sources), it may be necessary to carry out measurements under selected meteorological conditions which are reproducible and correspond to quite stable propagation conditions."

These conditions include:

- wind speed not exceeding 5 m/s (measured at a height of 3 to 11 m above the ground);
- no strong temperature inversions near the ground; and
- no heavy precipitation.

2.5 British Standard 8233: 2014 'Guidance on sound insulation and noise reduction for buildings'

BS 8233 establishes internal ambient noise levels for dwellings based upon occupancy patterns derived from World Health Organisation (WHO) guidelines for community noise. These are summarised below:

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

Note 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or Lmax, F, depending on the character and number of events per night. Sporadic noise events could require separate values.

Table 2.1 – Summary of internal ambient noise levels

BS8233 also provides design criteria for external noise and Section 7.7.3.2 states:

"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."

2.6 World Health Organisation – 'Guidelines for Community Noise', 1999

The World Health Organisation (WHO) Guidelines for Community Noise was published as a response to a need for action together with a generic need for improvements in legislation at a national level. Although not legislation, this document provides general guidance and guidelines which have been set for different health effects, using the lowest noise level that produces an adverse health effect in specific human environments. The guideline levels which are relevant to this assessment are set out in **Table 2.2**.

Activity	Location	L_{Aeq}, dB	Time base, T hours	L_{AFmax}, dB
Outdoor living area	Serious annoyance, daytime and evening	55	16	--
	Moderate annoyance, daytime and evening	50		
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	--
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

(1) Should not exceed 45 dB L_{AFmax} more than 10-15 times a night.

Table 2.2 – WHO guidelines for community noise

2.7 Acoustics Ventilation and Overheating - Residential Design Guide: 2020 and Approved Document O (2021 Edition) – The Building Regulations: 2010

Whilst the noise criteria outlined within BS 8223: 2014 provides guidance for 'normal' conditions, it is widely considered that a relaxation in acoustic criteria is permissible during peak summer months where occupants may be willing to compromise on noise ingress for purpose of thermal comfort. Suitable internal noise levels during overheating periods (i.e. when open windows or other measures are required to be implemented for the control of overheating) are provided in Acoustics Ventilation and Overheating: Residential Design Guide (AVO).

Approved Document O (AD-O), 2021 edition (under Building Regulations 2010) provides additional guidance and firms up requirements from developers for overheating scenarios. Whilst broadly in line with the AVO Guide, the AD-O (along with the recently published ANC/IOA document 'Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O') provides more definition in terms of assessment categories. . Based on typical assumptions, the resulting outside-to-inside level difference for window openings necessary to satisfy the simplified method of AD-O are expected to be approximately 4 dB for 'high' risk locations and 9 dB for 'medium' risk locations.

A summary of the recommended levels for the most noise-sensitive spaces (bedrooms) are provided below in **Table 2.3** for average ambient noise levels throughout a given time period (L_{Aeq}) and maximum noise levels (L_{max}) during the night.

Period	**Normal condition (as per BS 8233)**	**Overheating condition (AVO)**	**Overheating condition (ADO)**
Daytime (07:00 to 23:00)	35 dB $L_{Aeq,16hr}$	40 – 50 dB $L_{Aeq,16hr}$	--
Night-time (23:00 to 07:00)	30 dB $L_{Aeq,8hr}$ 45 dB L_{Amax}	35 – 42 dB $L_{Aeq,8hr}$ 65 dB L_{Amax}*	40 dB $L_{Aeq,8hr}$ 55 dB L_{Amax}*

Note – internal noise levels
** L_{AFmax} refers to the level not normally exceeded, and not the 10th highest L_{AFmax} highest level used within WHO guidelines*

Table 2.3 – AVO and AD-O overheating condition criteria

The lower ambient noise level thresholds in the overheating condition (40 dB(A) and 35 dB(A) for day and night respectively) correspond to the recommendation within BS 8233:2014 for internal noise levels that would be considered "reasonable" under normal conditions.

The appropriate target level associated with the AVO guidance within the range is determined by considering the duration for which windows or ventilation openings are required to be utilised to control overheating. While there are no defined values as to what is considered "rarely" or "most of the time", guidance is provided through assessment of overheating risk assessments or thermal modelling output.

It should be noted that the noise levels stated are considered to apply for transportation noise sources and industrial noise is not considered by the AVO guide.

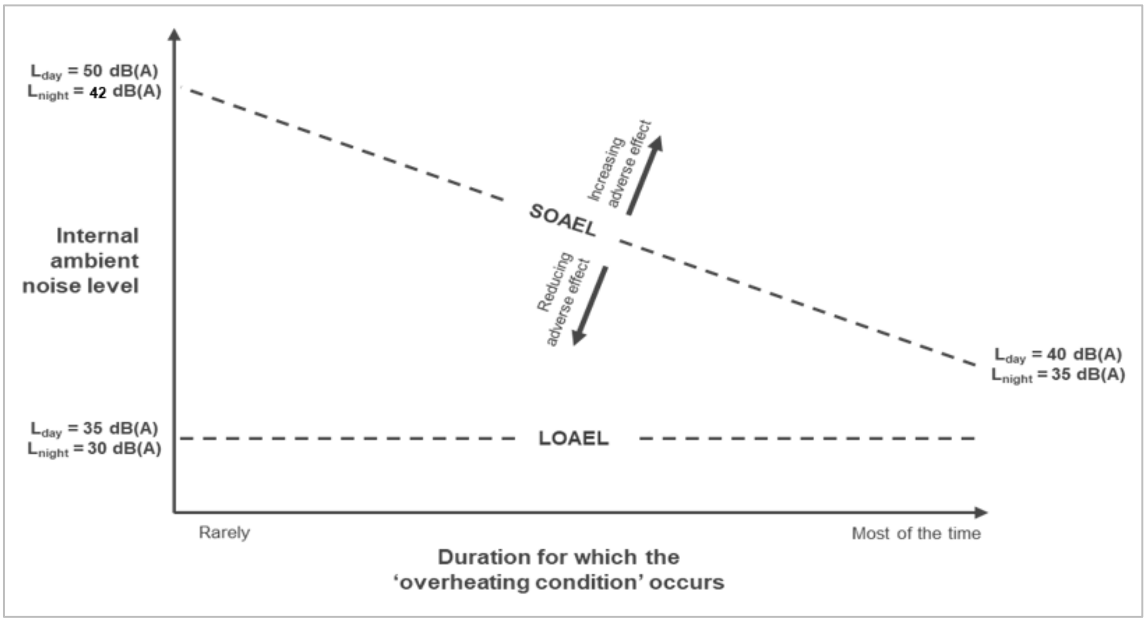

Figure 2.1 - Relationship between internal ambient noise level and overheating condition – AVO Guidance

2.8 Professional Practice guidance on Planning and Noise (ProPG): 2017

The Professional Practice Guidance on Planning and Noise is written to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. The CIEH, IOA and the ANC have worked together to produce the guidance which encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise. This Professional Practice Guidance is based on the best knowledge available at the time of publication. It does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy on which users should take their own advice as appropriate.

In relation with achieving internal noise values with open windows ProPG states that:

"Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal LAeq target levels should not normally be exceeded".

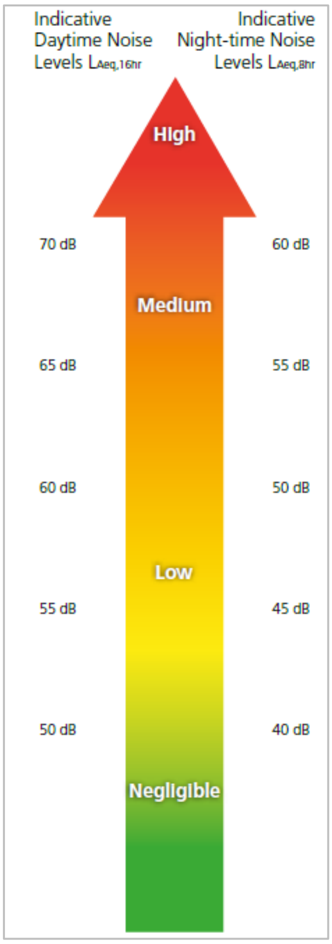

Figure 2.2 – Stage 1 – Initial site noise risk assessment

Stage 1 – Initial Site Noise Risk Assessment

ProPG recommends practitioners to undertake an initial noise risk assessment of the proposed development site to provide an indication of the likely risk of adverse effects from noise were no subsequent mitigation to be included as part of the development proposal. **Figure 2.2** summarises the Stage 1 Initial Site Noise Risk Assessment providing indicative daytime and night-time noise levels associated with four categories of risk: *Negligible*, *Low*, *Medium* and *High*.

The figure illustrates how this initial noise risk assessment is linked with an increasing risk of adverse effect from noise. The assessment should include the acoustic effect of any existing site features that will remain (e.g. retained buildings, changes in ground level) and exclude the acoustic effect of any site features that will not remain (e.g. buildings to be demolished, fences and barriers to be removed) if development proceeds.

Acoustic Design

ProPG encourages the use of acoustic design as a means to inform the site masterplans and is key to avoiding or reducing to a minimum any adverse effects on any sensitive internal or external spaces. In considering acoustic design, consideration should be given by the developer to the management of noise through a hierarchy of potential mitigation measures which may include:

- Maximising the separation distance between source and receiver;
- Incorporate noise barriers (where applicable) to screen the development site (or individual plots) from significant sources of noise;
- Use existing features to reduce noise propagation across the site;
- Orientate the buildings in a manner which reduces the noise levels within habitable rooms (particularly bedrooms);
- Building envelope design to mitigate the noise to acceptable levels, whilst providing adequate ventilation.

2.9 International Standard ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation'

International Standard: ISO 9613-2: 1 provides a prediction methodology which is suitable for a wide range of engineering applications where external noise propagation is of interest. The noise source(s) may be moving or stationary and the method considers the following major mechanisms of noise attenuation:

- Geometrical divergence (also known as distance loss or geometric damping);
- Atmospheric absorption;
- Ground effect;
- Reflection from surfaces; and
- Screening by obstacles.

The method predicts noise levels under metrological conditions favourable to propagation from the sound source to the receiver, such as downwind conditions, or equivalently, propagation under a moderate ground-based temperature inversion as commonly occurs at night.

2.10 Calculation of Road Traffic Noise, 1988

The Calculation of Road Traffic Noise (CRTN) describes the procedures for calculating noise from Road traffic. The memorandum uses traffic flows, %HGV's and Road speed, amongst other parameters to calculate the noise level in terms of the $L_{A10,\ 18hr}$. The 18-hour period is defined between 06:00 and 24:00.

CRTN also allows provision for a shortened measurement procedure which is equally appropriate for the calculation of road traffic noise. The procedure involves obtaining traffic noise measurements throughout a representative sample period within any three consecutive hours between 10:00 and 17:00. In order to calculate an equivalent daytime noise ($L_{Aeq,\ 16hrs}$), the correction of $L_{A10,\ 3hrs}$ – 3 dB would be applied.

2.11 Design Manual for Roads and Bridges, LA111 Noise and Vibration, 2020

The assessment is based on the procedure set out in the Design Manual for Roads and Bridges (DMRB). The assessment covers both the magnitude and significance of any change as a result of any new or amended highway scheme however is relevant for noise assessment of other project types. DMRB refers specifically to noise impacts and as such will be discussed in these terms for the purposes of this assessment.

A significant change is defined as an increase in the 18-hour traffic flow which is equal or greater than 25%, or a decrease which is equal or greater than 20%. Changes of this magnitude are equivalent to a change in noise level of at least 1 dB.

The magnitude of noise impact is therefore assessed by comparing the increase and decrease in noise levels between both short term and long-term scenarios. DMRB defines this impact both in the short term (immediate impact) and long term (future impact).

Magnitude of change	Noise change, $L_{A10, 18hr}$ Short term	Long term
Major	Greater than or equal 5.0	Greater than or equal to 10.0
Moderate	3.0 to 4.9	5.0 to 9.9
Minor	1.0 to 2.9	3.0 to 4.9
Negligible	Less than 1.0	Less than 3.0

Table 2.4 – DMRB magnitude of change

In relation with the significance of impacts from noise as defined by NPSE, LA111 sets out the following operational LOAELs and SOAELs for all receptors:

Time period	LOAEL	SOAEL
Day (06:00 to 24:00)	55 dB $L_{A10,18hr}$ facade	68 dB $L_{A10,18hr}$ facade
Night (23:00 to 07:00)	40 dB $L_{night,outside}$ (free-field)	55 dB $L_{night,outside}$ (free-field)

Table 2.5 – DMRB LA111 Operational noise LOAELs and SOAELs

2.12 Local Authority Consultation

The noise monitoring and assessment methodology was shared by email with the ERS Pollution team at West Oxfordshire District Council on 21 July 2022, where it was proposed to undertake long tern measurements at up to four locations for at least 96 hours (including midweek and weekend days). The selected indicative monitoring positions would be distributed along the north, east, south and west boundaries.

The proposed methodology included:

- A baseline noise survey carried out to establish the existing noise levels at the site. The extent of the survey would comprising of environmental noise measurements (background and ambient) aimed to characterise the existing noise environment inclusive of maximum noise levels (L_{AFmax}) during night-time hours.
- A suitability assessment of the site for residential development in line with the National Planning Policy Framework (NPPF) and West Oxfordshire District Council. Consideration of internal and external noise levels against the criteria within BS 8233: 2014 '*Guidance on sound insulation and noise reduction for buildings*'. The assessment would look to

incorporate the design target thresholds for internal noise levels (30 dB(A) night, 35 dB(A) daytime). In addition, the WHO guidance on maximum internal night-time levels for residential amenity of 45 dB L_{AFmax} would also be incorporated into the assessment. Any external amenity spaces should be designed to achieve 50 – 55 dB(A) daytime.

- Consideration of the guidance set out within the Professional Practice Guidance on Planning & Noise (ProPG document), should any acoustic features from commercial/industrial sources be readily distinctive at future occupants. These corrections would be applied to the noise level guideline values in order to derive suitable effect thresholds and/ or mitigation design targets (i.e. the addition of relevant penalties to measured 16-hr daytime or 8-hr night-time levels, where appropriate, to provide a more conservative assessment).

A second attempt to obtain feedback was made by email to the enquiries@westoxon.gov.uk address on 10 August 2022; however, no reply was received.

3 Development Location

3.1 Site Location and Description

The site is located approximately 0.5 km to the west, along the outskirts of Minster Lovell. The proposed northern site boundary runs adjacent to the B4047 Burford Road. The nearest town of Witney is located approximately 4.5 km to the east. Access to the site is proposed to be off Burford Road.

The site is predominantly flat, and bounded by Burford Road to the north, agricultural land to the south and west, and the 'Dovecote Park' residential scheme to the east. The A40 is located 800 metres to the south of the site boundary.

3.2 Proposed Development

The applicant is seeking outline planning permission for the development of up to 140 dwellings (Use Class C3) including means of access into the site (not internal roads) and associated highway works, with all other matters (relating to appearance, landscaping, scale and layout) reserved.

The proposed development framework plan is presented in **Figure 3.1** with the illustrative masterplan reproduced in greater detail in **Appendix 1**.

Figure 3.1 – Proposed Framework plan (466_P02-Framework Plan, Rev E dated October 2022)

4 Baseline Survey Methodology

4.1 Measurement Details

A baseline noise survey was undertaken between Friday 09 September 2022 and Wednesday 14 September 2022 with the acquisition of continuous noise data throughout daytime (07:00 – 23:00) and night-time periods (23:00 – 07:00). Four unattended measurements (UL1 to UL4) were undertaken over a representative midweek and weekend period at positions along the northern, south-eastern, western and southern boundaries to quantify the prevailing noise environment.

A description of the measurement positions and rationale is provided in **Table 4.1**:

No.	Type	Long term	Rationale
UL1	U	Northern boundary	To quantify the noise contribution from Burford Road
UL2	U	South-Eastern boundary	To quantify attenuated noise levels from Burford Road and A40
UL3	U	Southern boundary	To quantify attenuated noise levels from Burford Road and A40
UL4	U	Western Boundary	To quantify attenuated noise levels from Burford Road and A40

** U – unattended*

Table 4.1 – Measurement location details

A graphical representation of the monitoring positions is presented in **Figure 4.1**.

Figure 4.1 – Baseline measurement locations

4.2 Survey Equipment

Noise monitoring was undertaken using the following equipment:

Equipment	Type	Serial number	Calibration date
Class 1 sound level meter	Rion NL-52	453832	16/06/2021
		976247	28/06/2021
		197728	28/06/2021
	01dB Fusion	14023	15/06/2021
Acoustic calibrator	Rion NC-75	35270126	24/03/2022

Table 4.2 – Monitoring equipment

All measurements were undertaken in free field conditions with the microphone positioned at least 3.5 metres away from reflecting surfaces and at 1.5 metres above ground height to the requirements of BS 7445.

The calibration of each sound level meter was checked before and after the measurements, using the acoustic calibrator at 94 dB at 1 kHz; no significant calibration drift ± 0.5 dB(A) was noted. The sound level meters used conform to the requirements of BS EN 61672-1: 2013 *'Electroacoustics. Sound level meter, Specifications'*. The calibrator used conforms to the requirements of BS EN 60942: 2018 *'Electroacoustics, Sound calibrators'*. The equipment used has a calibration history that is traceable to a certified calibration institution.

Measurements were logged in continuous 15-minute integration periods (with supplementary 1- second data) and obtained using a combination of broadband indices (L_{Aeq}, L_{A10}, L_{A90} and L_{Amax}).

4.3 Noise Environment

The noise environment across the site was dominated by vehicular movements along Burford Road and to a lesser extent, the A40. Construction noise was audible intermittently at the northern boundary location of the site from the adjacent 'Dovecote Park' residential development. No other significant sources of noise were noted during times of attendance, although it is likely that aircraft movements from RAF Brize Norton would be also audible at the site.

4.4 Weather Conditions

Representative weather conditions during the monitoring period have been obtained from *www.wunderground.com* (Station ID: ICARTE10 situated in Carterton – approximately 3.5 km to the south-west the development site) and are summarised in **Table 4.3**.

Date/time	Average temperature, ºC	Average wind speed, ms^{-1}	Dominant wind direction	Precipitation mm
09/09/2022	16	<0.5	W	0.2
10/09/2022	16	<0.5	NNW	0.2
11/09/2022	16	<0.5	SSE	0.2
12/09/2022	19	<0.5	WSW	0.61
13/09/2022	16	<0.5	NNE	1.8
14/09/2022	16	<0.5	N	0.41

Table 4.3 – Summary of weather data

Weather conditions were calm with precipitation noted on 13 September 2022. Noise monitoring data has been analysed throughout this period and there was a negligible change in noise levels as a result of the period of precipitation. The weather conditions are considered suitable for monitoring purposes in accordance with BS 7445.

5 Baseline Survey Results

A summary of the measured noise levels at the long-term, continuous measurement locations UL1 to UL4 are presented in **Tables 5.1 to 5.4**. Graphical output of the survey data is provided in **Appendix 2**. Analysis of the dataset accounting for the standard 16-hour daytime period (07:00 – 23:00) and 8-hour night-time period (23:00 – 07:00) in accordance with BS 8233: 2014. Values are rounded to the nearest whole number.

5.1 Long Term Monitoring

Date	Time Period	Measured noise levels, dB[1]			
		$L_{Aeq,T}$	$L_{AFmax,15min}$	$L_{A90,T}$	$L_{A10,T}$
09/09/2022	13:45 – 23:00	64	95	42	66
	23:00 – 07:00	55	82	26	44
10/09/2022	07:00 – 23:00	63	89	37	67
	23:00 – 07:00	53	81	30	45
11/09/2022	07:00 – 23:00	62	90	42	64
	23:00 – 07:00	56	82	34	47
12/09/2022	07:00 – 23:00	65	100	45	69
	23:00 – 07:00	56	81	29	44
13/09/2022	07:00 – 23:00	64	86	42	67
	23:00 – 07:00	56	83	29	44
14/09/2022	07:00 – 16:15	65	86	43	70
Average [2]	**Daytime**	**64**	**100**	**42**	**67**
	Night-time	**55**	**83**	**29**	**45**

(1) $L_{Aeq,T}$ values are the logarithmic average of $L_{Aeq,15min}$ samples, and the $L_{A10,T}$ and $L_{A90,T}$ are the arithmetic average of $L_{A10,15min}$ and $L_{A90,15min}$ samples. L_{AFmax} accounts for the highest $L_{AFmax,15min}$ sample within the period.
(2) Logarithmic and arithmetic average of derived daytime 16hr and night-time 8hr values. Part time periods on 09.09.22 and 14.09.21 also included.

Table 5.1 Noise survey results – Unattended monitoring location UL1 (Northern boundary)

Date	Time Period	Measured noise levels, dB[1] $L_{Aeq,T}$	$L_{AFmax,15min}$	$L_{A90,T}$	$L_{A10,T}$
09/09/2022	12:45 – 23:00	46	75	40	47
	23:00 – 07:00	37	59	26	39
10/09/2022	07:00 – 23:00	41	77	35	42
	23:00 – 07:00	36	57	28	39
11/09/2022	07:00 – 23:00	45	71	40	46
	23:00 – 07:00	45	73	35	45
12/09/2022	07:00 – 23:00	46	71	39	45
	23:00 – 07:00	34	56	27	35
13/09/2022	07:00 – 23:00	48	84	36	42
	23:00 – 07:00	35	73	29	36
14/09/2022	07:00 – 15:30	47	73	37	46
Average[2]	**Daytime**	**45**	**84**	**38**	**45**
	Night-time	**37**	**73**	**29**	**39**

(1) $L_{Aeq,T}$ values are the logarithmic average of $L_{Aeq,15min}$ samples, and the $L_{A10,T}$ and $L_{A90,T}$ are the arithmetic average of $L_{A10,15min}$ and $L_{A90,15min}$ samples. L_{AFmax} accounts for the highest $L_{AFmax,15min}$ sample within the period.

(2) Logarithmic and arithmetic average of derived daytime 16hr and night-time 8hr values. Part time periods on 09.09.22 and 14.09.21 also included.

Table 5.2 Noise survey results – Location UL2 (South-eastern boundary)

Date	Time Period	Measured noise levels, dB(1)			
		$L_{Aeq,T}$	$L_{AFmax,15min}$	$L_{A90,T}$	$L_{A10,T}$
09/09/2022	13:07 – 23:00	47	76	41	48
	23:00 – 07:00	39	76	26	40
10/09/2022	07:00 – 23:00	44	77	37	46
	23:00 – 07:00	41	64	30	44
11/09/2022	07:00 – 23:00	49	74	43	49
	23:00 – 07:00	45	76	35	46
12/09/2022	07:00 – 23:00	47	78	40	47
	23:00 – 07:00	41	60	32	43
13/09/2022	07:00 – 23:00	48	84	38	45
	23:00 – 07:00	37	65	30	38
14/09/2022	07:00 – 15:37	47	77	39	48
Average(2)	**Daytime**	**47**	**84**	**40**	**47**
	Night-time	**41**	**76**	**31**	**42**

(1) $L_{Aeq,T}$ values are the logarithmic average of $L_{Aeq,15min}$ samples, and the $L_{A10,T}$ and $L_{A90,T}$ are the arithmetic average of $L_{A10,15min}$ and $L_{A90,15min}$ samples. L_{AFmax} accounts for the highest $L_{AFmax,15min}$ sample within the period.

(2) Logarithmic and arithmetic average of derived daytime 16hr and night-time 8hr values. Part time periods on 09.09.22 and 14.09.21 also included.

Table 5.3 Noise survey results – Location UL3 (Southern boundary)

Date	Time Period	Measured noise levels, dB(1) $L_{Aeq,T}$	$L_{AFmax,15min}$	$L_{A90,T}$	$L_{A10,T}$
09/09/2022	13:30-23:00	47	75	40	49
	23:00 – 07:00	38	72	26	40
10/09/2022	07:00 – 23:00	45	72	36	48
	23:00 – 07:00	41	61	29	44
11/09/2022	07:00 – 23:00	47	70	42	48
	23:00 – 07:00	46	68	35	46
12/09/2022	07:00 – 23:00	47	71	40	48
	23:00 – 07:00	40	64	29	41
13/09/2022	07:00 – 23:00	49	83	39	49
	23:00 – 07:00	38	66	29	38
14/09/2022	07:00 – 15:45	48	75	39	49
Average(2)	**Daytime**	**47**	**83**	**39**	**49**
	Night-time	**41**	**72**	**30**	**42**

(1) $L_{Aeq,T}$ values are the logarithmic average of $L_{Aeq,15min}$ samples, and the $L_{A10,T}$ and $L_{A90,T}$ are the arithmetic average of $L_{A10,15min}$ and $L_{A90,15min}$ samples. L_{AFmax} accounts for the highest $L_{AFmax,15min}$ sample within the period.

(2) Logarithmic & arithmetic average of derived daytime 16hr and night-time 8hr values. Part time periods on 09.09.22 and 14.09.21 also included.

Table 5.4 Noise survey results – Location UL4 (Western boundary)

The highest averaged daytime noise level of 64 dB $L_{Aeq,16hr}$ was measured at monitoring position UL1 along the northern boundary of the site. This is due to the monitoring position's proximity to vehicle movements along Burford Road. The averaged night-time noise level throughout the monitoring period at this location was 55 dB $L_{Aeq,8hr}$. Daytime noise levels at UL1 ranged between 62 and 65 $L_{Aeq,16hr}$ (07:00 – 23:00) with night-time levels ranging between 53 – 56 dB $L_{Aeq,8hr}$ (23:00 - 07:00).

The lowest averaged noise levels were measured along the south-eastern boundary at location UL2; this was understandably due to the increased distance from Burford Road. The daily averaged noise level at this location was 45 dB $L_{Aeq,16hr}$ during the daytime, and 37 dB $L_{Aeq,8hr}$ at night.

Measured noise levels at the two remaining monitoring positions, namely UL3 (south boundary) and UL4 (western boundary) were consistent, with daytime noise levels of 47 dB $L_{Aeq,16hr}$ and night-time levels of 41 dB $L_{Aeq,8hr}$.

5.2 Maximum Event Levels

The analysis of maximum noise levels considered the 1-second L_p samples measured during each night-time period (23:00 - 07:00) at each monitoring position. This analysis was able to obtain a true maximum noise level, in order to identify independent noisy events occurring at least 30 seconds apart (this is the assumed period to avoid consideration of various peaks from the same event/action).

Night Period Date	**10th Highest L_{AFmax}, dB**			
(23:00-07:00)	**UL1**	**UL2**	**UL3**	**UL4**
09-10 September 2022	78	51	55	56
10-11 September 2022	79	49	55	57
11-12 September 2022	78	58	58	61
12-13 September 2022	78	48	54	58
13-14 September 2022	79	49	51	54
Maximum 10th Highest L_{AFmax}	**79**	**58**	**58**	**61**

The maximum 10th highest noise level (L_{AFmax}) has been adopted for night-time assessment purposes (in accordance with the requirements of the WHO guidelines).

6 Assessment Methodology

6.1 Noise Prediction Model

A computer noise model of the proposed development has been constructed using SoundPLAN v8.2. Noise levels across the proposed development site have been derived from a noise prediction model which has been calibrated against the measured levels at the baseline survey locations. The model has considered the following scenarios:

- Daytime - ambient $L_{Aeq,16hr}$;
- Night-time - ambient $L_{Aeq,8hr}$; and
- Night-time – individual events L_{AFmax}.

An overview of the modelling parameters is given in **Table 6.1**. Noise contour maps for both daytime and night-time periods are provided in **Appendices 3 and 4**.

Parameter	Setting
Algorithms	Calculation of Road Traffic Noise (CRTN) ISO 9613-2:1996 '*Attenuation of sound during propagation outdoors – general method of calculation*'.
Ground Absorption	Acoustically soft (assumed 0.9 coefficient) – grass or vegetated areas.
Met Conditions	10 degrees Celsius. 70% humidity. Wind from source to receiver.
Receptor Height	Ground Floor 1.5 m above ground First Floor 4 m above ground
Source Modelling	External noise sources, such as road traffic have been treated as line sources. Existing buildings and intervening structures modelled as structures (heights identified on site or through 3D views). Calibration of the model accounts for the road network acting as the primary source of noise impacting the site. The night-time L_{AFmax} levels from road pass-by events has been calibrated against the representative event level occurring at all monitoring positions i.e. the value typically not exceeded more than 10 times per night.
Site Layout	Catesby drawing ref: 466_P02 Rev C-Framework Plan: dated Oct 2022
Terrain	LiDAR DTM with a 2-metre resolution has been imported into the model.

Table 6.1 Noise modelling parameters

6.2 Validation of Computer Noise Model

The noise levels across the proposed development site have been derived from a computer noise prediction model. The model has been validated against the measured levels at the baseline survey locations.

Differences between measured and predicted levels are presented in **Table 6.2**.

Location	Measured noise level, dB			Predicted noise level, dB			Difference, dB		
	Day $L_{Aeq, T}$	Night $L_{Aeq, T}$	Night $L_{AF,max}$*	Day $L_{Aeq, T}$	Night $L_{Aeq, T}$	Night $L_{AF,max}$*	Day $L_{Aeq, T}$	Night $L_{Aeq, T}$	Night $L_{AF,max}$*
UL1	64	55	79	63	56	78	0	1	-2
UL2	45	37	58	44	37	57	-1	0	-1
UL3	47	41	58	46	39	59	-1	-2	1
UL4	47	41	61	49	41	62	1	1	1

** 10th Highest $L_{AFmax,}$*

Table 6.2 – Noise model validation

Calibrated noise levels at the monitoring locations indicates a maximum difference of 2 dB(A) during night-time hours, providing an acceptable level of confidence to the modelling exercise. It is considered that the noise model is suitable in determining the attenuation of noise across the development site.

6.3 Predicted Noise Levels

The assessment receptors have been positioned along the extremities of the indicative building areas within each area/phase to represent the likely noise levels across the proposed development site. This is the result of the outline nature of the application and is intended to provide a conservative estimation of the noise impact (in the absence of screening provided by development buildings) to assess its suitability and to inform potential mitigation measures. It is expected that the noise predictions would be refined at the detailed design stage once the final masterplan, including internal layouts, is available in order to evaluate the noise impact at individual building plots. The adopted evaluation points are presented in **Figure 6.1** below.

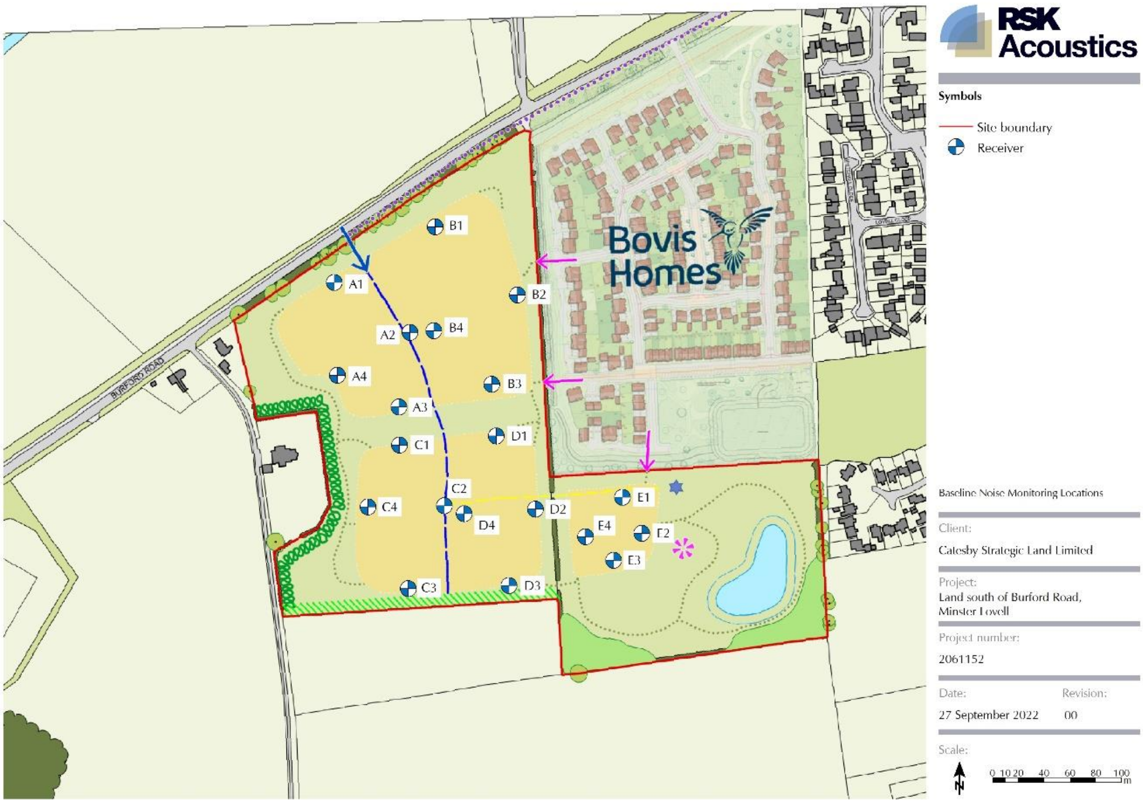

Figure 6.1 – Noise evaluation points

6.4 Design Targets for Residential Development

For the purposes of this assessment, the acoustic design targets presented in **Table 6.3** have been adopted. The design targets are based on the requirements of the appropriate guidelines for residential developments.

Condition	Criterion
Internal ambient daytime noise levels within bedroom / living room areas daytime (BS 8233)	35 dB $L_{Aeq,16hrs}$
Internal ambient noise levels within bedrooms at night (BS 8233)	30 dB $L_{Aeq,8hrs}$
Internal individual event levels within bedrooms during the night (>10 occurrences – WHO/ProPG)	45 dB L_{AFmax}
Noise levels within external amenity areas associated with the proposed dwellings* (BS 8233)	50 to 55 dB $L_{Aeq,16hrs}$

** 50 dB $L_{Aeq,T}$ is the desirable threshold level, 55 dB $L_{Aeq,T}$ is the upper guideline level. However, these guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels.*

Table 6.3 - Noise design target for residential use

It is considered that these levels are the lowest observed adverse effect level (LOAEL) in line with the Noise Policy Statement for England (NPSE).

7 Site Suitability Assessment

7.1 Predicted Noise Levels – Indoor Living Area

Predicted noise levels for the adopted evaluation points presented in **Figure 6.1** above are summarised in **Table 7.1**. The receptors included in the noise model and provided in the table below, detail the predicted noise level at receptor heights of 1.5 metres (ground floor) and 4 metres above ground (first floor), for respective daytime and night-time levels. An indication of the level of mitigation required by the building envelope (to comply with the noise design targets outlined in **Table 6.3**) is also presented.

Location	Period	Predicted Noise Level, $L_{Aeq,T}$ dB*	BS8233 Internal Ambient Noise Requirements, dB*	Attenuation Required by Building Envelope, dB**
Area A – A1 North boundary	Daytime	59	35	24
	Night-time	52	30	22
		74	45 L_{AFmax}	**29**
Area A – A2 East boundary	Daytime	52	35	17
	Night-time	46	30	16
		68	45 L_{AFmax}	**23**
Area A – A3 South boundary	Daytime	50	35	15
	Night-time	44	30	14
		65	45 L_{AFmax}	**20**
Area A – A4 West boundary	Daytime	53	35	18
	Night-time	46	30	16
		68	45 L_{AFmax}	**23**
Area B – B1 North boundary	Daytime	58	35	23
	Night-time	52	30	22
		73	45 L_{AFmax}	**28**
Area B – B2 East boundary	Daytime	50	35	15
	Night-time	44	30	14
		66	45 L_{AFmax}	**21**
Area B – B3 South boundary	Daytime	48	35	13
	Night-time	42	30	12
		64	45 L_{AFmax}	**19**
Area B – B4 West boundary	Daytime	52	35	17
	Night-time	45	30	15
		67	45 L_{AFmax}	**22**
Area C – C1 North boundary	Daytime	48	35	13
	Night-time	42	30	12
		64	45 L_{AFmax}	**19**
Area C – C2 East boundary	Daytime	47	35	12
	Night-time	41	30	11
		62	45 L_{AFmax}	**17**
Area C – C3 South boundary	Daytime	46	35	11
	Night-time	40	30	10
		61	45 L_{AFmax}	**16**
Area C – C4 West boundary	Daytime	48	35	13
	Night-time	42	30	12
		63	45 L_{AFmax}	**18**
Area D – D1 North boundary	Daytime	47	35	12
	Night-time	41	30	11
		62	45 L_{AFmax}	**17**

Area D – D2 East boundary	Daytime	45	35	10
	Night-time	40	30	10
		60	45 L_{AFmax}	**15**
Area D – D3 South boundary	Daytime	45	35	10
	Night-time	39	30	9
		60	45 L_{AFmax}	**15**
Area D – D4 West boundary	Daytime	46	35	11
	Night-time	40	30	10
		62	45 L_{AFmax}	**17**
Area E – E1 North boundary	Daytime	44	35	9
	Night-time	38	30	8
		59	45 L_{AFmax}	**14**
Area E – E2 East boundary	Daytime	44	35	9
	Night-time	38	30	8
		58	45 L_{AFmax}	**13**
Area E – E3 South boundary	Daytime	44	35	9
	Night-time	39	30	9
		59	45 L_{AFmax}	**14**
Area E – E4 West boundary	Daytime	45	35	10
	Night-time	39	30	9
		59	45 L_{AFmax}	**14**

Note – noise levels rounded to nearest whole number, bold denotes highest level of attenuation required at boundary location
** Daytime criteria for resting / living rooms. Night time criteria for bedrooms*
*** Based on simple level difference*

Table 7.1 – Predicted noise levels

Averaged daytime noise levels predicted at ground floor level range between 44 – 59 dB $L_{Aeq,16hr}$; night-time noise levels at first floor range between 38 – 52 dB $L_{Aeq,8hr}$. Highest noise levels are predicted towards the northern boundary of the site due to the proximity to Burford Road.

Noise contour maps are provided in **Appendices 3 and 4**. The maps illustrate graphically, the attenuation of noise across the site without any form of mitigation or screening due to intervening buildings.

As a result of the predictions presented in **Table 7.1**, the level of mitigation required by the building envelope to adhere to the design targets in BS 8233/WHO is provided. The highest level of mitigation afforded by the building envelope is 29 dB R_w+C_{tr} for those properties likely to be positioned towards the northern boundary of the site.

Based on the predicted noise levels indicative of those likely to be experienced by proposed residential receptors, an initial noise risk assessment (Stage 1) following ProPG guidance indicates the majority of the site is considered to pose a low risk of adverse effect, with those proposed developable areas along the northern boundary being subject to a medium risk. The indicative noise levels are intended to provide a sense of the noise challenge at the proposed residential development site before considering any mitigation measures or other factors such as the locality, the project and the wider context.

7.2 Internal Noise Levels – Façade Treatments

Noise level reduction can be provided through various façade treatment methods such as glazing and ventilation products, however the final level of mitigation would be dependent on factors such as room size and room volume.

On the basis that a partially open window typically provides in the order of 13 dB attenuation, it is apparent that the predicted noise levels will result in an exceedance of the recommended internal acoustic design target during a situation in which windows are partially open for ventilation purposes.

To ensure an appropriate internal acoustic standard within the proposed residential properties during normal conditions (non-overheating), the acoustic specifications (i.e. level of noise reduction) set out in **Table 7.1** are recommended for occupied bedrooms. The values in the table represent the highest level of attenuation required, based on a simple difference, afforded by the building envelope at indicative positions around the site. Understandably, treatments at those façades facing away from the identified road sources or those dwellings positioned within the central portion of the site can afford a lower level of specification due to likely screening effects.

7.3 Internal Noise Levels – Overheating

AVO Assessment

In line with the guidance set out in the Acoustics, Ventilation and Overheating Residential Design Guide (AVO Guide), it is considered reasonable to allow higher levels of internal ambient noise when increased rates of ventilation are required in relation to an overheating condition. The basis for this is that the overheating condition occurs for a limited time and during this period, occupants may accept a trade-off between acoustic and thermal conditions, given that they have some control over their environment.

During an overheating condition, the preference is to adopt opening windows as a primary means of mitigating thermal issues, however, this is subject to the resultant internal ambient noise level.

On the basis that a partially open window provides 13 dB of attenuation to meet an internal ambient level of 42 dB $L_{Aeq,8hr}$, the upper SOAEL limit for night-time hours, the external façade free-field level must not exceed 55 dB $L_{Aeq,8hr}$. The predicted external night-time noise levels range between 38 and 53 dB(A). Noise levels are therefore unlikely to exceed the upper SOAEL limit.

Assuming the same level of reduction for a partially open window during the daytime hours, the upper SOAEL limit for internal ambient levels would be 50 dB $L_{Aeq,16hr}$, meaning the external façade free-field level must not exceed 63 dB $L_{Aeq,16hr}$. The predicted external daytime noise levels range between 44 and 59 dB(A); noise levels are therefore unlikely to exceed the upper daytime SOAEL limit.

Based on the assessment of external daytime and night-time noise levels in accordance with AVO, the use of partially open windows is likely to be an acceptable means of overheating control for the majority of the site.

AD-O Assessment

On the basis that a partially open window provides 9 dB of attenuation, in order to meet an internal ambient level of 40 dB $L_{Aeq,8hr}$ in line with the requirements of the recently published Approved Document O (AD-O), the external noise limit for night-time hours must not exceed 49 dB $L_{Aeq,8hr}$. The predicted external night-time is likely to exceed by a maximum of 4 dB(A) along the northern extremities of the site. Similarly, maximum noise levels during the night-time period are likely to exceed the adopted criteria of 64 dB L_{Amax} at various positions across the northern portion of the development. It should be noted that the above conclusions are based on the simplified method of assessment, and it is recommended that input be sought from the wider design team to identify areas of high overheating risk through dynamic thermal modelling to ensure subsequent mitigation options are explored in the form of compliment ventilation, architecture and structural design strategies.

Confirmation of the exact mitigation requirements and level thereof, would be provided on receipt of the masterplans during the detailed design stage of the application.

7.4 External Amenity Noise Levels

It is expected that the proposed development includes provision for outdoor amenity areas associated with the residential buildings in the form of gardens. The indicative developable private gardens within the northern portion of the site may be subject to noise levels of up to 59 dB $L_{Aeq,16hr}$, this is without any form of mitigation (e.g. acoustic barrier along the most exposed boundary) or screening by the building footprints and associated fencing. It should be noted that this noise level is at closest distance of approach to the adjacent road noise sources.

It is considered that noise levels within amenity areas can be reduced by up to 10 dB through sympathetic building orientation and the use of standard garden fencing in order to cut or disrupt the line of sight between source and receiver, and therefore, would likely comply with the upper design target of 55 dB $L_{Aeq,16hr}$, as specified within BS 8223 : 2014.

It should be noted that the predictions are based on an 'open' site, without the screening properties afforded by the incorporation of all development buildings. The likelihood is that actual noise levels would be lower than those indicated within this assessment.

8 Road Traffic Noise Assessment

8.1 Traffic Count Data

In order to quantify potential noise impacts at receptor locations during the operational phase of the development, two assessment scenarios (short term and long term) are assessed. The traffic data for this assessment was provided by the appointed traffic consultants (DTA).

The scenarios assessed were as follows:

- Scenario 1 – 'Do-Minimum' in the opening year (2024) against 'Do-Something' in the opening year (2024);
- Scenario 2 – 'Do-Minimum' in the opening year (2024) against 'Do-Something' scenario in the future year (2039).

The 'do-minimum' data includes the baseline traffic counts without the development and the 'do-something' data includes traffic counts with the development in place, plus those committed developments near the site. Traffic count data is provided in **Table 8.1**.

Road link	2024 Base		2024 Opening + Committed		2039 Future + Committed	
	AAWT 18hr	**HGV%**	**AAWT 18hr**	**HGV%**	**AAWT 18hr**	**HGV%**
1	5359	2.4	6040	2.1	6509	2.1
2	5359	2.4	5402	2.3	5870	2.3
3	9965	4.3	10342	4.2	11213	4.2
4	5734	3.5	6038	3.3	6539	3.4

1. B4047 Burford Road East (to Brize Norton road junction)
2. B4047 Burford Road West (towards the A40 roundabout)
3. B4047 east of Brize Norton Road
4. Brize Norton Road (south of junction with Burford Road)

Table 8.1 – Development traffic counts

8.2 Noise Level Change

The change in basic noise level (in dB) has been calculated in accordance with the CRTN methodology and assessed against the short and long term significance criteria set out in DMRB LA111.

Road link	Scenario 1 – Short term		Scenario 2 – Long term	
	Noise level change, dB $L_{A10,\ 18hr}$	Magnitude	Noise level change, dB $L_{A10,\ 18hr}$	Magnitude
1	0.4	Negligible	0.7	Negligible
2	0.0	Negligible	0.4	Negligible
3	0.1	Negligible	0.5	Negligible
4	0.1	Negligible	0.5	Negligible

1. B4047 Burford Road East (to Brize Norton road junction)
2. B4047 Burford Road West (towards the A40 roundabout)
3. B4047 east of Brize Norton Road
4. Brize Norton Road (south of junction with Burford Road)

Table 8.2 – Noise level change due to road traffic

The predictions show that the effect of the development on traffic noise in the short term would increase noise levels by a maximum of 0.4 dB $L_{A10,\ 18hr}$ along the B4047 Burford Road East (to Brize Norton road junction). An increase of this magnitude would be of a negligible impact in the short term in accordance with DMRB. All remaining road links result in a negligible impact.

Long term noise impacts from road traffic noise would increase existing noise levels by a maximum of 0.7 dB $L_{A10,\ 18hr}$ along B4047 Burford Road East (to Brize Norton road junction), resulting in a negligible impact. All remaining road links result in a negligible impact.

9 Conclusions

RSK Acoustics Ltd has been instructed by Catesby Strategic Land Limited (the applicant) to undertake a noise assessment to accompany an outline planning submission for a proposed residential led development on land south of Burford Road, Minster Lovell.

A noise survey has been undertaken to establish the baseline noise levels across the site, comprising of unattended measurements throughout continuous daytime and night-time periods between 09 and 14 September 2022.

A site suitability assessment, to the requirements of BS 8233: 2014/WHO, 1999 and West Oxfordshire District Council has been undertaken to determine potential internal and external noise levels at locations across the development site.

Predicted levels, in conjunction with highest maximum noise levels, are of a magnitude where a standard specification double glazed system to the building façade, providing a minimum sound reduction of 29 dB R_w+C_{tr} and accompanied by a suitable ventilator, would be required to meet the internal design targets within BS 8233: 2014/WHO, 1999 during daytime and night-time periods (at a worse case along the northern boundary of the site). External noise levels would not exceed the highest overheating SOAEL limits within the AVO Guide, although there are likely to be marginal exceedances of the overheating condition prescribed in AD-O (simple method). It is recommended that input be sought from the wider design team to identify areas of high overheating risk through dynamic thermal modelling to ensure subsequent mitigation options are explored in the form of compliment ventilation, architecture and structural design strategies.

Initial noise level predictions within garden amenity areas can be reduced by up to 10 dB through sympathetic building orientation and the use of standard garden fencing in order to cut or disrupt the line of sight between source (i.e the road) and receiver (i.e the amenity space). External noise levels are therefore likely to comply with the upper design target of 55 dB $L_{Aeq,16hr}$, as specified within BS 8223: 2014.

In summary, predicted noise levels across the site are within the relevant noise design targets and of a magnitude suitable for the proposed development. Given that the development site is currently within the outline stage, it is recommended that the principles of good acoustic design be adopted within the final masterplan. Those design considerations should include the positioning of buildings to maximise the screening effects to those adjacent properties, orientation of façades and considerate internal layout design.

10 References

1. Acoustics Ventilation and Overheating: Residential Design Guide (AVO), 2020
2. Approved Document O: 'Overheating mitigation' 2021 Edition – The Building Regulations 2010
3. British Standard 7445-1:2003, Description and measurement of environmental noise – Part 1: Guide to quantities and procedures. British Standards Institution, 2003
4. British Standard 8233: 2014, Sound insulation and noise reduction in buildings – code of practice. British Standards Institution, 2014
5. Calculation of Road Traffic Noise. Department of Transport, Welsh Office HMSO
6. Design Manual for Roads and Bridges, LA111 Noise and Vibration, 2020
7. International Standard ISO 9613:1996 - Acoustics – Attenuation of sound during propagation outdoors
8. National Planning Policy Framework – Department for Communities and Local Government. March 2012 (as amended July 2021)
9. National Planning Practice Guidance (NPPG): 2019
10. Noise Policy Statement for England (NPSE). DEFRA, 2010
11. Professional Practice guidance on Planning and Noise (ProPG), 2017
12. WHO Guidelines for Community Noise, 1999

Appendix 1 – Indicative Site Layout

Reproduced from drawing 'Illustrative Masterplan – 466_P03 Rev D', dated October 2022

Appendix 2 – Noise Monitoring Results

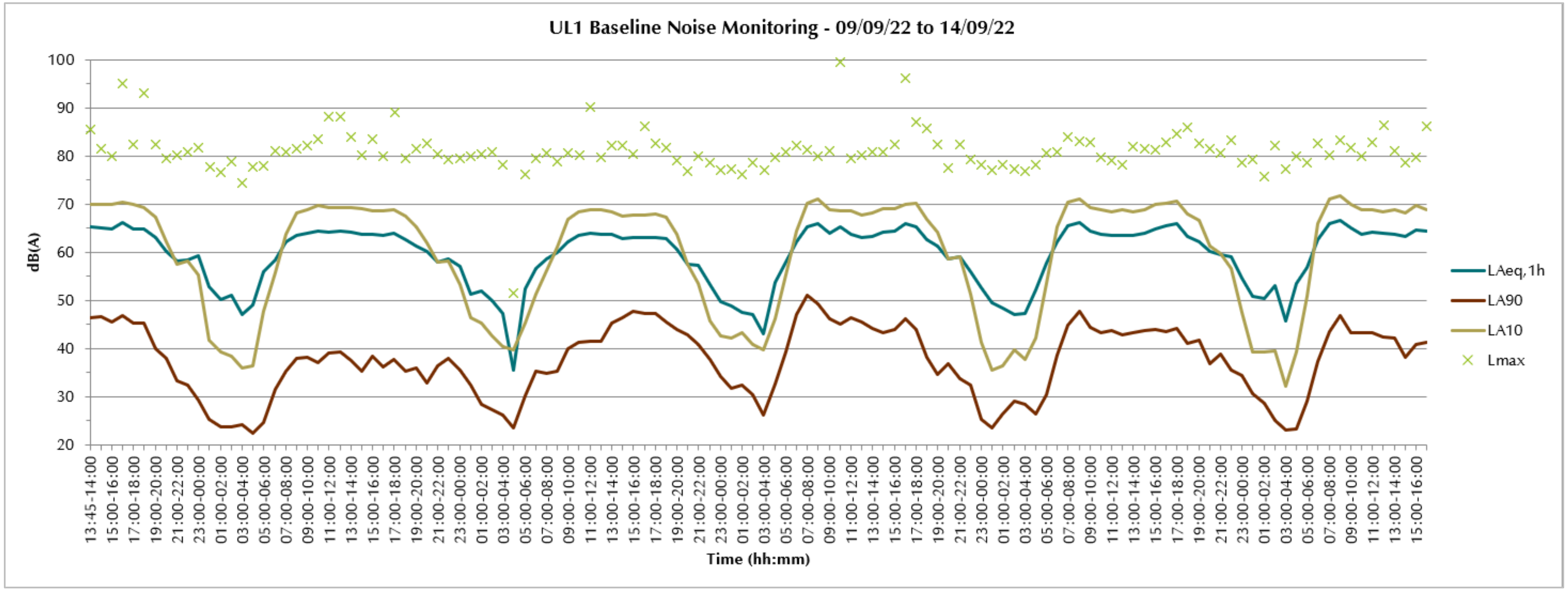

Figure A2.1 – Hourly noise evolution (UL1 north boundary monitoring position)

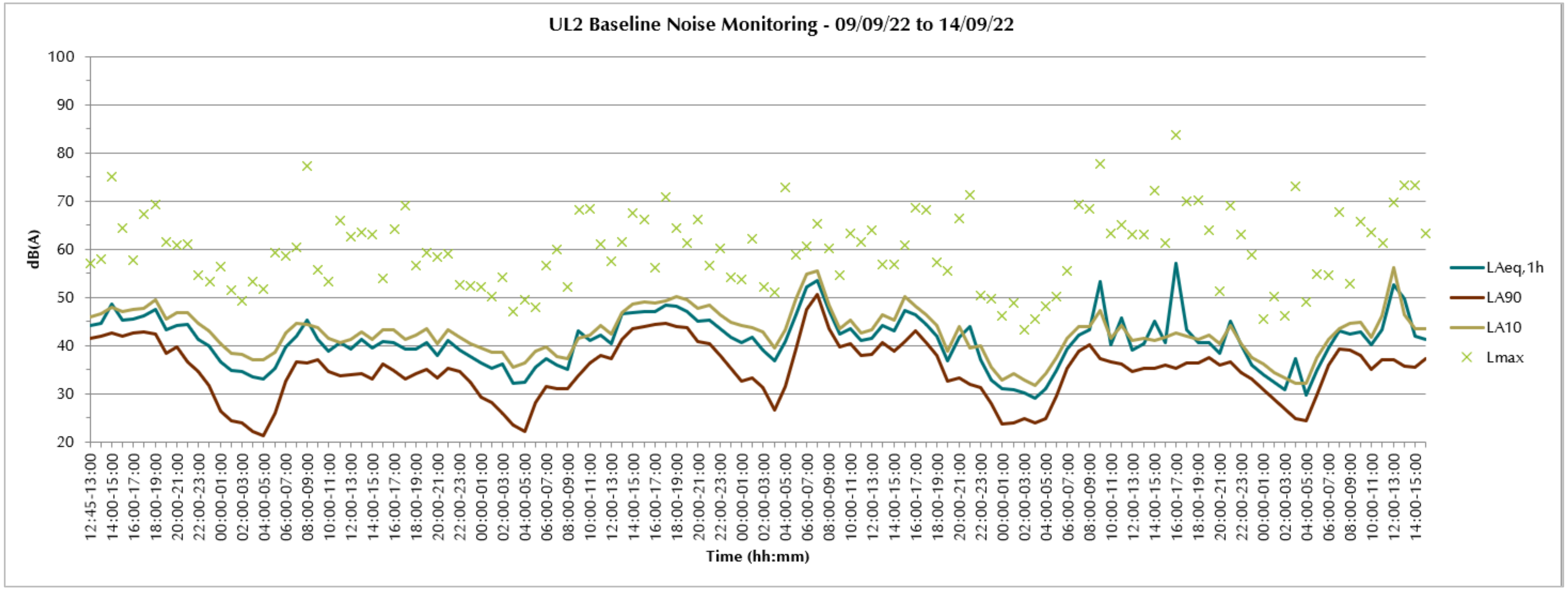

Figure A2.2 – Hourly noise evolution (UL2 south-east boundary monitoring position)

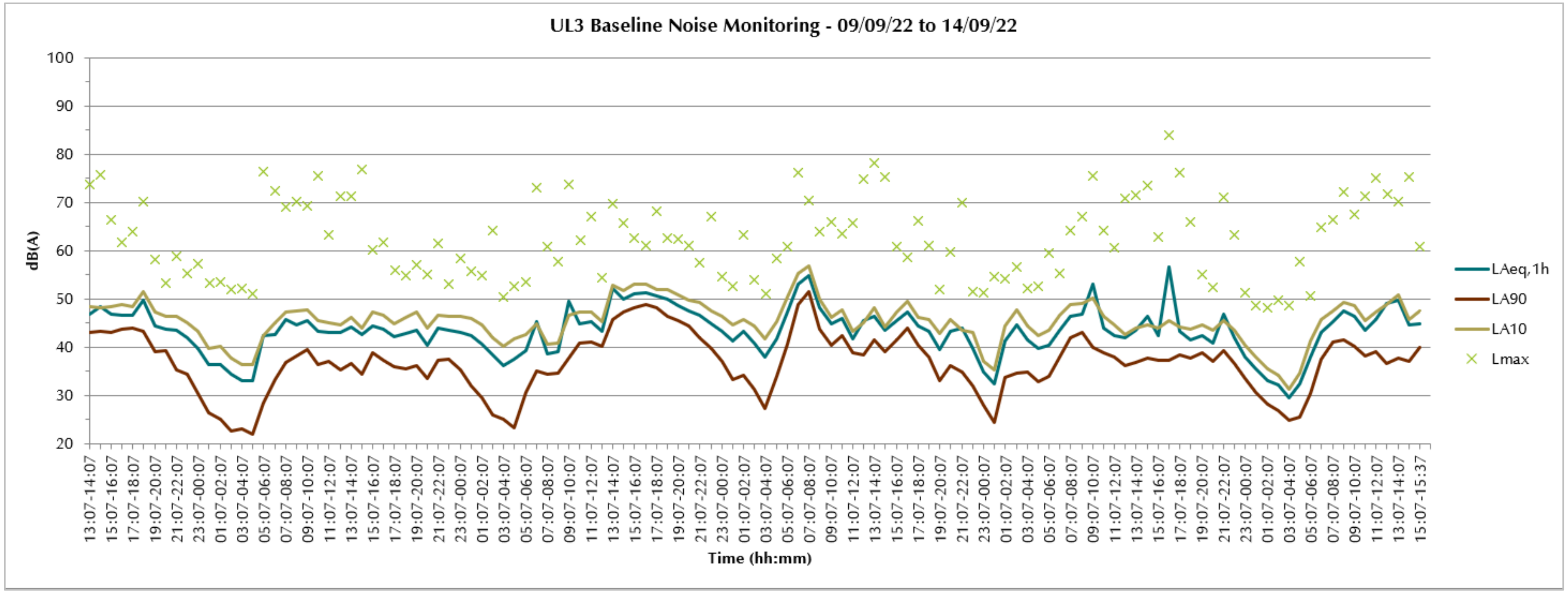

Figure A2.3 – Hourly noise evolution (UL3 south boundary monitoring position)

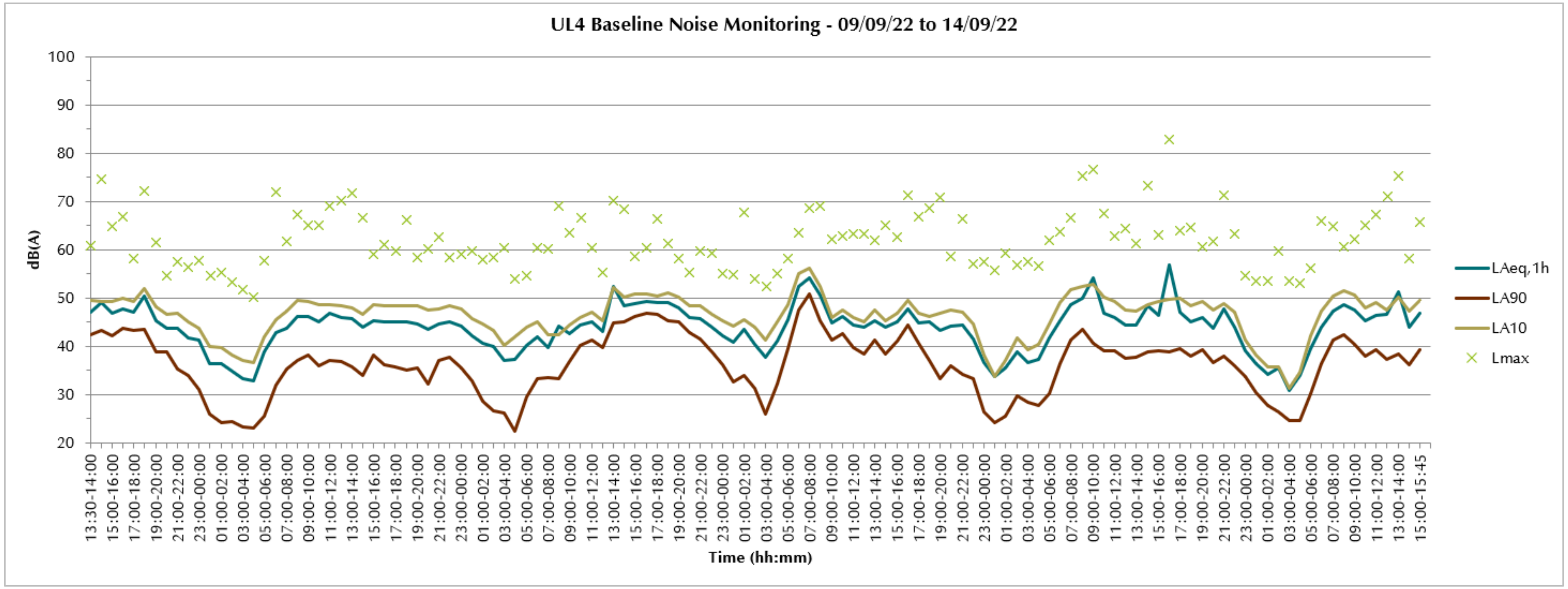

Figure A2.4 – Hourly noise evolution (UL4 west boundary monitoring position)

Appendix 3 – Daytime Noise Contour Map (1.5m Height)

Noise Assessment Report

Appendix 4 – Night-time Noise Contour Map (4m Height)

Appendix 5 – Photographic Report

	
UL1 – North boundary	UL2 – South-east boundary
	
UL3 – South boundary	UL4 – West boundary

Appendix 6 - Glossary of Acoustic Terms

dB (decibel)
Scale for expressing sound pressure level. It is defined as 20 times the logarithm of the ratio between the root mean square pressure of the sound field and a reference pressure i.e. 2x 10-5 Pascal.

dB (A)
A-weighted decibel. This provides a measure of the overall level of sound across the audible spectrum with a frequency weighting to compensate for the varying sensitivity of the human ear to sound at different frequencies.

Time Weighting
Sound level meters use various averaging times for the measurement of RMS sound pressure level. The most commonly used are fast (0.125 s averaging time), slow (1 s averaging time) and impulse (0.035 s averaging time). Variables that are measures with time weightings are expressed as L_{AFmax} etc.

Frequency Weighting Networks
Frequency weighting networks, which are generally built into sound level meters, attenuate the signal at some frequencies and amplify it at others. The A-weighting network approximately corresponds to human frequency response to sound. Sound levels measured with the A-weighting network are expressed in dB(A). Other weighting networks also exist, such as C-weighting which is nearly linear (i.e. unweighted) and other more specialised weighting networks. Variables such as L_p and L_{eq} that can be measured using such weightings are expressed as L_{pA} / L_{pC}, L_{Aeq} / L_{Ceq} etc.

$L_{Aeq,T}$
This is defined as the notional steady sound level over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.

L_{Amax}
This is the maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{Aeq} noise level but will still affect the noise environment.

L_N - Percentile or Statistical Levels
If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L10 is the level exceeded for 10% of the time, and the L90 is the level exceeded for 90% of the time.

L_p
Sound Pressure Level. The basic unit of sound measurement is the sound pressure level, which is measured on a logarithmic scale and expressed in decibels (dB). The logarithmic scale makes

it easier to manage the large range of audible sound pressures, and also more closely represents the way the human ear responds to differences in sound pressure.

Pre-existing ambient noise
Pre-existing ambient noise means the level of ambient noise, expressed as a level of LAeq determined with respect to the relevant time period and the relevant LAeq averaging time, prevailing one metre in front of relevant windows or doors in a façade of a dwelling, immediately before the placing of a contract for the construction.

Free-field Level
A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and away from buildings.

Façade Level
A sound field determined at a distance of 1 metre in front of a large sound reflecting object such as a building façade.

R_w – Weighted Sound Reduction Index
Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies. Value, in decibels, of the reference curve at 500 Hz after shifting it in accordance with the method specified in this part of ISO 717.

C; C_{tr} – Spectrum Adaptation Terms
Value, in decibels, to be added to the single-number rating (e.g. Rw) to take account of the characteristics of a particular sound spectra.

$L_{A90,T}$ – Background sound level
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.

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.

Specific sound source
Sound source being assessed.

L_{Ar} – Rating level
Specific sound level plus any adjustment for the characteristic features of the sound as per BS 4142:2014+A1:2019. 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, for example: tonality, impulsivity, intermittency or other sound characteristics that are readily distinctive against the residual acoustic environment.