RSK Acoustics

Land off Moat Road, Headcorn

Noise Assessment Report

Report Ref. 2060674-RSK-RP-001(04)

Land off Moat Road, Headcorn

Noise Assessment Report

Report Ref. 2060674-RSK-RP-001(04)

Catesby Strategic Land Limited

Orchard House,
Papple Close,
Houlton,
Rugby,
United Kingdom,
CV23 1EW

Revision	Description	Date	Prepared	Approved
01	Final issue	01 November 2022	George Baker	Jonathan Mart
02	Revised Issue	08 November 2022	George Baker	Jonathan Mart
03	Revised Issue	26 July 2023	George Baker	Federico Gottardo
04	Revised Issue	11 September 2023	George Baker	Robert Bungay

Table of Contents

1 Introduction

1.1 Instruction

RSK Acoustics Ltd has been instructed by Catesby Strategic Land Limited (the applicant) to undertake a noise assessment for a parcel of land off Moat Road, Headcorn. The applicant is seeking outline application (with all matters reserved except access) for the development of up to 120no. dwellings (Use Class C3) including demolition of existing buildings, means of access into the site from Moat Road (not internal roads), associated highway works, provision of public open space, emergency / pedestrian access to Millbank and associated infrastructure including surface water drainage (with related off site s278 highway works to Moat Road).

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): 2023

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), now published by the Department for Levelling Up, Housing & Communities in September 2023, 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.

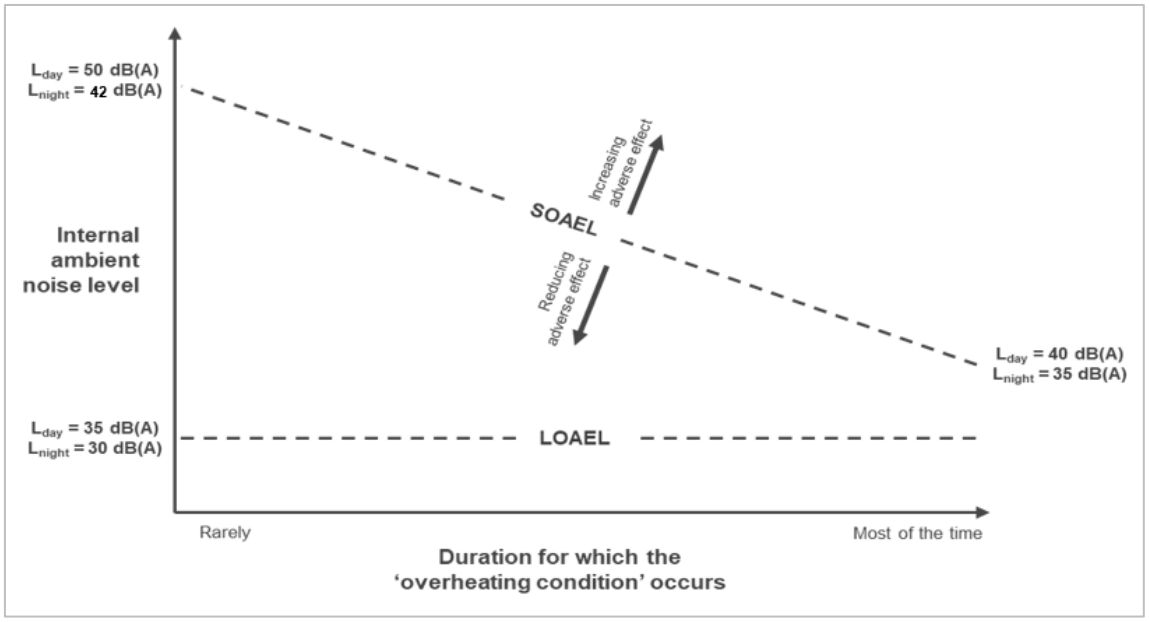


Figure 2.1 - Relationship between internal ambient noise level and overheating condition – AVO Guidance

2.8 BS 4142: 2014 + A1: 2019 'Methods for rating and assessing industrial and commercial sound'

BS 4142 describes the methods for rating and assessing noise from industrial or commercial sources, including manufacturing processes, fixed installations and plant equipment, loading of goods and sound from mobile plant. The standard is applicable for the purpose of assessing sound at proposed new dwellings, through the determination of a rating level of an industrial or commercial noise source.

Where certain acoustic features are present at the assessment location, a character correction should be applied to the specific sound level to give the rating level to be used in the assessment.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of adverse impact depending on the context.
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact depending on the context.

BS 8233 provides good internal design threshold for new developments, including residential. This standard is derived from the WHO Guidelines for Community Noise (see above). For the use of BS 4142 in assessing new residential development applications ProPG (Paragraph 2.43) states that:

"Professional judgement will have to be exercised in addressing these sorts of issues. One possible approach may be to apply BS 4142:2014 character corrections to the noise level guideline values in order to derive suitable effect thresholds and/ or mitigation design targets and to use the same reference time periods recommended in the standard".

Where the initial estimate of the impact needs to be modified due to the context, all pertinent factors should be considered, including:

- The absolute level;
- The character and level of the residual sound;
- The sensitivity of the receptor and whether dwellings will already (or likely) to incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as: i) façade insulation treatments, ii) ventilation and/or cooling, and iii) acoustic screening.

BS 4142 states that;

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

2.9 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".

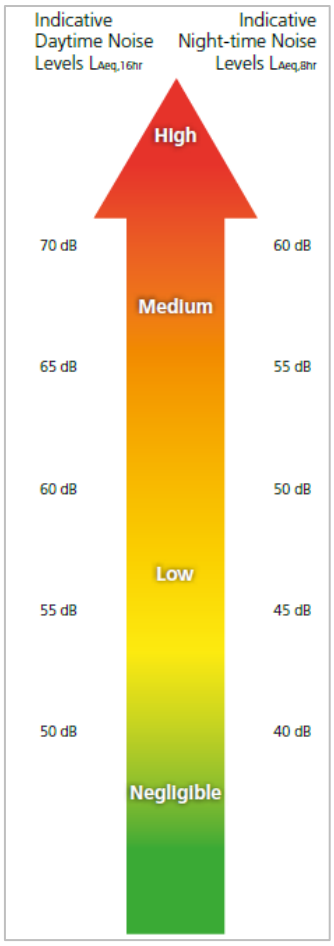


Figure 2.2 – ProPG Stage 1 – Initial site noise risk assessment

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.

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

International Standard: ISO 9613-2 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.

2.11 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.

2.12 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 flows 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).

	Noise change, $L_{A10, 18hr}$	
Magnitude of change	**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

2.13 Local Authority Consultation

The noise monitoring and assessment methodology was shared by email with the Environmental Protection team at Mid-Kent Services on 10 October 2022, where it was proposed to undertake long tern measurements at four locations for at least 96 hours (including midweek and weekend days). The selected indicative monitoring positions would be distributed along the north-east, west, south-west and south 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 comprise 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 Mid-Kent Services. 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 response was received from the Mid-Kent Environmental Protection Team Leader *Duncan Haynes* on the 17 October 2022, stating approval of the above methodology.

3 Development Location

3.1 Site Location and Description

The site is located off Moat Road, Headcorn, approximately 350 metres to the west of Headcorn village (village square). Access to the site is proposed off Moat Road, with pedestrian and emergency access off Mill Bank.

The site lies on a partial decline from north to south, beginning at ~30 metres elevation along the northern boundary and concluding at ~20 metres elevation along the southern boundary.

The site is bounded by Moat Road to the south, Mill Bank to the east and north-east, agricultural land to the west, and the '*Bovis Homes*' residential scheme to the north. A passenger railway is located approximately 280 metres to the south of the site boundary. The site is bounded to the south-west by an electrical substation.

3.2 Proposed Development

The applicant is seeking outline application (with all matters reserved except access) for the development of up to 120no. dwellings (Use Class C3) including demolition of existing buildings, means of access into the site from Moat Road (not internal roads), associated highway works, provision of public open space, emergency / pedestrian access to Millbank and associated infrastructure including surface water drainage (with related off site s278 highway works to Moat Road).

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

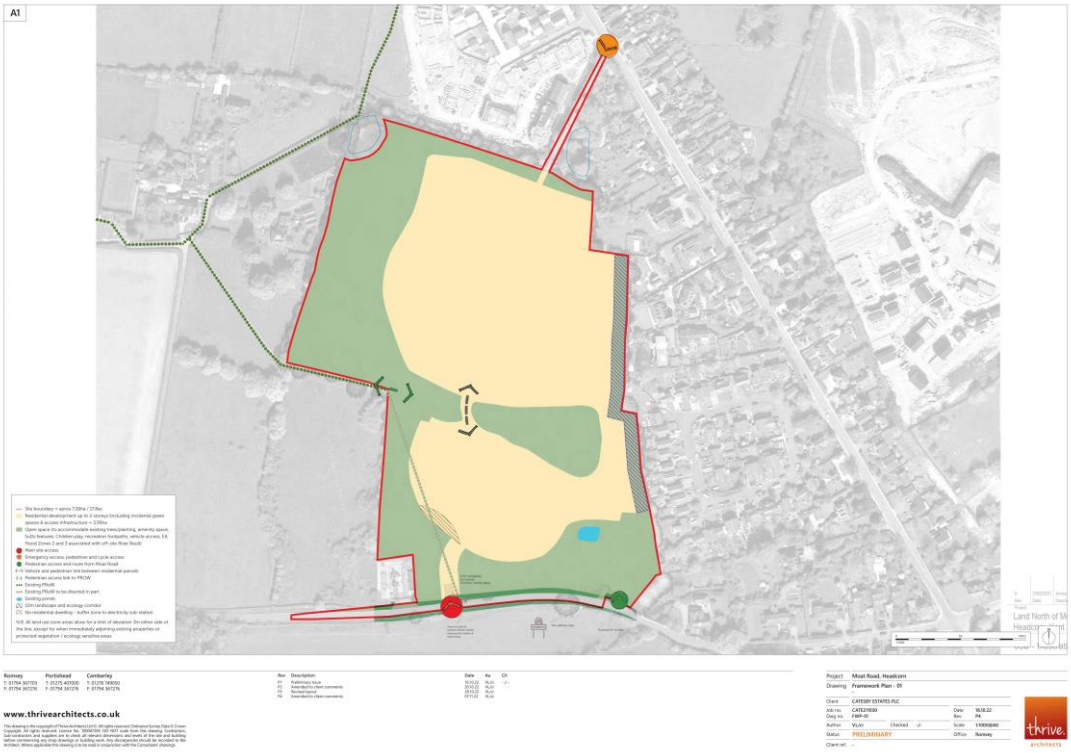


Figure 3.1 – Proposed Framework plan (*CATE211030 FWP-01 P5* - Dated October 2022)

4 Baseline Survey Methodology

4.1 Measurement Details

A baseline noise survey was undertaken between Friday 14 October 2022 and Wednesday 19 October 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 (MP1_NE to MP4_S) were undertaken over a representative midweek and weekend period at positions along the north-eastern, western, south-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
MP1_NE	U	North-Eastern boundary	To quantify the noise contribution from Mill Bank
MP2_W	U	Western boundary	To quantify noise levels towards the centre of the site and adjacent farmland
MP3_SW	U	South-Western boundary	To quantify noise levels from Moat Road and the adjacent electrical transformer station
MP4_S	U	Southern Boundary	To quantify noise levels from Moat Road

** 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	Position	Type	Serial Number	Calibration Expiry
Sound level meter	MP1_NE	Rion NL-52	01054195	27/01/2024
Sound level meter	MP2_W	Rion NL-52	01054197	28/01/2024
Sound level meter	MP3_SW	Rion NL-52	00620863	09/06/2023
Sound level meter	MP4_S	Rion NL-52	00253698	09/06/2023
Acoustic Calibrator	MP1_NE	Rion NC-75	34991930	27/01/2023
Acoustic Calibrator	MP2_W	Rion NC-75	34991932	27/01/2023
Acoustic Calibrator	MP3_SW	Rion NC-74	34625616	14/06/2023
Acoustic Calibrator	MP4_S	Rion NC-74	34257026	17/06/2023

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 Moat Road and to a lesser extent, Mill Bank. An electrical transformer station located towards the south-west boundary of the site was also noted to output intermittent, low frequency noise. No other significant sources of noise were noted during times of attendance, although it is likely that aircraft movements from Headcorn Aerodrome (approx. 1.6 miles south-east) would be intermittently audible at the site.

4.4 Weather Conditions

Representative weather conditions during the monitoring period have been obtained from *www.wunderground.com* (Station ID: IASHFO19 situated in Headcorn – approximately 0.2 km to the north-east of the development site) and are summarised in **Table 4.3**.

Date/time	Average temperature, °C	Average wind speed, ms^{-1}	Dominant wind direction	Precipitation mm
14/10/2022	12.5	0.0	NW	0.51
15/10/2022	12.8	0.3	NW	1.80
16/10/2022	13.8	0.1	NNW	3.61
17/10/2022	15.2	0.2	NNW	0.71
18/10/2022	11.7	0.3	NW	0.30
19/10/2022	14.3	0.4	NW	0.00

Table 4.3 – Summary of weather data

Weather conditions were calm with precipitation noted between the 15 and 16 October 2022. Noise monitoring data has been analysed throughout this period and there was a negligible change in noise levels as a result of this 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 MP1_NE to MP4_S 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)			
		$L_{Aeq,T}$	$L_{AFmax,15min}$	$L_{A90,T}$	$L_{A10,T}$
14/10/2022	13:30 – 23:00	42	74	34	44
	23:00 – 07:00	34	57	23	35
15/10/2022	07:00 – 23:00	48	76	39	48
	23:00 – 07:00	39	58	30	40
16/10/2022	07:00 – 23:00	49	94	37	46
	23:00 – 07:00	38	61	30	40
17/10/2022	07:00 – 23:00	44	77	37	46
	23:00 – 07:00	39	59	27	39
18/10/2022	07:00 – 23:00	45	70	37	45
	23:00 – 07:00	36	57	28	37
19/10/2022	07:00 – 11:00	46	96	41	48
Average (2)	**Daytime**	**46**	**96**	**38**	**46**
	Night-time	**37**	**61**	**28**	**38**

(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 14.10.22 and 19.10.22 also included.

Table 5.1 Noise survey results – Location MP1_NE

Date	Time Period	Measured noise levels, dB[1]			
		$L_{Aeq,T}$	$L_{AFmax,15min}$	$L_{A90,T}$	$L_{A10,T}$
14/10/2022	14:00 – 23:00	44	68	35	45
	23:00 – 07:00	35	67	29	36
15/10/2022	07:00 – 23:00	49	77	48	49
	23:00 – 07:00	40	64	32	42
16/10/2022	07:00 – 23:00	45[3]	75[3]	38	48
	23:00 – 07:00	41	64	33	42
17/10/2022	07:00 – 23:00	45	75	38	47
	23:00 – 07:00	41	69	32	42
18/10/2022	07:00 – 23:00	46	73	40	47
	23:00 – 07:00	39	63	33	40
19/10/2022	07:00 – 11:30	48	72	44	51
Average [2]	**Daytime**	**46**	**77**	**41**	**48**
	Night-time	**39**	**69**	**32**	**40**

(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 14.10.22 and 19.10.22 also included.
(3) Noise data between 12:45 and 13:30 on 16/10/2022 has been disregarded due to an anomalous high-noise event.

Table 5.2 Noise survey results – Location MP2_W

Date	Time Period	Measured noise levels, dB[1]			
		$L_{Aeq,T}$	$L_{AFmax,15min}$	$L_{A90,T}$	$L_{A10,T}$
14/10/2022	13:00 – 23:00	50	71	46	52
	23:00 – 07:00	48	61	46	48
15/10/2022	07:00 – 23:00	52	79	48	54
	23:00 – 07:00	49	61	47	49
16/10/2022	07:00 – 23:00	51	81	48	53
	23:00 – 07:00	47	62	46	48
17/10/2022	07:00 – 23:00	51	80	47	54
	23:00 – 07:00	49	64	46	49
18/10/2022	07:00 – 23:00	50	75	47	53
	23:00 – 07:00	49	61	47	49
19/10/2022	07:00 – 11:45	51	66	48	54
Average [2]	**Daytime**	**51**	**81**	**47**	**53**
	Night-time	**48**	**64**	**46**	**49**

(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 14.10.22 and 19.10.22 also included.

Table 5.3 Noise survey results – Location MP3_SW

Date	Time Period	Measured noise levels, dB[1]			
		$L_{Aeq,T}$	$L_{AFmax,15min}$	$L_{A90,T}$	$L_{A10,T}$
14/10/2022	13:30 – 23:00	59	80	36	60
	23:00 – 07:00	48	76	30	37
15/10/2022	07:00 – 23:00	59	84	39	60
	23:00 – 07:00	49	75	33	44
16/10/2022	07:00 – 23:00	58	97	38	58
	23:00 – 07:00	51	77	32	43
17/10/2022	07:00 – 23:00	60	79	37	62
	23:00 – 07:00	51	76	33	44
18/10/2022	07:00 – 23:00	59	84	40	61
	23:00 – 07:00	51	77	33	42
19/10/2022	07:00 – 12:15	60	78	43	64
Average [2]	**Daytime**	**59**	**97**	**38**	**60**
	Night-time	**50**	**77**	**32**	**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 14.10.22 and 19.10.22 also included.

Table 5.4 Noise survey results – Location MP4_S

The highest resultant daytime noise level of 59 dB $L_{Aeq,16hr}$ was measured at monitoring position MP4_S along the southern boundary of the site. This is due to the monitoring position's proximity to vehicle movements along Moat Road. The resultant night-time noise level throughout the monitoring period at this location was 50 dB $L_{Aeq,8hr}$.

Daytime noise levels at MP3_SW ranged between 50 and 52 $L_{Aeq,16hr}$ (07:00 – 23:00) with night-time levels ranging between 35 – 41 dB $L_{Aeq,8hr}$ (23:00 - 07:00).

The lowest averaged daytime noise levels were measured along the western boundary at location MP2_W; this was understandably due to the increased distance from Moat Road and Mill Bank. The daily averaged noise level at this location was 46 dB $L_{Aeq,16hr}$ during the daytime, and 39 dB $L_{Aeq,8hr}$ at night. The lowest averaged night-time noise levels were measured at location MP1_NE, at 37 dB $L_{Aeq,8hr}$.

5.2 Maximum Event Levels

The analysis of maximum noise levels considered the 100-milisecond 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)	MP1_NE	MP2_W	MP3_SW	MP4_S
14-15 September 2022	51	53	58	73
15-16 September 2022	54	57	58	72
16-17 September 2022	52	55	58	74
17-18 September 2022	53	57	59	74
18-19 September 2022	52	56	59	74
Maximum 10th Highest L_{AFmax}	**54**	**57**	**59**	**74**

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).

Maximum noise events at MP4_S are significantly higher due to the measurement locations close proximity to Moat Road. The noise monitor at this location was placed on the immediate boundary between the site and the road's edge.

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, 4** and **5**.

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 plus calibrated noise emissions from the existing substation. 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: CATE211030 FWP-01 P5 - October 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	Night	Night	Day	Night	Night	Day	Night	Night
	$L_{Aeq,\ T}$	$L_{Aeq,\ T}$	$L_{AF,max}$*	$L_{Aeq,\ T}$	$L_{Aeq,\ T}$	$L_{AF,max}$*	$L_{Aeq,\ T}$	$L_{Aeq,\ T}$	$L_{AF,max}$*
MP1_NE	46	37	54	46	39	54	0	+2	0
MP2_W	46	39	57	43	38	46[1]	-3	-1	-11[1]
MP3_SW	51	48	59	52	50	58	+1	+2	-1
MP4_S	59	50	74	58	51	75	-1	+1	+1

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

[1] *MP2_W* Predicted $L_{AF,max}$ value not calibratable due to nature of nearby noise sources (i.e., vegetation noise, animal movements)

Table 6.2 – Noise model validation

Calibrated noise levels at the monitoring locations indicate a maximum difference of 11 dB(A) during night-time hours at MP2_W, specifically with regards to maximum noise events at this location. However, considering the receptor's increased distance from surrounding roads and adjacency to dense vegetation, maximum noise events are likely attributable to wildlife and/or vegetation noise. In order to ensure a conservative approach for night-time maximum levels, assessment positions in the immediate vicinity of monitoring position MP2 default to the measured noise level of 57 dB L_{max}, rather than the predicted noise level given the elevated uncertainty in calibrating the computer noise model at this position.

Calibrated noise levels aside from the night-time $L_{AF,max}$ levels at MP2_W indicate a maximum difference of 3 dB(A), providing an acceptable level of confidence to the modelling exercise. It is therefore considered that the noise model, plus the approach discussed with regards to maximum noise levels at receptors surrounding MP3, 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 **Figures 6.1** and **6.2**.

Figure 6.1 – Noise evaluation areas

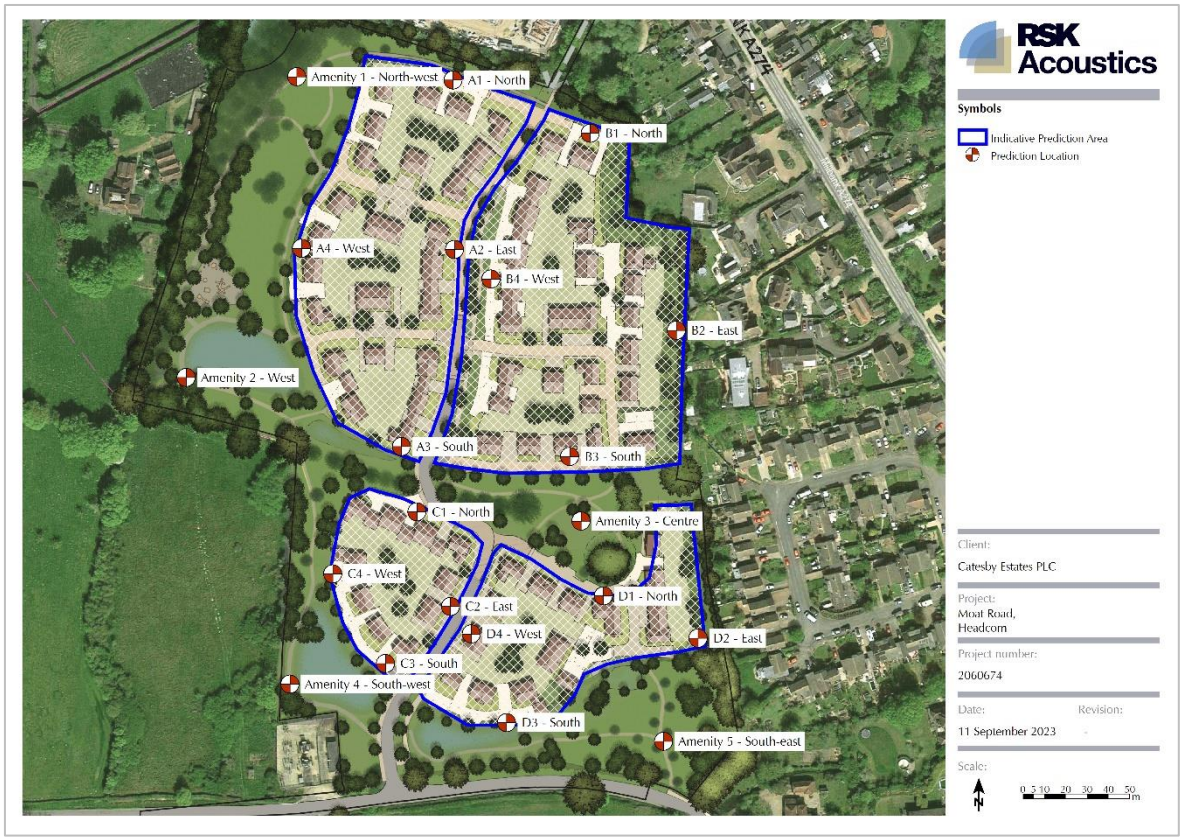


Figure 6.2 – Noise evaluation points

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	42	35	**7**
	Night-time	37	30	**7**
		51	45 L_{AFmax}	6
Area A – A2 East boundary	Daytime	42	35	**7**
	Night-time	37	30	**7**
		50	45 L_{AFmax}	5
Area A – A3 South boundary	Daytime	43	35	8
	Night-time	38	30	8
		57[1]	45 L_{AFmax}	**12**
Area A – A4 West boundary	Daytime	41	35	**6**
	Night-time	36	30	**6**
		48	45 L_{AFmax}	3
Area B – B1 North boundary	Daytime	46	35	**11**
	Night-time	40	30	10
		54	45 L_{AFmax}	9
Area B – B2 East boundary	Daytime	42	35	**7**
	Night-time	37	30	**7**
		50	45 L_{AFmax}	5
Area B – B3 South boundary	Daytime	43	35	**8**
	Night-time	38	30	**8**
		48	45 L_{AFmax}	3
Area B – B4 West boundary	Daytime	42	35	**7**
	Night-time	37	30	**7**
		50	45 L_{AFmax}	5
Area C – C1 North boundary	Daytime	43	35	8
	Night-time	39	30	9
		57[1]	45 L_{AFmax}	**12**
Area C – C2 East boundary	Daytime	45	35	10
	Night-time	41	30	**11**
		52	45 L_{AFmax}	7
Area C – C3 South boundary	Daytime	47	35	12
	Night-time	45	30	**15**
		55	45 L_{AFmax}	10
Area C – C4 West boundary	Daytime	44	35	9
	Night-time	41	30	**11**
		50	45 L_{AFmax}	5
Area D – D1 North boundary	Daytime	44	35	**9**
	Night-time	39	30	**9**
		52	45 L_{AFmax}	7

Area D – D2 East boundary	Daytime	43	35	8
	Night-time	39	30	9
		55	45 L_{AFmax}	**10**
Area D – D3 South boundary	Daytime	50	35	15
	Night-time	45	30	15
		64	45 L_{AFmax}	**19**
Area D – D4 West boundary	Daytime	45	35	10
	Night-time	41	30	**11**
		54	45 L_{AFmax}	9

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*
[1] Measured 10th Highest $L_{AF,max}$ value at MP2_W utilised due to non-calibration of measurement position

Table 7.1 – Predicted noise levels

Averaged daytime noise levels predicted at ground floor level range between 41 – 50 dB $L_{Aeq,16hr}$; night-time noise levels at first floor range between 36 – 45 dB $L_{Aeq,8hr}$. Highest noise levels are predicted towards the southern boundary of the site due to the proximity to Moat 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 the proposed development.

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 19 dB R_w+C_{tr} for those properties likely to be positioned towards the southern 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 negligible risk of adverse effect, with those proposed developable areas along the southern boundary being subject to a low 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 at those properties on and facing the southern boundary of the

site (receptors adjacent to C3 and D3 in **Figure 6.2**) 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 36 and 45 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 41 and 50 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 $L_{Aeq,8hr}$. Predicted external night-time levels range between 36 and 45 dB $L_{Aeq,8hr}$, and are therefore not expected to exceed this level.

Similarly, maximum noise levels during the night-time period are not likely to exceed the adopted criteria of 64 dB L_{Amax} at all positions across the development, as predicted maximum noise events during the night range between 47 and 64 dB L_{AFmax}. It should be noted that the above conclusions are based on the simplified method of assessment, and it is recommended during the detailed design stage that input be sought from the wider design team to identify potential areas of overheating risk to ensure appropriate mitigation options are explored (where necessary) 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 southern portion of the site may be subject to noise levels of up to 50 dB $L_{Aeq,16hr}$ and would therefore comply with the upper design target of 55 dB $L_{Aeq,16hr}$, as specified within BS 8223 : 2014.

The computer noise model has also included predictions for those open spaces within the confines of the development. Predictions indicate that noise levels would likely range between 42 dB $L_{Aeq,16hr}$ (amenity area 1 and 2) and 50 dB $L_{Aeq,16hr}$ (amenity area 4).

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 Plant Noise Assessment

Positioned adjacent to the south-west boundary, is an electrical substation which was witnessed to be in operation and audible during the baseline measurements. Audible sources include low frequency type noise (at 100 Hz) operating intermittently at the boundary of the site. At a distance of 50 metres, it was noted that the noise from the substation was reduced and significantly less audible above the residual noise environment.

RSK Acoustics, previously obtained attended measurements at the boundary of the substation in September 2019. Measurements obtained during operation of the substation are reproduced below and in **Appendix 2**:

Date	Start Time	Measured noise levels, dB(1)			
		$L_{Aeq,T}$	L_{AFmax}	$L_{A90,T}$	$L_{A10,T}$
10.09.19	10:10	56	59	55	56

Table 8.1 - Noise survey results – Substation noise (transformer at 10 metres)

8.1 Rating Penalties

According to BS 4142:2014+A1: 2019, where certain features of the specific noise level can increase the significance of impact of a sound level, a character correction is applied to provide a rated noise level. The characteristics of a sound that are likely to cause an increase in the significance of impact are tonality, impulsivity, intermittency or other characteristic features such as an identifiable 'hiss'.

The specific sound level of the source has the following penalties added:

Characteristic	Reason	Penalty
Tonality	The specific sound will have tonality characteristics	+2 dB
Impulsivity	The specific sound will have no impulsivity characteristics	0
Intermittency	The specific sound will have intermittency characteristics	+3 dB
Other	The sound is likely to have an identifiable "Hiss"	0

Table 8.2 – Rating level assumptions

8.2 Operational Assessment

An assessment of predicted rated noise level, against the representative background noise at the garden of the nearest indicative receptor location is summarised in **Table 8.3**. For the purposes of the assessment, a distance of 50 metres has been assumed from substation transformer to the

nearest receptor within Area C (C3 – south west). In accordance with the procedures within BS 4142:2014 + A1:2019, predicted levels are rounded to integer values.

Assessment	Daytime Noise Level / dB	Night Noise Level / dB
(1) Specific Noise*	26	32
(2) Acoustic Correction	+5	+5
(3) Rating Noise Level	31	37
(4) Background Noise (L_{A90})	37	33
(5) Excess over Background	-6	+4

Note – a) specific noise calculation assumes garden amenity area does not have direct line of sight to the substation as per outline site plans, b) on-time correction of 25% applied for daytime, 100% on-time for night

Table 8.3 – Noise assessment

The assessment indicates that predicted rated noise level would be 6 dB below the representative background ($L_{90,T}$) during the daytime and 4 dB above the representative background ($L_{90,T}$) during the night.

As indicated previously within this report, the significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. BS 4142:2014+A1: 2019 states:

"An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context".

In accordance with BS 4142:2014+A1: 2019, the context in this scenario can include the absolute level of sound incidence on the receptor. It is noted that although the outdoor rated sound levels are likely to exceed the representative background noise level, internal levels within bedrooms would be in the order of 25 - 30 dB assuming a standard level of noise reduction (for external to internal noise) for an open window. As a result, internal noise levels within bedrooms would comply with the design targets within BS 8233: 2014 and WHO, 1999.

8.3 Uncertainty

BS 4142:2014+A1: 2019 requires that the assessment considers the level of uncertainty in the data and associated calculations. Consideration of the uncertainty can enable a more informed decision regarding the likely significance of impact, within the context of assessment.

It is accepted that uncertainty may arise from all levels of measurement and assessment and reasonably practicable steps have been made at all stages with the aim of reducing uncertainty.

The following measures have been taken to reduce uncertainty:

- Background sound level measurements have been obtained at a representative assessment location to measure existing residual environment during the intended operational hours of the proposed development;
- Use of monitoring equipment in accordance with Section 5 of BS 4142: 2014+A1: 2019, using Class 1 instrumentation;
- Measurement procedures followed in accordance with Section 6 of BS 4142: 2014+A1: 2019 with all precautions taken to minimise interference; and
- Specific sound levels have been calculated to the requirements of ISO 9613-2: 1996 which is the widely accepted procedure for the calculation of sound propagation (including favourable wind conditions from source to receiver). The development has yet to be built; therefore, the assessment is informed by comparison of the predicted Rating Levels against the representative background sound levels in accordance with Section 7 of BS 4142: 2014+A1: 2019.

Given the measures outlined above and the magnitude of predicted operational levels in the context of the existing local noise environment, it is considered that the uncertainty does not have any significance on the outcome of the assessment.

9 Road Traffic Noise Assessment

9.1 Traffic Count Data

In order to quantify the potential impact of traffic noise at receptor locations, traffic data was provided by the appointed traffic consultants (DTA).

The scenario was assessed were as follows:

- Scenario 1 – 'Do-Minimum' in the opening year (2025) against 'Do-Something' in the opening year (2025)
- Scenario 2 – 'Do-Minimum' in the opening year (2025) against 'Do-Something' in the future year (2040)

Traffic count data is provided in **Table 9.1**.

Road link	2025 Opening Year		2025 Opening + Development		2040 Future + Development	
	AAWT 18hr	HGV%	AAWT 18hr	HGV%	AAWT 18hr	HGV%
1	2565	2	2703	2	3025	2
2	2614	2	2755	2	3083	2
3	7930	5	8359	5	9352	5
4	3075	4	3241	4	3626	4
5	7928	5	8357	4.8	9350	5

1. Moat Road (west of site access)
2. Moat Road (east of site access)
3. A274 Mill Bank
4. Kings Road
5. North Street

Table 9.1 – Development traffic counts

9.2 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. The assessment of short term and long term impact is provided in **Table 9.2**.

Road link	Scenario 1 – Short Term Noise level change, dB $L_{A10,18hr}$	Magnitude	Scenario 2 – Long Term Noise level change, dB $L_{A10,18hr}$	Magnitude
1	0.2	Negligible	0.7	Negligible
2	0.2	Negligible	0.7	Negligible
3	0.2	Negligible	0.7	Negligible
4	0.2	Negligible	0.7	Negligible
5	0.2	Negligible	0.7	Negligible

1. Moat Road (west of site access)
2. Moat Road (east of site access)
3. A274 Mill Bank
4. Kings Road
5. North Street

Table 9.2 - Noise level change

The predictions indicate that the effect of the development on traffic noise would increase noise levels by a maximum of 0.2 dB $L_{A10, 18hr}$ in the short term and 0.7 dB $L_{A10, 18hr}$ in the long term. An increase of this magnitude would be of a negligible impact in accordance with DMRB.

10 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 north of Moat Road, Headcorn.

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 14 and 19 September 2022.

A site suitability assessment, to the requirements of BS 8233: 2014/WHO, 1999 and Mid-Kent 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 19 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 southern boundary of the site).

Based on the simplified method of assessment, there are no areas across the site deemed as being of high risk of overheating. External noise levels would also not exceed the highest overheating SOAEL limits within the AVO Guide nor the AD-O. It is recommended during the detailed design stage that input be sought from the wider design team to identify potential areas of overheating risk to ensure appropriate mitigation options are explored (where necessary) in the form of compliment ventilation, architecture and structural design strategies.

External noise levels are likely to comply with the upper design target of 55 dB $L_{Aeq,16hr}$, as specified within BS 8223: 2014. Similarly, an assessment of the operational substation (in accordance with BS 4142:2014+A1: 2019) indicates a low impact during both daytime and night-time periods.

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.

11 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 4142: 2014 + A1: 2019 Methods for rating and assessing industrial and commercial sound. British Standards Institution, 2014
4. British Standard 7445-1:2003, Description and measurement of environmental noise – Part 1: Guide to quantities and procedures. British Standards Institution, 2003
5. British Standard 8233: 2014, Sound insulation and noise reduction in buildings – code of practice. British Standards Institution, 2014
6. Calculation of Road Traffic Noise. Department of Transport, Welsh Office HMSO
7. Design Manual for Roads and Bridges, LA111 Noise and Vibration, 2020
8. International Standard ISO 9613:1996 - Acoustics – Attenuation of sound during propagation outdoors
9. National Planning Policy Framework, September 2023
10. National Planning Practice Guidance (NPPG): 2019
11. Noise Policy Statement for England (NPSE). DEFRA, 2010
12. Professional Practice guidance on Planning and Noise (ProPG), 2017
13. WHO Guidelines for Community Noise, 1999

Appendix 1 – Indicative Site Layout

Reproduced from drawing 'CATE211030 SKMP-01 A2' – dated September 2023

Appendix 2 – Noise Monitoring Results

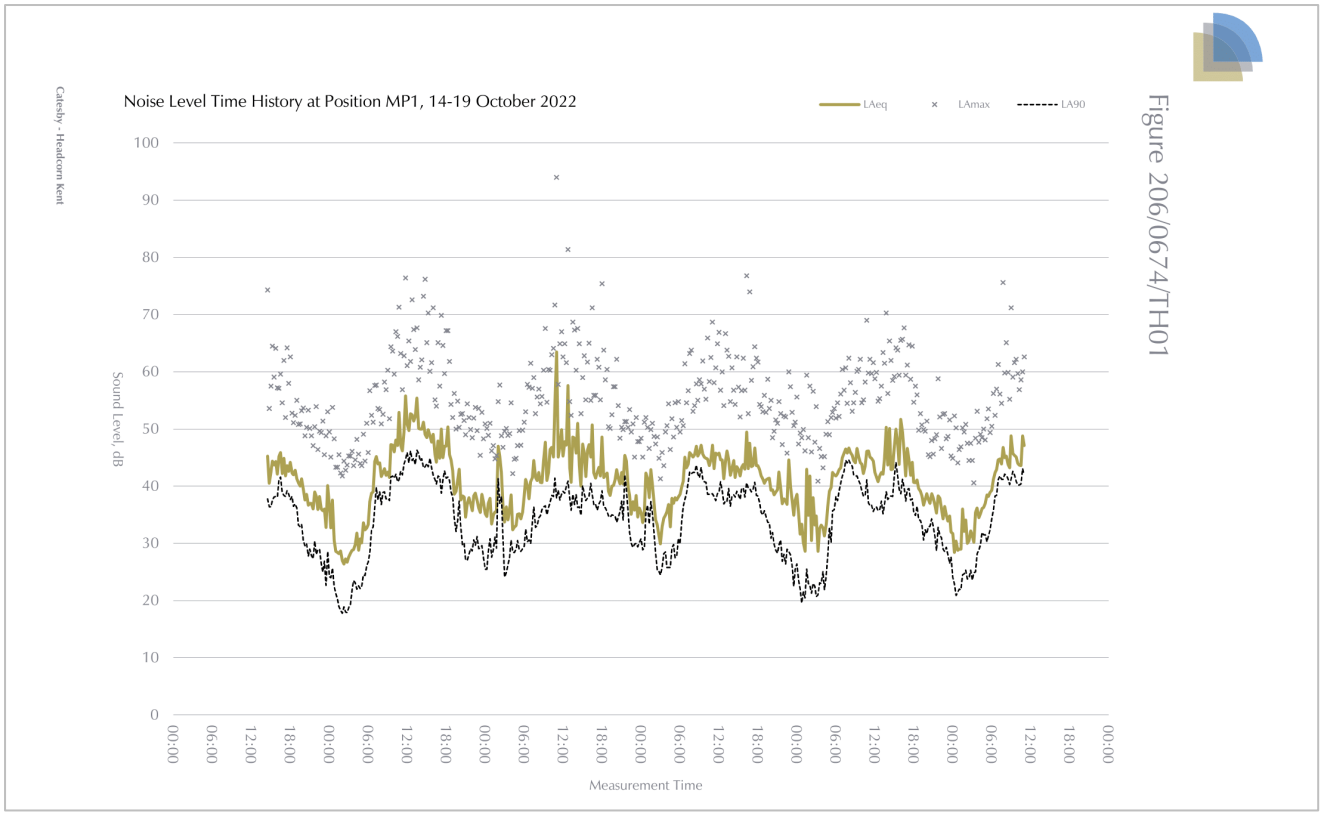


Figure 206/0674/TH01

Figure A2.1 – Hourly noise evolution (MP1_NE)

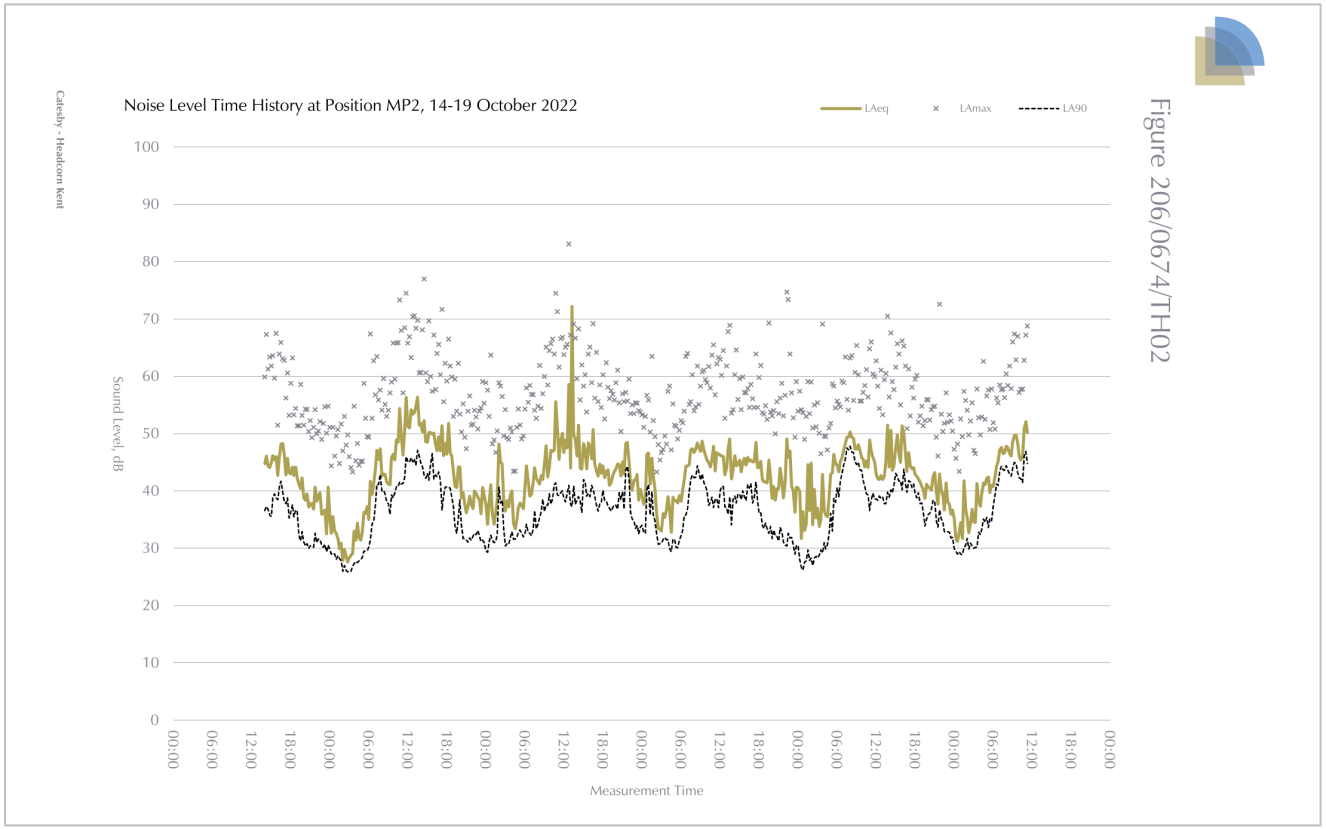


Figure A2.2 – Hourly noise evolution (MP2_W)

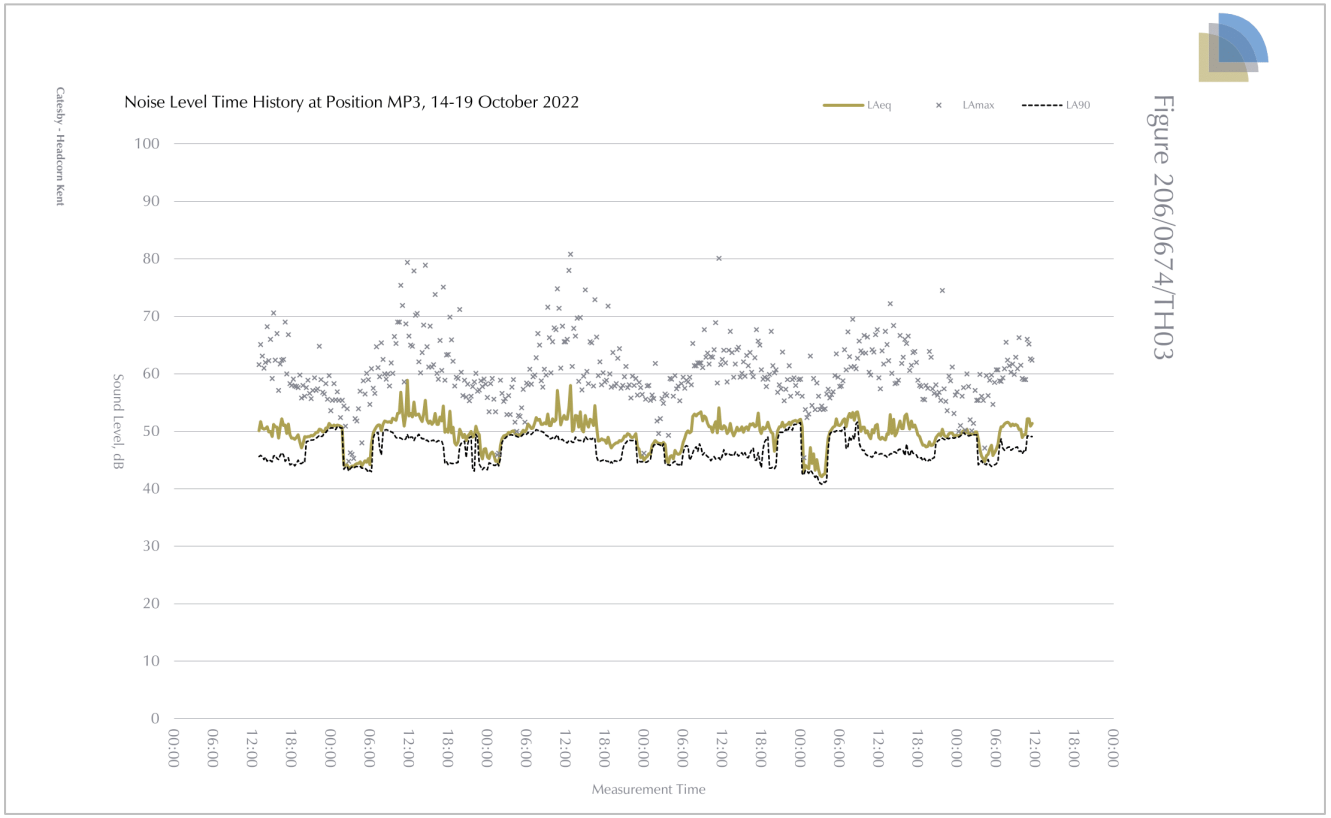


Figure 206/0674/TH03

Figure A2.3 – Hourly noise evolution (MP3_SW)

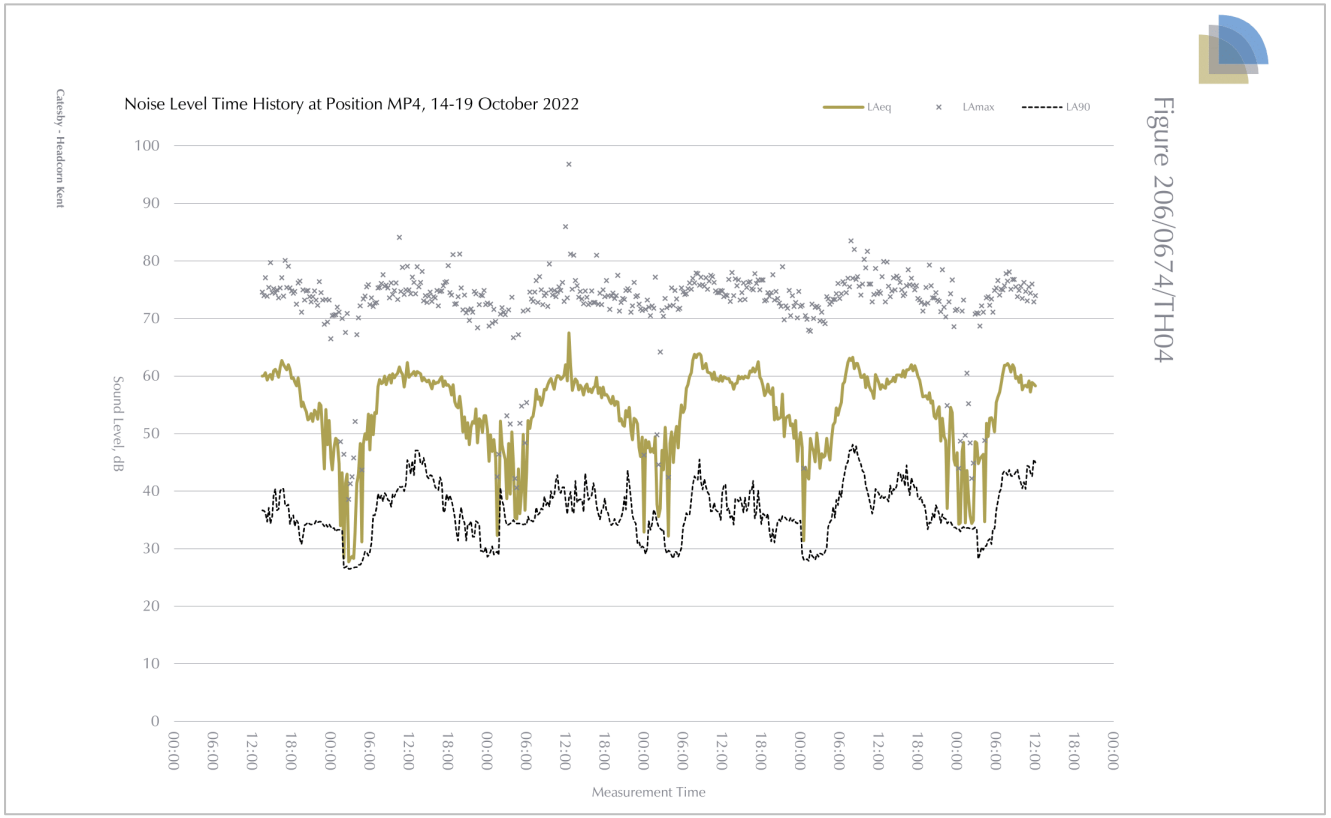


Figure 206/0674/TH04

Figure A2.4 – Hourly noise evolution (MP4_S)

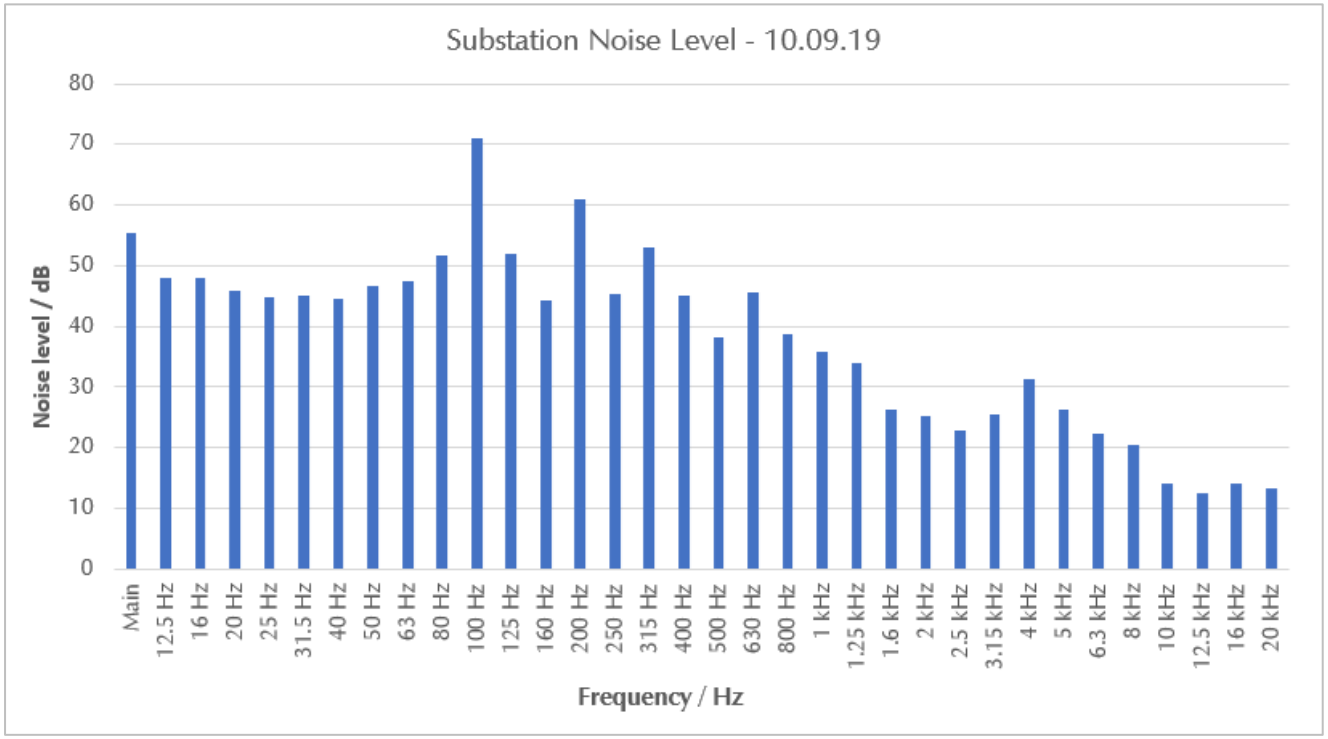


Figure A2.5 – Substation noise at 10 metres

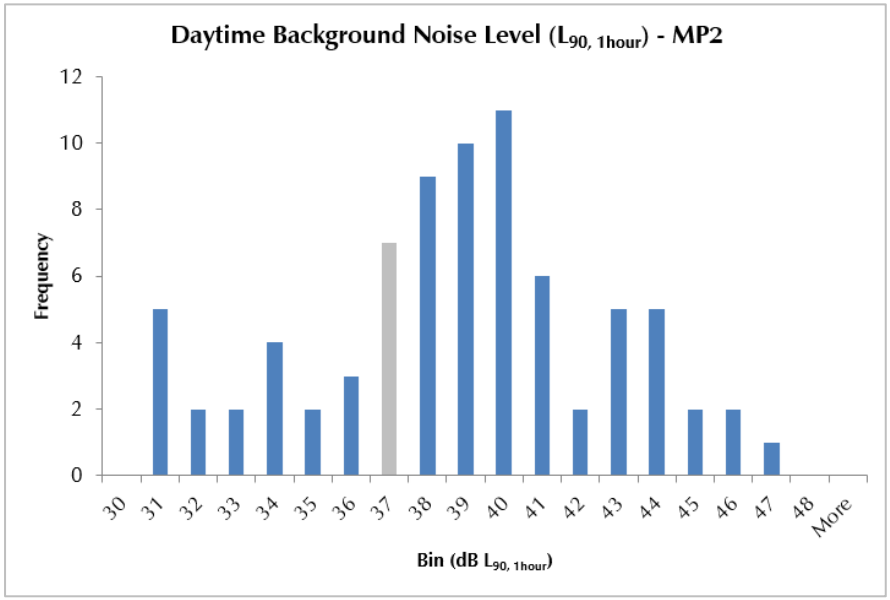


Figure A2.6 – Daytime background noise level data analysis

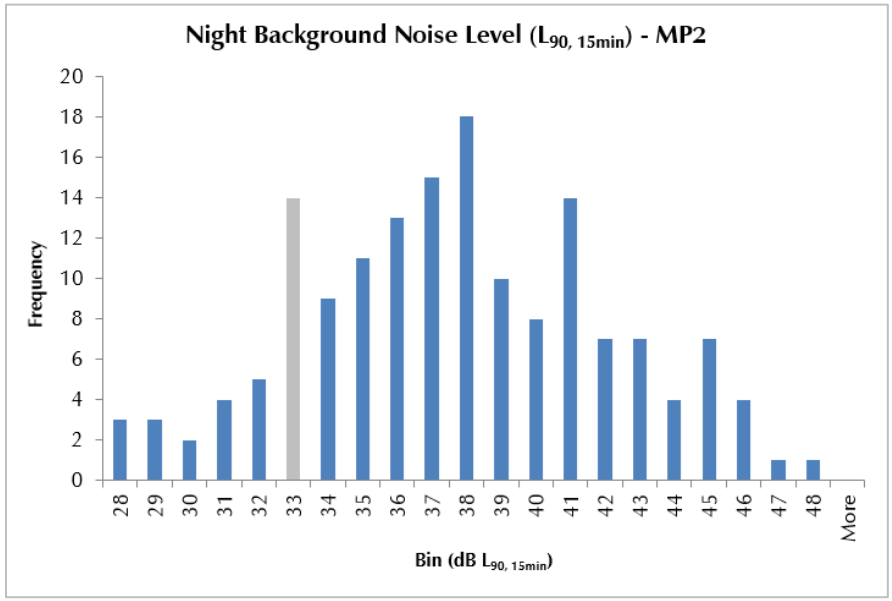
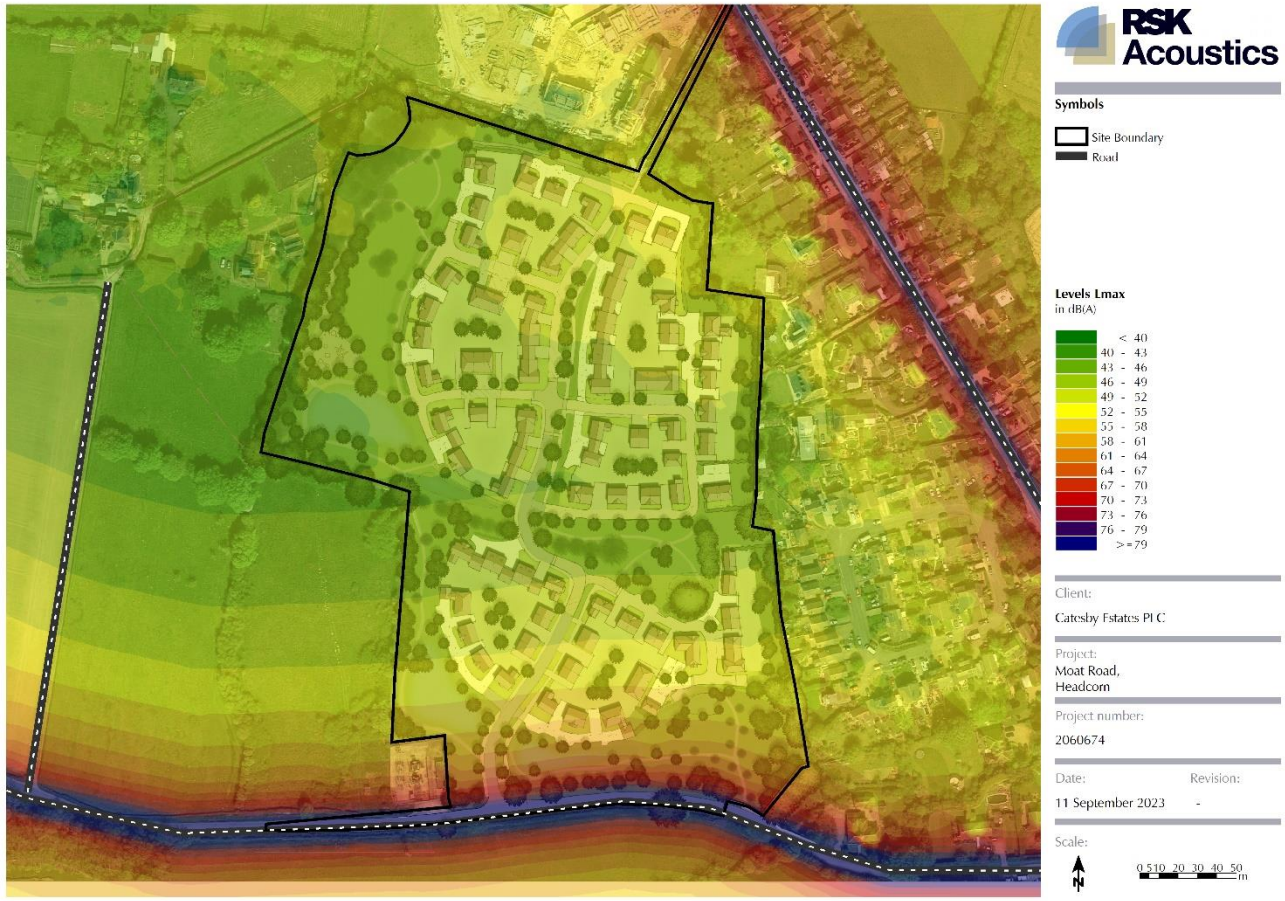


Figure A2.7 – Night background noise level data analysis

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

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

Appendix 5 – Night-time Noise Contour Map - L_{AFMax}



Appendix 6 – Photographic Report

MP1_NE – North-east boundary

MP2_W – West boundary

MP3_SW – South-west boundary

MP4_S – South boundary

Appendix 7 - 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.

RSK Acoustics Limited Reg. in England and Wales No. 7102436
rskacoustics.com info@rskacoustics.com +44 (0)1932 829007

Registered Office: Spring Lodge, 172 Chester Road, Helsby, WA6 0AR
Addlestone | Bristol | Coventry | Glasgow | Helsby | Hemel | Leeds | Manchester