

# Noise Impact Assessment

Land south of 295 Main Street,  
Stanton Under Bardon



Presented to: Allison Homes East Midlands Limited

Issued: May 2025

Lucion Contract Reference: 127983.662636

## Report Details

|                           |                                                                                        |
|---------------------------|----------------------------------------------------------------------------------------|
| <b>Client</b>             | Allison Homes East Midlands Limited                                                    |
| <b>Report Title</b>       | Noise Impact Assessment                                                                |
| <b>Site Address</b>       | Land South Of 295 Main Street, Stanton Under Bardon                                    |
| <b>Contract Reference</b> | 127983.662636                                                                          |
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## Quality Assurance

| Issue No. | Status | Issue Date                | Comments | Author                            | Technical Review         | Authorised                |
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| 2         | Final  | 23 <sup>rd</sup> May 2025 | -        | Dan Boote<br>Principal Consultant | John Goodwin<br>Director | Sarah Slater<br>Associate |

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## Executive Summary

|                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Site and Report Context</b>                                                                                                               | <p>Lucion Delta-Simons Ltd ('Lucion') was instructed by Allison Homes East Midlands Limited (the 'Client') to prepare a Noise Impact Assessment to support a planning application for 50No. residential units (the 'Proposed Development'), located on land south of 295 Main Street, Stanton Under Bardon (the 'Site')</p> <p>This assessment has been undertaken to identify the key noise sources associated with the proposal and which may have the potential to impact the closest sensitive residential dwellings. Accordingly, this assessment has been completed with due regard to:</p> <ul style="list-style-type: none"><li>• National Planning Policy Framework (NPPF);</li><li>• Planning Policy Guidance (PPG);</li><li>• Professional Practice Guidance on Planning &amp; Noise; and</li><li>• BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'.</li></ul> |
| <b>Summary</b>                                                                                                                               | <p>This assessment has been informed by a noise survey to quantify the existing background noise environment at the Proposed Development.</p> <p>Sound insulation specifications for glazing and ventilation have been provided to ensure suitable internal ambient noise levels are achieved across the Site.</p> <p>Noise in external amenity areas do not exceed WHO guideline levels.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Recommendations</b>                                                                                                                       | <p>The glazing and ventilation specifications should be considered as minimum specifications to achieve suitable internal ambient noise levels. Installing glazing or ventilation with higher sound reduction would result in lower internal ambient noise levels.</p> <p>Calculations have been undertaken based on the site layout provided by the Client (shown in Figure 2). If changes are made to the proposed layout, additional calculations will be required to ensure the conclusions of this report remain valid.</p>                                                                                                                                                                                                                                                                                                                                                                        |
| <p>This is intended as a summary only. Further detail and limitations of the assessment are provided within the main body of the Report.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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## 1.0 Introduction

### 1.1 Appointment

- 1.1.1 Lucion Delta-Simons Ltd ('Lucion') was instructed by Allison Homes East Midlands Limited (the 'Client') to prepare a Noise Impact Assessment to support a planning application for 50No. residential units (the 'Proposed Development'), located on land south of 295 Main Street, Stanton Under Bardon (the 'Site').

### 1.2 Site Location and Context

- 1.2.1 The Site is bordered by Main Street which runs the full length of the north-western boundary. Further to the north-west is Cliffe Hill Side Quarry. Existing residential receptors are situated to the north of the Site on Main Street and south on Thornton Lane. To the east of the Site, there is green land assumed to be used for agricultural purposes. To the north-east is a commercial/industrial premises (approximately 200m from the Site), and a second quarry (approximately 600m from the Site) assumed to be associated with Cliffe Hill Quarry.
- 1.2.2 The existing commercial/industrial premises are understood to normally operate between the hours 08:00 – 17:30 Monday to Friday, with the exception of some premises operating into the evening including the quarry(s).
- 1.2.3 Reference should be made to **Figure 1** for a map of the Site and surrounding area, and **Figure 2** for the proposed Site layout.
- 1.2.4 The standard limitations associated with this assessment are presented in **Appendix A**.
- 1.2.5 A glossary of terms used in this report is provided in **Appendix B**.

## 2.0 Legislation and Policy

### 2.1 Planning Policy

2.1.1 A summary of the national and local planning policy relevant to the Proposed Development is provided below.

#### National Planning Policy Framework and Planning Practice Guidance

2.1.2 The Government published the revised National Planning Policy Framework (NPPF, December 2024) and the Planning Practice Guidance (PPG) in July 2019<sup>1</sup>. Together, the NPPF and PPG set out what the Government expects of local authorities. The overall aim is to ensure the planning system allows land to be used for new homes and jobs, while protecting valuable natural and historic environments.

2.1.3 The PPG adds further context to the NPPF and it is intended that the two documents should be read together.

2.1.4 Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment, including cumulative effects. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

2.1.5 Local planning authorities' plan-making and decision making should take account of the acoustic environment and in doing so consider:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and
- Whether or not a good standard of amenity can be achieved.

2.1.6 In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

2.1.7 The Observed Effect Levels are as follows:

- Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur;
- Lowest observed adverse effect level: This is the level of noise exposure above which adverse effects on health and quality of life can be detected; and
- No observed effect level: This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

2.1.8 **Table 1** summarises the noise exposure hierarchy, based on the likely average response.

**Table 1 - Noise Exposure Hierarchy**

| Perception                       | Examples of Outcomes | Increasing Effect Level | Action                        |
|----------------------------------|----------------------|-------------------------|-------------------------------|
| No Observed Adverse Effect Level |                      |                         |                               |
| Not Noticeable                   | No Effect            | No Observed Effect      | No specific measures required |

<sup>1</sup> Parts of PPG were updated in February 2024, however, the Noise section was updated in July 2019.

| Perception                                | Examples of Outcomes                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Increasing Effect Level     | Action                           |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------------------------------|
| Noticeable and not intrusive              | Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.                                                                                                                                                                                                                                                              | No Observed Adverse Effect  | No specific measures required    |
| Lowest Observed Adverse Effect Level      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                  |
| Noticeable and intrusive                  | Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.                                                          | Observed Adverse Effect     | Mitigate and reduce to a minimum |
| Significant Observed Adverse Effect Level |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                  |
| Noticeable and disruptive                 | The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area. | Significant Observed Effect | Avoid                            |
| Noticeable and very disruptive            | Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory                                                                                                                                                                               | Unacceptable Adverse Effect | Prevent                          |

## 2.2 Local Planning Policy

- 2.2.1 The Hinckley and Bosworth Local Plan 2020-2039 Consultation Draft Plan document, published in June 2021, provides guidance and policies for future sustainable development within the Borough until 2039. Development is desired, allowing the supported communities to grow sustainably, whilst providing opportunities and addressing the needs of residents. The policies pertinent to the Proposed Development and Noise are set out below

### Policy PMD01 High Quality Design

*“The Borough Council will require the highest standards of design, architecture, inclusivity and place-making.*

*Development will be supported where it positively takes into consideration the adopted Hinckley & Bosworth Good Design Guide (SPD), the National Design Guide and National Model Design Code, any Design Guide contained in a made Neighbourhood Plan, and any other relevant national design guidance.*

*Development will be supported where the following requirements are met:*

*[...]*

- b) The amenity and privacy of nearby residents are not adversely affected, including by matters of lighting, air quality, odour, noise, vibration and visual intrusion;*
- c) The amenity of the proposed users of the development would not be adversely affected by activities in the near vicinity of the site.*

*[...]”*

### Policy PMD03 Preventing Pollution

*"Adverse impacts from pollution will be prevented by ensuring that development proposals demonstrate that:*

*[...]*

*d) It would not cause noise or vibrations of a level which would disturb areas that are valued for their tranquillity in terms of recreation or amenity. Development proposals that generate significant levels of noise must be accompanied by a scheme to mitigate such effects, having regard to the nature of surrounding uses. [...]"*

## 2.3 Guidance

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

#### Noise Criteria Limits

- 2.3.1 The scope of this Standard is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.
- 2.3.2 The Standard suggests suitable internal noise levels within different types of buildings, including dwellings, as shown in **Table 2**.

**Table 2 - BS 8233:2014 Internal Target Noise Levels**

| Criterion                                                                                                                                     | Typical Situation | Design $L_{Aeq,T}$ (dB) |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------|
| Suitable resting/sleeping conditions                                                                                                          | Living Room       | 35                      |
|                                                                                                                                               | Bedroom*          | 30                      |
| *For a Reasonable standard in bedrooms at night, individual noise events (measured with fast time weighting) should not exceed 45dB $L_{max}$ |                   |                         |

- 2.3.3 BS 8233 goes on to recommend noise levels for gardens as follows:

*'It is desirable that the external noise level does not exceed 50dB  $L_{Aeq,T}$ , with an upper guideline value of 55dB  $L_{Aeq,T}$  which would be acceptable in noisier environments. However, it is also recognised 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 might be warranted'.*

- 2.3.4 BS 8233 goes on to say:

*'In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited'.*

#### Ventilation Requirements

- 2.3.5 It is widely accepted that a partially open window will provide around 15dB noise attenuation. Where a partially open window cannot be relied upon to provide an adequate level of façade sound insulation performance, it is necessary to consider alternative ventilation for habitable rooms. Section 8.4.5.4 within BS 8233 states:

*'The Building Regulations' supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used, and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice.*

*Alternatively, acoustic ventilation units (see 7.7.2 [of the Standard] below) are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However,*

*ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans.'*

2.3.6 Section 7.7.2 of the Standard states:

*'NOTE 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.'*

#### Professional Practice Guidance on Planning & Noise (ProPG)

2.3.7 Professional Practice Guidance (ProPG): Planning and noise was published in May 2017 in order to encourage better acoustic design for new residential scheme in order to protect future residents from the harmful effects of noise. The guidance can be seen as the missing link between the current NPPF and its predecessor, PPG24 (Planning Policy Guidance 24: Planning and Noise), which provided a prescriptive method for assessing sites for residential development, but without the nuance of 'good acoustic design as outlined in ProPG.

2.3.8 ProPG allows the assessor to take a holistic approach to consider the site's suitability, taking into consideration numerous design factors which previously may not have been considered alongside the noise level measured on site, for example the orientation of the building in relation to the main source of noise incident upon it.

2.3.9 It should be noted this document is not an official government code of practice, and neither replaces nor provides an authoritative interpretation of the law or government policy, and therefore should be seen as a good practice document only. The guidance presents a 2-phased assessment process.

#### Stage 1 – Initial Criteria

2.3.10 Stage 1 is an initial noise risk assessment of the proposed development site. This should ideally be undertaken as early as possible, before any planning application is submitted. The noise risk assessment should indicate the likely risk of adverse effects from noise in the absence of any form of mitigation.

2.3.11 The noise risk assessment may be based on measurement or prediction, as appropriate and should aim to describe noise levels over a "typical worst case" 24-hour day either now or in the foreseeable future.

2.3.12 The Indicative Daytime ( $L_{Aeq,16hr}$ ) and Indicative Night-time ( $L_{Aeq,8hr}$ ) noise levels for each category are shown in **Table 3** which extracted from Figure 1 in ProPG. These are combined free-field noise levels from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".

2.3.13 The indicative noise levels provide an indication of the noise effect 'challenge' at a potential residential development site.

2.3.14 The table below summarises the Stage 1 assessment.

**Table 3 - ProPG Stage 1: Initial Site Noise Risk Assessment**

| Indicative Noise Levels<br>dB   |                                   | Risk Level | Potential<br>Effect<br>Without<br>Noise<br>Mitigation                                                                   | Pre-planning Application Advice                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Daytime<br>L <sub>Aeq,16h</sub> | Night-time<br>L <sub>Aeq,8h</sub> |            |                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 70                              | 60                                | High       | <br>Increasing risk of adverse effect | High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed Acoustic Design Statement (ADS). Applicants are strongly advised to seek expert advice.                                                                                                                |
| 65                              | 55                                | Medium     |                                                                                                                         | As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development. |
| 60                              | 50                                | Low        |                                                                                                                         | At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development                                                                                                                                        |
| 55                              | 45                                |            |                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 50                              | 40                                | Negligible | No adverse effect                                                                                                       | These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds                                                                                                                                                                                                                                                |

2.3.15 It is strongly expressed in ProPG that the noise risk assessment outcome identified at a potential development site is “not the basis for an eventual recommendation to the decision maker”, but an opportunity for good acoustic design to be incorporated from the onset of the design process. A site considered to be high risk will be recognised as having more acoustic challenges, and a site defined with negligible risk is likely to be acceptable from a noise perspective and need not normally be delayed on noise grounds.

#### Stage 2 – Full Assessment

2.3.16 There are four key elements to Stage 2. These are:

- Element 1 – demonstrating a ‘Good Acoustic Design Process’;
- Element 2 – observing internal ‘Noise Level Guidelines’;
- Element 3 – undertaking an ‘External Amenity Area Noise Assessment’; and
- Element 4 – consideration of ‘Other Relevant Issues’.

### **Element 1 – Good Acoustic Design**

- 2.3.17 Good acoustic design does not mean overdesigning a new development but seeking to deliver the optimum acoustic outcome for a particular site. It is not just compliance with recommended internal and external noise levels, but should provide a solution to achieve the optimum acoustic outcome without design compromises that will adversely affect living conditions, quality of life, or other sustainable design objectives and requirements.
- 2.3.18 Planning applications for new residential developments should consider the following aspects of good acoustic design:
- Check the feasibility of relocating, or reducing noise levels from relevant sources;
  - Consider options for planning the site or building layout;
  - Consider the orientation of proposed building(s);
  - Select construction types and methods for meeting building performance requirements;
  - Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc;
  - Assess the viability of alternative solutions; and
  - Assess external amenity area noise.

### **Element 2 – Internal Noise Level Guidelines**

- 2.3.19 The element seeks to achieve recommended noise levels inside noise sensitive rooms in new residential development. Guideline levels can be found in BS 8233 and are set out in **Table 3**.
- 2.3.20 Care should be taken when specifying very high façade sound insulation in order to reduce the level of internal noise from external sources, as this may also reduce the extent to which a low level of steady external noise can help to mask any noise from neighbours.

### **Element 3 – External Amenity Area Noise Assessment**

- 2.3.21 ProPG quotes BS 8233 regarding external amenity. The quote is set out in paragraph 2.3.3 of this Report.
- 2.3.22 PPG Noise is also quoted:
- “If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.”*
- 2.3.23 ProPG extends these guidelines to cover scenarios where recommended levels cannot be achieved, despite good acoustic design.

### **Element 4 – Assessment of Other Relevant Issues**

- 2.3.24 This element seeks to build upon relevant national and local planning and noise policies to provide recommendations for the issues that should be considered before any planning application is determined.

### **World Health Organisation (WHO) Guidelines for Community Noise 1999**

- 2.3.25 Published by the WHO in 2000, this document was prepared as a response to a need for action together with a generic need for improvements in legislation at a national level.
- 2.3.26 The document provides guideline sound levels in specific human environments. There is also information on the likely ‘critical health effects’ associated with sound levels exceeding the guideline values. The guideline values for ambient sound levels ( $L_{Aeq,T}$ ) and maximum sound levels ( $L_{AFmax}$ ) that are relevant in this case are set out in **Table 4**.

**Table 4 - WHO Guidelines Levels**

| <b>Specific Environment</b> | <b>Critical Health Effect</b>                                      | <b>dB<br/>L<sub>Aeq</sub></b> | <b>Time Base,<br/>hours</b> | <b>dB<br/>L<sub>AFmax</sub></b> |
|-----------------------------|--------------------------------------------------------------------|-------------------------------|-----------------------------|---------------------------------|
| Outdoor Living Area         | Serious annoyance, daytime and evening                             | 55                            | 16                          | -                               |
|                             | Moderate annoyance, daytime and evening                            | 50                            | 16                          | -                               |
| 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*                             |

\*With regard to the assessment of maximum sound levels, it is suggested in Section 3.4 of the WHO Guidelines that the L<sub>AFmax</sub> levels shown in this table should not be exceeded more than 10-15 times per night

## 3.0 Scope and Methodology

### 3.1 Scope

3.1.1 The scope of the assessment has been determined in the following way:

- A Baseline Noise Survey has been undertaken to establish the existing background sound environment at the closest Noise Sensitive Receptors (NSRs);
- Assess the suitability of the Site for residential development based upon the criteria set out in ProPG;
- Calculate the incident noise level on each sensitive façade within the development to determine if uprated glazing and ventilation specifications are required; and
- Where uprated glazing and ventilation is required, provide specifications to meet internal ambient noise level criteria set out in BS 8233:2104.

### 3.2 BS 8233:2014 Assessment

3.2.1 Noise levels measured at the Site have been used to construct a 3D noise model. This model has been used to propagate measured noise from the adjacent road to the façades of the Proposed Development.

3.2.2 The calculated noise levels at each sensitive window have been used to determine specifications for glazing and ventilation to meet BS 8233:2014 guideline internal noise levels, where a partially open window would not provide sufficient mitigation. It is widely accepted that a partially open window will provide 15dB attenuation.

### 3.3 External Amenity Assessment

3.3.1 In order to assessment the noise levels in external amenity areas, outputs from the noise model have been used to calculate the area of each garden that exceeds guideline levels set out in WHO Community Noise. Where levels exceed the guideline for serious annoyance, commentary regarding the context is provided.

### 3.4 3D Noise Model

3.4.1 The 3D noise model has been developed using CadnaA. CadnaA allows for the detailed modelling of road noise sources, considering terrain, buildings, and other relevant factors influencing sound propagation. The software's advanced algorithms implement the methodology set out in ISO 9613 to generate accurate noise level predictions at receptor locations. These results informed the assessment of noise impacts.

3.4.2 The table below sets out the noise model parameters.

**Table 5 - Noise Model Parameters**

| Parameter            | Setting                                                                                                                                       |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Ground Absorption    | Mixed acoustically soft and hard ground (assumed 0.8 coefficient) – i.e. grass or vegetated areas / hard ground.                              |
| Reflections          | 2 <sup>nd</sup> order                                                                                                                         |
| Source Modelling     | Main Street. Source noise modelled based on measured L <sub>Aeq</sub> and L <sub>AFmax</sub> noise levels, as set out in <b>Section 4.0</b> . |
| Receptors            | Noise levels are predicted at 1m from the façade at each floor level (i.e. 1.5m and 4.2m above ground level)                                  |
| Barriers / Screening | Development buildings have been included in the noise model                                                                                   |
| Site Layout          | "SUB_PL_001 Planning Layout Rev C"                                                                                                            |

## 4.0 Baseline Survey

### 4.1 Introduction

- 4.1.1 A noise monitoring survey was undertaken to quantify the sound environment currently experienced on the Site.
- 4.1.2 Unattended noise measurements were undertaken from Wednesday 27<sup>th</sup> October 2021 to Thursday 28<sup>th</sup> October 2021 encompassing daytime and night-time periods at the following location:
- LT1 - approximately 10m to the east of the Main Street, representative of worst-case proposed façades of the development along the western boundary.
- 4.1.3 The monitoring location is shown in **Figure 1**.

### 4.2 Measurement Equipment

- 4.2.1 The following monitoring equipment was used throughout the noise and vibration survey.

**Table 6 - Measurement Equipment**

| Measurement Position | Equipment         | Model Type | Serial Number | Last Laboratory Calibration Before Survey Date |
|----------------------|-------------------|------------|---------------|------------------------------------------------|
| LT1                  | Sound Level Meter | Rion NL-52 | 00231665      | 14 October 2020                                |
|                      | Pre-amplifier     | Rion NH-25 | 21609         |                                                |
|                      | Microphone        | Rion UC-59 | 3789          |                                                |
|                      | Calibrator        | Rion NC-74 | 34536109      | 21 December 2020                               |

- 4.2.2 The noise measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with recommended best practice; no significant drift was observed. Calibration certificates for the equipment are available on request.

### 4.3 Weather Conditions

- 4.3.1 Weather conditions during the survey period were measured as being dry and sunny, with low wind speeds for the full duration of the survey, as shown in the summary in **Table 7** below.

**Table 7 - Meteorological Conditions during the Survey**

| Survey Location | Date                                                           | Average Temperature (°C) | Average Wind Speed (m/s) | Wind Direction | Rain Intensity (mm/h) |
|-----------------|----------------------------------------------------------------|--------------------------|--------------------------|----------------|-----------------------|
| LT1             | 27 <sup>th</sup> October 2021 to 28 <sup>th</sup> October 2021 | 13.0                     | 2.5                      | SW             | 0.0                   |

### 4.4 Survey Results

- 4.4.1 For location LT1, the measured data presented below consists of the energetic average of  $L_{Aeq,5min}$  samples over the stated survey period, the maximum level during each period (with fast time weighting), and the arithmetic average of the  $L_{A90,5min}$ . A graphical representation of the survey data is shown in **Figure 3**.

**Table 8 - Results of unattended Baseline Survey – LT1**

| Period                        | Duration (hours) | Monitoring Date                                                | L <sub>Aeq,T</sub> dB | L <sub>Amax,T</sub> dB |
|-------------------------------|------------------|----------------------------------------------------------------|-----------------------|------------------------|
| Daytime<br>(07:00 -23:00)     | 16               | 27 <sup>th</sup> October 2021 to 28 <sup>th</sup> October 2021 | 55.2                  | 84.5                   |
| Night-time<br>(23:00 – 07:00) | 8                |                                                                | 48.7                  | 67.7                   |

- 4.4.2 The results of the measurements conducted at location LT1 during the survey are summarised in the above table.
- 4.4.3 Road traffic movements along Main Street are the dominant noise source at location LT1. In periods where no vehicles were passing, birdsong could be heard and horses running on the field. No other major noise sources were noted at this location.
- 4.4.4 During the survey set up, the onsite consultant undertook a listening exercise at the eastern boundary of the Site to identify if any noise that could be associated with the commercial/industrial premises. No specific source of noise attributable to any plant or operational could be perceived.

## 5.0 Assessment

### 5.1 ProPG Initial Assessment

- 5.1.1 Daytime noise levels across the Site were measured as being 55.2dB  $L_{Aeq,16hr}$ , and night-time noise levels were measured as being 48.7dB  $L_{Aeq,8hr}$ .
- 5.1.2 The measured noise levels indicate that the Site is 'Low' risk during daytime and night-time hours.

### 5.2 Glazing and Ventilation Assessment

#### Habitable Rooms

- 5.2.1 Internal layouts for the Proposed Development have been provided by the Client in drawings as set out in **Appendix C**. To assess the potential glazing and ventilation requirements for the proposed dwellings, noise ingress calculations have been undertaken using measurements scaled from the received drawings.

#### Calculated Noise Levels

- 5.2.2 The majority of plots within the development would achieve suitable internal ambient and maximum noise levels with a partially open window.
- 5.2.3 Façade break-in calculations are included in **Appendix C** for façades where a partially open window would not provide sufficient mitigation to achieve suitable internal ambient and maximum noise levels. Please note that the glazing and ventilation specifications used have been uprated by +3dB to allow a safety margin for any variation in noise levels measured.
- 5.2.4 With the specified façade mitigation in place, internal noise criteria for the daytime and night-time periods would be achieved.
- 5.2.5 **Figure 4**, **Figure 5**, and **Figure 6** show the propagation of noise across the Site during the daytime, night-time, and  $L_{AFmax}$  scenarios, respectively.

#### Façade Mitigation Strategy

- 5.2.6 The table below summarises the façade mitigation strategies.

**Table 9 – Façade Mitigation Strategies**

| Façade Strategy                                                                                                                                                                                                                                    | Item        | Sound Insulation Specification  | Example Product*                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------------------------|---------------------------------------------|
| 1                                                                                                                                                                                                                                                  | Glazing     | 29(-1;-4) dB $R_w$ (C;Ctr)      | Glass Systems 4/(6-16)/4 Double Glazed Unit |
|                                                                                                                                                                                                                                                    | Ventilation | 34(-2;-1) dB $D_{ne,W}$ (C;Ctr) | Titon Trimvent Mk11                         |
| * Products provided are an example that meets the required specification. Other products from different manufacturers may be available that meet the required specification. Inclusion in this table does not constitute an endorsement by Lucion. |             |                                 |                                             |

- 5.2.7 The specification provided in the table above represents the minimum required to achieve guideline internal noise levels where a partially open window would not provide sufficient mitigation. The specified façade mitigation strategies do not represent anything unusual and can be met using standard double-glazing sets and slot vents which are available from several manufacturers.

### 5.3 External Amenity

- 5.3.1 Noise levels in the gardens areas of the Proposed Development are calculated to be less than 50dB  $L_{Aeq,16hr}$  which is below the WHO guideline for moderate annoyance. These calculated noise levels are considered suitable, and do not require additional mitigation.

5.3.2 **Figure 7** shows a noise contour plot with the calculated noise levels split into the various WHO annoyance thresholds.

## 6.0 Summary and Conclusions

### 6.1 General

- 6.1.1 Lucion was instructed by Allison Homes East Midlands Limited to prepare a Noise Impact Assessment to support a planning application for 50No. residential units, located on land south of 295 Main Street, Stanton Under Bardon.
- 6.1.2 This assessment has been undertaken to identify the key noise sources associated with the proposal and which may have the potential to impact upon the closest sensitive residential dwellings. Accordingly, this assessment has been completed with due regard:
- National Planning Policy Framework (NPPF);
  - Planning Policy Guidance (PPG);
  - Professional Practice Guidance on Planning & Noise; and
  - BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'.
- 6.1.3 This assessment has been informed by a noise survey to quantify the existing background noise environment at the sensitive receptors.

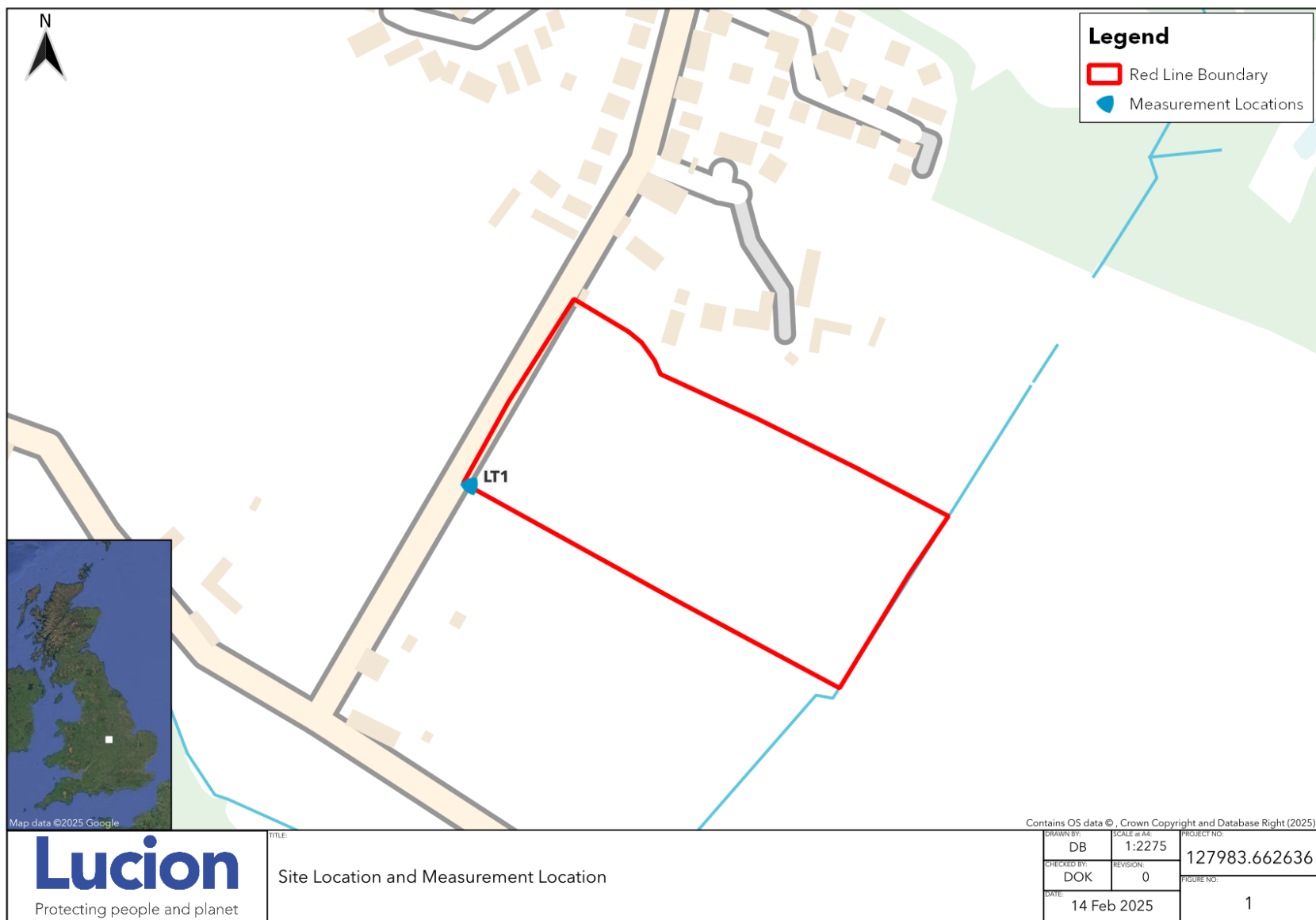
### 6.2 Glazing and Ventilation Assessment

- 6.2.1 The majority of plots within the Site would achieve suitable internal ambient noise levels with a partially open window. Sound insulation specifications have been provided for rooms where a partially open window would not provide sufficient attenuation to meet internal ambient noise level criteria. The specifications provided can be achieved using standard double-glazing sets and off the shelf ventilation.

### 6.3 External Amenity

- 6.3.1 Noise levels calculated across external amenity areas on the Site do not exceed WHO guidelines for moderate annoyance. Therefore, it is considered that noise levels in amenity areas are at suitable, and do not require additional mitigation.

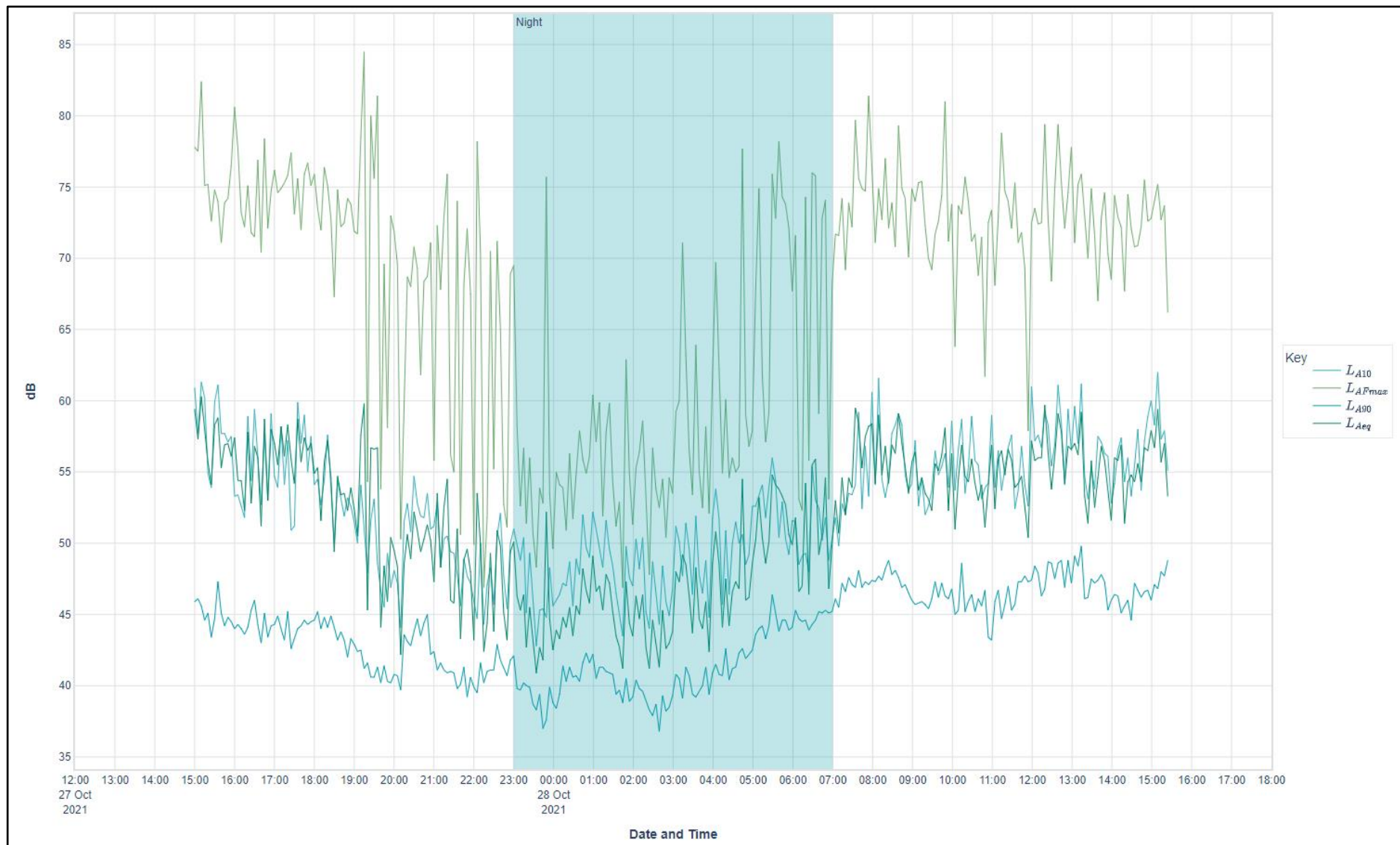
## **Figure 1 – Site Location, Sensitive Receptor Locations, and Measurement Locations**



**Figure 2 – Proposed Site Layout**



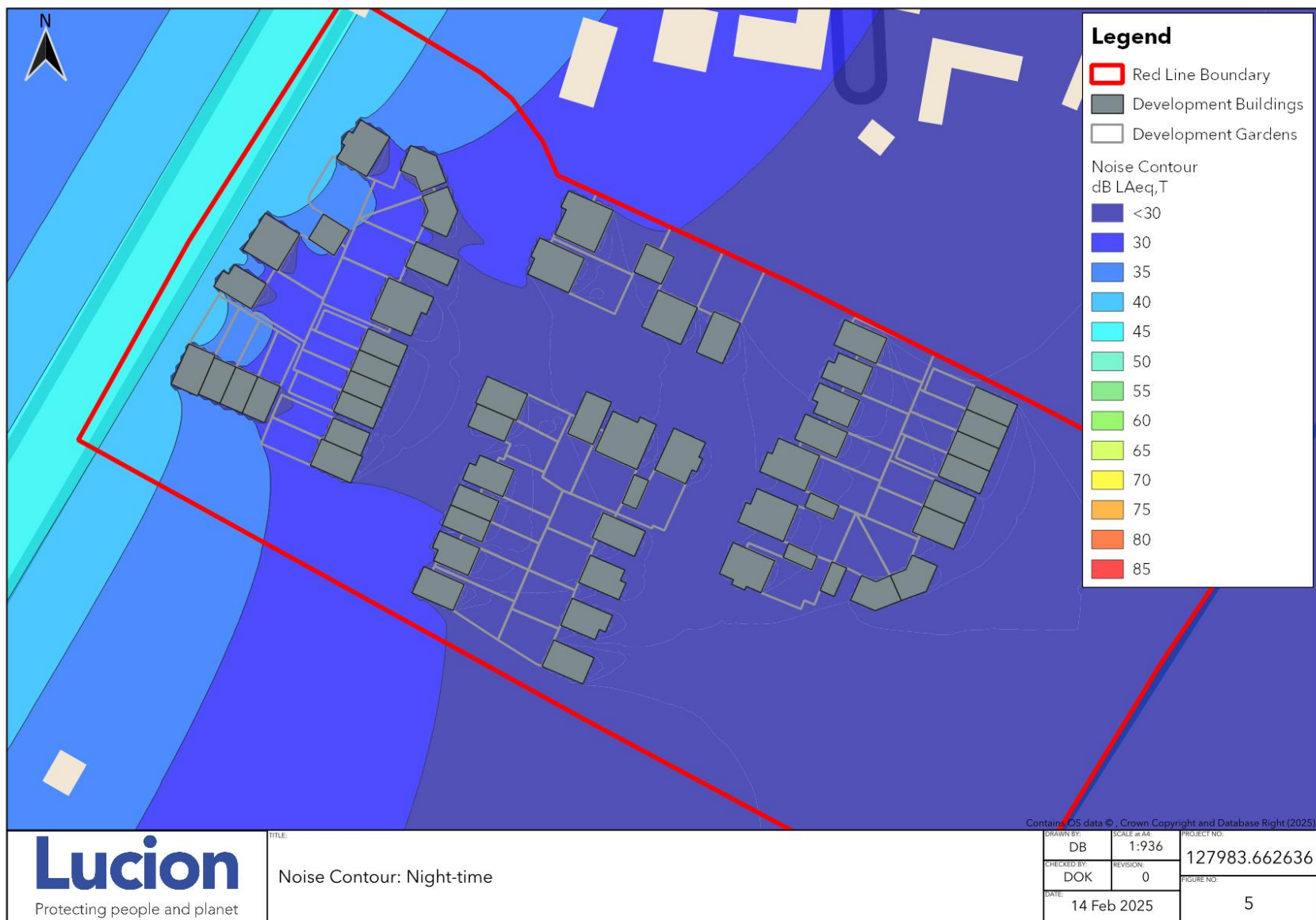
**Figure 3 – Measured Time History: LT1**



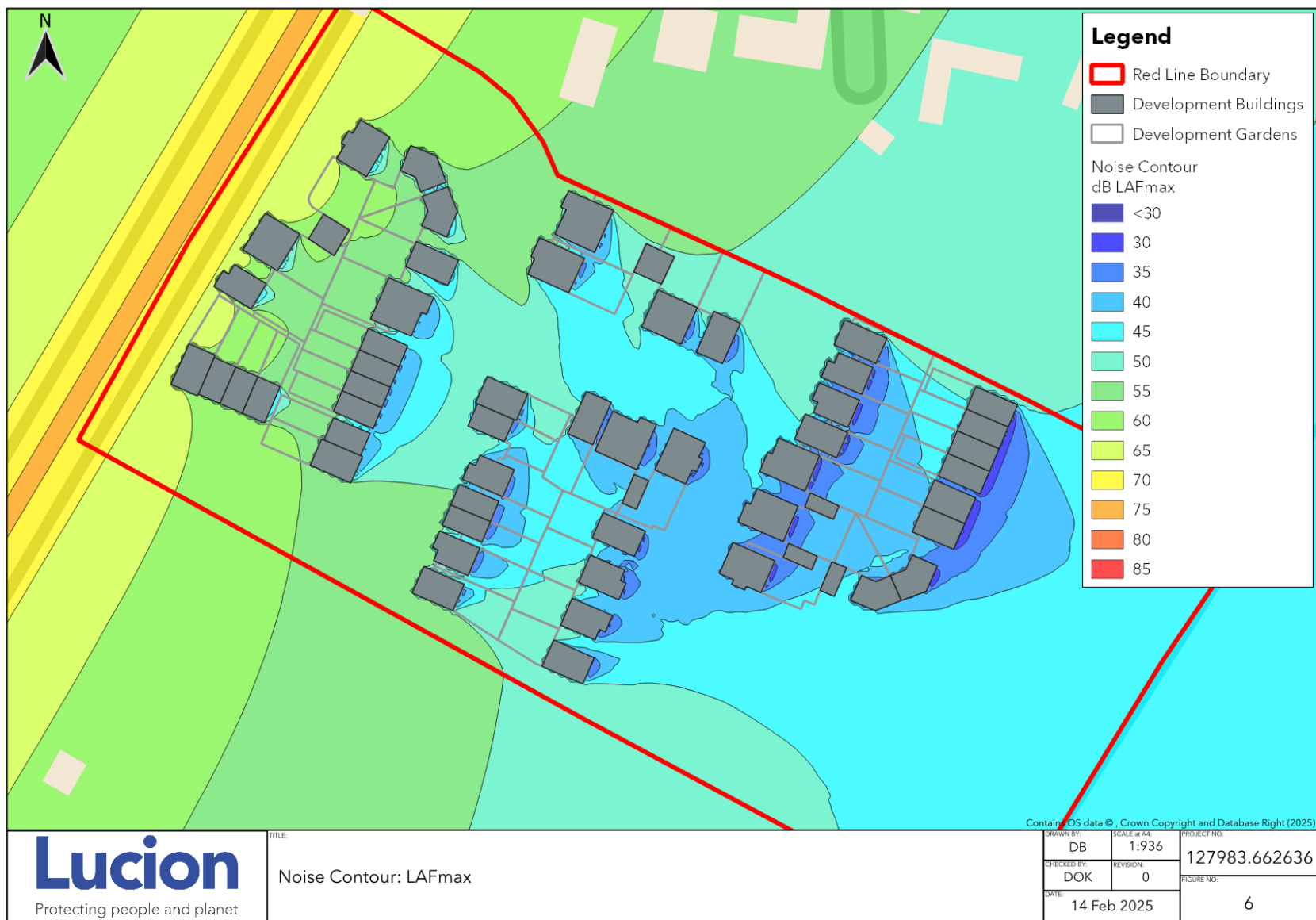
**Figure 4 – Noise Contour: Daytime**



**Figure 5 – Noise Contour: Night-time**



## Figure 6 – Noise Contour: $L_{AFmax}$



**Figure 7 – Noise Contour: WHO External Amenity**



# Appendix A – Limitations

## Limitations

The recommendations contained in this Report represent Lucion's professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Environmental Consultant. Lucion does not warrant or guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

Lucion obtained, reviewed and evaluated information in preparing this Report from the Client and others. Lucion's conclusions, opinions and recommendations has been determined using this information. Lucion does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Lucion has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

This Report was prepared by Lucion for the sole and exclusive use of the Client and for the specific purpose for which Lucion was instructed. Nothing contained in this Report shall be construed to give any rights or benefits to anyone other than the Client and Lucion, and all duties and responsibilities undertaken are for the sole and exclusive benefit of the Client and not for the benefit of any other party. In particular, Lucion does not intend, without its written consent, for this Report to be disseminated to anyone other than the Client or to be used or relied upon by anyone other than the Client. Use of the Report by any other person is unauthorised and such use is at the sole risk of the user. Anyone using or relying upon this Report, other than the Client, agrees by virtue of its use to indemnify and hold harmless Lucion from and against all claims, losses and damages (of whatsoever nature and howsoever or whensoever arising), arising out of or resulting from the performance of the work by the Consultant.

# Appendix B – Glossary

## Glossary

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or  $L_{Aeq}$ ,  $L_{A90}$  etc., according to the parameter being measured.

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

An indication of the range of sound levels commonly found in the environment is given in the following table.

**Table B1 - Typical Sound Pressure Levels**

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

**Table B2 - Terminology**

| Descriptor          | Explanation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| dB (decibel)        | The scale on which sound pressure level is expressed. 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 ( $2 \times 10^{-5}$ Pa).                                                                                                                                                                                                                                                                                                           |
| dB(A)               | A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.                                                                                                                                                                                                                                                                                    |
| $L_{Aeq, T}$        | $L_{Aeq}$ is defined as the notional steady sound level which, 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.                                                                                                                                                                                                                                                                                                             |
| $L_{Amax}$          | $L_{Amax}$ 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 $L_{eq}$ noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.                                                                                                                             |
| $L_{10}$ & $L_{90}$ | If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The $L_n$ indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence $L_{10}$ is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, $L_{90}$ is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the $L_{10}$ index to describe traffic noise. |
| 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.                                                                                                                                                                                                                                                                                                   |
| Fast                | A time weighting used in the root mean square section of a sound level meter with a 125 millisecond time constant.                                                                                                                                                                                                                                                                                                                                                                                                               |
| Slow                | A time weighting used in the root mean square section of a sound level meter with a 1000 millisecond time constant.                                                                                                                                                                                                                                                                                                                                                                                                              |

# Appendix C – Glazing and Ventilation Assessment

## House Type Layouts and Elevations

The following documents set out the room layouts and elevations for each of the house types assessed :

- “M0003-Ashford”
- “M0003-Corby”
- “M0003-Danbury”
- “M0003-Eltham”
- “M0003-Gosford”
- “M0003-Loxley”
- “M0003-Lynford”
- “M0003-Morley”
- “M0003-Northam”
- “M0003-Oakham”
- “M0003-Oxford”
- “M0003-Trentham”

Daytime Break-in Calculations

Where a room/plot is not listed in the table below, glazing and ventilation do not need to be specified due to external ambient noise levels being low enough that a partially open window will provide sufficient mitigation to achieve suitable internal ambient noise levels.

| Plot | Dwelling Type | Room        | Facade Mitigation Strategy | Absorption, A | 10*log(S/A) | Incident Noise Level, dB | Floor Area, m <sup>2</sup> | Volume, m <sup>3</sup> | Facade Area, m <sup>2</sup> | Glazing              |                 |                             | Solid Facade         |                 |                             | Ventilation     |                             | Roof                 |                 |                             | Combined Noise Level | Target level | Pass/Fail |
|------|---------------|-------------|----------------------------|---------------|-------------|--------------------------|----------------------------|------------------------|-----------------------------|----------------------|-----------------|-----------------------------|----------------------|-----------------|-----------------------------|-----------------|-----------------------------|----------------------|-----------------|-----------------------------|----------------------|--------------|-----------|
|      |               |             |                            |               |             |                          |                            |                        |                             | Area, m <sup>2</sup> | Area Correction | Noise Level through element | Area, m <sup>2</sup> | Area Correction | Noise Level through element | Area Correction | Noise Level through element | Area, m <sup>2</sup> | Area Correction | Noise Level through element |                      |              |           |
| 1    | Lynford (opp) | Living Room | 1                          | 12.8          | -1.3        | 51.3                     | 14.6                       | 39.4                   | 9.5                         | 2.4                  | -35.0           | 21.0                        | 7.1                  | -55.3           | 0.7                         | -33.8           | 22.2                        | N/A                  | N/A             | N/A                         | 24.7                 | 35           | Pass      |
| 1    | Lynford (opp) | Bedroom 1   | 1                          | 12.8          | -1.3        | 51.2                     | 14.6                       | 39.4                   | 9.5                         | 2.0                  | -35.8           | 20.1                        | 7.5                  | -55.0           | 0.9                         | -33.8           | 22.1                        | 14.6                 | -43.0           | 12.9                        | 24.6                 | 35           | Pass      |
| 2    | Northam       | Living Room | 1                          | 15.0          | -2.6        | 50.7                     | 17.0                       | 45.9                   | 8.2                         | 1.6                  | -36.1           | 18.0                        | 6.6                  | -54.9           | -0.9                        | -33.1           | 20.9                        | N/A                  | N/A             | N/A                         | 22.7                 | 35           | Pass      |
| 2    | Northam       | Bedroom 1   | 1                          | 9.0           | -0.3        | 50.7                     | 10.2                       | 27.5                   | 8.4                         | 1.4                  | -36.8           | 19.6                        | 7.0                  | -54.8           | 1.6                         | -33.2           | 23.2                        | 10.2                 | -43.0           | 13.4                        | 25.1                 | 35           | Pass      |
| 2    | Northam       | Bedroom 2   | 1                          | 9.2           | -1.2        | 50.7                     | 10.4                       | 28.1                   | 7.0                         | 1.4                  | -36.0           | 19.5                        | 5.6                  | -55.0           | 0.6                         | -32.5           | 23.1                        | 10.4                 | -43.0           | 12.5                        | 24.9                 | 35           | Pass      |
| 3    | Eltham        | Bedroom 1   | 1                          | 9.2           | -0.7        | 44.5                     | 10.4                       | 28.1                   | 7.8                         | 1.4                  | -36.5           | 13.3                        | 6.4                  | -54.9           | -5.1                        | -32.9           | 16.9                        | 10.4                 | -43.0           | 6.8                         | 18.8                 | 35           | Pass      |
| 3    | Eltham        | Bedroom 2   | 1                          | 8.7           | -0.5        | 48.2                     | 9.9                        | 26.7                   | 7.7                         | 1.4                  | -36.4           | 17.3                        | 6.3                  | -54.9           | -1.2                        | -32.9           | 20.8                        | 9.9                  | -43.0           | 10.7                        | 22.7                 | 35           | Pass      |
| 3    | Eltham        | Bedroom 3   | 1                          | 8.7           | -0.5        | 48.2                     | 9.9                        | 26.7                   | 7.7                         | 1.4                  | -36.4           | 17.3                        | 6.3                  | -54.9           | -1.2                        | -32.9           | 20.8                        | 9.9                  | -43.0           | 10.7                        | 22.7                 | 35           | Pass      |
| 3    | Eltham        | Bedroom 4   | 1                          | 6.0           | 1.1         | 45.2                     | 6.8                        | 18.4                   | 7.8                         | 1.4                  | -36.5           | 15.9                        | 6.4                  | -54.9           | -2.5                        | -32.9           | 19.4                        | 6.8                  | -43.0           | 9.3                         | 21.3                 | 35           | Pass      |
| 4    | Corby (opp)   | Bedroom 2   | 1                          | 8.4           | -0.1        | 42.5                     | 9.5                        | 25.7                   | 8.2                         | 1.4                  | -36.7           | 11.7                        | 6.8                  | -54.8           | -6.4                        | -33.1           | 15.3                        | 9.5                  | -43.0           | 5.4                         | 17.2                 | 35           | Pass      |
| 14   | Ashford (opp) | Bedroom 1   | 1                          | 9.9           | -1.5        | 42.2                     | 11.3                       | 30.5                   | 7.0                         | 1.4                  | -36.0           | 10.7                        | 5.6                  | -55.0           | -8.3                        | -32.5           | 14.2                        | 11.3                 | -43.0           | 3.7                         | 16.1                 | 35           | Pass      |
| 14   | Ashford (opp) | Bedroom 2   | 1                          | 9.9           | -1.5        | 40.6                     | 11.3                       | 30.5                   | 7.0                         | 1.4                  | -36.0           | 9.1                         | 5.6                  | -55.0           | -9.9                        | -32.5           | 12.6                        | 11.3                 | -43.0           | 2.1                         | 14.5                 | 35           | Pass      |
| 14   | Ashford (opp) | Bedroom 3   | 1                          | 5.0           | 0.2         | 40.6                     | 5.7                        | 15.4                   | 5.3                         | 1.0                  | -36.2           | 10.6                        | 4.3                  | -54.9           | -8.1                        | -31.2           | 15.6                        | 5.7                  | -43.0           | 3.8                         | 17.0                 | 35           | Pass      |
| 15   | Ashford       | Bedroom 1   | 1                          | 9.9           | -1.5        | 43.2                     | 11.3                       | 30.5                   | 7.0                         | 1.4                  | -36.0           | 11.7                        | 5.6                  | -55.0           | -7.3                        | -32.5           | 15.2                        | 11.3                 | -43.0           | 4.7                         | 17.1                 | 35           | Pass      |
| 15   | Ashford       | Bedroom 2   | 1                          | 9.9           | -1.5        | 42.1                     | 11.3                       | 30.5                   | 7.0                         | 1.4                  | -36.0           | 10.6                        | 5.6                  | -55.0           | -8.4                        | -32.5           | 14.1                        | 11.3                 | -43.0           | 3.6                         | 16.0                 | 35           | Pass      |
| 15   | Ashford       | Bedroom 3   | 1                          | 5.0           | 0.2         | 42.1                     | 5.7                        | 15.4                   | 5.3                         | 1.0                  | -36.2           | 12.1                        | 4.3                  | -54.9           | -6.6                        | -31.2           | 17.1                        | 5.7                  | -43.0           | 5.3                         | 18.5                 | 35           | Pass      |
| 16   | Ashford       | Bedroom 1   | 1                          | 9.9           | -1.5        | 44.4                     | 11.3                       | 30.5                   | 7.0                         | 1.4                  | -36.0           | 12.9                        | 5.6                  | -55.0           | -6.1                        | -32.5           | 16.4                        | 11.3                 | -43.0           | 5.9                         | 18.3                 | 35           | Pass      |
| 16   | Ashford       | Bedroom 2   | 1                          | 9.9           | -1.5        | 44.0                     | 11.3                       | 30.5                   | 7.0                         | 1.4                  | -36.0           | 12.5                        | 5.6                  | -55.0           | -6.5                        | -32.5           | 16.0                        | 11.3                 | -43.0           | 5.5                         | 17.9                 | 35           | Pass      |
| 16   | Ashford       | Bedroom 3   | 1                          | 5.0           | 0.2         | 44.0                     | 5.7                        | 15.4                   | 5.3                         | 1.0                  | -36.2           | 14.0                        | 4.3                  | -54.9           | -4.7                        | -31.2           | 19.0                        | 5.7                  | -43.0           | 7.2                         | 20.4                 | 35           | Pass      |
| 17   | Oxford        | Bedroom 1   | 1                          | 9.2           | -0.7        | 50.4                     | 10.4                       | 28.1                   | 7.8                         | 1.4                  | -36.5           | 19.2                        | 6.4                  | -54.9           | 0.8                         | -32.9           | 22.8                        | 10.4                 | -43.0           | 12.7                        | 24.7                 | 35           | Pass      |
| 17   | Oxford        | Bedroom 2   | 1                          | 10.5          | -0.8        | 50.4                     | 11.9                       | 32.1                   | 8.7                         | 1.4                  | -36.9           | 18.7                        | 7.3                  | -54.8           | 0.8                         | -33.4           | 22.2                        | 11.9                 | -43.0           | 12.6                        | 24.1                 | 35           | Pass      |
| 17   | Oxford        | Bedroom 3   | 1                          | 5.2           | 0.3         | 46.7                     | 5.9                        | 15.9                   | 5.6                         | 1.4                  | -35.0           | 18.0                        | 4.2                  | -55.2           | -2.2                        | -31.5           | 21.6                        | 5.9                  | -43.0           | 10.0                        | 23.4                 | 35           | Pass      |
| 17   | Oxford        | Living Room | 1                          | 17.4          | -3.4        | 50.4                     | 19.8                       | 53.5                   | 8.0                         | 1.6                  | -36.0           | 17.0                        | 6.4                  | -55.0           | -2.0                        | -33.0           | 20.0                        | N/A                  | N/A             | N/A                         | 21.8                 | 35           | Pass      |

## Night-time Break-in Calculations

Where a room/plot is not listed in the table below, glazing and ventilation do not need to be specified due to external ambient noise levels being low enough that a partially open window will provide sufficient mitigation to achieve suitable internal ambient noise levels.

| Plot | Dwelling Type | Room      | Facade Mitigation Strategy | Absorption, A | 10*log(S/A) | Incident Noise Level, dB | Floor Area, m <sup>2</sup> | Volume, m <sup>3</sup> | Facade Area, m <sup>2</sup> | Glazing              |                 |                             | Solid Facade         |                 |                             | Ventilation     |                             | Roof                 |                 |                             | Combined Noise Level | Target level | Pass/Fail |
|------|---------------|-----------|----------------------------|---------------|-------------|--------------------------|----------------------------|------------------------|-----------------------------|----------------------|-----------------|-----------------------------|----------------------|-----------------|-----------------------------|-----------------|-----------------------------|----------------------|-----------------|-----------------------------|----------------------|--------------|-----------|
|      |               |           |                            |               |             |                          |                            |                        |                             | Area, m <sup>2</sup> | Area Correction | Noise Level through element | Area, m <sup>2</sup> | Area Correction | Noise Level through element | Area Correction | Noise Level through element | Area, m <sup>2</sup> | Area Correction | Noise Level through element |                      |              |           |
| 1    | Lynford (opp) | Bedroom 1 | 1                          | 12.8          | -1.3        | 45.3                     | 14.6                       | 35.0                   | 9.5                         | 2.0                  | -35.8           | 14.2                        | 7.5                  | -55.0           | -5.0                        | -33.8           | 16.2                        | 14.6                 | -43.0           | 7.0                         | 18.7                 | 30           | Pass      |
| 2    | Northam       | Bedroom 1 | 1                          | 9.0           | -0.3        | 44.8                     | 10.2                       | 24.5                   | 8.4                         | 1.4                  | -36.8           | 13.7                        | 7.0                  | -54.8           | -4.3                        | -33.2           | 17.3                        | 10.2                 | -43.0           | 7.5                         | 19.2                 | 30           | Pass      |
| 2    | Northam       | Bedroom 2 | 1                          | 9.2           | -1.2        | 44.8                     | 10.4                       | 25.0                   | 7.0                         | 1.4                  | -36.0           | 13.6                        | 5.6                  | -55.0           | -5.3                        | -32.5           | 17.2                        | 10.4                 | -43.0           | 6.6                         | 19.0                 | 30           | Pass      |
| 3    | Eltham        | Bedroom 1 | 1                          | 9.2           | -0.7        | 38.5                     | 10.4                       | 25.0                   | 7.8                         | 1.4                  | -36.5           | 7.3                         | 6.4                  | -54.9           | -11.1                       | -32.9           | 10.9                        | 10.4                 | -43.0           | 0.8                         | 12.8                 | 30           | Pass      |
| 3    | Eltham        | Bedroom 2 | 1                          | 8.7           | -0.5        | 42.4                     | 9.9                        | 23.8                   | 7.7                         | 1.4                  | -36.4           | 11.5                        | 6.3                  | -54.9           | -7.0                        | -32.9           | 15.0                        | 9.9                  | -43.0           | 4.9                         | 16.9                 | 30           | Pass      |
| 3    | Eltham        | Bedroom 3 | 1                          | 8.7           | -0.5        | 42.4                     | 9.9                        | 23.8                   | 7.7                         | 1.4                  | -36.4           | 11.5                        | 6.3                  | -54.9           | -7.0                        | -32.9           | 15.0                        | 9.9                  | -43.0           | 4.9                         | 16.9                 | 30           | Pass      |
| 3    | Eltham        | Bedroom 4 | 1                          | 6.0           | 1.1         | 39.3                     | 6.8                        | 16.3                   | 7.8                         | 1.4                  | -36.5           | 10.0                        | 6.4                  | -54.9           | -8.4                        | -32.9           | 13.5                        | 6.8                  | -43.0           | 3.4                         | 15.4                 | 30           | Pass      |
| 4    | Corby (opp)   | Bedroom 2 | 1                          | 8.4           | -0.1        | 36.7                     | 9.5                        | 22.8                   | 8.2                         | 1.4                  | -36.7           | 5.9                         | 6.8                  | -54.8           | -12.2                       | -33.1           | 9.5                         | 9.5                  | -43.0           | -0.4                        | 11.4                 | 30           | Pass      |
| 14   | Ashford (opp) | Bedroom 1 | 1                          | 9.9           | -1.5        | 36.5                     | 11.3                       | 27.1                   | 7.0                         | 1.4                  | -36.0           | 5.0                         | 5.6                  | -55.0           | -14.0                       | -32.5           | 8.5                         | 11.3                 | -43.0           | -2.0                        | 10.4                 | 30           | Pass      |
| 14   | Ashford (opp) | Bedroom 2 | 1                          | 9.9           | -1.5        | 34.7                     | 11.3                       | 27.1                   | 7.0                         | 1.4                  | -36.0           | 3.2                         | 5.6                  | -55.0           | -15.8                       | -32.5           | 6.7                         | 11.3                 | -43.0           | -3.8                        | 8.6                  | 30           | Pass      |
| 14   | Ashford (opp) | Bedroom 3 | 1                          | 5.0           | 0.2         | 34.7                     | 5.7                        | 13.7                   | 5.3                         | 1.0                  | -36.2           | 4.7                         | 4.3                  | -54.9           | -14.0                       | -31.2           | 9.7                         | 5.7                  | -43.0           | -2.1                        | 11.1                 | 30           | Pass      |
| 15   | Ashford       | Bedroom 1 | 1                          | 9.9           | -1.5        | 37.4                     | 11.3                       | 27.1                   | 7.0                         | 1.4                  | -36.0           | 5.9                         | 5.6                  | -55.0           | -13.1                       | -32.5           | 9.4                         | 11.3                 | -43.0           | -1.1                        | 11.3                 | 30           | Pass      |
| 15   | Ashford       | Bedroom 2 | 1                          | 9.9           | -1.5        | 36.1                     | 11.3                       | 27.1                   | 7.0                         | 1.4                  | -36.0           | 4.6                         | 5.6                  | -55.0           | -14.4                       | -32.5           | 8.1                         | 11.3                 | -43.0           | -2.4                        | 10.0                 | 30           | Pass      |
| 15   | Ashford       | Bedroom 3 | 1                          | 5.0           | 0.2         | 36.1                     | 5.7                        | 13.7                   | 5.3                         | 1.0                  | -36.2           | 6.1                         | 4.3                  | -54.9           | -12.6                       | -31.2           | 11.1                        | 5.7                  | -43.0           | -0.7                        | 12.5                 | 30           | Pass      |
| 16   | Ashford       | Bedroom 1 | 1                          | 9.9           | -1.5        | 38.6                     | 11.3                       | 27.1                   | 7.0                         | 1.4                  | -36.0           | 7.1                         | 5.6                  | -55.0           | -11.9                       | -32.5           | 10.6                        | 11.3                 | -43.0           | 0.1                         | 12.5                 | 30           | Pass      |
| 16   | Ashford       | Bedroom 2 | 1                          | 9.9           | -1.5        | 38.1                     | 11.3                       | 27.1                   | 7.0                         | 1.4                  | -36.0           | 6.6                         | 5.6                  | -55.0           | -12.4                       | -32.5           | 10.1                        | 11.3                 | -43.0           | -0.4                        | 12.0                 | 30           | Pass      |
| 16   | Ashford       | Bedroom 3 | 1                          | 5.0           | 0.2         | 38.1                     | 5.7                        | 13.7                   | 5.3                         | 1.0                  | -36.2           | 8.1                         | 4.3                  | -54.9           | -10.6                       | -31.2           | 13.1                        | 5.7                  | -43.0           | 1.3                         | 14.5                 | 30           | Pass      |
| 17   | Oxford        | Bedroom 1 | 1                          | 9.2           | -0.7        | 44.5                     | 10.4                       | 25.0                   | 7.8                         | 1.4                  | -36.5           | 13.3                        | 6.4                  | -54.9           | -5.1                        | -32.9           | 16.9                        | 10.4                 | -43.0           | 6.8                         | 18.8                 | 30           | Pass      |
| 17   | Oxford        | Bedroom 2 | 1                          | 10.5          | -0.8        | 44.5                     | 11.9                       | 28.6                   | 8.7                         | 1.4                  | -36.9           | 12.8                        | 7.3                  | -54.8           | -5.1                        | -33.4           | 16.3                        | 11.9                 | -43.0           | 6.7                         | 18.2                 | 30           | Pass      |
| 17   | Oxford        | Bedroom 3 | 1                          | 5.2           | 0.3         | 40.8                     | 5.9                        | 14.2                   | 5.6                         | 1.4                  | -35.0           | 12.1                        | 4.2                  | -55.2           | -8.1                        | -31.5           | 15.7                        | 5.9                  | -43.0           | 4.1                         | 17.5                 | 30           | Pass      |

LAFmax
Break-in Calculations

Where a room/plot is not listed in the table below, glazing and ventilation do not need to be specified due to external ambient noise levels being low enough that a partially open window will provide sufficient mitigation to achieve suitable internal ambient noise levels.

| Plot | Dwelling Type | Room      | Facade Mitigation Strategy | Absorption, A | 10*log(S/A) | Incident Noise Level, dB | Floor Area, m² | Volume, m³ | Facade Area, m² | Glazing  |                 |                             | Solid Facade |                 |                             | Ventilation     |                             | Roof     |                 |                             | Combined Noise Level | Target level | Pass/Fail |
|------|---------------|-----------|----------------------------|---------------|-------------|--------------------------|----------------|------------|-----------------|----------|-----------------|-----------------------------|--------------|-----------------|-----------------------------|-----------------|-----------------------------|----------|-----------------|-----------------------------|----------------------|--------------|-----------|
|      |               |           |                            |               |             |                          |                |            |                 | Area, m² | Area Correction | Noise Level through element | Area, m²     | Area Correction | Noise Level through element | Area Correction | Noise Level through element | Area, m² | Area Correction | Noise Level through element |                      |              |           |
| 1    | Lynford (opp) | Bedroom 1 | 1                          | 12.8          | -1.3        | 71.3                     | 14.6           | 35.0       | 9.5             | 2.0      | -35.8           | 40.2                        | 7.5          | -55.0           | 21.0                        | -33.8           | 42.2                        | 14.6     | -43.0           | 33.0                        | 44.7                 | 45           | Pass      |
| 2    | Northam       | Bedroom 1 | 1                          | 9.0           | -0.3        | 70.8                     | 10.2           | 24.5       | 8.4             | 1.4      | -36.8           | 39.7                        | 7.0          | -54.8           | 21.7                        | -33.2           | 43.3                        | 10.2     | -43.0           | 33.5                        | 45.2                 | 45           | Pass      |
| 2    | Northam       | Bedroom 2 | 1                          | 9.2           | -1.2        | 70.8                     | 10.4           | 25.0       | 7.0             | 1.4      | -36.0           | 39.6                        | 5.6          | -55.0           | 20.7                        | -32.5           | 43.2                        | 10.4     | -43.0           | 32.6                        | 45.0                 | 45           | Pass      |
| 3    | Eltham        | Bedroom 1 | 1                          | 9.2           | -0.7        | 64.5                     | 10.4           | 25.0       | 7.8             | 1.4      | -36.5           | 33.3                        | 6.4          | -54.9           | 14.9                        | -32.9           | 36.9                        | 10.4     | -43.0           | 26.8                        | 38.8                 | 45           | Pass      |
| 3    | Eltham        | Bedroom 2 | 1                          | 8.7           | -0.5        | 68.4                     | 9.9            | 23.8       | 7.7             | 1.4      | -36.4           | 37.5                        | 6.3          | -54.9           | 19.0                        | -32.9           | 41.0                        | 9.9      | -43.0           | 30.9                        | 42.9                 | 45           | Pass      |
| 3    | Eltham        | Bedroom 3 | 1                          | 8.7           | -0.5        | 68.4                     | 9.9            | 23.8       | 7.7             | 1.4      | -36.4           | 37.5                        | 6.3          | -54.9           | 19.0                        | -32.9           | 41.0                        | 9.9      | -43.0           | 30.9                        | 42.9                 | 45           | Pass      |
| 3    | Eltham        | Bedroom 4 | 1                          | 6.0           | 1.1         | 65.3                     | 6.8            | 16.3       | 7.8             | 1.4      | -36.5           | 36.0                        | 6.4          | -54.9           | 17.6                        | -32.9           | 39.5                        | 6.8      | -43.0           | 29.4                        | 41.4                 | 45           | Pass      |
| 4    | Corby (opp)   | Bedroom 2 | 1                          | 8.4           | -0.1        | 62.7                     | 9.5            | 22.8       | 8.2             | 1.4      | -36.7           | 31.9                        | 6.8          | -54.8           | 13.8                        | -33.1           | 35.5                        | 9.5      | -43.0           | 25.6                        | 37.4                 | 45           | Pass      |
| 14   | Ashford (opp) | Bedroom 1 | 1                          | 9.9           | -1.5        | 62.5                     | 11.3           | 27.1       | 7.0             | 1.4      | -36.0           | 31.0                        | 5.6          | -55.0           | 12.0                        | -32.5           | 34.5                        | 11.3     | -43.0           | 24.0                        | 36.4                 | 45           | Pass      |
| 14   | Ashford (opp) | Bedroom 2 | 1                          | 9.9           | -1.5        | 60.7                     | 11.3           | 27.1       | 7.0             | 1.4      | -36.0           | 29.2                        | 5.6          | -55.0           | 10.2                        | -32.5           | 32.7                        | 11.3     | -43.0           | 22.2                        | 34.6                 | 45           | Pass      |
| 14   | Ashford (opp) | Bedroom 3 | 1                          | 5.0           | 0.2         | 60.7                     | 5.7            | 13.7       | 5.3             | 1.0      | -36.2           | 30.7                        | 4.3          | -54.9           | 12.0                        | -31.2           | 35.7                        | 5.7      | -43.0           | 23.9                        | 37.1                 | 45           | Pass      |
| 15   | Ashford       | Bedroom 1 | 1                          | 9.9           | -1.5        | 63.4                     | 11.3           | 27.1       | 7.0             | 1.4      | -36.0           | 31.9                        | 5.6          | -55.0           | 12.9                        | -32.5           | 35.4                        | 11.3     | -43.0           | 24.9                        | 37.3                 | 45           | Pass      |
| 15   | Ashford       | Bedroom 2 | 1                          | 9.9           | -1.5        | 62.1                     | 11.3           | 27.1       | 7.0             | 1.4      | -36.0           | 30.6                        | 5.6          | -55.0           | 11.6                        | -32.5           | 34.1                        | 11.3     | -43.0           | 23.6                        | 36.0                 | 45           | Pass      |
| 15   | Ashford       | Bedroom 3 | 1                          | 5.0           | 0.2         | 62.1                     | 5.7            | 13.7       | 5.3             | 1.0      | -36.2           | 32.1                        | 4.3          | -54.9           | 13.4                        | -31.2           | 37.1                        | 5.7      | -43.0           | 25.3                        | 38.5                 | 45           | Pass      |
| 16   | Ashford       | Bedroom 1 | 1                          | 9.9           | -1.5        | 64.6                     | 11.3           | 27.1       | 7.0             | 1.4      | -36.0           | 33.1                        | 5.6          | -55.0           | 14.1                        | -32.5           | 36.6                        | 11.3     | -43.0           | 26.1                        | 38.5                 | 45           | Pass      |
| 16   | Ashford       | Bedroom 2 | 1                          | 9.9           | -1.5        | 64.1                     | 11.3           | 27.1       | 7.0             | 1.4      | -36.0           | 32.6                        | 5.6          | -55.0           | 13.6                        | -32.5           | 36.1                        | 11.3     | -43.0           | 25.6                        | 38.0                 | 45           | Pass      |
| 16   | Ashford       | Bedroom 3 | 1                          | 5.0           | 0.2         | 64.1                     | 5.7            | 13.7       | 5.3             | 1.0      | -36.2           | 34.1                        | 4.3          | -54.9           | 15.4                        | -31.2           | 39.1                        | 5.7      | -43.0           | 27.3                        | 40.5                 | 45           | Pass      |
| 17   | Oxford        | Bedroom 1 | 1                          | 9.2           | -0.7        | 70.5                     | 10.4           | 25.0       | 7.8             | 1.4      | -36.5           | 39.3                        | 6.4          | -54.9           | 20.9                        | -32.9           | 42.9                        | 10.4     | -43.0           | 32.8                        | 44.8                 | 45           | Pass      |
| 17   | Oxford        | Bedroom 2 | 1                          | 10.5          | -0.8        | 70.5                     | 11.9           | 28.6       | 8.7             | 1.4      | -36.9           | 38.8                        | 7.3          | -54.8           | 20.9                        | -33.4           | 42.3                        | 11.9     | -43.0           | 32.7                        | 44.2                 | 45           | Pass      |
| 17   | Oxford        | Bedroom 3 | 1                          | 5.2           | 0.3         | 66.8                     | 5.9            | 14.2       | 5.6             | 1.4      | -35.0           | 38.1                        | 4.2          | -55.2           | 17.9                        | -31.5           | 41.7                        | 5.9      | -43.0           | 30.1                        | 43.5                 | 45           | Pass      |