

LAND SOUTH OF WHITE HORSE BUSINESS PARK, NORTH BRADLEY

Proposed Residential Development

Noise Assessment

Prepared for: Castlewood Properties Ventures Ltd

SLR Ref: 416.06713.00003
Version No: Rev2
January 2022



BASIS OF REPORT

This document has been prepared by SLR Consulting Limited with reasonable skill, care and diligence, and taking account of the manpower, timescales and resources devoted to it by agreement with Castlewood Properties Ventures Ltd (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

SLR shall not be liable for the use of or reliance on any information, advice, recommendations and opinions in this document for any purpose by any person other than the Client. Reliance may be granted to a third party only in the event that SLR and the third party have executed a reliance agreement or collateral warranty.

Information reported herein may be based on the interpretation of public domain data collected by SLR, and/or information supplied by the Client and/or its other advisors and associates. These data have been accepted in good faith as being accurate and valid.

The copyright and intellectual property in all drawings, reports, specifications, bills of quantities, calculations and other information set out in this report remain vested in SLR unless the terms of appointment state otherwise.

This document may contain information of a specialised and/or highly technical nature and the Client is advised to seek clarification on any elements which may be unclear to it.

Information, advice, recommendations and opinions in this document should only be relied upon in the context of the whole document and any documents referenced explicitly herein and should then only be used within the context of the appointment.

CONTENTS

1.0	INTRODUCTION	1
2.0	SITE DESCRIPTION	2
2.1	Existing Site	2
2.2	Development Proposals	3
3.0	SCOPE AND GUIDANCE	4
3.1	Scope	4
3.2	BS8233:2014	4
3.3	Professional Practice Guidance	5
3.4	The 'Agent of Change' Principle from the National Planning Policy Framework.....	7
4.0	ENVIRONMENTAL NOISE SURVEY.....	8
4.1	Equipment.....	8
4.2	Weather	9
4.3	Soundscape and Context	9
4.4	Noise Survey Results	9
5.0	NOISE MODEL METHODOLOGY	13
6.0	RESULTS AND ASSESSMENT	15
6.1	Daytime Sound Levels	15
6.2	Night-time Sound Levels	16
6.3	Assessment Summary	17
7.0	MITIGATION	18
7.1	External Sound Levels	18
7.2	Internal Sound Levels.....	19
7.3	Summary.....	21
8.0	AGENT OF CHANGE ASSESSMENT.....	22
9.0	SUMMARY AND CONCLUSION	23

DOCUMENT REFERENCES

TABLES

Table 3-1 Suitable Internal Noise Levels, dB	5
Table 3-2 ProPG Internal Noise Level Guidelines	6
Table 4-1 Noise Survey Equipment	8
Table 4-2 Location 1: Summary of Measured L_{AFmax} Sound Levels, free-field, dB	10
Table 4-3 Location 2: Summary of Measured L_{AFmax} Sound Levels, free-field, dB	11
Table 5-1 $L_{A10,18hr}$ Conversion Calculations.....	13
Table 5-2 Traffic Data	14
Table 7-1 Sound Reduction Performance of Example Window Configurations.....	20

FIGURES

Figure 2-1 Site Location	2
Figure 4-1 Noise Survey Locations.....	9
Figure 6-1 Predicted Daytime $L_{Aeq,16hr}$ dB Sound Levels Across the Proposed Development	15
Figure 6-2 Predicted Night-time $L_{Aeq,8hr}$ dB Sound Levels Across the Proposed Development	16
Figure 6-3 Predicted L_{Amax} dB Sound Levels Across the Proposed Development	17
Figure 7-1 Predicted $L_{Aeq,16hr}$ dB Sound Levels Across the Proposed Development- With Mitigation	19

APPENDICES

Appendix 01: Glossary of Terminology	
Appendix 02: Illustrative Sketch layout	

1.0 Introduction

SLR Consulting Ltd (SLR) has been commissioned by Castlewood Properties Ventures Ltd to undertake a noise assessment in support of an outline planning application for a proposed residential development ('Proposed Development'), on land south of White Horse Business Park, North Bradley, Trowbridge (the 'Site'). The planning application seeks approval for a residential development comprising up to 100 dwellings as well as vehicular access from the A363.

The Site is located adjacent to Woodmarsh and the A363 Bradley Road; road traffic is the dominant noise source at the site.

Pre-application advice relating to the noise assessment has been received from Wiltshire Council, as follows:

"The noise assessment should assess road traffic noise as well as any commercial/industrial noise from the businesses nearby. There has in the past been valid complaints about noise from elevated air handling plant on industrial units on the White Horse Business Park impacting on properties on Woodmarsh. The problem was resolved but these proposed dwellings are closer to the business park. Evidence must be provided to show noise from the business park will not have an adverse impact at residential dwellings."

This Noise Assessment seeks to establish existing sound levels at the proposed site, identify whether adverse impacts on future residents may occur and where necessary, provide recommendations for mitigation.

Whilst reasonable effort has been made to make this report easily understandable, it is technical in nature. To assist the reader, a glossary of terminology is included in Appendix 01.

2.0 Site Description

2.1 Existing Site

The Site is located within North Bradley, Trowbridge, largely comprising residential, commercial and greenfield land uses, at the approximate National Grid Reference (NGR): x385900, y155500. The Site is bounded by:

- Green space and White Horse Business Park to the north. There is an ongoing application on the green space land for a residential scheme (ref. 19/11459/OUT) which forms part of the 'Elm Grove' allocation;
- White Horse Business Park to the east, with green space located further afield;
- Residential properties to the south, with green space located further afield; and
- Residential properties to the west.

The Site location is shown on Figure 2-1.

Figure 2-1
Site Location



2.2 Development Proposals

The planning application seeks approval for a residential development comprising up to 100 dwellings as well as vehicular access from the A363 Bradley Road.

The illustrative sketch layout can be seen on the drawing provided in Appendix 02.

3.0 Scope and Guidance

3.1 Scope

SLR consulted with an Environmental Health Officer at Wiltshire Council in January 2021. The following methodology was agreed:

- This assessment will be completed with reference to the following relevant guidance document, which provide recommended external and internal noise level limits for new dwellings:
 - British Standard BS 8233:2014, Guidance on sound insulation and noise reduction for buildings;
 - ProPG: Planning & Noise – Professional Practice Guidance on Planning & Noise, New Residential Development; and
 - The ‘Agent of Change’ Principle from the National Planning Policy Framework; and
- Road traffic is anticipated to be the dominant noise source at the site, however, it was also recognised at the time of writing that, due to the nationwide lockdown due to COVID-19, road traffic levels may be atypical at this time.
- Traffic count data for Woodmarsh and the A363 Bradley Road (available from the DfT Traffic Counts website) will therefore be used to predict noise levels across the proposed site using CadnaA noise modelling software. CadnaA uses the principal methodology set out in the Calculation of Road Traffic Noise 1988 to determine the $L_{A10,T}$ sound level. To allow the BS8233:2014 assessment to be undertaken, the $L_{A10,18hr}$ noise levels will be converted to $L_{Aeq,T}$ using formulae as recommended within ‘*Method for Converting the UK Road Traffic Noise Index $L_{A1018hr}$ to the EU Noise Indices for Road Noise Mapping*’ (Defra 2006).
- Attended short term noise survey will be undertaken at northern and southern boundaries to establish L_{Amax} levels from road traffic.
- Calculated daytime $L_{Aeq,16hr}$ and night-time $L_{Aeq,8hr}$ and L_{Amax} sound levels will be assessed with reference to recommended internal and external criteria for new dwellings contained within BS8233:2014 and ProPG. Further to this, Wiltshire Council advised that the desirable sound level of $L_{Aeq,T}$ 50 dB should be achieved within external amenity space.
- If assessment indicates that sound levels exceed the recommended criteria, then mitigation measures to achieve the recommended internal and external (amenity space) criteria will be identified and included within this noise assessment report.
- To determine the level of assessment required, walkover of the site and surrounding commercial areas/buildings will be undertaken during the daytime and night-time to identify noise sources and determine whether they are audible at the proposed site. Survey and assessment would then be undertaken if necessary, with reference to BS4142:2014 + A1:2019. If observations indicate that nearby commercial use is unlikely to lead to adverse impact, then in accordance with the ‘*Agent of Change*’ Principle (defined in the National Planning Policy Framework), the new development should not result in ‘*unreasonable restrictions*’ being placed on existing businesses and any proposed new development should include ‘*suitable mitigation*’. Recommendations to mitigate future noise by site design would be identified for inclusion in the masterplan as necessary.

3.2 BS8233:2014

BS8233:2014 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

or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate. The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 3-1.

Table 3-1
Suitable Internal Noise Levels, dB

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

BS8233:2014 states that the recommended limits can be relaxed by up to 5dB “where development is considered necessary or desirable”.

Whilst it may be considered desirable to achieve the BS8233:2014 recommended internal noise levels with windows open, it is stated that where the limit cannot be met with an open window “there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level”.

It is therefore not essential that the recommended internal noise levels are achievable with open windows if suitable alternative means of ventilation can be provided.

With regard to external noise, Section 7.7.3.2 of BS8233:2014 states that:

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

3.3 Professional Practice Guidance

ProPG seeks to secure good acoustic design for new residential development within England’s planning system.

The guidance includes a framework to enable situations where noise is not an issue to be clearly determined, and to help identify the extent of risk at noisier sites. However, the guidance does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy.

The scope of the guidance is also restricted to sites that are exposed predominantly to noise from transportation sources. Where industrial or commercial noise is present on the site but is “not dominant”, its contribution may be included in the noise level used to establish the degree of risk. Where industrial or commercial noise is present on the site and is considered to be “dominant”, then the risk assessment should not be applied to the industrial or commercial noise component and regard should be had to the guidance in BS4142:2014.

The overall approach is underpinned by the preparation of an “Acoustic Design Statement” (ADS), for which guidance is contained in ProPG Supplementary Document 2, Good Acoustic Design. An ADS for a site assessed

as high risk should be more detailed than for a site assessed as low risk, and an ADS should not be necessary for a site assessed as negligible risk.

ProPG internal noise guidelines are shown in Table 3-2. These guidelines reflect those provided within BS8233:2014, and also include internal limits for maximum noise levels within bedrooms during the night-time. The document states:

“For a reasonable standard in noise-sensitive rooms at night (e.g. bedrooms) individual noise events should not normally exceed 45dB $L_{A\text{Fmax}}$ more than 10 times a night.”

Table 3-2
ProPG Internal Noise Level Guidelines

ACTIVITY	LOCATION	07:00 – 23:00 HRS	23:00 – 07:00 HRS
Resting	Living room	35 dB $L_{Aeq,16\text{ hr}}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16\text{ hr}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\text{ hr}}$	30 dB $L_{Aeq,8\text{ hr}}$ 45 dB $L_{A\text{max,F}}$ (Note 4)

NOTE 1 The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the internal L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{A\text{max,F}}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{A\text{max,F}}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the “open” position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as “unreasonable”. Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as “unacceptable” by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing “unacceptable” noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (see Section 3.D).

3.4 The 'Agent of Change' Principle from the National Planning Policy Framework

In accordance with the 'Agent of Change' Principle, the new development should not result in 'unreasonable restrictions' being placed on existing businesses and any proposed new development should include 'suitable mitigation'.

Section 187 from the National Planning Policy Framework states:

'Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.'

4.0 Environmental Noise Survey

To determine L_{AFmax} sound levels at the Site, a short-term noise survey was undertaken on Friday 23rd April 2021. L_{AFmax} sound levels were measured at the following locations:

- Location 1 – at the western site boundary with Woodmarsh; and
- Location 2 – at the northern site boundary with Bradley Road.

4.1 Equipment

The sound monitoring equipment used during the survey is detailed in Table 4-1. All measurement instrumentation was calibrated before and after the measurements. No significant drift was observed. The calibration chain is traceable via the United Kingdom Accreditation Service to National Standards held at the National Physical Laboratory.

Table 4-1
Noise Survey Equipment

Location	Equipment	Serial Number
Locations 1 and 2	Cirrus CR:171C Type 1 Sound Level Meter	G061698
	Cirrus CR:515 Acoustic Calibrator	59336

At each survey location, the sound level meter microphone was placed 1.5m above local ground level in free-field conditions, i.e. at least 3.5m from the nearest vertical reflecting surface.

The survey locations are shown in Figure 4-1.

Figure 4-1
Noise Survey Locations



4.2 Weather

Weather conditions conducive for noise monitoring, being dry with wind speeds below 5m/s during the survey period.

4.3 Soundscape and Context

Observations on the prevailing acoustic climate were made during site walkover during the daytime site visit to undertake the short-term survey. During site walkover, the surveyor noted that the dominant noise source at all locations was road traffic, with other sources including birdsong, high altitude aircraft and mowing from nearby playing fields.

A site visit was also undertaken during the night-time period of the 22nd April 2021, from approximately 23:00 to 00:00, to observe whether sound from nearby commercial/industrial premises (business parks to the north and north-east) was audible at the nearest site boundary locations. It was considered that, due to reduced traffic flows, this time period would be appropriate to undertake a critical listening exercise, with minimal influence of road traffic.

The surveyor noted that sound from distant road traffic dominated along the northern boundary, and that any commercial sound was imperceptible.

4.4 Noise Survey Results

The L_{AFmax} survey results are shown in Table 4-2 (Location 1) and 4-3 (Location 2).

Table 4-2
Location 1: Summary of Measured L_{AFmax} Sound Levels, free-field, dB

Date and Time	L_{AFmax}
23/04/2021 10:17	86.4
23/04/2021 10:18	83.9
23/04/2021 10:19	86.6
23/04/2021 10:20	86.2
23/04/2021 10:21	85.5
23/04/2021 10:22	88.8
23/04/2021 10:23	85.6
23/04/2021 10:24	87.5
23/04/2021 10:25	85.2
23/04/2021 10:26	84.7
23/04/2021 10:27	84.9
23/04/2021 10:28	85.6
23/04/2021 10:29	86.8
23/04/2021 10:30	84.8
23/04/2021 10:31	85.3
23/04/2021 10:32	85.8
23/04/2021 10:33	88.0
23/04/2021 10:34	85.4
23/04/2021 10:35	85.9
23/04/2021 10:36	85.0
23/04/2021 10:37	87.2
23/04/2021 10:38	85.6
23/04/2021 10:39	85.4
23/04/2021 10:40	85.7
23/04/2021 10:41	85.9
23/04/2021 10:42	84.8
23/04/2021 10:43	85.5
23/04/2021 10:44	85.2
23/04/2021 10:45	85.8
23/04/2021 10:46	83.9
23/04/2021 10:47	83.4

Table 4-3
Location 2: Summary of Measured L_{AFmax} Sound Levels, free-field, dB

Date and Time	L_{AFmax}
23/04/2021 10:56	86.5
23/04/2021 10:57	77.1
23/04/2021 10:58	77.1
23/04/2021 10:59	80.3
23/04/2021 11:00	83.1
23/04/2021 11:01	79.5
23/04/2021 11:02	80.9
23/04/2021 11:03	76.6
23/04/2021 11:04	79.9
23/04/2021 11:05	82.7
23/04/2021 11:06	79.6
23/04/2021 11:07	85.4
23/04/2021 11:08	79.5
23/04/2021 11:09	79.1
23/04/2021 11:10	75.4
23/04/2021 11:11	71.6
23/04/2021 11:12	79.8
23/04/2021 11:13	84.6
23/04/2021 11:14	83.6
23/04/2021 11:15	80.5
23/04/2021 11:16	81.8
23/04/2021 11:17	78.9
23/04/2021 11:18	79.8
23/04/2021 11:19	81.4
23/04/2021 11:20	78.1
23/04/2021 11:21	76.9
23/04/2021 11:22	80.5
23/04/2021 11:23	80.8
23/04/2021 11:24	82.4
23/04/2021 11:25	84.8
23/04/2021 11:26	79.6

The following L_{AFmax} sound levels will be referred to within the assessment:

- MP1:
 - L_{AFmax} : 88dB(A)
- MP2:
 - L_{AFmax} : 85dB(A)

5.0 Noise Model Methodology

To determine the daytime and the night-time noise environment across the site, SLR has developed a noise model of the proposed development using the noise modelling software package CadnaA. CadnaA is a proprietary software-based noise model, which implements the full range of UK calculation methods. The calculation algorithms set out in ISO 9613-2:1996 *Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of calculation* have been used.

The noise model assumes:

- A ground absorption factor of 0.5 for mixed ground;
- A receptor height of 1.5m above each floor level for daytime; and
- A reflection factor of 2.

Model inputs include Woodmarsh and Bradley Road, traffic flow data, the proposed layout and topographical data. It is noted that the noise model includes a previous layout, however as the previous scheme is broadly similar to the latest proposals, it considered suitable for use in this assessment at the outline planning stage.

The following road links have been included within the model:

- Woodmarsh: $L_{Aeq,T}$ sound levels have been predicted using traffic flow data. L_{Amax} sound levels have been calculated using noise survey data; and
- A363 Bradley Road: $L_{Aeq,T}$ sound levels have been predicted using traffic flow data. L_{Amax} sound levels have been calculated using noise survey data.

CadnaA uses the principal methodology set out in the Calculation of Road Traffic Noise 1988 (CRTN), for determining the $L_{A10,T}$ noise level; the noise level that is exceeded for 10% of the time. To allow the BS8233:2014 assessment to be undertaken, the $L_{A10,18hr}$ noise levels require conversion to a $L_{Aeq,T}$.

For assessment purposes, the modelled $L_{A10,18hr}$ sound levels have been converted to $L_{Aeq,T}$ (the equivalent continuous sound level) using the formulae presented in Table 5-1, as recommended in the 'Method for Converting the UK Road Traffic Noise Index $L_{A1018hr}$ to the EU Noise Indices for Road Noise Mapping' (2006).

Table 5-1
 $L_{A10,18hr}$ Conversion Calculations

Time period	Non-motorway conversion	Motorway conversion
07:00 – 21:00	$L_{day} = 0.95 \times L_{A10,18hr} + 1.44$	$L_{day} = 0.98 \times L_{A10,18hr} + 0.09$
21:00 – 23:00	$L_{evening} = 0.97 \times L_{A10,18hr} - 2.87$	$L_{evening} = 0.89 \times L_{A10,18hr} + 5.08$
23:00 – 07:00	$L_{night} = 0.90 \times L_{A10,18hr} - 3.77$	$L_{night} = 0.87 \times L_{A10,18hr} + 4.24$
07:00 – 23:00	$L_{Aeq,16hr} = 10 \log_{10} ((12 \times (10^{L_{day}/10}) + 4 \times (10^{L_{evening}/10}))/16)$	

For this assessment, the non-motorway conversion calculations have been applied.

18-hour Annual Average Weekly Traffic (AAWT) traffic data (in accordance with procedures contained within the CRTN) inputs to the noise model are shown in Table 5-2 below. To provide a robust scenario, 'With development' traffic flows provided by the Transport consultant for the project have been included.

Table 5-2
Traffic Data

Road	18hr AAWT Future Year with Development	% HGV	Speed Km/hr ¹	Road Type
Woodmarsh	16698	4%	50kph	Impervious bituminous
Bradley Road (west of site access)	15766	2%	50kph	
Bradley Road (east of site access)	14007	2%	50kph	

CadnaA uses the principal methodology set out in the Calculation of Road Traffic Noise 1988 (CRTN), for determining the $L_{A10,T}$ noise level; the noise level that is exceeded for 10% of the time. To allow the BS8233:2014 assessment to be undertaken, the $L_{A10,18hr}$ noise levels have been converted to a $L_{Aeq,T}$.

With reference to the noise criteria outlined in Section 3.0, the CadnaA model has been used to create noise models for the following scenarios, to predict and assess sound levels across the proposed development:

- Daytime $L_{Aeq,16hour}$ external sound levels at ground floor (1.5m) height;
- Night-time $L_{Aeq,8hour}$ external sound levels at first floor (4m) height; and
- Night-time L_{Amax} external sound levels at first floor (4m) height.

¹ Average traffic speed data should be used but in its absence these road speed limits have been assumed. The road speed has then been determined with reference to the Traffic Speed Table in CRTN.

6.0 Results and Assessment

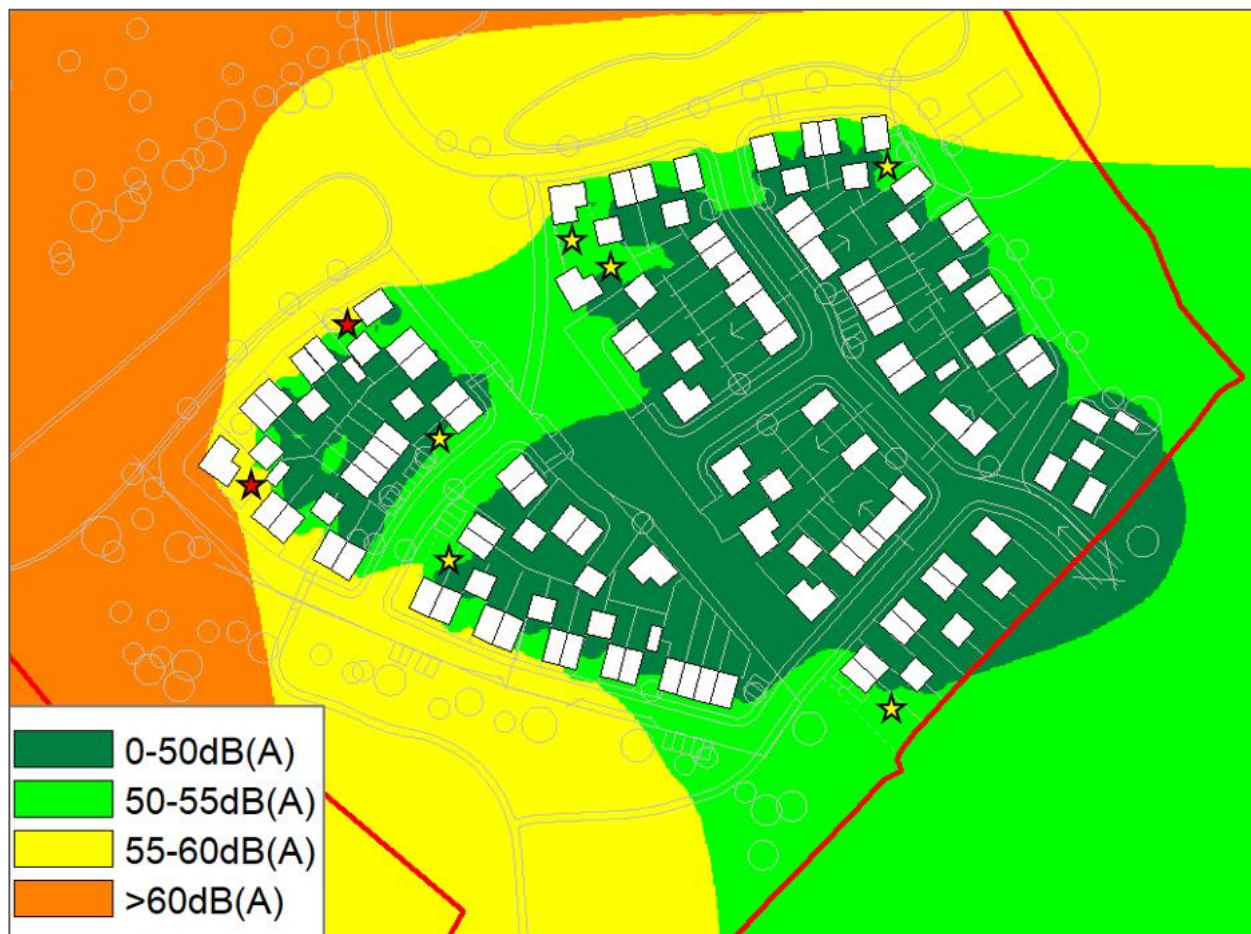
As described in Section 3.0, BS8233:2014 and ProPG provide recommended guideline values for external living areas, living rooms and bedrooms. A summary of the guideline values against which the following assessment has been undertaken is given below:

- Living rooms (daytime) $L_{Aeq,16hr}$ 35dB(A);
- Bedrooms (daytime) $L_{Aeq,16hr}$ 35dB(A);
- Bedrooms (night-time) $L_{Aeq,8hr}$ 30dB(A);
- Bedrooms (night-time) L_{Amax} 45dB(A); and
- Outdoor living areas (gardens) Wiltshire Council desirable and recommended lower guideline value of $L_{Aeq,16hr}$ 50dB(A), upper guideline value of $L_{Aeq,16hr}$ 55dB(A).

6.1 Daytime Sound Levels

Daytime $L_{Aeq,16hr}$ sound levels at a height of 1.5m above ground level are shown on the CadnaA noise contour map, presented in Figure 6-1.

Figure 6-1
Predicted Daytime $L_{Aeq,16hr}$ dB Sound Levels Across the Proposed Development



The noise contours in Figure 6-1 show that, with the proposed site layout, external sound levels are expected to remain within the recommended lower guideline value of $L_{Aeq,16hr}$ 50dB in the majority of proposed gardens. Six Plots are shown to experience sound levels between 50dB and the recommended upper guideline value of $L_{Aeq,16hr}$ 55dB (indicated by the yellow stars in Figure 6-1). Two Plots are shown to experience sound levels above the recommended upper guideline value of $L_{Aeq,16hr}$ 55dB (indicated by the red stars in Figure 6-1).

As sound levels are shown to exceed the recommended values in some areas, additional mitigation measures for outdoor living areas will be required to reduce sound levels as far as practicable.

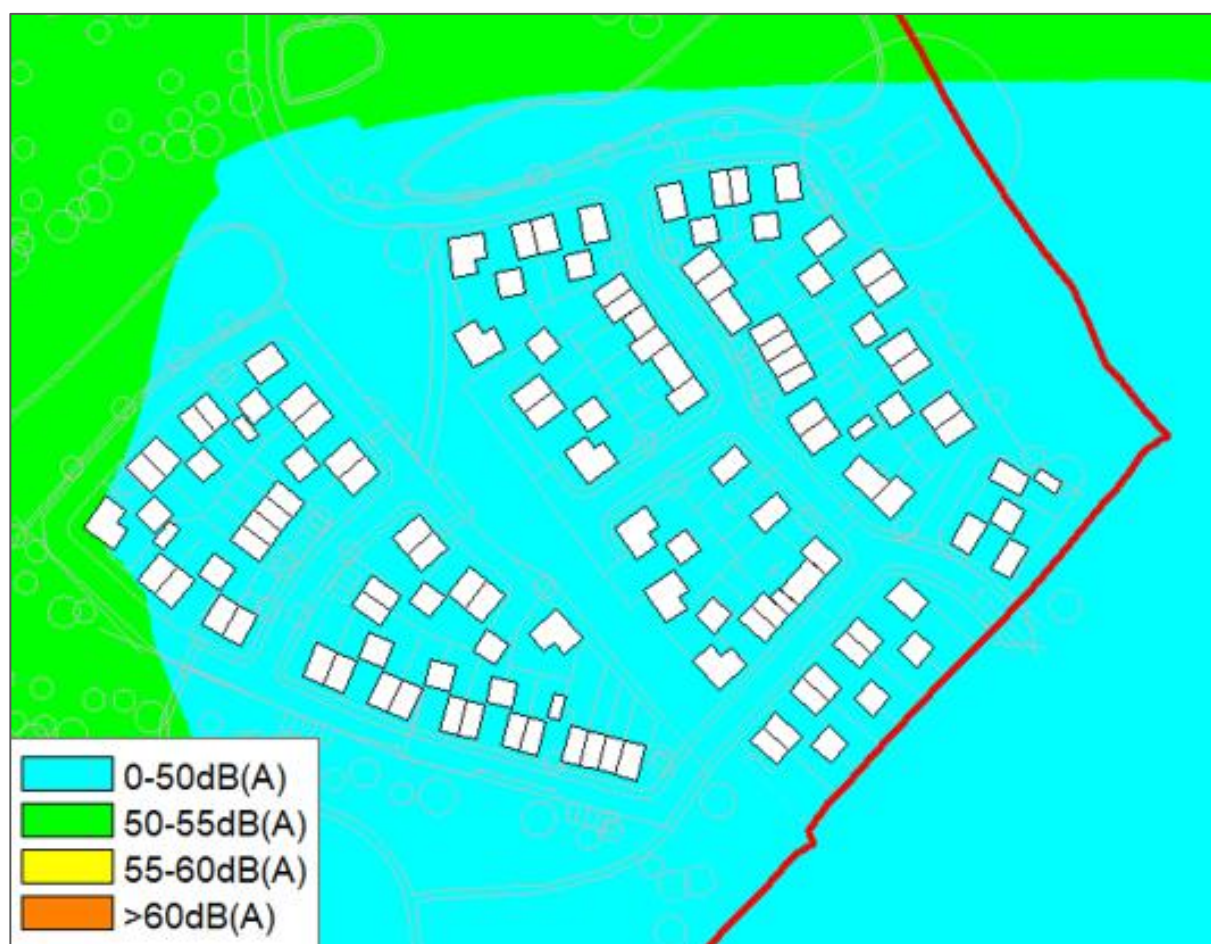
With regard to internal sound levels, analysis of the CadnaA noise contours shows that daytime façade sound levels are expected to exceed the recommended value of $L_{Aeq,16hr}$ 35dB(A) for living and bedrooms by up to 26dB.

An open window can be expected to reduce the attenuation of a glazing unit to approximately 15dB sound reduction, and an open window will provide sufficient sound attenuation for the majority of facades. Mitigation will be required for facades where sound levels exceed 50dB(A), to reduce sound levels further to within the guideline value for living rooms.

6.2 Night-time Sound Levels

Night-time $L_{Aeq,8hr}$ sound levels at a height of 4m above ground level are shown on the noise contour map, in Figure 6-2.

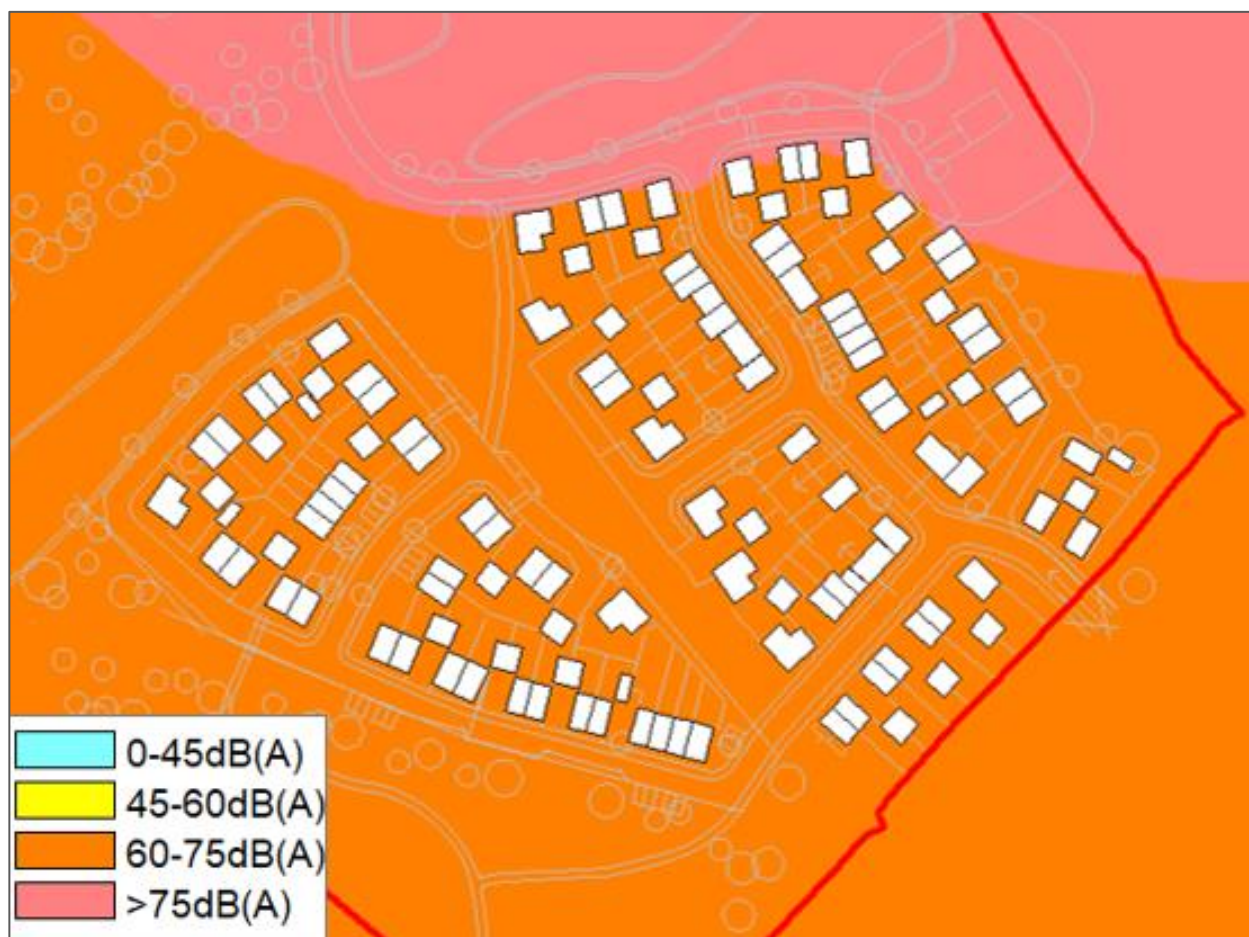
Figure 6-2
Predicted Night-time $L_{Aeq,8hr}$ dB Sound Levels Across the Proposed Development



Analysis of the CadnaA noise contours shows that $L_{Aeq,8hour}$ façade sound levels are expected to exceed the recommended value of 30dB(A) by up to 21dB. Mitigation will therefore be required in order to reduce sound levels to within the guideline value within bedrooms.

Night-time L_{Amax} sound levels at a height of 4m above ground level are shown on the noise contour map, in Figure 6-3.

Figure 6-3
Predicted L_{Amax} dB Sound Levels Across the Proposed Development



Analysis of the CadnaA noise contours shows that L_{Amax} façade sound levels are expected to exceed the recommended value of L_{Amax} 45dB(A) by up to 27dB. Mitigation will therefore be required in order to reduce sound levels to within the guideline value within bedrooms.

6.3 Assessment Summary

Assessment of sound levels against the relevant criteria indicates that sound levels in areas of the development currently exceed the recommended external and internal guideline values for new dwellings. Mitigation measures to reduce external and internal sound levels to within the guideline values will therefore be required.

Mitigation is discussed further in Section 7.0.

7.0 Mitigation

Assessment indicates that to achieve acceptable internal and external sound levels at proposed dwellings, mitigation will be required. An iterative Cadna-A modelling exercise has been undertaken to identify a practicable mitigation strategy, to inform the master planning process. The proposed mitigation strategy comprises:

- The orientation of dwellings so that gardens are located at facades facing away road sources, where practicable (included within the proposed site layout);
- Installation of acoustically sound garden fencing of 2m height at identified Plots; and
- Selection of glazing and acoustically attenuated ventilation to provide sufficient sound reduction.

7.1 External Sound Levels

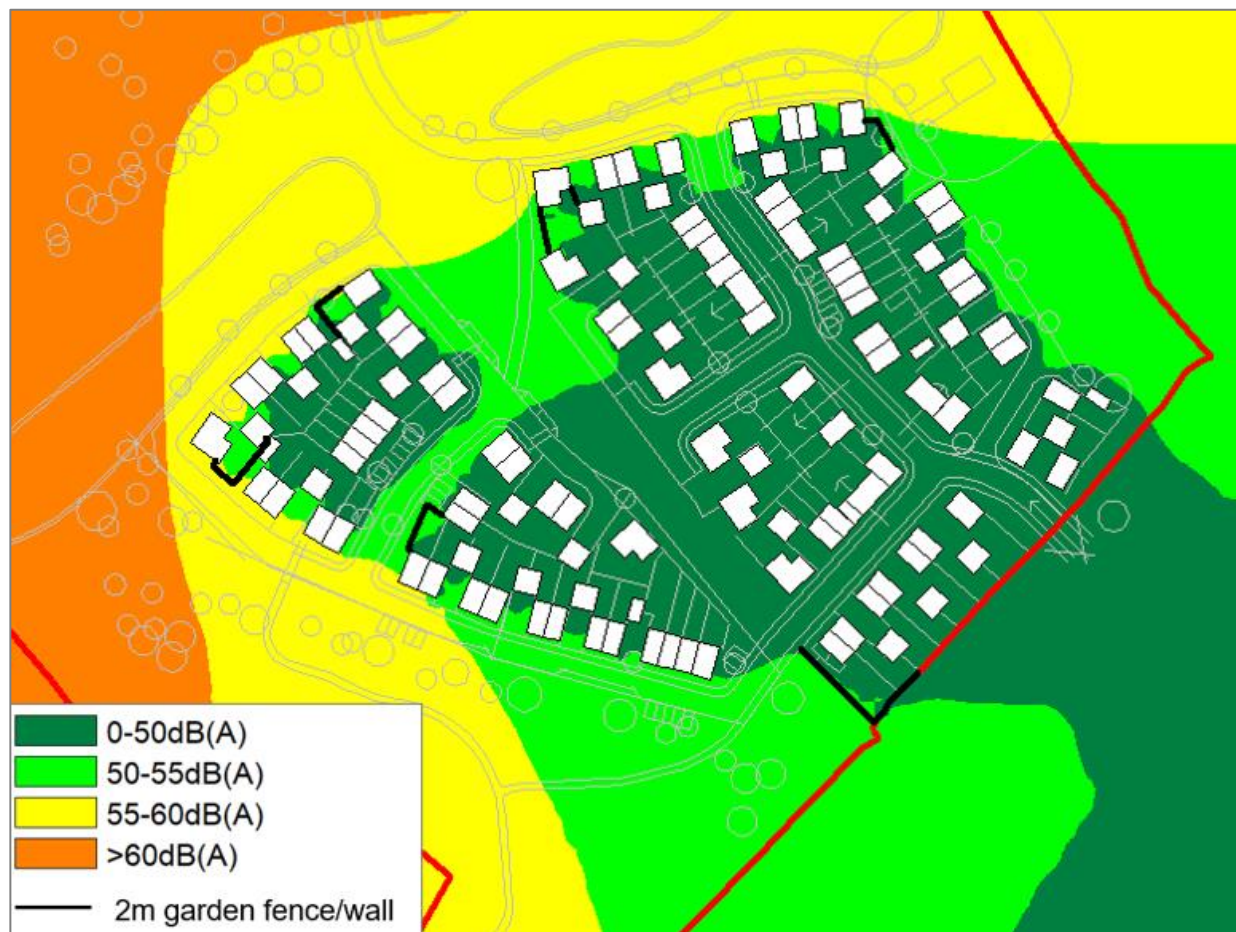
The noise contour map shown in Figure 7-1 indicates that, with the installation of acoustically sound garden fencing or walls of 2m height at identified plots, sound levels will be sufficiently attenuated to achieve the recommended criteria as follows:

- Sound levels in the majority of gardens are predicted to remain within the recommended lower guideline value of $L_{Aeq,16hr}$ 50dB;
- Sound levels in all gardens are predicted to remain within the recommended upper guideline value of $L_{Aeq,16hr}$ 55dB

It is noted that if fencing is to be installed at identified locations, then the following specification is recommended as a minimum:

- Good quality timber with no warping, knots etc;
- At least 25mm thick in all places;
- Close-boarder and continued across the front of posts to minimise gaps;
- Boards should overlap 25mm as a minimum;
- No gaps should be present between gravel board and the ground; and
- Minimum superficial mass of 15kg/m².

Figure 7-1
Predicted $L_{Aeq,16hr}$ dB Sound Levels Across the Proposed Development- With Mitigation



7.2 Internal Sound Levels

In terms of acoustics, windows are the 'weakest' point in any façade. Therefore, the required level of sound reduction would be provided by appropriate glazing and ventilation systems.

Considering that a partially open window provides a sound reduction of up to 15 dB between outside and inside, it is anticipated that at the façades which have a reduction value of 15 dB or lower, the noise limits would be met even during occasional purge ventilation with an open window.

At façades where the required sound reduction is greater than 15dB, the sound reduction will be provided by the installation of glazing and ventilation systems. Glazing does not reduce sound equally across the entire frequency spectrum, so the frequency content of the sound will influence the overall sound reduction performance of a given window and by extension, the resulting noise levels within the receiving room.

However, many glazing manufacturers test their products under laboratory conditions using a typical road traffic noise frequency spectrum source. The resultant measured noise attenuation, in dB, gives a useful guide to in-situ sound reduction performance of the window for situations where road traffic noise dominates. This performance index is known as the $R_w + C_{tr}$ (the weighted sound reduction index, which takes into account the road traffic frequency spectrum), and the sound reduction requirement set out above should be considered as an $R_w + C_{tr}$ noise level.

Living Rooms

Analysis of the daytime sound level predictions shows that the highest glazing specification required to meet the guideline values within habitable rooms is $26\text{dB } R_w + C_{tr}$.

Standard thermal double glazing (4mm float-12mm cavity-4mm float or similar) is generally capable of providing up to $26\text{dB } R_w + C_{tr}$ (the weighted sound reduction index, which takes into account the road traffic frequency spectrum) sound reduction.

The installation of standard thermal double glazing is therefore expected to be sufficient to reduce sound levels to within the guideline values at all facades, for living rooms at ground floor level.

Bedrooms

Analysis of the night-time sound level predictions shows that the highest glazing specification required to meet the guideline values within bedrooms is $27\text{dB } R_w + C_{tr}$.

To assist in identifying appropriate glazing systems, a guide to the sound reduction performance delivered by an example glazing configuration is provided in Table 7-1.

Table 7-1
Sound Reduction Performance of Example Window Configurations

Example Glazing System (mm)	4/12/4	6/16/6
Sound Reduction $R_w + C_{tr}$ (dB)	26	28

Source: St Gobain

As the sound reduction performance of glazing systems can vary from manufacturer to manufacturer, the actual sound reduction performance of the glazing system should first be confirmed with the glazing system supplier.

It is noted that, at this stage, the mitigation measures can only be outlined. The detailed design of the proposed development will affect both the required sound reduction performance of the façade and the appropriate selection of glazing and the ventilation strategy. The aspects of the detailed design that are important are the room dimensions, room finishes, window dimensions and the sound reduction performance of non-glazed elements.

Background ventilation must be provided in accordance with the Building Regulations Approved Document F. If a passive ventilation strategy will be implemented, then window mounted trickle vents or through-wall ventilators, which are acoustically attenuated to provide an equivalent sound reduction to the glazing, should be installed. Professional Practice Guidance on Planning & Noise (ProPG) recommends that, *“Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however, any facade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the ‘open’ position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded”*. This means that the vent, when ‘open’, should provide a sound reduction not less than that provided by the selected glazing system.

The sound reduction performance of ventilators is typically indicated as a $D_{n,e,w} + C_{tr}$ rating. Where window mounted or through-wall ventilators are to be installed, in order to provide a sound reduction equivalent to that of the specified glazing, the $D_{n,e,w} + C_{tr}$ value of the vent (when open) should be approximately 7dB higher than the specified $R_w + C_{tr}$ of the glazing.

It is important to note that the sound insulation performance of the external building fabric must be at least that of any specified glazing and ventilation system. Furthermore, the glazing attenuation specified previously must be achieved by the glazing system as a whole, including all framing and furniture.

The requirement for glazing and ventilation to mitigate sound levels will reduce with distance into the site and with screening provided by intervening dwellings.

7.3 Summary

It is considered that, based on the proposed site layout, and with the implementation of the recommended mitigation strategy, sound levels across the proposed development can be attenuated to achieve the requisite external and internal sound level criteria.

It is noted that although the noise model includes a previous layout, as the previous scheme is broadly similar to the latest proposals, it is considered that the above assessment demonstrates that an acceptable scheme can be delivered.

It is therefore considered that, in terms of noise, there are not any constraints to the principle of the development.

8.0 Agent of Change Assessment

The northern area of the proposed development is located in proximity to existing commercial use. However, as sound from nearby commercial premises was observed to be imperceptible at the Site, with road traffic being the dominant noise source, it is considered that the BS8233:2014 assessment above is appropriate.

Notwithstanding this, in accordance with the '*Agent of Change*' Principle (defined within the National Planning Policy Framework), the new development should not result in '*unreasonable restrictions*' being placed on existing businesses, and any proposed new development should include '*suitable mitigation*'. Example mitigation measure are included within ProPG and include:

- Maximising the spatial separation of noise source(s) and receptor(s).
- Investigating the necessity and feasibility of reducing existing noise levels and relocating existing sources.
- Using existing topography and existing structures (that are likely to last the expected life of the noise-sensitive scheme) to screen the Proposed Development site from significant sources of noise.
- Incorporating noise barriers as part of the scheme to screen the Proposed Development site from significant sources of noise.
- Using the layout of the scheme to reduce noise propagation across the site.
- Using the orientation of buildings to reduce the noise exposure of noise sensitive rooms.
- Using the building envelope to mitigate noise to acceptable levels.

As detailed above, on-site observations were that sound from road traffic sources was dominant at the site, and that nearby sound from commercial use was imperceptible. It is therefore considered that a detailed BS4142:2014 + A1:2019 assessment is not required.

The development has been designed to provide separation between the proposed development and the commercial use, and external amenity areas will be screened by the proposed buildings.

Glazing and ventilation requirements have been identified to attenuate road traffic sound levels. It is considered that, with the installation of the proposed mitigation, residents will be suitably protected against potential commercial noise impact.

It is therefore considered that the proposed development would not result in '*unreasonable restrictions*' being placed on existing businesses, and that further, more detailed assessment is not required.

9.0 Summary and Conclusion

SLR was commissioned by Castlewood Properties Ventures Ltd to undertake a noise assessment in support of an outline planning application for a proposed residential development, on land south of White Horse Business Park, North Bradley, Trowbridge. This noise assessment has been completed with reference to:

- BS8233:2014 Guidance on sound insulation and noise reduction for buildings.
- ProPG: Planning & Noise – Professional Practice Guidance on Planning & Noise, New Residential Development; and
- The NPPF Agent of Change Principle.

Sound levels at the proposed development have been predicted using CadnaA noise modelling software. Road traffic data, noise survey data and the proposed site layout have been used to calculate daytime and night-time $L_{Aeq,T}$ and L_{Amax} sound levels across the proposed development.

Results and assessment indicate that sound levels within all external living areas are expected to remain within the recommended upper value of $L_{Aeq,16hr}$ 55dB. Additional mitigation measures will therefore not be required to reduce sound levels within gardens.

Results and assessment indicate that mitigation will be required to achieve external and internal sound level criteria in certain areas of the proposed development.

The proposed mitigation strategy for the site comprises:

- The orientation of dwellings so that gardens are located at facades facing away road sources, where practicable (taken account of in the site layout);
- Installation of acoustically sound garden fencing of 2m height at identified Plots; and
- Selection of glazing and acoustically attenuated ventilation to provide sufficient sound reduction.

It is considered that, with implementation of the proposed mitigation measures, sound levels at the proposed development can be readily attenuated to achieve the requisite external and internal noise level criteria.

With regard to existing commercial use near to the Site, it has been demonstrated that the proposed development would not result in '*unreasonable restrictions*' being placed on existing businesses.

The noise assessment confirms that noise is not a constraint to residential development, and that good standard of acoustic design can be achieved using reasonable and practicable design measures.

APPENDIX 01

Glossary of Terminology

To assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0dB (the threshold of hearing) to over 120dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table 01-1
Sound Levels Commonly Found in the Environment

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

Acoustic Terminology

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 (2×10^{-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}	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
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.
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.

APPENDIX 02

Illustrative Sketch Layout



Housetype	Number
2 Bed FOG	2
2 Bed Home	31
3 Bed Home	51
4 Bed Home	7
Total	91
Net Developable Area	2.56 ha 6.32 ac

- Site Boundary

Retained Trees and/or hedgerow

Public Open Space

Wildflower Meadow Planting

Proposed Tree Planting

Proposed Road

Residential Area

LAP
- 1

Primary access point via a new junction on Bradley Road.
- 2

Access into Vistry Land
- 3

Pedestrian access to Woodmarsh
- 4

Proposed Pedestrian routes around the site
- 5

Existing trees and hedges to be retained, where possible
- 6

New tree and copse planting to implement a green buffer between the proposed masterplan and the existing development at North Bradley.
- 7

Existing established tree to become focal a focal point of central green spaces
- 8

New tree planting within landscape buffers
- 9

Proposed Orchard
- 10

A series of flood attenuation features proposed within the lower parts of the site and could contribute to the ecological ad biodiversity enhancement of the development proposals
- 11

Proposed Pumping Station
- 12

Local Area for Play

EUROPEAN OFFICES

United Kingdom

AYLESBURY

T: +44 (0)1844 337380

BELFAST

T: +44 (0)28 9073 2493

BRADFORD-ON-AVON

T: +44 (0)1225 309400

BRISTOL

T: +44 (0)117 906 4280

CAMBRIDGE

T: + 44 (0)1223 813805

CARDIFF

T: +44 (0)29 2049 1010

CHELMSFORD

T: +44 (0)1245 392170

EDINBURGH

T: +44 (0)131 335 6830

EXETER

T: + 44 (0)1392 490152

GLASGOW

T: +44 (0)141 353 5037

GUILDFORD

T: +44 (0)1483 889800

LEEDS

T: +44 (0)113 258 0650

LONDON

T: +44 (0)203 805 6418

MAIDSTONE

T: +44 (0)1622 609242

MANCHESTER

T: +44 (0)161 872 7564

NEWCASTLE UPON TYNE

T: +44 (0)191 261 1966

NOTTINGHAM

T: +44 (0)115 964 7280

SHEFFIELD

T: +44 (0)114 245 5153

SHREWSBURY

T: +44 (0)1743 23 9250

STIRLING

T: +44 (0)1786 239900

WORCESTER

T: +44 (0)1905 751310

Ireland

DUBLIN

T: + 353 (0)1 296 4667

France

GRENOBLE

T: +33 (0)6 23 37 14 14