

Burbage Field Farm, Burbage

Noise Impact Assessment

2061522-RSK-RP-001-(04)

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Noise Impact Assessment

Document Ref. 2061522-RSK-RP-001-(04)

Redrow Homes Limited

Revision	Description	Date	Prepared	Approved
01	First draft	08 February 2023	Gwenc'hlan Tournier MIOA	Nacho Granizo MIOA
02	Update following Masterplan changes	27 February 2023	Gwenc'hlan Tournier MIOA	Nacho Granizo MIOA
03	Update following powerline swing and sag issue	28 June 2023	Gwenc'hlan Tournier MIOA	Nacho Granizo MIOA
04	Update following care home addition	14 November 2023	Nick Messer AMIOA	Gwenc'hlan Tournier MIOA

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Attachments



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Glossary of Acoustic Terms

Appendix A - Time History Graphs

Appendix B - External Building Fabric Acoustic Performance Specification



End of Section



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1 Introduction

1.1 Background

- 1.1.1 RSK Acoustics Limited (RSKA) has been commissioned by Redrow Homes Limited to undertake a noise assessment report to support a hybrid planning application for the proposed development at Burbage Field Farm, Burbage, Leicestershire.
- 1.1.2 The development will consist of a full planning application for 422 dwellings, public open space and associated infrastructure, and an outline planning application for a residential care home and up to eleven self-build plots.
- 1.1.3 The proposed care home is located to the south of the development area, adjacent to the M69 motorway. The two proposed self-build areas are located within the development area; one central and one to the north of the site.
- 1.1.4 An environmental sound survey has been undertaken RSKA to establish the existing environmental sound levels associated with transportation sources incident on the proposed development.
- 1.1.5 The results of the environmental sound survey have been used to establish noise levels in external amenity areas and façade incident noise levels for the proposed development, which form the basis of our assessment of the acoustic requirements of the building façades.
- 1.1.6 This report presents the relevant results of the environmental sound surveys, details of our assessments of external and internal noise levels and the proposed acoustic specifications for the critical elements of the building facades.
- 1.1.7 The report also considers the suitability of the site for the proposed car home and self-built areas.
- 1.1.8 An explanation of the acoustic terminology used in this report has been appended at the end of the document.
- 1.1.9 There is an overhead electricity line which runs from west to east and intersect the southern parts of the proposed development area. Due to the constraint of the pylons and associated swing and sag of the powerline, the acoustic model was updated with a shortened barrier/bund to the west, so it is not below the powerline. The layout of the masterplan was also slightly updated. The model and assessment have been updated based on the latest masterplan.

1.2 Site Description and Location

- 1.2.1 The development site is located at land south of Burbage, in the Borough of Hinckley and Bosworth, Leicestershire.
- 1.2.2 The site is bounded to the south by the M69 Motorway, by Bullfurlong Lane to the west, by Workhouse Lane to the east and by agricultural land and Coventry Road to the north.



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- 1.2.3 Figure 1 overleaf presents the site location, including the section of the powerline which will affect the development site.



Symbols

-  Site Boundary
-  Approximate Location of Power Line

Client:

Redrow Homes Ltd

Project:

Burbage Field Farm, Burbage

Project number:

2061522

Date:

16 June 2023

Revision:

-

Scale:



Figure 1 Site Location



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1.3 Scope of Report

1.3.1 The scope of this report is to:

- Detail appropriate assessment criteria based on the requirements of the local authority and industry standard guidance.
- Present the results of the environmental sound survey undertaken at the site.
- Create an acoustic model of the development site and wider area based on the data obtained from the sound surveys.
- Present the results of the assessment of the predicted noise levels in external amenity areas.
- Present the results of the detailed assessment of the likely airborne noise ingress into habitable spaces and identify the requirement acoustic performance of critical elements of the building façades in order to achieve the proposed criteria.
- Assess the change in noise level at existing receptor due to the change in traffic flow, in accordance with DMRB (Design Manual for Roads and Bridges).

1.3.2 Advice and recommendations within this report will need to be integrated, coordinated and ratified with the design by the principal designer and design team to ensure that all other design interfaces, buildability, workmanship and other requirements are considered. Any sketches or drawings provided illustrate acoustic principles only.

2 Policy, Guidance and Standards

2.1 National Policy

The National Planning Policy Framework (NPPF)

2.1.1 The revised National Planning Policy Framework (NPPF) (MHCLG, 2021) was published in July 2021. In respect of noise, paragraph 174 states that in relation to conserving and enhancing the natural environment:

“Planning policies and decisions should contribute to and enhance the natural and local environment by...

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of ... noise pollution...”

2.1.2 In relation to ground conditions and pollution, paragraph 185 states that:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health,



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living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and quality of life;

- *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason...*

2.1.3 In relation to the integration of new development with existing premises and community facilities, paragraph 187 states that:

“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.”

2.1.4 The NPPF indicates that the Noise Policy Statement for England (NPSE) should be used to define the “significant adverse impacts”.

Planning Practice Guidance: Noise

2.1.5 The Planning Practice Guide (PPG) was launched in 2014 (with the latest update being in 2019) and provides additional guidance and interpretation to the Government’s strategic policies outlined within the NPPF in a regularly updated, web-based resource.

2.1.6 Paragraph: 001 Reference ID: 30-001-20190722, “When is noise relevant to planning?” states:

“Noise needs to be considered when development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced). When preparing plans, or taking decisions about new development, there may also be opportunities to make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.”

2.1.7 PPG provides advice on how noise impacts should be determined. Paragraph: 003 Reference ID: 30-003-20190722 states the plan-making and decision making processes should 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.



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- 2.1.8 This paragraph also refers to the Noise Policy Statement for England (NPSE), in stating that the overall effect of the noise exposure (including the impact during the construction phase where applicable) should be identified against the significant observed adverse effect level (SOAEL) and the lowest observed adverse effect level (LOAEL) for the given situation.

Noise Policy Statement for England

- 2.1.9 The Noise Policy Statement for England (NPSE) was published in March 2010 and clarifies the underlying principles and aims of existing policy documents that relate to noise. It also sets out the long-term vision of Government noise policy which is: “to promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development”.
- 2.1.10 The NPSE states that noise should not be considered in isolation of the wider benefits of a scheme or development, and that the intention is to minimise noise and its effects as far as is reasonably practicable having regard to the underlying principles of sustainable development.
- 2.1.11 Paragraphs 2.20 and 2.21 define ‘significant adverse’ and ‘adverse’ impacts as applied to noise as follows:

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

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

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

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

SOAEL – Significant Observed Adverse Effect Level

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

- 2.1.12 Paragraph 2.22 clarifies that:

“It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values



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in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.”

2.1.13 The three aims of the NPSE are defined as follows:

“Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”

*“Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”
(Note: Applies when the impact lies somewhere between the LOAEL and SOAEL and does not mean that adverse effects cannot occur).”*

“Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”

2.1.14 It is necessary to define the LOAEL and SOAEL for the potential source of noise to relate the potential impact to the aims and requirements of the NPSE.

2.2 Local Policy

Hinckley and Bosworth Draft Local Plan 2020-2041

2.2.1 The draft Hinckley & Bosworth Local Plan will set out the vision and objectives for the growth of the borough up to 2041.

2.2.2 Policy PMD01 High Quality Design states:

“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;

[...]



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In exceptional circumstances, where outstanding and innovative architectural design is evident and/or the design incorporates outstanding eco-initiatives to become resilient and truly sustainable, applications will be considered favourably, even where this may result in some conflict with the above criteria. However any conflicts with the above criteria must be addressed in the design statement, and where appropriate, mitigation measures must be considered and implemented."

2.2.3 Policy PMD03 Preventing Pollution states:

"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 and Standards

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

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

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

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

2.3.3 These conditions include:

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



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British Standard 8233: 2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'

- 2.3.4 BS 8233, in relation to this development, sets out desirable guideline values in habitable rooms, such as living rooms and bedrooms.
- 2.3.5 The guideline values relate to steady external noise without a specific character, previously termed '*anonymous noise*'. According to the standard, noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate. Examples of noise with a character may include tonal/intermittent plant noise emissions, music playback, and workshop noise. Examples of external steady noise sources may include environmental noise sources such as busy road traffic.
- 2.3.6 The desirable internal ambient noise levels for dwellings are presented in Table T1.

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

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

Note 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative source of ventilation that does not compromise the façade insulation or the resulting noise levels.

Note 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

*A selection of the available notes

T1 Summary of Internal Noise Levels

- 2.3.7 The Standard also provides advice in relation to desirable levels for external noise. It 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.



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In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."

- 2.3.8 The standard also states that recommendations for ambient noise in residential care homes are similar to those for living accommodation, as presented in Table T1.

Professional Practice Guidance on Planning and Noise, 2017

- 2.3.9 The Professional Practice Guidance on Planning and Noise (ProPG) provides guidance on a recommended approach to the management of noise within the planning system in England and is limited to new residential development that will be predominantly exposed to airborne noise from transport sources.
- 2.3.10 With respect to internal ambient noise levels in habitable rooms, ProPG recommends that noise levels set out in BS 8233 are used for residential development. However, an additional criterion is proposed by ProPG for night-time L_{Amax} levels as follows:

"[...] 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 45 dB $L_{Amax,F}$ 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."

Good Acoustic Design

- 2.3.11 ProPG encourages the use of good acoustic design as a means to inform the site masterplans and is key to avoiding or reducing to a minimum any adverse effects on any sensitive internal or external spaces. In considering acoustic design, consideration should be given by the developer to the management of noise through a hierarchy of potential mitigation measures which may include:
- Maximising the separation distance between source and receiver;
 - Incorporate noise barriers (where applicable) to screen the development site (or individual plots) from significant sources of noise;
 - Use existing features to reduce noise propagation across the site;
 - Orientate the buildings in a manner which reduces the noise levels within habitable rooms (particularly bedrooms); and
 - Building envelope design to mitigate the noise to acceptable levels, whilst providing adequate ventilation.



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Design Manual for Road and Bridges– Design Manual for Road and Bridges LA 111 Traffic Noise and Vibration

- 2.3.12 The Design Manual for Roads and Bridges (DMRB) is considered to be the regulatory standard for the design of a new, or improvements to, a trunk road or motorway. In particular, LA 111 was published in 2020 by National Highways and provides guidance on the assessment and the reporting of noise and vibration impacts relating to roads (including the change in traffic flows and construction).
- 2.3.13 Typically, the impact of the proposed development on the noise climate in the surrounding areas is based on the change in noise levels at noise sensitive receptors due to the changes in the volume of road traffic generated by the proposed development.
- 2.3.14 The DMRB provides two magnitude scales of impact for the change in noise levels in the '*short-term*' (opening year) and in the '*long-term*' (future year). The choice of impact scale depends on whether the assessment is comparing the opening year with and without the development, or the opening year without development and the future year with development.
- 2.3.15 The assessment has been informed by the criteria stated in DMRB.

Technical Guidance Note 287 – Third Party Guidance for Working Near National Grid Electricity Transmission Equipment

- 2.3.16 The purpose of this document is to give guidance and information to third parties who are proposing, scheduling or designing developments close to National Grid Electricity Transmission assets.
- 2.3.17 The guidance has been taken into account when suggesting the height and location of any proposed mitigation measures.

2.4 Proposed Assessment Criteria

- 2.4.1 Based on the relevant national policies and technical guidance, the assessment criteria are proposed in Table T2 below.
- 2.4.2 The magnitude of change in existing noise levels due to the change in traffic flow is presented in Table T3.



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Location			Period	Assessment Criteria
Internal Ambient Noise Levels			Daytime (07:00 – 23:00 hours)	Living Room ($L_{Aeq,16h}$) = 35 dB
			Night-time (23:00– 07:00 hours)	Bedroom ($L_{Aeq,8h}$) = 30 dB
				Bedroom (L_{Amax}) = 45 dB*
Ambient Noise Levels in	External Amenity Areas		Daytime (07:00 – 23:00 hours)	External Amenity Areas = 50-55 dB $L_{Aeq,16hr}$

*No more than 10 times per night

T2 Ambient Noise Level Criteria

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

T3 DMRB magnitude of change

3 Environmental Sound Survey

3.1 Background

- 3.1.1 A baseline sound survey was undertaken by RSK in June 2017 in the adjacent areas to the east of the site, in order to inform a noise assessment report for the Lutterworth Road development (noise survey results as shown in document ref. '296859-01 00', dated July 2017). Further to this, an updated baseline sound survey was undertaken in July and August 2020 in order to further investigate noise sources affecting the proposed development at Land to the South West of Lutterworth Road Phase 2, details of which can be found in document ref. '297753-RSK-RP-002(01)' Noise Impact Assessment for Land to the South West of Lutterworth Road Phase 2, Burbage, dated April 2021.
- 3.1.2 Due to the time passed since the original survey and the COVID19 travel restrictions in place during the second survey, it was agreed with the client that a new survey would be undertaken around the site, to inform this application.



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3.2 Methodology

- 3.2.1 An unattended environmental sound survey was undertaken at four locations within the site boundary between approximately 14:00 hours on Thursday 01 December 2022 and 13:00 hours on Tuesday 06 December 2022 in order to determine the existing ambient sound climate at the site.
- 3.2.2 The measurement positions are summarised in Table T4 and presented graphically in Figure 2.

Ref.	Measurement type	Description
UT1	Unattended	The microphone was located at the western site boundary, approximately 180 m north of the M69 Motorway and approximately 80 m east of Bullfurlong Lane, at a height of 1.5 m in a free field position. The main noise source affecting this location vehicular movement along the M69.
UT2	Unattended	The microphone was located at the southern site boundary, approximately 15 m north of the M69 Motorway, at a height of 1.5 m in a free field position. The main noise source affecting this location vehicular movement along the M69.
UT3	Unattended	The sound level meter was located on the northern part of the site, approximately 580 m north of the M69 Motorway Road and 200 m south of Coventry Road, at a height of 1.5 m in a free field position. The main noise source affecting this location vehicular movement along the M69.
UT4	Unattended	The sound level meter was located on the northern part of the site, approximately 400 m north of the M69 Motorway Road and 390 m south of Coventry Road, at a height of 1.5 m in a free field position. The main noise source affecting this location vehicular movement along the M69.

T4 Noise Monitoring Locations



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Figure 2 Sound Survey Locations



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3.3 Survey Equipment

3.3.1 The noise measurements were undertaken using the following equipment:

Equipment	Type	Serial Number	Calibration Date
Class 1 sound level meters	Rion NL-52	00197783	19/04/2021
	Rion NL-52	00453835	10/09/2021
	Rion NL-52	01276553	09/08/2022
	Rion NL-52	00976248	01/12/2021
Acoustic calibrator	Rion NC-75	34378202	09/08/2022

T5 Survey Equipment

- 3.3.2 The sound level meters conformed to the Class 1 requirements of *BS EN 61672-1:2013 'Electroacoustics. Sound level meter, Specifications'*. The calibrator used conformed to the Class 1 requirements of *BS EN IEC 60942:2018 'Electroacoustics, Sound calibrators'*. The equipment used had a calibration history that is traceable to a certified calibration institution. Under BS EN 61672-1, Sound Level Meters are required for calibration every two years, with acoustic calibrators requiring calibration annually.
- 3.3.3 The calibration of the sound level meters was field checked prior to commencing measurements and prior to removing the equipment from site upon completion; no significant calibration drift was observed i.e., within a +/- 0.5 dB tolerance.

3.4 Meteorological Conditions

- 3.4.1 Due to the nature of the survey which includes unattended noise measurements, it is not possible to accurately comment on the meteorological conditions throughout the entire survey period. However, based on a review of publicly available monitored data from Weather Station ID IHINCK9¹, installed at Burbage, and observations at the beginning and end of the survey period. The weather conditions are detailed in Table T6.

¹ <https://www.wunderground.com/>



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Date	Temperature range (°C)	Precipitation (mm)	Cloud Cover (%)	Wind Speed Range (m/s)	Prevailing Wind Direction
Thursday 01/12/22	2 – 6	0	50	0 – 2.5	S
Friday 02/12/22	1 – 5	0	50	0 – 3.3	NNE
Saturday 03/12/22	4 – 7	1.5	100	0 – 5	NNE
Sunday 04/12/22	3 – 5	0.25	100	0 – 4	NNE
Monday 05/12/22	4 – 7	1.8	100	0 – 5.2	NNE
Tuesday 06/12/22	0 – 5	0.25	90	0 – 4.5	NNW

T6 Meteorological Conditions

- 3.4.2 Weather conditions as shown in Table T7 are considered suitable for obtaining representative sound level measurements.

3.5 Environmental Sound Survey Results

- 3.5.1 Due to the nature of the survey involving unattended measurements, it is not possible to accurately comment on the dominant noise sources or specific noise events during the entire survey period. However, at the beginning and end of the survey period it was noted that on-site sound levels were dominated by vehicle movements on the M69 motorway.
- 3.5.2 A summary of the unattended sound survey results is presented in Tables T7 to T10. Time history graphs detailing the full set of noise data for the unattended locations are contained in Appendix A.



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Date	Time Period	Measured noise levels, dB*		
		L _{Aeq, T}	L _{AFmax, 15min}	L _{A90, T}
Thursday 01/12/2022	Daytime (14:30-23:00)	58	65	57
	Night-time (23:00-07:00)	52	59	40
Friday 02/12/2022	Daytime (07:00-23:00)	60	68	59
	Night-time (23:00-07:00)	54	65	49
Saturday 03/12/2022	Daytime (07:00-23:00)	60	68	59
	Night-time (23:00-07:00)	54	65	50
Sunday 04/12/2022	Daytime (07:00-23:00)	61	68	60
	Night-time (23:00-07:00)	56	64	45
Monday 05/12/2022	Daytime (07:00-23:00)	61	68	59
	Night-time (23:00-07:00)	55	64	49
Averaged Sound Levels	Daytime (07:00-23:00)	60	67	59
	Night-time (23:00-07:00)	54	63	46

*L_{Aeq, T} values are the logarithmic average of L_{Aeq, 15min} samples. L_{A90, T} are calculated based on the statistical distribution of background sound levels during the measurement period in general accordance with guidance in BS 4142:2014+A1:2019. L_{AFmax, 15min} is based on the 10th highest measured L_{AFmax} sample within the period. All values rounded to the nearest whole number.

T7 Summary of Measured Environmental Sound Survey Results at Location UT1

Date	Time Period	Measured noise levels, dB*		
		L _{Aeq, T}	L _{AFmax, 15min}	L _{A90, T}
Thursday 01/12/2022	Daytime (14:30-23:00)	81	88	79
	Night-time (23:00-07:00)	75	85	53
Friday 02/12/2022	Daytime (07:00-23:00)	81	88	78
	Night-time (23:00-07:00)	74	86	55
Saturday 03/12/2022	Daytime (07:00-23:00)	80	88	77
	Night-time (23:00-07:00)	74	85	57
Sunday 04/12/2022	Daytime (07:00-23:00)	80	89	77
	Night-time (23:00-07:00)	76	85	61
Monday 05/12/2022	Daytime (07:00-23:00)	81	88	77
	Night-time (23:00-07:00)	76	86	55
Tuesday 06/12/2022	Daytime (07:00-12:15)	81	87	79
Averaged Sound Levels	Daytime (07:00-23:00)	81	88	78
	Night-time (23:00-07:00)	75	85	56

*L_{Aeq, T} values are the logarithmic average of L_{Aeq, 15min} samples. L_{A90, T} are calculated based on the statistical distribution of background sound levels during the measurement period in general accordance with guidance in BS 4142:2014+A1:2019. L_{AFmax, 15min} is based on the 10th highest measured L_{AFmax} sample within the period. All values rounded to the nearest whole number.

T8 Summary of Measured Environmental Sound Survey Results at Location UT2



Noise Impact Assessment

Date	Time Period	Measured noise levels, dB*		
		L _{Aeq, T}	L _{AFmax, 15min}	L _{A90, T}
Thursday 01/12/2022	Daytime (14:00-23:00)	51	59	48
	Night-time (23:00-07:00)	42	53	40
Friday 02/12/2022	Daytime (07:00-23:00)	51	70	50
	Night-time (23:00-07:00)	47	58	42
Saturday 03/12/2022	Daytime (07:00-23:00)	53	68	51
	Night-time (23:00-07:00)	46	56	43
Sunday 04/12/2022	Daytime (07:00-23:00)	54	73	53
	Night-time (23:00-07:00)	48	58	38
Monday 05/12/2022	Daytime (07:00-23:00)	57	68	52
	Night-time (23:00-07:00)	46	55	40
Tuesday 06/12/2022	Daytime (07:00-14:00)	48	67	48
Averaged Sound Levels	Daytime (07:00-23:00)	53	68	51
	Night-time (23:00-07:00)	46	56	41

*L_{Aeq, T} values are the logarithmic average of L_{Aeq, 15min} samples. L_{A90, T} are calculated based on the statistical distribution of background sound levels during the measurement period in general accordance with guidance in BS 4142:2014+A1:2019. L_{AFmax, 15min} is based on the 10th highest measured L_{AFmax} sample within the period. All values rounded to the nearest whole number.

T9 Summary of Measured Environmental Sound Survey Results at Location UT3

Date	Time Period	Measured noise levels, dB*		
		L _{Aeq, T}	L _{AFmax, 15min}	L _{A90, T}
Thursday 01/12/2022	Daytime (14:15-23:00)	55	62	55
	Night-time (23:00-07:00)	44	54	42
Friday 02/12/2022	Daytime (07:00-23:00)	52	65	51
	Night-time (23:00-07:00)	48	59	45
Saturday 03/12/2022	Daytime (07:00-23:00)	54	66	52
	Night-time (23:00-07:00)	47	57	44
Sunday 04/12/2022	Daytime (07:00-23:00)	56	67	55
	Night-time (23:00-07:00)	49	58	41
Monday 05/12/2022	Daytime (07:00-19:15)	54	67	53
Averaged Sound Levels	Daytime (07:00-23:00)	54	65	53
	Night-time (23:00-07:00)	47	57	45

*L_{Aeq, T} values are the logarithmic average of L_{Aeq, 15min} samples. L_{A90, T} are calculated based on the statistical distribution of background sound levels during the measurement period in general accordance with guidance in BS 4142:2014+A1:2019. L_{AFmax, 15min} is based on the 10th highest measured L_{AFmax} sample within the period. All values rounded to the nearest whole number.

T10 Summary of Measured Environmental Sound Survey Results at Location UT4



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4 Assessment Methodology

4.1 Site Suitability and Noise Prediction Model

- 4.1.1 A computer noise model of the site has been constructed using SoundPLAN (v8.2) noise prediction software. The baseline noise model is validated to the measured noise levels during the day and night-time periods. The model has been set up with the following parameters and best practice assumptions as listed below in Table T11.

Ref.	Location
Algorithms	ISO 9613-2:1996.
Ground Absorption	Hard, acoustically reflective ground (0.2 coefficient) – Roads, pavements and hard standing areas including the development site; and Acoustically soft (assumed 0.8 coefficient) – grass or vegetated areas.
Met Conditions	10 degrees Celsius; 70% humidity; and Wind from source to receiver.
Receptor Height	Ground Floor 1.5 m above ground, representative of living rooms. Used for daytime calculations; and First Floor 4 m above ground, representative of bedrooms. Used for night-time calculations.
Source Modelling	External noise sources, such as road traffic have been treated as line sources.
Buildings and barriers	All the existing structures and buildings in the immediate surroundings of the site have been incorporated into the model. The model includes the proposed 5 m high barrier along the full southern boundary of the site, along the M69 motorway. The proposed location of the barrier has been adapted so as to avoid issues with the overhead line, in accordance with Technical Guidance Note 287.
Terrain	Terrain data (2 m resolution contour lines) has been included within the model.
Illustrative Masterplan	As shown in the drawing ref '1693-08-02-100-Site Layout', dated July 2023.

T11 Modelling Parameters

- 4.1.2 The sound transmission calculations for the proposed dwellings have been carried out using the calculation method set out in Section G.2.1 of BS 8233, which is based on the method presented in BS EN ISO 12354-3:2017 '*Building acoustics. Estimation of acoustic performance of buildings from the performance of elements. Airborne sound insulation against outdoor sound*'.

4.2 Validation of the Acoustic Model

- 4.2.1 The model has been validated using the measured sound levels at the unattended survey locations.



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- 4.2.2 It is assumed that measured sound levels are representative of typical traffic flows at the M69 motorway and therefore measured noise levels can be used in order to validate the noise model.
- 4.2.3 Two different noise models have been validated using the results of the sound survey. One noise model has been calibrated to the recorded daytime $L_{Aeq,16hr}$ and night-time $L_{Aeq,8hr}$ presented in Table T8, a different noise model has been calibrated to the recorded night-time L_{Amax} presented in Table T8.

4.3 Maximum Noise Levels

- 4.3.1 An assessment of the maximum noise levels projected at each proposed dwelling has been undertaken taking into consideration the maximum 10th and 15th highest individual night maximum (L_{max}) events analysed during the night-time dataset in accordance with ProPG guidelines.
- 4.3.2 The assessment considered the analysis of 100 millisecond samples measured between 23:00 - 07:00 during the night (23:00 – 07:00) to obtain a true maximum noise level, in order to identify independent noisy events occurring at least 30 seconds apart (this is the assumed period to avoid consideration of various peaks from a same event/action).
- 4.3.3 From the measurement data at unattended roadside measurement position UT2, the value of 85 dB L_{AFmax} has been adopted, which corresponds to the 10th highest individual night maximum events recorded during the baseline survey. This model provides an estimation of the maximum (L_{max}) events during the night at the proposed new dwellings across the site. It is confirmed that the development site is dominated by road traffic noise from the M69 motorway and therefore the measurements at UT2 are considered to be a good source of data for the noise model.

4.4 Embedded Mitigation

- 4.4.1 The proposed development has implemented a continuous 5 m bund across the southern boundary of site, along the M69 motorway, as presented in the drawing ref 'Burbage Farm 1693-08-02-100-Site Layout', dated 23 June 2023. This has been included in the model.
- 4.4.2 Following a first round of modelling, the masterplan was revised in order to incorporate further considerations on good acoustic design. The masterplan was updated so that more buildings are facing the M69 motorway, with garden being shielded from the noise behind the building. The modelling results presented in this report include the latest iteration of the masterplan.

5 Suitability of Site for Residential Development (Detailed Element of Application)

5.1 External Amenity Noise Levels

- 5.1.1 Figure 3 presents the results of the acoustics model with the proposed development in place during the daytime. The model includes the proposed 5 m high barrier along the M69 motorway.



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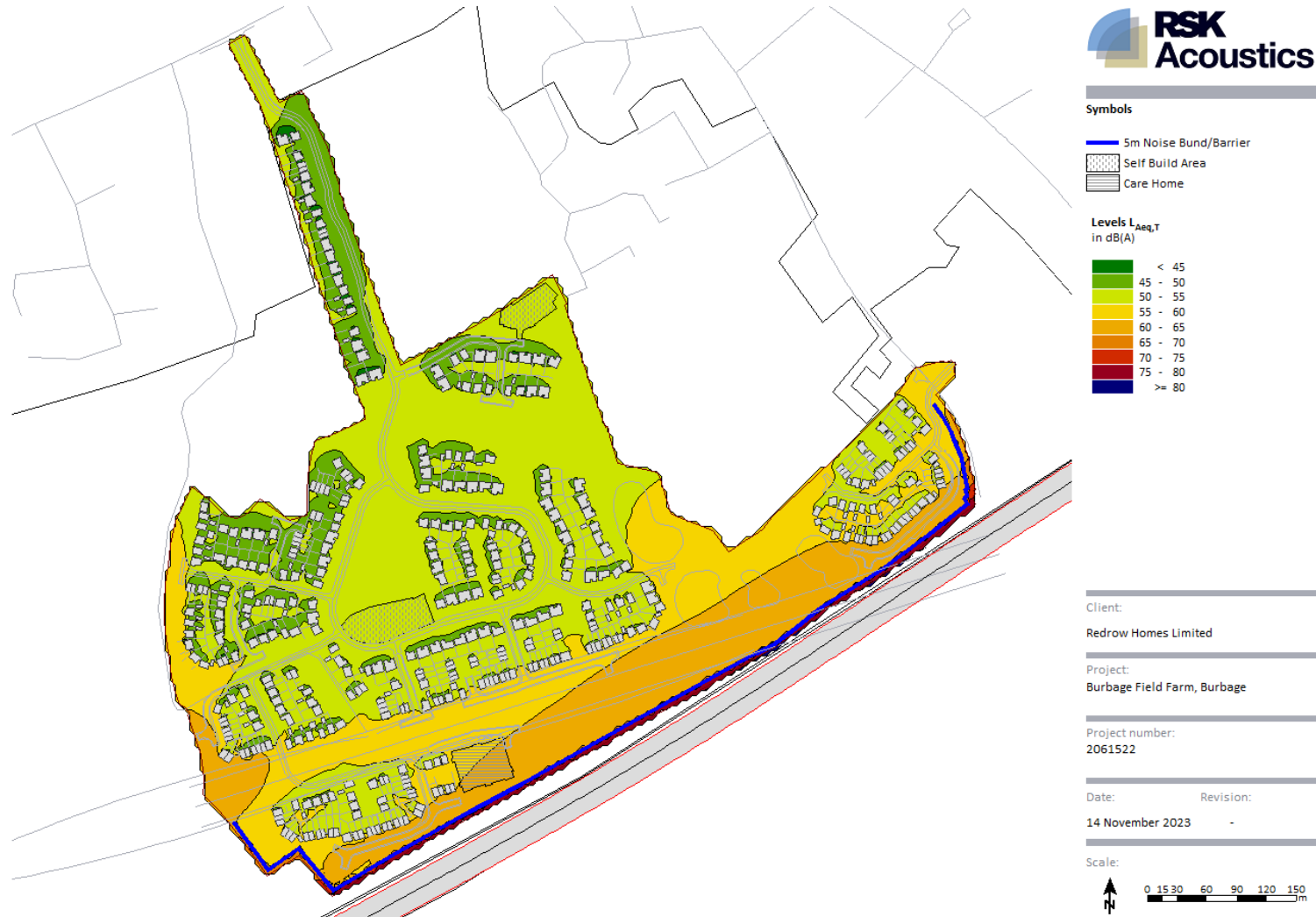


Figure 3 Daytime Ambient Noise Levels (including embedded mitigation measures). Receptor height: 1.5 m above ground level



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- 5.1.2 With reference to the BS8233 criteria for external amenity areas, daytime calculations indicate that sound levels in the vast majority of proposed external amenities are likely to fall below the upper guideline of 55 dB $L_{Aeq,16hr}$. Sound levels in a limited number of external amenity areas to the front of the development (i.e. parts of the development area facing the M69 motorway) are likely to fall above the upper guideline of 55 dB $L_{Aeq,16hr}$ due to noise from vehicular movements along the M69.
- 5.1.3 Due to the close proximity of the M69, it is likely that, even with additional mitigation in the form of acoustic treatment to the boundary of amenity areas, the upper guideline of 55 dB $L_{Aeq,16hr}$ would still be exceeded at a limited number of properties.
- 5.1.4 With reference to BS8233:2014, Paragraph 7.7.3.2 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.”*
- 5.1.5 It should be recognised that external noise levels in amenity areas should be balanced against other factors such as the convenience of living in such a location and the sustainability of the development. As such, as the development has been designed (within the constraints of the scheme) to achieve the lowest practicable levels in the majority of external amenity spaces, residential use of the site should not be prohibited.

5.2 External Building Fabric Assessment

Ventilation

- 5.2.1 The requirements for building ventilation in dwellings are detailed in ‘*Ventilation: Approved Document F*’ (ADF) and include provision for ‘whole dwelling ventilation’, ‘extract ventilation’ and ‘purge ventilation’.
- Whole Dwelling Ventilation - Nominally continuous ventilation of rooms or spaces at a relatively low rate to dilute and remove pollutants not removed by operation of extract ventilation or purge ventilation.
 - Extract Ventilation - The removal of air directly to the outside. May be provided by passive or mechanical means.
 - Purge Ventilation - Manually controlled ventilation at a relatively high rate to rapidly dilute pollutants and/or water vapour. Purge ventilation is typically provided by means of openable windows. Due to the temporary nature of purge ventilation, significant noise impacts are not normally expected.
- 5.2.2 ADF provides four ‘*template*’ systems which comply with the ventilation requirements for new dwellings and can be adopted to demonstrate compliance. These are:
- System 1: Background ventilators and intermittent extract fans.
 - System 2: Background ventilators and passive stack ventilation.



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- System 3: Continuous Mechanical Extract (MEV) with trickle ventilators providing inlet air.
- System 4: Continuous Mechanical Supply and Extract with Heat Recovery (MVHR).

5.2.3 Each system has different noise implications, however in the context of this assessment external noise ingress via the ventilation system is the primary concern. Generally, for systems 1-3 this is via the ventilators and for system 4 (MVHR) this is via the inlet and exhaust grilles within the dwelling associated with the MVHR system.

5.2.4 It is understood that ventilation to dwellings is to be provided by trickle ventilator units (i.e. System 1) located within each dwelling.

Calculation Parameters

5.2.5 Our external building fabric analysis has assumed the following:

Room Absorption

5.2.6 We have assumed the bedrooms and living rooms to be acoustically 'soft' with carpets, curtains and other soft furnishings. For the purposes of our analyses, we have assumed the average equivalent absorption coefficients detailed in Table T12.

Room	Average Equivalent Acoustic Absorption Coefficient (α) at Octave-band Centre Frequency (Hz)					
	63	125	250	500	1k	2k
Bedroom/Living room	0.1	0.18	0.25	0.27	0.31	0.32

T12 Average Equivalent Acoustic Absorption Coefficients

Proposed External Building Fabric

5.2.7 We have based our assessment on a typical brick and block external wall build-up and tiled roof. Please note that assessment of internal sound transfer falls outside the scope of this report and should be assessed in detail by the relevant specialists.

5.2.8 Table T13 details typical sound reduction indices associated with the assumed external building fabric construction.



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Construction	Average Equivalent Acoustic Absorption Coefficient (α) at Octave-band Centre Frequency (Hz)					
	63	125	250	500	1k	2k
100 mm brick/140 mm block cavity wall	36	41	45	45	54	58
Tiled/slatted roof, 12 mm plasterboard internal layer with 100 mm mineral wool insulation	19	24	34	40	45	49

T13 Assumed External Building Fabric Construction

- 5.2.9 Our calculations have been based on building and window dimensions obtained from drawings available in the document titled “*Burbage Filed Farm - House Type Brochure*”, dated January 2023, provided by email by Redrow.

5.3 Glazing and Ventilation Acoustic Specification and Guidance on Construction

- 5.3.1 The glazing performance specifications have been calculated based on the highest calculated incident façade noise levels, for each façade, presented in Figures 4 and 5 for the daytime and night-time respectively. The L_{max} levels have also been used for the assessment and are presented in Figure 6.



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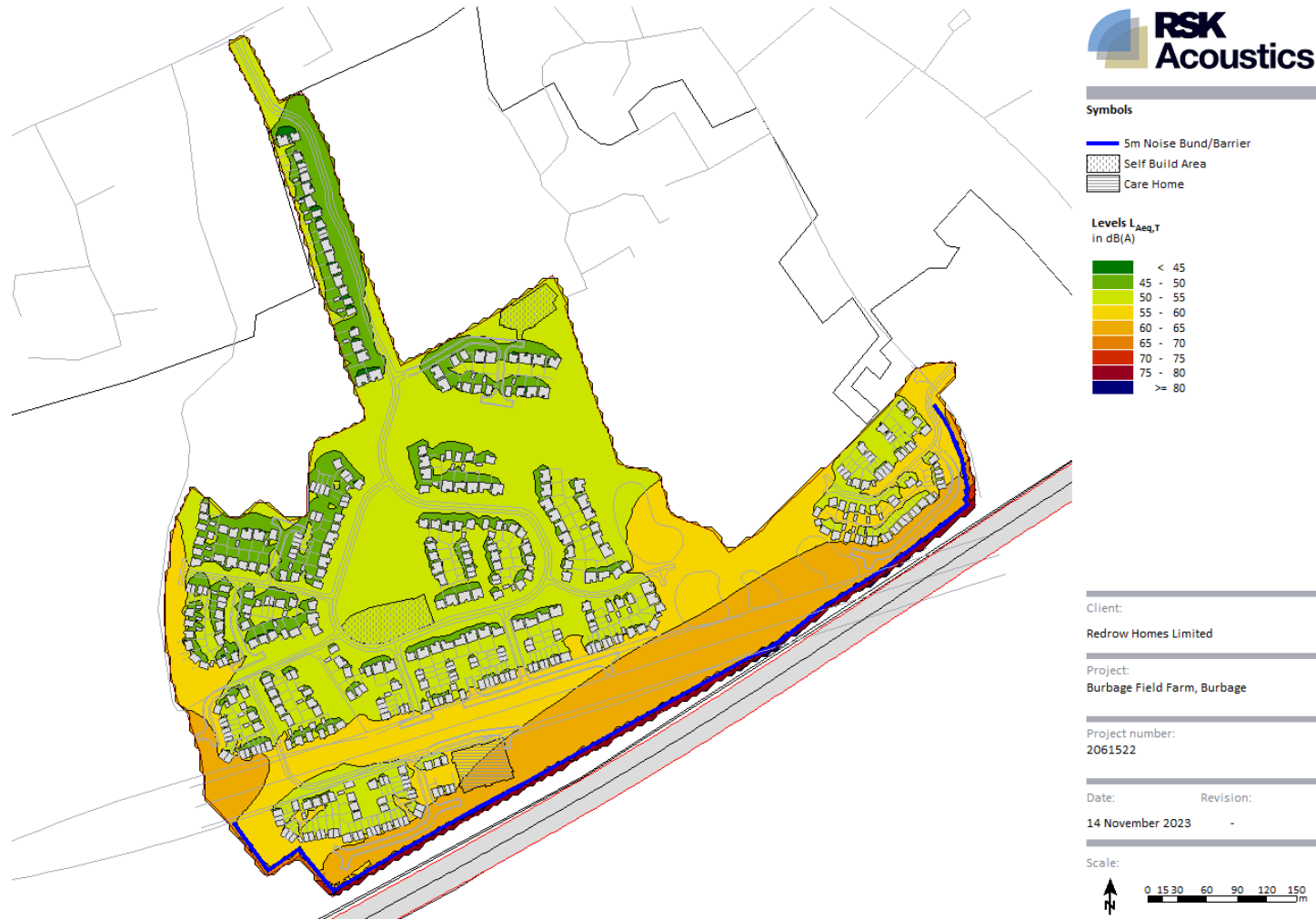


Figure 4 Daytime Ambient Noise Levels $L_{Aeq,16h}$.



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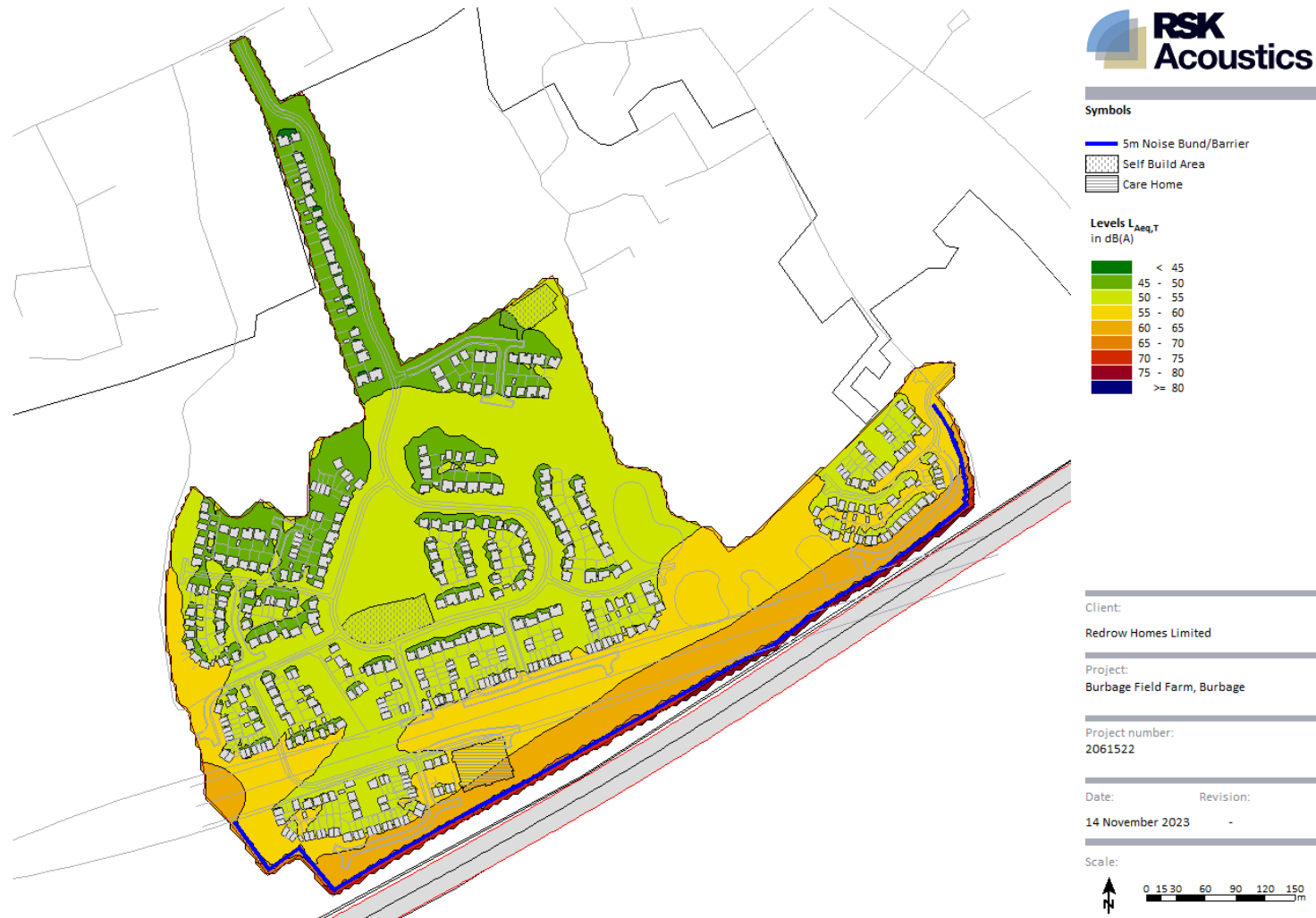


Figure 5 Night-time Ambient Noise Levels $L_{Aeq,8h}$.



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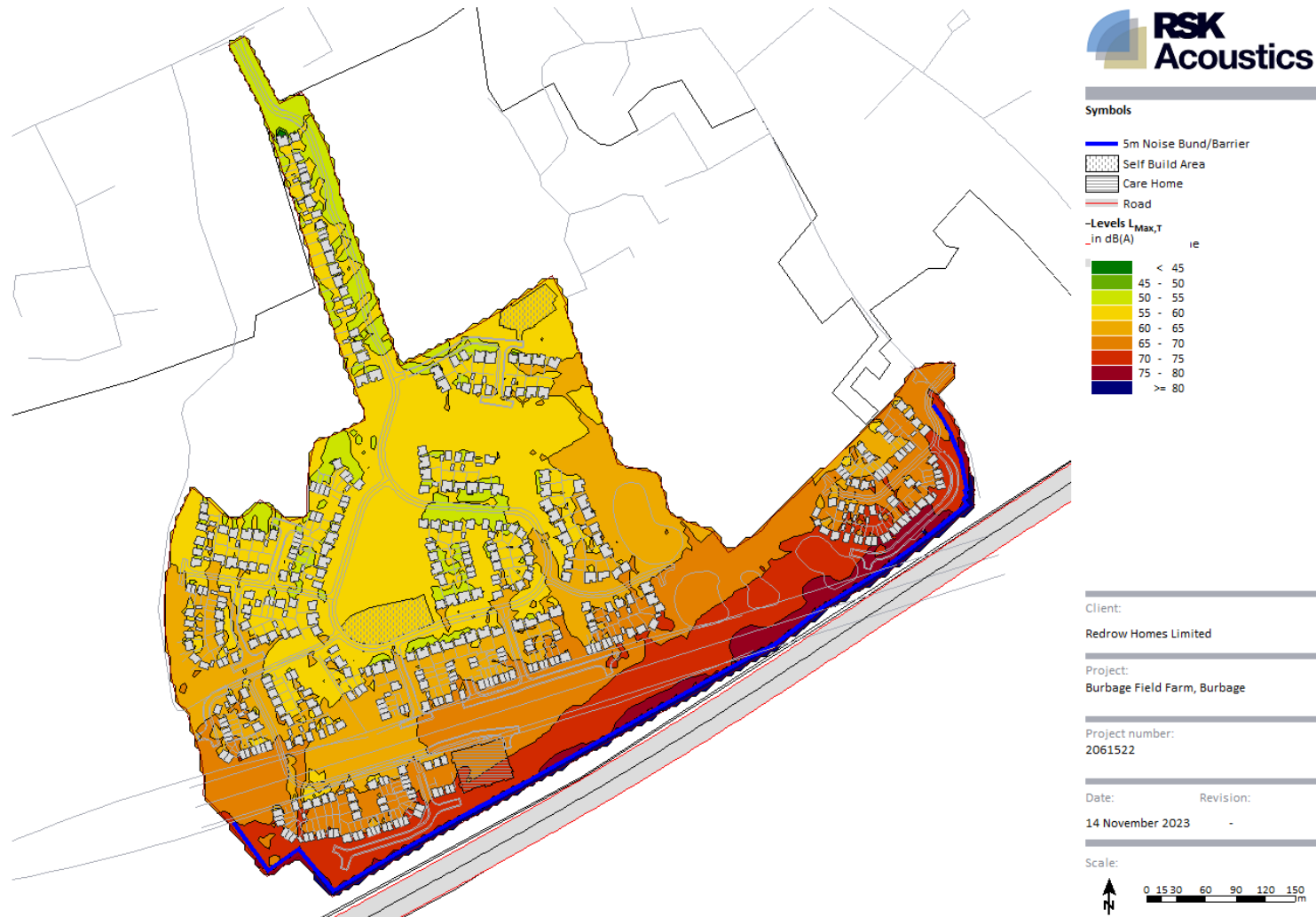


Figure 6 Night-time Maximum Levels, L_{Max}



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- 5.3.2 The glazing performance specifications apply to the glazing package as a whole inclusive of glazing, louvres, spandrel panels, framing, opening lights, doors, seal etc. The performance of the glazing system will depend on many factors such as the glazing configuration, size of windows panels, quality of framing, quality of sealing etc.
- 5.3.3 The proposed windows should be tested in accordance with BS EN ISO 10140-2:2021 “*Acoustics. Laboratory measurement of sound insulation of building elements - Measurement of airborne sound insulation*” and the quoted minimum sound reduction specifications should be met by the system as a whole, including frames etc. as appropriate, and not just the glass.
- 5.3.4 In accordance with the relevant guidance, calculations have been undertaken based on the windows being closed.
- 5.3.5 For guidance purposes we would suggest that a construction based around the following configurations is likely to prove commensurate with achieving the sound insulation performance specifications detailed within Appendix B.

Zone	Ventilation Type	Glazing Type	Guidance Glazing Construction
Zone 1	Acoustic Trickle Vents	Uprated Double Glazing	Uprated double glazing comprising 6.4 mm laminated glass / 12 mm cavity / 10 mm glass
Zone 2	Conventional Trickle Vents	Conventional Double Glazing	Double glazing comprising 10 mm glass / 16 mm cavity / 6 mm glass

T14 Glazing and Trickle Ventilator Guidance Constructions

- 5.3.6 Calculations show that Zone 1 will also need a second layer of plasterboard in the roof, as presented in Table T15.

Construction	Average Equivalent Acoustic Absorption Coefficient (α) at Octave-band Centre Frequency (Hz)					
	63	125	250	500	1k	2k
Tiled/slatted roof, 25 mm plasterboard internal layer with 100 mm mineral wool insulation	21	27	37	43	48	52

T15 Zone 1 Roof Guidance Constructions

- 5.3.7 Façade zones are presented in the below Figure 7. Glazing zones apply on all floors.



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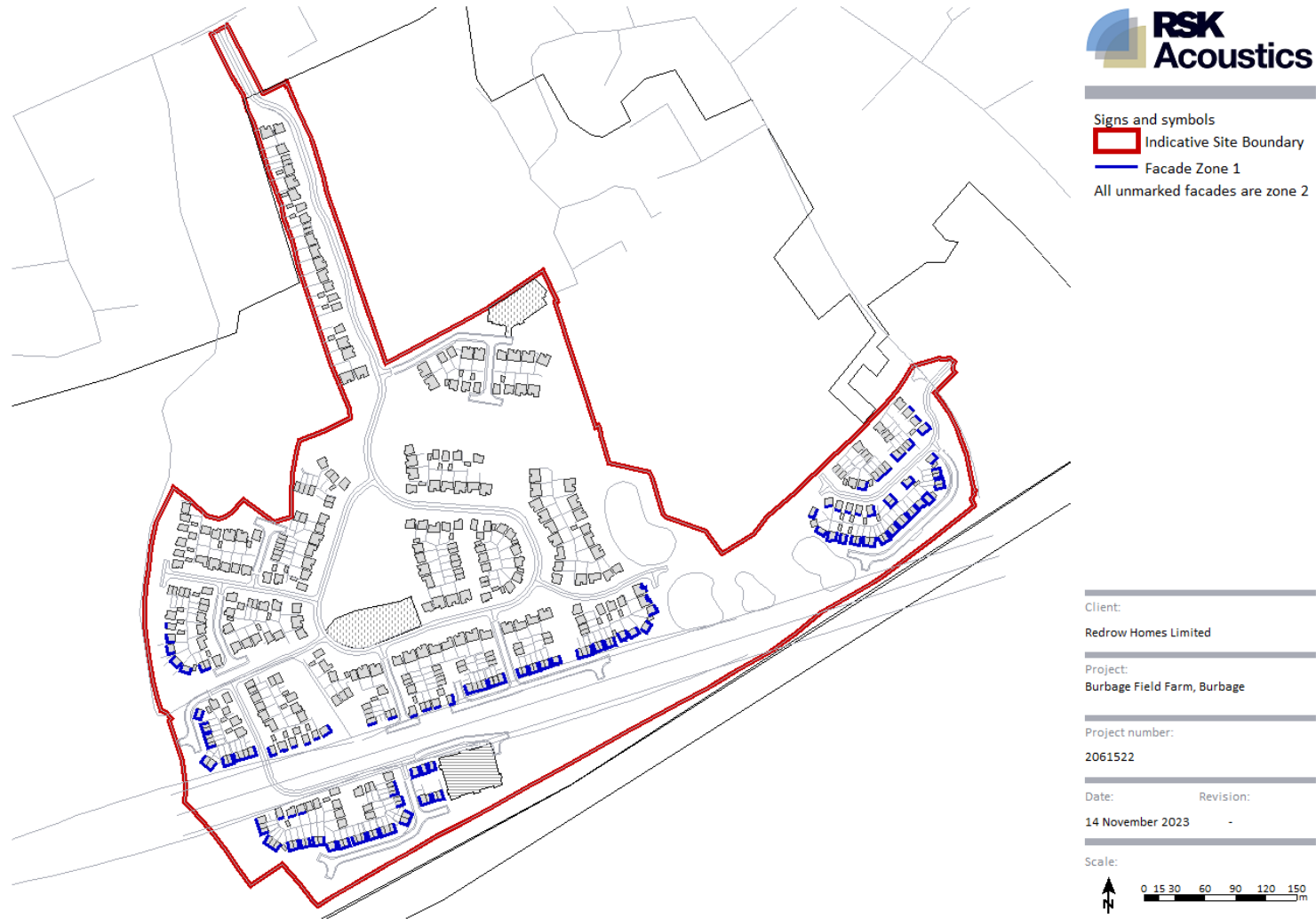


Figure 7 Façade Zones



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- 5.3.8 The guidance construction detailed above is provided for analysis purposes only. Selected glazing and ventilation systems should be capable of meeting the performance specifications shown in Appendix B, with laboratory test certificates being made available in support of the quoted performance. Glazing proposals which simply reflect the guidance constructions indicated in this report will not, in isolation, be sufficient evidence that a glazing configuration will meet the performance specification.
- 5.3.9 The acoustic specifications will need to be integrated, coordinated and ratified with the design by the principal designer and design team to ensure that all other design interfaces, buildability, workmanship and other requirements are considered.
- 5.3.10 Based on the results of the external building fabric assessment, the internal ambient sound levels are likely to meet the proposed criteria presented in Table T2, during both the daytime and night-time periods. This includes the L_{max} criterion during the night-time.

6 Site Suitability for Care Home and Self Build Areas (Outline Planning)

6.1 Self-build areas

- 6.1.1 Figures 4 and 5 show the calculated noise levels across the self-build areas during the daytime and night-time respectively.
- 6.1.2 Noise levels are likely to be below 55 dB $L_{Aeq,16h}$ during the daytime and 50 dB $L_{Aeq,8h}$ during the night-time.
- 6.1.3 With reference to the BS8233 criteria for external amenity areas, daytime calculations indicate that sound levels are likely to fall below the upper guideline of 55 dB $L_{Aeq,16hr}$ across the areas.
- 6.1.4 Internal noise criteria are also likely to be met with standard double glazing and trickle vents and the areas are deemed suitable for residential development provided that a good acoustic design process is followed.

6.2 Care Home

- 6.2.1 Figures 4 and Figure 5 show that, noise levels across the proposed car home area are likely to be up to approximately 64 dB $L_{Aeq,16h}$ during the daytime and up to approximately 62 dB $L_{Aeq,8h}$ during the night-time.
- 6.2.2 Due to the proximity of the M69 motorway, high performing acoustic glazing and acoustic trickle vents are likely to be required to meet the internal noise criteria.
- 6.2.3 It is also likely that external amenity areas of the care home will fall above the upper guideline level of 55 dB $L_{Aeq,16h}$ and the building layout and the orientation of the building should be considered in order to meet the criterion.



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- 6.2.4 Exact mitigation requirements for the care home should be reviewed during the detailed design phase.

7 Operational Road Traffic Noise Assessment

- 7.1.1 The assessment of noise due to the Proposed Development on the existing sound climate in surrounding areas is based on the change in sound levels at noise sensitive receptors due to a change in the volumes of road traffic generated by the Proposed Development.
- 7.1.2 Table T16 below presents the predicted change in noise levels, in both the short term and in the long term, based on the traffic flow predictions along the road links provided by the transport consultants.

Road Links.	Short Term Change in Sound Levels, in dB	Long Term Change in Sound Levels, in dB
M69 Eastbound	0.0	0.3
M69 Westbound	0.0	0.2
Rugby Road south of Canberra Way	0.1	0.2
Rugby Road south of Coventry Road	0.2	0.2
Rugby Road north of Coventry Road	0.1	0.2
Coventry Road West of site access	0.8	0.8
Coventry Road east of site access	0.9	1.3
Strutt Road	0.4	1.0
B578 Lutterworth Road	0.3	0.9

T16 Noise Monitoring Locations

- 7.1.3 The change in noise levels at noise sensitive receptors as a result of traffic generated by the proposed development is likely to be negligible at all noise sensitive receptors in both the short term and in the long term. No mitigation measures have therefore been deemed necessary.

8 Conclusions

- 8.1.1 RSK Acoustics Limited has been commissioned by Redrow Homes Limited to undertake a noise assessment report to support a detailed planning application for the proposed residential development at Burbage Field Farm, Burbage
- 8.1.2 An unattended environmental sound survey was undertaken at four locations within the site boundary between Thursday 01 December 2022 Tuesday 06 December 2022 in order to determine the existing ambient sound climate at the site.
- 8.1.3 An acoustic model of the site has been developed based on the survey data and the traffic information provided by the transport consultants.



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- 8.1.4 Assessment criteria have been proposed based on relevant guidance and standards.
- 8.1.5 Analysis of the proposed external building fabric has been undertaken in order to determine the acoustic performance of the glazed and ventilation elements. Compliance with the acoustic performance specification detailed herein is expected to result in compliance with the proposed acoustic criteria.
- 8.1.6 It is recommended that the acoustic specifications will need to be integrated, coordinated and ratified with the design by the principal designer and design team to ensure that all other design interfaces, buildability, workmanship and other requirements are considered.
- 8.1.7 The predicted sound levels in external amenity areas are likely to meet the proposed criterion, without specific mitigation measures in the majority of proposed external amenities. Sound levels in a limited number of external amenity areas adjacent to the M69 are likely to fall above the upper guideline level of 55 dB $L_{Aeq,16hr}$ due to noise from vehicular movements along the motorway.
- 8.1.8 It should be recognised that external noise levels in amenity areas should be balanced against other factors such as the convenience of living in such a location and the sustainability of the development. As such, as the development has been designed (within the constraints of the scheme) to achieve the lowest practicable levels in the majority of external amenity spaces, residential use of the site should not be prohibited.
- 8.1.9 A high-level site suitability assessment for outline planning has been undertaken for a proposed care home and self-build plots. Due to the care home's proximity to the M69 motorway, it is likely that additional mitigation (ventilation and glazing) will be required to achieve desired internal noise levels. There is a possibility that the external amenity areas for the care home will exceed the upper guideline level 55 dB $L_{Aeq,16hr}$ due to noise from the motorway.
- 8.1.10 It is recommended that a full assessment is undertaken during the detailed design of the care home.
- 8.1.11 The change in noise levels as a result of traffic generated by the proposed development has been assessed. The results of the assessment show that the changes in noise levels due to the changes in road traffic are likely to be negligible at all noise sensitive receptors and no specific mitigation is proposed.



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9 References

- Noise Policy Statement for England (NPSE). DEFRA, 2010.
- National Planning Policy Framework. Department for Communities and Local Government. July 2021.
- Night Noise Guidelines for Europe. World Health Organisation, 2009.
- Professional Practice Guidance on Planning & Noise (ProPG: Planning & Noise). Acoustics & Noise Consultants (ANC), Institute of Acoustics (IoA) and Character Institute of Environmental Health (CIEH). November 2017.
- British Standard 8233: 2014, Sound insulation and noise reduction in buildings – code of practice. British Standards Institution, 2014.
- Guidelines for community noise. World Health Organisation, 1999.
- Design Manual for Roads and Bridges. LA 111 'Noise and Vibration' (formerly HD 213/11, IAN 185/15). Highways England, 2020.
- ISO 9613-2:1996. Acoustics – Attenuation of sound during propagation outdoors. Part 2: General method of calculation. International Organization for Standardization, 1996.
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- British Standard 7445-1:2003, Description and measurement of environmental noise. Parts 1 to 3: Guide to quantities and procedures. British Standards Institution, 1991 to 2003.
- British Standard EN 61672-1:2013, Electroacoustics. Sound level meters. Specifications. British Standards Institution, 1991 to 2013.
- Calculation of Road Traffic Noise. Department of Transport, Welsh Office HMSO, 1988.
- British Standard EN IEC 60942:2018, Electroacoustics. Sound calibrators.
- BS EN ISO 10140-2:2021 Acoustics. Laboratory measurement of sound insulation of building elements - Measurement of airborne sound insulation. International Organization for Standardization, 2021.

 End of Section



Noise Impact Assessment

Glossary of Acoustic Terms

L_{Aeq} :

The notional steady sound level (in dB) which over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measurement over that period. Values are sometimes written using the alternative expression dB(A) L_{eq} .

L_{Amax} :

The maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise when occasional loud noises occur, which may have little effect on the L_{Aeq} noise level. Unless described otherwise, L_{Amax} is measured using the “fast” sound level meter response.

L_{A10} and L_{A90} :

If non-steady noise is to be described, it is necessary to know both its level and degree of fluctuation. The L_{An} indices are used for this purpose. The term refers to the A-weighted level (in dB) exceeded for n % of the time specified. L_{A10} is the level exceeded for 10 % of the time and as such gives an indication of the upper limit of fluctuating noise. Similarly, L_{A90} gives an indication of the lower levels of fluctuating noise. It is often used to define the background noise.

L_{A10} is commonly used to describe traffic noise. Values of dB L_{An} are sometimes written using the alternative expression dB(A) L_n .

L_{AX} , L_{AE} or SEL

The single event noise exposure level which, when maintained for 1 second, contains the same quantity of sound energy as the actual time varying level of one noise event. L_{AX} values for contributing noise sources can be considered as individual building blocks in the construction of a calculated value of L_{Aeq} for the total noise. The L_{AX} term can sometimes be referred to as Exposure Level (L_{AE}) or Single Event Level (SEL).

$L_{Ar,Tr}$:

The rating level $L_{Ar,Tr}$ is the specific sound level of the source under assessment plus any adjustment for the characteristic features of the sound.

■ End of Section

Appendix A - Time History Graphs

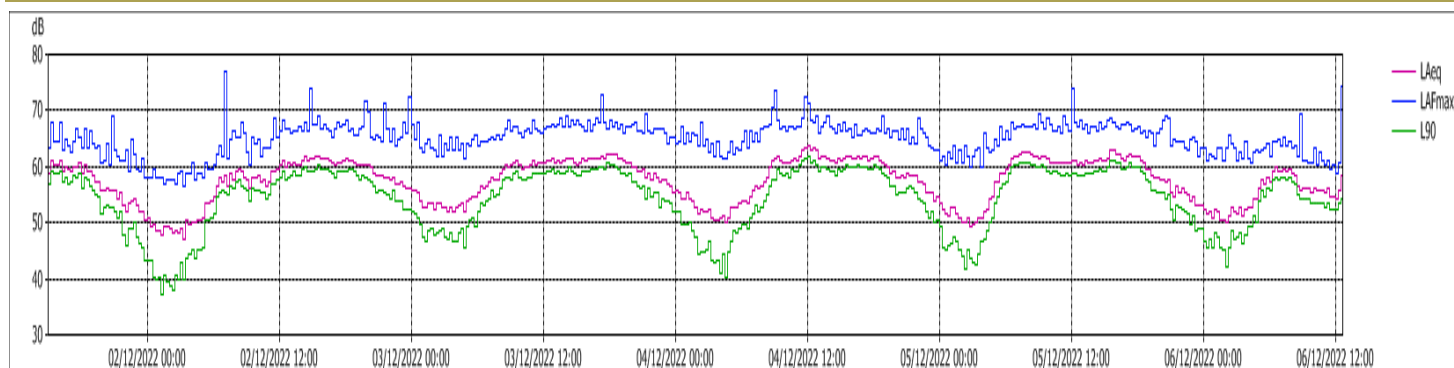


Figure A.1 Time History Graph UT1

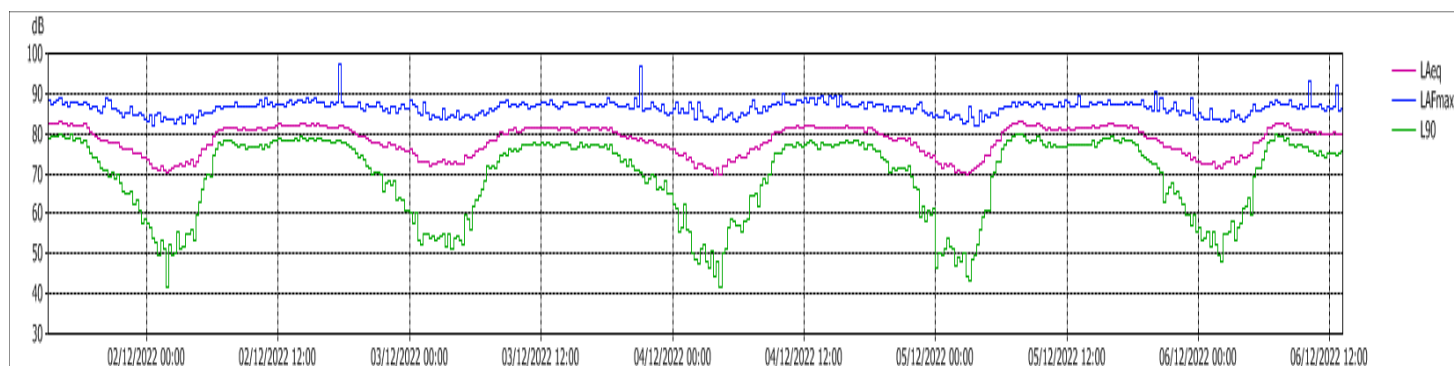


Figure A.2 Time History Graph UT2



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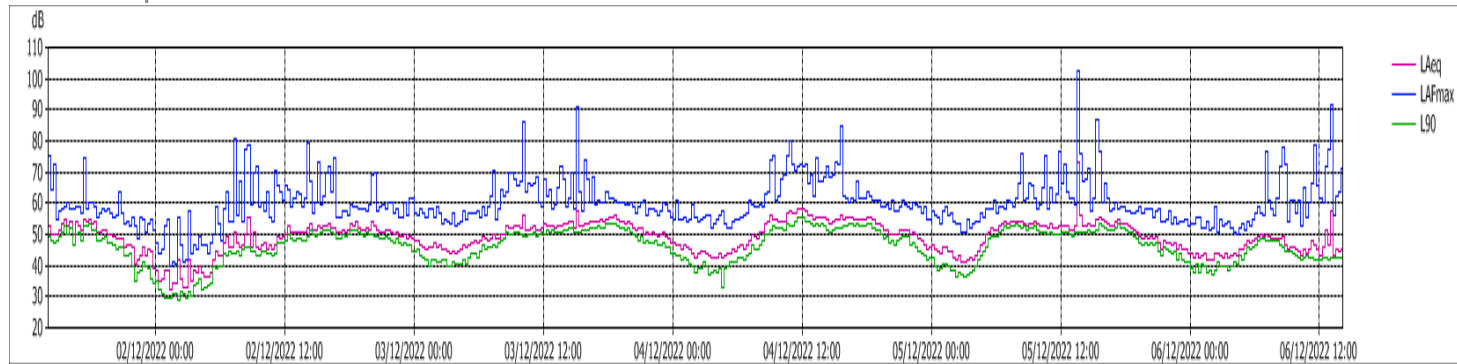


Figure A.3 Time History Graph UT3

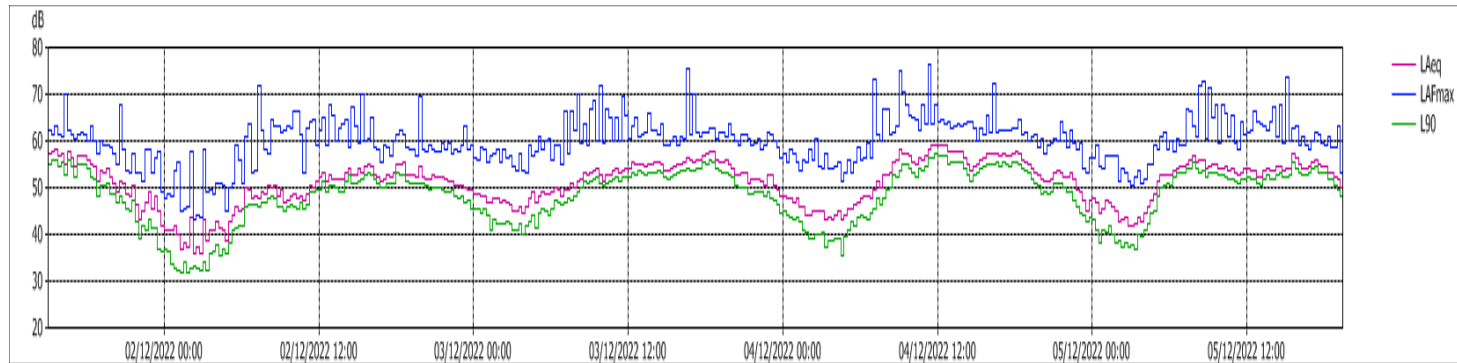


Figure A.4 Time History Graph UT4

Appendix B - External Building Fabric Acoustic Performance Specification

The project criteria are expressed in terms of an overall A-weighted dB sound level. Alternative frequency specific performance levels may therefore be acceptable subject to confirmation from RSKA.

Fully detailed test reports from independent acoustic test authorities shall be supplied. All test reports shall be in English or, a full English translation.

Test data should include the 1/3 octave band results from 100 Hz to 3150 Hz inclusive, together with the corresponding octave band results from 125 Hz to 4000 Hz inclusive.

As a result of wind or other atmospheric effects, external building elements should not give rise to rattling, creaking or whistling.

Glazing Sound Insulation Performance

The complete glazing system (including frames, joints, seals, spandrel panels and opening lights and trickle vents (as appropriate)) shall achieve the following minimum sound reduction indices when tested in accordance with BS EN ISO 10140-2:2021.

Glazing Type	Minimum Sound Reduction Index (R) value (dB) at Octave Band Frequency (Hz)					R _w *
	125	250	500	1k	2k	
Z1	30	27	34	41	47	38
Z2	19	22	25	33	33	30

*The overall R_w figure is provided for guidance purposes only. The octave-band specification should be referred to in order to check compliance with the requirements.

Trickle Ventilator Sound Insulation Performance

Trickle ventilators should achieve the following minimum element normalised level differences when tested in accordance with BS EN 10140-2:2021.

Ventilator Type	Minimum Normalised Element Difference ($D_{n,e}$) Value (dB) at Octave Band Centre Frequency (Hz) for Single Ventilator					$D_{n,e,w}$ *
	125	250	500	1k	2k	
Z1	39	37	34	35	39	36
Z2	26	27	28	30	30	30

*The overall $D_{n,e,w}$ figure is provided for guidance purposes only. The octave-band specification should be referred to in order to check compliance with the requirements.

It should be noted that the acoustic specification for trickle ventilators is based on a single ventilator within the room providing an equivalent free area of 8000 mm². If the number of ventilators (of the same free area) in a habitable space is greater than this, then the specification of each ventilator should be adjusted using the corrections in the table below.

Performance Correction (dB) For Equivalent Opening Area of Trickle Ventilators in Room (mm ²)				
4000	8000	10,000	12,000	16,000
-3	+0	+1	+2	+3

If the equivalent free area is not listed within the table, please refer to a suitably qualified acoustician to determine the appropriate performance correction.

 End of Section

