MEC Consulting Group

ACOUSTIC AIR

Land off Desford Lane, Ratby
Acoustics Assessment
November 2024

Report Ref: 29158-ENV-0401

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REPORT REF: 29158-ENV-0401

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REGISTRATION OF AMENDMENTS

Date	Rev	Comment	Prepared By	Checked By	Approved By
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APPENDICES

1.0 INTRODUCTION

1.1 MEC Consulting Group Ltd (MEC) has been commissioned by Bellway Homes Limited, to undertake an Acoustics Assessment aimed at discharging the planning condition pertaining to the planning permission for the proposed residential development on Land off Desford Lane, Ratby (hereafter referred to as 'the Site').

1.2 Planning condition 23 of the outline planning permission (ref: 21/01295/OUT), requires the following:

"23. Layout and appearance reserved matters shall include a noise investigation and mitigation strategy detailing how occupants of dwellings on the site will be protected from adverse noise effects arising from the adjacent Stonecraft works. The development shall be implemented in accordance with the approved noise investigation and mitigation strategy prior to occupation of the development."

Existing Site

1.3 The Site, comprised of arable land, is bound by Desford Lane and the Ratby Sports Club to the north; scrub land, with the Benlowe Group (hereafter referred to as 'Benlowe'), a manufacturer of timber windows and doors, to the east; arable land to the south; and Stonecraft Paving Centre (hereafter referred to as 'Stonecraft') and arable land to the west.

1.4 The principal sources of noise affecting the Site will be from Stonecraft and Benlowe, coupled with contributions from road traffic using Desford Lane.

1.5 An approximate redline boundary is presented in Figure 1.1

Figure 1.1: Approximate Redline Boundary

1.6 Development proposals for the Site comprise the erection of residential dwellings, with associated infrastructure and access via Desford Lane.

1.7 The presentation layout is provided in **Appendix A**.

Assessment Scope

1.8 The following scope of works has been undertaken:

- An environmental sound survey has been undertaken within the Site in order to determine the prevailing conditions;
- Assessment of Stonecraft and Benlowe has been undertaken in accordance with BS 4142[1], based upon source noise levels presented within the Noise Assessment prepared for the outline application (report ref: GM11484 0002), and an Occupational Noise Assessment prepared for Stonecraft (report ref: 6519/AD/SAF);
- An acoustic model has been created in order to predict sound levels across the Site for comparison against relevant criteria contained within BS 4142, ProPG[2] and the British Standard BS 8233[3];
- An acoustics-led overheating assessment has been undertaken to determine the number of dwellings that can achieve internal sound levels outlined in AVOG[4]; and
- Where required, appropriate mitigation measures have been provided to demonstrate compliance with the relevant standards.

1.9 The conclusions of this report aim to demonstrate to the Local Planning Authority (LPA) that external and internal acoustic conditions will be compliant with the relevant British Standards and Acoustics Guidance.

Disclaimer

1.10 MEC has completed this report for the benefit of the individuals referred to in Paragraph 1.1 and any relevant statutory authority which may require reference in relation to approvals for the proposed development. Other third parties should not use or rely upon the contents of this report unless explicit written approval has been gained from MEC.

1.11 MEC accepts no responsibility or liability for:

- The consequence of this documentation being used for any purpose or project other than that for which it was commissioned;
- The issue of this document to any third party with whom approval for use has not been agreed.

[1] BS 4142:2014 +A1:2019 *'Methods for rating and assessing industrial and commercial sound.'*
[2] Professional Practice Guidance on Planning and Noise, May 2017.
[3] BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'
[4] Acoustics Ventilation and Overheating, Residential Design Guide, V1.1. January 2020.

2.0 STANDARDS AND GUIDANCE

General

2.1 An acoustics glossary is provided in **Appendix B** to assist the reader.

Summary of Guidance and Standards

2.2 The following guidance and standards relevant to the assessment are outlined below:

- National Planning Policy Framework (NPPF) 2023;
- Noise Policy Statement for England (NPSE) 2010;
- BS 4142:2014+A1:2019 *'Methods for rating and assessing industrial and commercial sound';*
- Professional Practice Guidance on Planning and Noise (ProPG) 2017;
- BS 8233:2014 *'Guidance on sound insulation and noise reduction for buildings'*; and
- Acoustics Overheating and Ventilation Guide (AVOG) 2020.

2.3 For conciseness, the guidance and standards most appropriate to this assessment are summarised in this section.

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

2.4 BS 4142 describes methods for rating and assessing industrial and/or commercial sound and includes, but is not limited to, the assessment of:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical equipment;
- Sound from the (un)loading of goods and materials at industrial/commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes such as that from forklift trucks on or around an industrial and/or commercial site.

2.5 The methods described in BS 4142 use outdoor sound levels to assess the likely effects of sound on people who are typically outside residential premises. Although indoor effects can be indicated where the façade composition is known. A summary of the approach set out in BS 4142 is set out below:

- Establish or predict the specific sound level of the source(s) by considering both the ambient (includes the source to be assessed) and residual (excludes the source to be assessed but includes all remaining sources) sound level;
- Measure the representative background sound levels, typically by measuring close to the receptor location;
- Rate the specific sound level to account for any distinguishing characteristics (see below);
- Estimate the impact by subtracting the background sound level from the rating level; and
- Consider the initial estimate of impact, as determined above, in the context of the noise and its environment.

2.6 The specific sound level is rated to account for distinguishing characteristics by using penalties for tonality, impulsivity, intermittency and other sound characteristics. The dominant acoustic characteristic should be applied to avoid large penalties which is in accordance with the Institute of Acoustics response to BS 4142.

2.7 The character corrections are flexible according to whether the acoustic character is just perceptible at the noise receptor, or is clearly perceptible or highly perceptible, and range from 0 to 6 dB for tonal noise, 3 to 9 dB for impulsive noise, and 3 dB for other non-tonal/impulsive acoustic characteristics.

2.8 An initial estimate of impact of the specific sound is obtained by subtracting the background sound level from the rating level. Typically, the greater the difference, the greater the magnitude of impact.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;
- At differences lower than +5 dB a low impact is likely, depending on the context. The lower the rating level is to the measured background sound level, the less likely it is that the specific sound source will have an impact.

2.9 The results of the initial assessment should then be considered in light of all pertinent contextual factors.

Professional Practice Guidance on Planning and Noise (ProPG) 2017

2.10 ProPG seeks to secure good acoustic design for new residential developments. The guidance includes a framework to enable situations where noise is not an issue but to help identify the extent of risk at noisier sites. 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.

2.11 The guidance is 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. However, if the industrial/commercial source is dominant, an assessment in accordance with BS 4142 should be conducted.

2.12 A two-stage approach is considered whereby:

- Stage 1 – an initial noise risk assessment of the proposed development site is undertaken;
- Stage 2 – a systematic consideration of internal and external noise levels is considered ensuring good acoustic design and consideration of other relevant issues is recognised.

2.13 ProPG also references the World Health Organisation (WHO) guidance on maximum noise levels at night. Guidance from the WHO states that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10 – 15 times per night. ProPG indicates that individual noise events do not exceed 45 dB L_{AFmax} more than 10 times a night and therefore this is considered as criteria in addition to that outlined in Table 2.1.

2.14 Whilst ProPG does not define a measurement interval for the assessment of L_{AFmax} levels, research[5] has been undertaken which indicates that, for Maximum Event Level assessments, a sampling interval of between 1 and 3 minutes relates most closely to how awakening events are experienced by people in reality when compared to longer sampling periods.

2.15 For brevity, within the study, the majority of people (circa 75-85%) under test returned to a sleep state by approximately 2.5 minutes after the initial awakening event.

2.16 In summary, a longer sampling period can result in the under assessment of the 10th highest maximum level, therefore, based upon research and the recommendation of the Institute of Acoustics (IOA), a sample measurement of 2 minutes has been used to inform this assessment.

2.17 Upon completion of the ProPG's Stage 1 and 2 assessments, the findings should enable one of four possible recommendations to be presented to the decision maker, namely to grant permission without conditions, grant with conditions, 'avoid' or 'prevent'.

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

2.18 BS 8233 provides recommendations for the control of noise in and around buildings. The guidance provided includes appropriate internal and external noise level criteria which are applicable to residential buildings exposed to steady external noise sources. It is stated in the British Standard that it is desirable for internal ambient noise levels to not exceed the criteria set out in Table 2.1.

Table 2.1: BS 8233: 2014 Table 4 – Indoor Ambient Noise Levels for Dwellings

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

2.19 Additional guidance in BS 8233 indicates that appropriate ventilation should be provided, if relying on closed windows to meet the guide values, and that such ventilation should not compromise the façade insulation and resulting noise levels.

2.20 BS 8233 additionally includes guidance on external amenity areas whereby it states that external noise levels should not exceed 50 dB $L_{Aeq,T}$ with an upper guideline of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments.

Acoustics Overheating and Ventilation Guide (AVOG) 2020

2.21 The AVOG was published by the Association of Noise Consultants (ANC) and The Institute of Acoustics (IOA) in 2020. The guide outlines a methodology for the assessment of airborne sound during overheating conditions, and emphasises the co-dependency of acoustics, ventilation and overheating design.

[5] Paxton et al., Assessing L_{max} for residential development: The AVO Guide Approach, Institute of Acoustics, 2019

2.22 Many developments require closed windows to provide good internal acoustic conditions. This is in direct contrast to the fact that residents typically open windows in order to keep a building cool. These opposing requirements are becoming a major issue in the design of buildings, in particular for housing, especially as the aim is to avoid widespread use of mechanical ventilation and cooling systems.

2.23 AVOG prescribes a two-level assessment procedure, as follows:

- Level 1 – Site Risk Assessment, based on external free-field noise levels (similar to that of ProPG); and
- Level 2 – Assessment of Adverse Effect, based on internal ambient noise level and duration.

2.24 An AVOG Level 2 assessment gives consideration to internal noise levels on a sliding scale depending on the likelihood and duration of overheating. The internal noise levels can be associated with adverse effect levels such as:

- NOAEL – No Observed Adverse Effect Level (no effect can be detected, typically BS 8233 criteria);
- LOAEL – Lowest Observed Adverse Effect Level (adverse effects start to be detected); and
- SOAEL – Significant Observed Adverse Effect Level (significant adverse effects on health and quality of life occur).

2.25 An interpretation of the sliding scale within AVOG is presented in Table 2.2.

Table 2.2: AVOG Level 2 Criteria

Effect Level	Internal Noise Level Criteria		
	Daytime $L_{Aeq,16hr}$ dB	Night-time $L_{Aeq,8hr}$ dB	Night-time Maximum $L_{AFmax,2min}$ dB
NOAEL	< 35	< 30	Fixed Criteria of 65 dB
LOAEL	35	30	
SOAEL	40 – 50	35 – 42	
Note: As internal noise levels rise from LOAEL to SOAEL, there is an increasing risk of an adverse effect level and mitigation measures may be required. Furthermore, SOAEL is dependent on how often overheating is likely to occur as higher noise levels may only be tolerable for shorter periods.			

2.26 With regards to the L_{AFmax} criteria during periods of overheating, AVOG applies heightened acoustic criteria above the 45 dB L_{AFmax} criterion outlined in ProPG, which is used for assessment during typical conditions.

2.27 This is due to the fact that the aforementioned research, undertaken by Paxton et al., indicates that sleep disturbance, in the form of behavioural awakenings which should be avoided, does not occur until event levels of 65 dB L_{AFmax} are experienced, and that the ProPG criteria is typically regarded as the point where minor sleep state changes occur, but are not remembered by those people affected.

2.28 When selecting a representative design maximum, it is proposed that a design maximum is selected for the LOAEL (ventilation) and SOAEL (overheating) assessments. In many cases, separate design values should be used to ensure that the SOAEL is not normally exceeded. However, in some cases, a single survey value may be more appropriate to use for both assessments, and practitioners are encouraged to use their judgement and clearly state the basis for their choice of design maximum or maxima.

3.0 ENVIRONMENTAL SOUND SURVEY

3.1 An environmental sound survey was undertaken between Thursday 3rd and Tuesday 8th October 2024. The survey was undertaken in full accordance with the guidance set out in BS 7445[6].

3.2 Sound Level Meters (SLMs) were installed at three locations, as follows:

- Continuous Measurement 1 (CM1): approximately 6m from the carriageway edge of Desford Lane;
- Continuous Measurement 2 (CM2): along the eastern boundary with Benlowe; and
- Continuous Measurement 3 (CM3): along the south western boundary with Stonecraft.

3.3 The measurement positions are identified in Figure 3.1.

Figure 3.1: Measurement Positions

Equipment

3.4 Measurements were taken using Class 1 integrating/averaging SLMs housed in environmental protection apparatus. The SLMs were installed in a free field position at a height of 1.5m above local ground level, and field calibrated before and after the survey using a Class 1 calibrator, with no significant drift in calibration noted.

[6] BS 7445-1:2003 'Description and measurement of environmental noise, Part 1: Guide to quantities and procedures.'

3.5 The SLMs were set up to capture the following parameters at a minimum: L_{Aeq}, L_{A90} and L_{AFmax} values, and full details of the equipment used to undertake the sound and vibration survey are presented in Table 3.1.

Table 3.1: Equipment and Calibration Details

Measurement Position	Description	Manufacturer & Type No.	Serial No.	Calibration Due Date
CM1 & CM3	Sound Level Meter	Type NOR140	1407599	20/08/2026
	Pre-Amplifier	Type 1209	22646	
	Microphone	Type 1225	384571	
	Calibrator	Norsonic 1255	125525494	21/08/2025
CM2	Sound Level Meter	Type NOR140	1407932	26/02/2025
	Pre-Amplifier	Type 1209	23695	
	Microphone	Type 1225	505583	
	Calibrator	Norsonic 1255	125525772	21/11/2024

Meteorological Conditions

3.6 During setup of the monitoring equipment, weather conditions were sunny and warm, with interchangeable winds of up to 1 m/s. On collection, weather conditions were sunny and dry, with occasional wind gusts from the southeast.

3.7 It can therefore be concluded that there were no significant adverse meteorological conditions that could influence the survey outcomes.

Observations

3.8 Site notes indicate the predominant source of noise affecting the Site was from external plant associated with Benlowe, with contributions from Desford Lane at CM1, and faint reversing beepers audible at CM2. It should be noted that during the attended measurement period, there was no audible contributions from Stonecraft, and certainly no dominant noise that would warrant assessment under BS 4142. Nevertheless, further consideration has been given to potential impacts from Stonecraft.

Results

3.9 Time history graphs are provided in **Appendix C.**

3.10 Table 3.2 provides a summary of measured assessment appropriate sound levels at CM1.

Table 3.2: Summary of Measured Sound Levels at CM1, dB

Date	Daytime 07:00 – 23:00	Night-time 23:00 – 07:00	
	$L_{Aeq,T}$	$L_{Aeq,8hr}$	Typical Maximum Event Level[(a)] $L_{AFmax,2min}$
Thu 3rd	62[(b)]	55	72
Fri 4th	62[(c)]	-	-

[(a)] Maximum noise level not exceeded more than 10 times per night.
[(b)] T = 9hr
[(c)] T = 5.5hr

3.11 At CM1, the derived daytime $L_{Aeq,16hr}$ was 62 dB (rounding to the nearest whole number for assessment purposes), while the measured night-time $L_{Aeq,8hr}$ was 55 dB.

3.12 Analysis of the night-time $L_{AFmax,2min}$ levels shows that the individual events did not exceed 72 dB more than 10 times during the measured night-time period. Investigation of the audio recordings shows that all values above 72 dB were caused by vehicular 'pass-bys', with no significant low frequency spectral content. Therefore, a value of 72 dB $L_{AFmax,2min}$ is considered appropriate for the assessment.

3.13 Table 3.3 provides a summary of measured assessment appropriate sound levels at CM2.

Table 3.3: Summary of Measured Sound Levels at CM2, dB

Date	Daytime 07:00 – 23:00	Night-time 23:00 – 07:00	
	$L_{Aeq,T}$	$L_{Aeq,8hr}$	Typical Maximum Event Level[(a)] $L_{AFmax,2min}$
Thu 3rd	53[(b)]	51	59
Fri 4th	51	44	55
Sat 5th	48	44	53
Sun 6th	47	41	53
Mon 7th	49	46	56
Tue 8th	52[(c)]	-	-

[(a)] Maximum noise level not exceeded more than 10 times per night.
[(b)] T = 9hr
[(c)] T = 7hr

3.14 At CM2, the measured daytime $L_{Aeq,T}$ ranged between 47 dB and 53 dB, while the measured night-time $L_{Aeq,8hr}$ ranged between 41 dB and 51 dB.

3.15 Analysis of the night-time $L_{AFmax,2min}$ levels shows that the individual events did not exceed 59 dB more than 10 times during each measured night-time period, and that this level was only exceeded once by more than 5 dB. However, analysis of the audio recording indicates that operations from Benlowe were audible above 59 dB and therefore, the highest repeatable night-time maximum value of $L_{AFmax,2min}$ of 61 dB will be used for assessment purposes.

3.16 Table 3.4 provides a summary of measured assessment appropriate sound levels at CM3.

Table 3.4: Summary of Measured Sound Levels at CM3, dB

Date	Daytime 07:00 – 23:00	Night-time 23:00 – 07:00	
	$L_{Aeq,T}$	$L_{Aeq,8hr}$	Typical Maximum Event Level[a] $L_{AFmax,2min}$
Fri 4th	48[b]	44	54
Sat 5th	48	44	53
Sun 6th	47	41	53
Mon 7th	49	46	56
Tue 8th	52[c]	-	-

[a] Maximum noise level not exceeded more than 10 times per night.
[b] T = 9hr
[c] T = 7hr

3.17 At CM3, the measured daytime $L_{Aeq,T}$ ranged between 47 dB and 52 dB, while the measured night-time $L_{Aeq,8hr}$ ranged between 41 dB and 46 dB.

3.18 Analysis of the night-time $L_{AFmax,2min}$ levels shows that the individual events did not exceed 56 dB more than 10 times during each measured night-time period. Investigation of the audio recordings shows that all values above 56 dB were caused by aircraft or bird song, with no significant low frequency spectral content. Therefore, no further consideration to night-time L_{AFmax} impacts from Stonecraft has been given.

Background Sound Levels

3.19 With regard to the L_{A90} background sound levels, the lower sound levels at CM3 have been used to derive assessment appropriate sound levels.

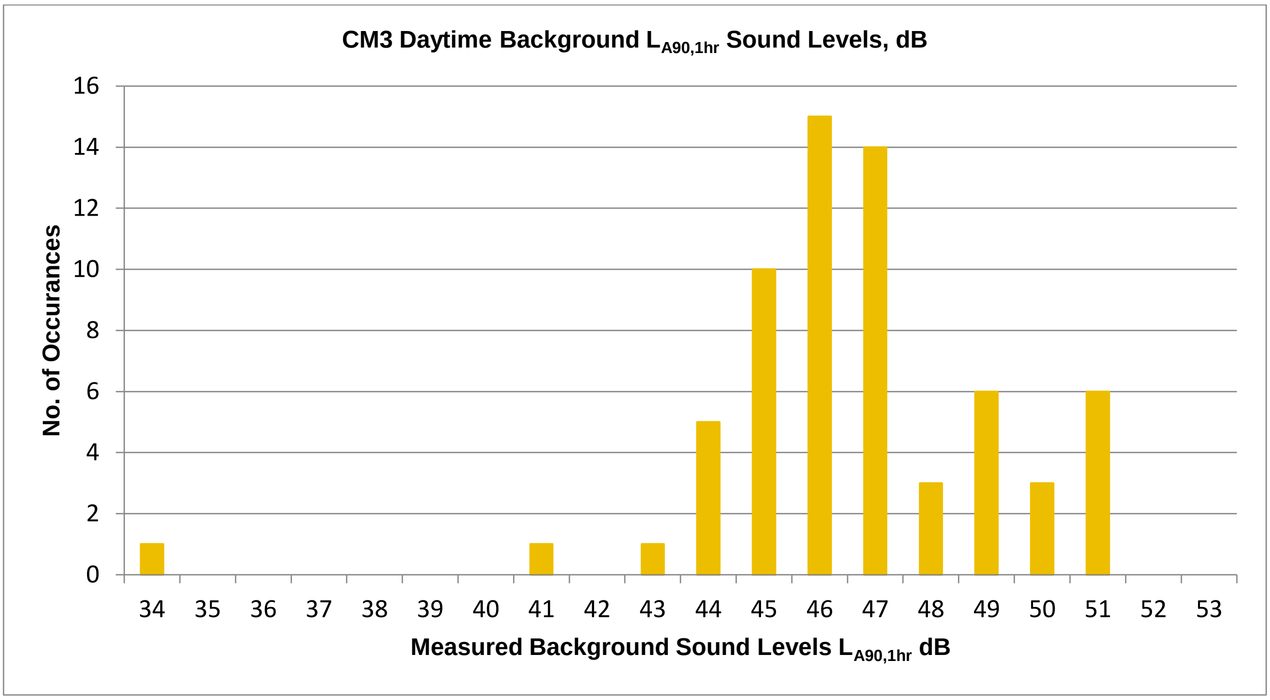
3.20 Section 8 of BS 4142 makes it clear that the objective of the assessment "*is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."*

3.21 Paragraph 8.14 of BS 4142 similarly remarks that *"The monitoring duration should reflect the range of background sound levels for the period being assessed. In practice, there is no 'single' background sound level as this is a fluctuating parameter. However, the background sound level used for the assessment should be representative of the period being assessed."*.

3.22 The subsequent Note 1 states that *"A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value"*.

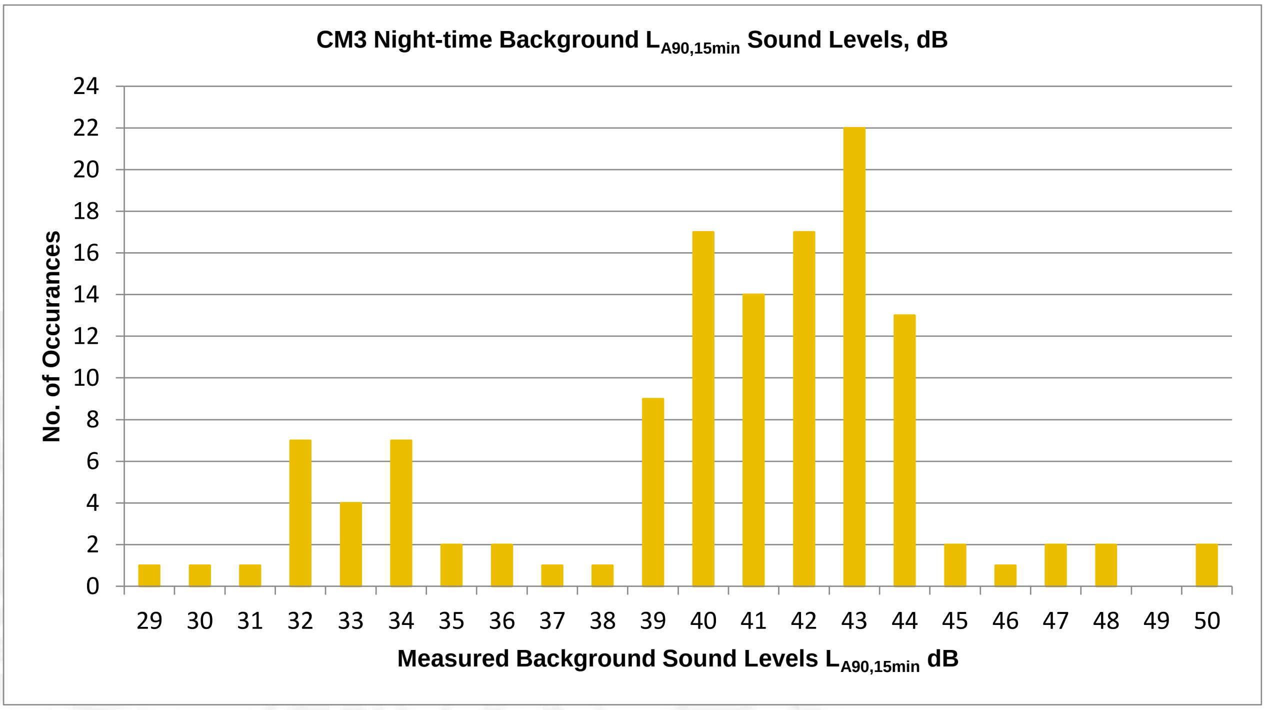
3.23 A statistical analysis of the daytime $L_{A90,1hr}$ and night-time $L_{A90,15min}$ sound measurements, consistent with the BS 4142 advice, is shown in Figure 3.2 and Figure 3.3.

Figure 3.2: Statistical Analysis of Measured Daytime Background Sound Levels at CM3



3.24 During the daytime, the data shows a distribution pattern centred around 46 dB, with an overall range in values extending from 34 dB to 51 dB.

Figure 3.3: Statistical Analysis of Measured Night-time Background Sound Levels at CM3

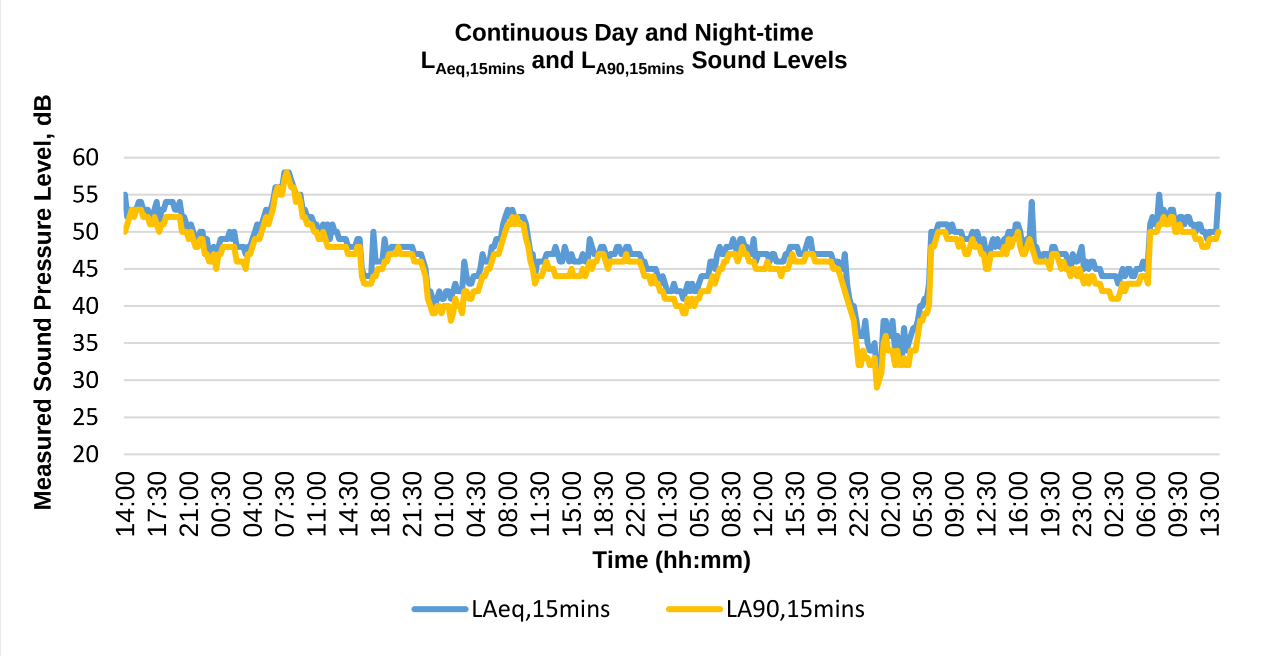


3.25 During the night-time, the data shows a distribution pattern centred around 43 dB, with an overall range in values extending from 29 dB to 50 dB.

3.26 Observations during the survey indicated that noise from external plant associated with Benlowe was audible when in operation across the Site, with the plant noted to increase the instantaneous $L_{Aeq,T}$ level at CM2 to 52 dB when in operation on the Thursday, and 48 dB when in operation on the Tuesday.

3.27 While the instantaneous level was unaffected at CM3, the plant was audible at times, with a review of the noise data indicating it to switch on and off periodically throughout both the day and night-time measurement period, as illustrated in Figure 3.4 below.

Figure 3.4: Continuous Day and Night-time $L_{Aeq,15min}$ and $L_{A90,15min}$ Sound Levels



3.28 Therefore, rather than use the most commonly occurring values of 46 dB during the daytime and 44 dB during the night-time, the lower levels of 44 dB and 39 dB during the day and night respectively, have been used for assessment purposes to provide a robust assessment approach.

4.0 ASSESSMENT METHODOLOGY

General

4.1 Information pertaining to the various noise generating activities, along with both external and internal plant operating at Benlowe and Stonecraft, has been obtained from the Noise Assessment prepared for the outline application (report ref: GM11484 0002).

Benlowe

4.2 Informal discussions have also been held with the local Environmental Health Officer (EHO) at Hinckley and Bosworth Borough Council, who has advised that Benlowe are proposing two additional items of external extraction plant, however, the specification and precise location is not known at this stage. Therefore, in addition to the two existing extracts as identified within the outline Noise Assessment to operate along the southern roof line of the closest building to the Site, two further indicative extracts have been included along the building's western roof line, i.e., at the closest point to the Site, based on the source noise levels for the existing equipment.

4.3 This approach is considered to represent a robust scenario, as any new plant is likely to be more efficient, and subsequently quieter, than the existing plant operating at Benlowe.

Stonecraft

4.4 Given the number of buildings across the Stonecraft site, additional discussions have been undertaken with their General Manager, to determine the processes and plant operating within the various buildings, along with any openings such as roller shutter door locations, which have been assumed to be in their open positions for assessment purposes.

4.5 It should be noted that where the internal operations of a building are not known, an internal reverberant noise level of 85 dB L_{Aeq}, has been assumed, i.e., the upper exposure action level defined by the CNWR[7], for which the daily (or weekly) exposure level (expressed as $L_{EP,d}$) is 85 dB(A).

4.6 With regard to internal noise break-out, to take account of the acoustic performance of each respective building's walls, a value of sound reduction representative of the building's construction should be defined. The sound reduction index (R) of a wall is based on the transmission coefficient of the material, which is defined as the ratio of the acoustic energy transmitted through the panel relative to the total energy incident upon it, and it can be calculated using the following equation:

$$R = 10*\log(1/t)$$

Where t is the transmission coefficient.

4.7 Available information indicates the construction of each building to be of lightweight cladding/corrugated sheet material. A typical sound reduction index (R) for lightweight cladding panels is a value of around 25 dB, which using equation 1 above results in a transmission coefficient τ of 0.00316228.

[7] Health and Safety Executive – The Control of Noise at Work Regulations 2005.

Acoustic Modelling

4.8 An acoustic model of the Site and environs has been generated in Datakustik CadnaA® modelling software. CadnaA® considers various inputs, including topography, buildings and noise sources, and calculates sound levels in accordance with national and international standards; in this case, the relevant UK standards are the procedures set out within ISO 9613-2[8].

4.9 The modelling assumptions and input information for the acoustic model are as follows:

- Digital Terrain Model – Lidar 1m (Environment Agency, downloaded on 9th October 2024);
- Open Street Map data (publicly available);
- Ground absorption for the Site = 0.5 (mixed ground);
- Building heights estimated following site observations or based upon masterplan;
- Buildings set to be reflective only with no absorption coefficient;
- First order reflections included in the modelling;
- Temperature set to 10°C; and
- Relative humidity set to 70%.

Source Noise Levels

4.10 The model has been generated to determine sound levels across the Site and source emissions have been informed by a combination of MEC's in house library data, source noise levels presented within the outline Noise Assessment, and the noise measurement data contained within the Occupational Noise Assessment prepared for Stonecraft (report ref: 6519/AD/SAF).

4.11 The source noise levels used within the model are presented in Table 4.1 for Benlowe, and Table 4.2 for Stonecraft.

Table 4.1: Benlowe Source Noise Levels

<table>
<tr><th colspan="7">Benlowe External Operations</th></tr>
<tr><th rowspan="2">Location</th><th rowspan="2">Noise Source</th><th colspan="2">Scenario</th><th rowspan="2">Sound Power Level, dB(A)</th><th rowspan="2">Source Type</th><th rowspan="2">Source Reference</th></tr>
<tr><th>Daytime (07:00 - 23:00)</th><th>Night-time (23:00 - 07:00)</th></tr>
<tr><td rowspan="4">Benlowe Exterior</td><td>Unloading and Loading Activities (Including Forklift Movements)</td><td colspan="2">1 activity per HGV delivery lasting 30 min</td><td>85 (per activity)</td><td rowspan="2">Line Source</td><td rowspan="2">MEC Data Library</td></tr>
<tr><td>HGV Movements</td><td>160 movements during Daytime (10 movements per hour)</td><td>34 movements during the Night-time (4 movements per hour)</td><td>106 (per unit)</td></tr>
<tr><td>Extraction Plant</td><td colspan="2">2 items of plant, operating at 100% (24hrs/day)</td><td>86 (per unit)</td><td rowspan="2">Point Source</td><td rowspan="2">Calibrated against measurement data</td></tr>
<tr><td>Rooftop Plant</td><td colspan="2">1 item of plant, operating at 100% (24hrs/day)</td><td>107.9 (per unit)</td></tr>
</table>

[8] ISO 9613-2 *'Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation.*

Table 4.2: Stonecraft Source Noise Levels

<table>
<tr><th colspan="7">Stonecraft External Operations</th></tr>
<tr><th rowspan="2">Location</th><th rowspan="2">Noise Source</th><th colspan="2">Scenario</th><th rowspan="2">Sound Power Level, dB(A)</th><th rowspan="2">Source Type</th><th rowspan="2">Source Reference</th></tr>
<tr><th>Daytime (07:00 - 23:00)</th><th>Night-time (23:00 - 07:00)</th></tr>
<tr><td rowspan="5">Stonecraft Exterior</td><td>Unloading and Loading Activities (Including Forklift Movements)</td><td colspan="2">1 activity per HGV delivery lasting 30 min</td><td>85 (per activity)</td><td rowspan="2">Line Source</td><td rowspan="2">MEC Data Library</td></tr>
<tr><td>HGV Movements</td><td>160 movements during Daytime (10 movements per hour)</td><td>34 movements during the Night-time (4 movements per hour)</td><td>106 (per unit)</td></tr>
<tr><td>Extraction Plant</td><td colspan="2">1 plant, operating at 100% (24hrs/day)</td><td>107.4 (per unit)</td><td rowspan="3">Point Source</td><td>Calibrated against measurements</td></tr>
<tr><td>Conveyor Drive Unit</td><td colspan="2">2 pieces of plant, operating at 100% (24hrs/day)</td><td>105.2 (per unit)</td><td rowspan="2">Wardell Armstrong Noise Assessment Report</td></tr>
<tr><td>Conveyor Rollers</td><td colspan="2">1 plant, operating at 100% (24hrs/day)</td><td>81 (per unit)</td></tr>
<tr><th colspan="7">Stonecraft Internal Operations</th></tr>
<tr><th>Location</th><th>Noise Source</th><th colspan="2">No. of Items of Plant/Operations[(a)]</th><th>Sound Power Level, dB(A)</th><th>Source Type</th><th>Source Reference</th></tr>
<tr><td>Press Building 1</td><td>Stone Saw</td><td colspan="2">1</td><td>97 (per unit)</td><td rowspan="6">Point Source</td><td rowspan="4">Wardell Armstrong Noise Assessment Report</td></tr>
<tr><td rowspan="2">Press Building 2</td><td>Block Splitter</td><td colspan="2">1</td><td>94 (per unit)</td></tr>
<tr><td>Rumbler</td><td colspan="2">1</td><td>98 (per unit)</td></tr>
<tr><td rowspan="2">Press Building 1 & 2</td><td>Hydraulic Press</td><td colspan="2">3</td><td>98 (per unit)</td></tr>
<tr><td>Masonry Sand/Shot Blasting</td><td colspan="2">1</td><td>92</td><td rowspan="2">Occupational Noise Assessment</td></tr>
<tr><td>Bagging Plant</td><td>Block Bagging & Banding</td><td colspan="2">1</td><td>90</td></tr>
<tr><td colspan="7">(a) All items of internal plant/operations are considered to be operating at 100% for 24hrs/day.</td></tr>
<tr><th colspan="7">Resultant Internal Sound Level used for Modelling</th></tr>
<tr><th colspan="2">Location</th><th>Sound Power Level, dB(A)</th><th colspan="2">Source Type</th><th colspan="2">Source Reference</th></tr>
<tr><td colspan="2">Press Building 1</td><td>89</td><td colspan="2" rowspan="4">Vertical Area Source</td><td colspan="2" rowspan="3">Occupational Noise Assessment</td></tr>
<tr><td colspan="2">Press Building 2</td><td>90</td></tr>
<tr><td colspan="2">Bagging Plant</td><td>90</td></tr>
<tr><td colspan="2">All other Buildings</td><td>85</td><td colspan="2">Wardell Armstrong Noise Assessment Report</td></tr>
</table>

Assessment Scenarios

4.12 With reference to the noise criteria outlined in Section 2.0, the acoustic model has been used to predict sound levels across the Site in the following BS 4142 assessment scenarios:

- Daytime $L_{Aeq,1hr}$ external sound levels at ground floor (1.5m) height, without mitigation;
- Night-time $L_{Aeq,15min}$ external sound levels at first floor (4m) height, without mitigation;
- Daytime $L_{Aeq,1hr}$ external sound levels at ground floor (1.5m) height, with mitigation; and
- Night-time $L_{Aeq,15min}$ external sound levels at first floor (4m) height, with mitigation.

4.13 For conciseness, the most exposed receptors to Benlowe (Plot 57) and Stonecraft (Plot 190), will be assessed within the body of this report, with the remainder of the Site assessed through the various sound level contour drawings presented within the appendices of this report.

4.14 In addition to the BS 4142 scenarios outlined above, an additional model has been prepared to predict road traffic impacts, along with daytime impacts from the neighbouring Ratby Sports Club, for new dwellings adjacent to Desford Lane and the sports pitches, for the following scenarios:

- Daytime $L_{Aeq,16hr}$ external road traffic sound levels at ground floor (1.5m) height;
- Night-time $L_{Aeq,8hr}$ external road traffic sound levels at first floor (4m) height; and
- Night-time $L_{Amax,2mins}$ external road traffic sound levels at first floor (4m) height

4.15 The model has been informed by the environmental sound survey presented in Section 3.0, and, in the absence of activity from the Ratby Sports Club's pitches during the attended measurement period, noise measurements undertaken by MEC at Brinsley Recreation Ground during full match play from the local football team have been used.

4.16 For conciseness, the most exposed dwelling to Desford Lane (Plot 3) and the Ratby Sports Club (Plots 21 – 24) will be assessed within the body of this report, with the remainder of the Site assessed through the various sound level contour drawings presented within the appendices of this report.

5.0 ACOUSTICS ASSESSMENT – BS 4142

5.1 BS 4142 assessments are undertaken at 3.5m from reflective structures, i.e., representing each receptor's garden area away from the reflective effect of the building, therefore, no facade reflection effects are included in the daytime assessment. However, during the night-time, as residents are likely to be asleep within bedrooms, a first floor façade level has been assessed.

5.2 BS 4142's character corrections are flexible according to whether the acoustic character is just perceptible at the noise receptor, or is clearly perceptible or highly perceptible, and range from 0 to 6 dB for tonal noise, 3 to 9 dB for impulsive noise, and 3 dB for other non-tonal/impulsive acoustic characteristics.

5.3 As indicated in the outline noise assessment, noise from the neighbouring operations was not particularly tonal or impulsive but it was clearly perceptible compared to the background sound levels. On this basis, an acoustic characteristic of 3 dB has been applied to all modelled sound levels, which is consistent with the outline noise assessment.

Initial Numerical Impact Assessment

5.4 The resulting Initial Numerical Impact Assessment (INIA) for the most exposed receptors of Plot 57 adjacent to Benlowe, and Plot 190 adjacent to Stonecraft, without mitigation, are presented in Table 5.1 and Table 5.2.

Table 5.1: Plot 57 – Initial Numerical Impact Assessment – without Mitigation

Assessment Step	Daytime	Night-time[(a)]
Modelled Specific Sound Level [A]	49 dB $L_{Aeq,1hr}$	50 dB $L_{Aeq,15min}$
Acoustic Character Correction [B]	+3 dB	+3 dB
Rating Level [C = A + B]	52 dB $L_{Ar,1hr}$	53 dB $L_{Ar,15min}$
Background Sound Level [D]	44 dB $L_{A90,1hr}$	39 dB $L_{A90,15min}$
Rating over Background [E = C – D]	+8 dB	+14 dB
Estimation of Impact[(b)]	Adverse	Significant Adverse

(a) First floor (4m) façade level.
(b) Impact dependent upon context and other pertinent factors.

5.5 The Rating Level due to operational noise from Benlowe on the most exposed receptor of Plot 57 exceeds the background sound level by +8 dB during the daytime, and +14 dB during the night-time, which is an indication of the specific sound source having an Adverse to Significant Adverse impact respectively in accordance with BS 4142, depending on context.

Table 5.2: Plot 190 – Initial Numerical Impact Assessment – without Mitigation

Assessment Step	Daytime	Night-time[a]
Modelled Specific Sound Level [A]	55 dB $L_{Aeq,1hr}$	56 dB $L_{Aeq,15min}$
Acoustic Character Correction [B]	+3 dB	+3 dB
Rating Level [C = A + B]	58 dB $L_{Ar,1hr}$	59 dB $L_{Ar,15min}$
Background Sound Level [D]	44 dB $L_{A90,1hr}$	39 dB $L_{A90,15min}$
Rating over Background [E = C – D]	+14 dB	+20 dB
Estimation of Impact[b]	Significant Adverse	Significant Adverse
[a] First floor (4m) façade level. [b] Impact dependent upon context and other pertinent factors.		

5.6 The Rating Level due to operational noise from Stonecraft on the most exposed receptor of Plot 190 exceeds the background sound level by +14 dB during the daytime, and +20 dB during the night-time. Therefore, the overall conclusion in accordance with BS 4142 is that this is likely an indication of a Significant Adverse impact, depending on context.

5.7 Additional testing has been undertaken of varying acoustic barrier height options adjacent to the boundaries of both Benlowe and Stonecraft. The tests indicate that additional screening adjacent to Benlowe made no difference to the modelled sound levels, due to the predominant impacts being from roof mounted extracts having a clear line of sight to the Site. For Stonecraft, a 4m high acoustic barrier has been determined as the most viable option adjacent to reduce the modelled sound levels. This could comprise a 4m high bund, acoustic fence, or combination bund/fence.

5.8 The revised INIA for the most exposed receptor to Stonecraft (Plot 190) is presented in Table 5.3.

Table 5.3: Plot 190 – Initial Numerical Impact Assessment – with Mitigation

Assessment Step	Daytime	Night-time[a]
Modelled Specific Sound Level [A]	52 dB $L_{Aeq,1hr}$	52 dB $L_{Aeq,15min}$
Acoustic Character Correction [B]	+3 dB	+3 dB
Rating Level [C = A + B]	55 dB $L_{Ar,1hr}$	55 dB $L_{Ar,15min}$
Background Sound Level [D]	44 dB $L_{A90,1hr}$	39 dB $L_{A90,15min}$
Rating over Background [E = C – D]	+11 dB	+ 16 dB
Estimation of Impact[b]	Significant Adverse	Significant Adverse
[a] First floor (4m) façade level. [b] Impact dependent upon context and other pertinent factors.		

5.9 With mitigation in place, the Rating Level due to operational noise from Stonecraft reduces slightly, though the overall conclusion in accordance with BS 4142 remains one of a Significant Adverse impact during both the day and night-time, depending on context.

INIA Discussion – Context

5.10 It should be acknowledged that, with regard to Stonecraft, the above assessment represents a robust approach, whereby all internal operations from the neighbouring buildings are predicted to operate together, throughout both the day and night-time period, which is unlikely to be the case.

5.11 Nevertheless, given there are no operational restrictions on Benlowe or Stonecraft, i.e., there is the potential for night-time operations to occur, it should be noted that BS 4142 recognises that where a new noise sensitive receptor is introduced, the industrial sound forms part of the acoustic environment and, in such circumstances, other guidance and criteria in addition to BS 4142 is applicable.

5.12 Contextual considerations for external conditions and internal impacts are now considered separately within the following subsections.

<u>External Amenity Areas</u>

5.13 Despite the indication of Adverse to Significant Adverse impacts, for the most exposed receptors adjacent to Benlowe and Stonecraft, all external amenity areas are predicted to lie below BS 8233's lower-level criterion of 50 dB $L_{Aeq,16hr}$, and this is supported by the environmental sound survey measurements for CM2 and CM3, where daytime $L_{Aeq,T}$ sound levels ranged between 47 dB to 53 dB.

5.14 Additionally, the stated daytime values represent the loudest 1-hour assessment period, and noise levels over BS 8233's 16-hour assessment period would likely be lower. Nevertheless, screening in the form of 4m high acoustic fencing is recommended for the boundary with Stonecraft, to minimise impacts as far as practicable.

<u>Internal Acoustic Conditions</u>

5.15 The Adverse to Significant Adverse impacts predicted at the most exposed dwellings during both the day and night-time are for external levels only.

5.16 When taking into consideration the internal sound levels, with an open window providing 9 dB[9] external to internal level reduction, the impact would be lower than that originally suggested as part of the INIA. However, it is likely that the first line of dwellings would require a closed window mitigation strategy in order to reduce the impact further.

5.17 It is important to note that BS 4142 recognises that where a new noise sensitive receptor is introduced, the industrial sound forms part of the acoustic environment and, in such circumstances, other guidance and criteria in addition to BS 4142 is applicable.

5.18 BS 4142 emphasises the need for matters to be placed into context, and in this respect, it mentions several matters for consideration, which include whether dwellings or other premises used for residential purposes will incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

[9] Association of Noise Consultants (ANC) and Institute of Acoustics (IOA) Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O July 2022 v1.0.

- facade insulation treatment;
- ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
- acoustic screening.

5.19 Therefore, additional noise mitigation measures such as the standard of glazing coupled with the use of acoustic ventilators and screening, will represent a means of preventing the potential adverse impacts.

6.0 ACOUSTICS ASSESSMENT – BS 8233

External Amenity Criteria

6.1 The acoustics criterion often the most difficult to meet in residential environments situated next to busy transportation sources is BS 8233's criterion of 55 dB $L_{Aeq,16hr}$ applicable to private external amenity spaces such as gardens.

6.2 All daytime modelled drawings in **Appendix D** indicate that, based on the presentation layout, BS 8233's lower-level criterion of 50 dB $L_{Aeq,16hr}$ will be satisfied across the Site through the provision of standard 1.8m high close boarded timber fencing.

Internal Acoustic Criteria

6.3 Table 6.1 presents the required external to internal reduction requirements for the most exposed indicative dwellings to all sources, namely, Plot 3 adjacent to Desford Lane; Plot 21 – 24 adjacent to Ratby Sports Club; Plot 57 adjacent to Benlowe; and Plot 190 adjacent to Stonecraft.

6.4 For Benlowe and Stonecraft, the $L_{Ar,T}$ Rating Levels as presented within Table 5.1 and Table 5.2 have been assumed to operate continuously throughout the daytime $L_{Aeq,16hr}$ and night-time $L_{Aeq,8hr}$ periods to provide a robust assessment approach.

Table 6.1: Required Façade Performance, dB

Plot	Parameter	External Level	Internal Criteria	Required Reduction
3	Daytime Ambient $L_{Aeq,16hr}$	51	35	16
	Night-time Ambient $L_{Aeq,8hr}$	45	30	15
	Night-time Maximum $L_{AFmax,2min}$	62	45	17
2 – 24[(a)]	Daytime Ambient $L_{Aeq,16hr}$	53	35	18
57	Daytime Ambient $L_{Aeq,16hr}$	52	35	17
	Night-time Ambient $L_{Aeq,8hr}$	53	30	23
	Night-time Maximum $L_{AFmax,2min}$	58	45	13
190	Daytime Ambient $L_{Aeq,16hr}$	58	35	23
	Night-time Ambient $L_{Aeq,8hr}$	59	30	29

[(a)] Impact relates to Ratby Sports Club and therefore, only a daytime $L_{Aeq,16hr}$ assessment is included.

6.5 For the most exposed receptor overlooking Desford Lane, the results in Table 6.1 show that sound reductions of up to 17 dB will be required to achieve all internal $L_{Aeq,T}$ and L_{AFmax} criteria.

6.6 For the most exposed receptors overlooking Ratby Sports Club, a required sound reduction of 18 dB will be required to achieve the daytime internal $L_{Aeq,16hr}$ criteria.

6.7 For the most exposed receptors overlooking Benlowe, sound reductions of up to 17 dB will be required to achieve the daytime $L_{Aeq,16hr}$ criteria, with sound reductions of up to 23 dB required to achieve the night-time $L_{Aeq,8hr}$ criteria.

6.8 For the most exposed receptors overlooking Stonecraft, sound reductions of up to 23 dB will be required to achieve the daytime $L_{Aeq,16hr}$ criteria, with sound reductions of up to 29 dB required to achieve the night-time $L_{Aeq,8hr}$ criteria.

7.0 ACOUSTICS-LED OVERHEATING ASSESSMENT

7.1 This part of the report considers the assessment of overheating in accordance with AVOG, and looks to determine whether an open windows acoustics strategy is permissible across the Site.

AVOG Level 1 Assessment

7.2 AVOG prescribes a two-stage assessment. Level 1 looks to determine if overheating needs to be considered further, based on the predicted external façade levels for the most exposed receptors. The initial Level 1 assessment is presented in Table 7.1.

Table 7.1: AVOG Level 1 Assessment

Plot	Parameter	Predicted External Level dB	Level 1 Risk Grading	Level 2 Advised?
3	Daytime Ambient $L_{Aeq,16hr}$	51	Negligible	Not required
	Night-time Ambient $L_{Aeq,8hr}$	45	Negligible	Not required
21 – 24[a]	Daytime Ambient $L_{Aeq,16hr}$	53	Negligible	Not required
57	Daytime Ambient $L_{Aeq,16hr}$	52	Negligible	Not required
	Night-time Ambient $L_{Aeq,8hr}$	53	Medium	Recommended
190	Daytime Ambient $L_{Aeq,16hr}$	58	Medium	Recommended
	Night-time Ambient $L_{Aeq,8hr}$	59	High	Recommended
[a] Impact relates to Ratby Sports Club and therefore, only a daytime $L_{Aeq,16hr}$ assessment is included.				

7.3 The results demonstrate that at the most exposed receptors overlooking Desford Lane and the Ratby Sports Club, an AVOG Level 2 assessment is not required due to the Negligible levels of noise.

7.4 For the most exposed receptors overlooking Benlowe and Stonecraft, an AVOG Level 2 assessment is recommended, due to the Medium to High levels of noise.

7.5 However, the required reductions needed to achieve the internal BS 8233 criterion are greater than the reduction provided by an open window (9 dB) and therefore, the acoustics mitigation strategy will be for a **closed window** approach for the most exposed receptors overlooking all sources during typical conditions and thus, alternative overheating ventilation will be required.

Risk of Overheating

7.6 The likelihood of overheating can be determined via a qualitative assessment through the GHA Toolkit[10].

7.7 A qualitative assessment using the GHA Toolkit is presented in **Appendix E**. The qualitative assessment indicates a 'High' risk of overheating, due to the fact that internal noise levels will be exceeded with windows open and therefore, the 'duration for which overheating occurs' is considered to be 'most of the time' in accordance with AVOG.

[10] Good Homes Alliance, Early-Stage Overheating Risk Tool, V1, July 2019 Toolkit

7.8 To combat overheating, an increased ventilation rate is typically required to remove excess heat from the property. The means in which increased ventilation can be achieved, without opening windows, is typically viable through a passive ventilator, such as a through-wall acoustically attenuated 'air brick' or, where significantly high external noise levels are present, through room specific Mechanical Ventilation (MV) systems within affected habitable rooms, or whole dwelling Mechanical Ventilation with Heat Recovery (MVHR) systems.

7.9 For the purpose of this assessment, a hit and miss acoustically attenuated 'air brick' has been used to test the viability of a passive, non-mechanical, ventilation strategy, however, the exact specification of such measures will need to be determined through Dynamic Thermal Modelling (DTM), which will need undertaken to satisfy the requirements of AD-O[11] at the Building Control stage.

AVOG Level 2 Assessment

7.10 Calculations have been undertaken in accordance with BS 12354-3[12] to determine the predicted internal noise levels using passive ventilation means for the most exposed receptors based upon a 'High' risk of overheating in accordance with the GHA toolkit.

7.11 It should be noted that this AVOG Level 2 Assessment can be seen as a worst-case scenario as the proposed ventilation measures would theoretically reduce the risk of overheating from that of a 'High' risk. Therefore, assuming a 'High' risk with the inclusion of the mitigation measures, would represent a robust assessment scenario.

7.12 The acoustics and overheating assessment has been considered using the sound insulation performance provided by a hit and miss acoustically attenuated 'air brick', which has a $D_{n,e,w} + C_{tr}$ value of 36 dB when open, and the results are presented in Figure 7.1 and Figure 7.2.

[11] The Building Regulations 2010, Overheating, Approved Document 'O'.
[12] BS EN ISO 12354-3:2017 *'Building acoustics – Estimation of acoustic performance of buildings from the performance of elements – Part 3: Airborne sound insulation against outdoor sound.'*

Figure 7.1: AVOG Level 2 Assessment of Daytime Conditions

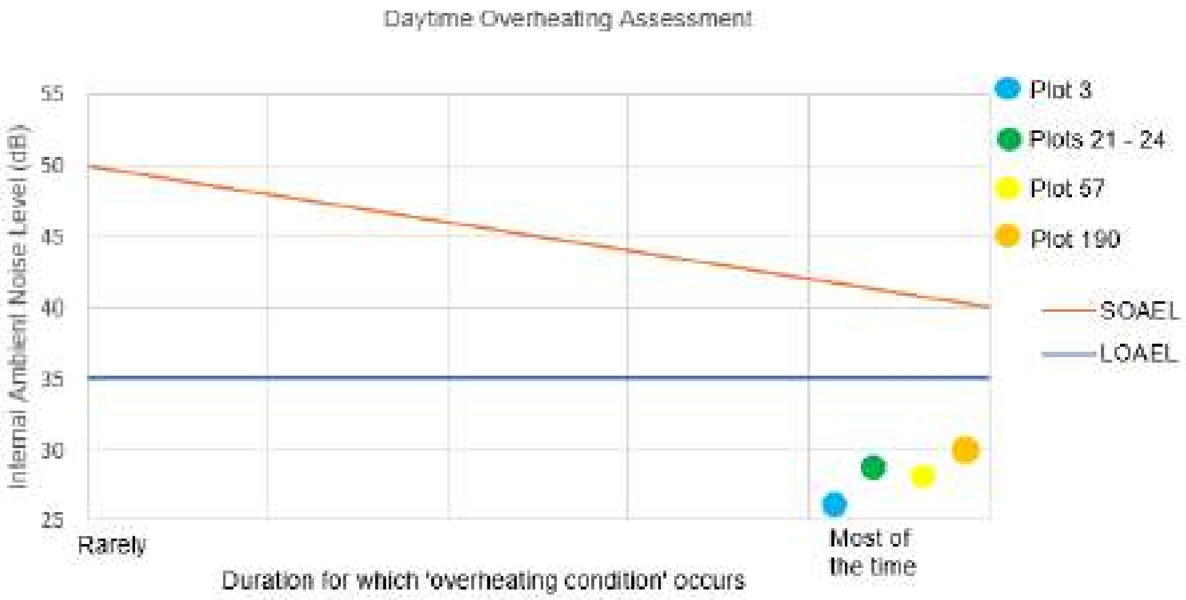
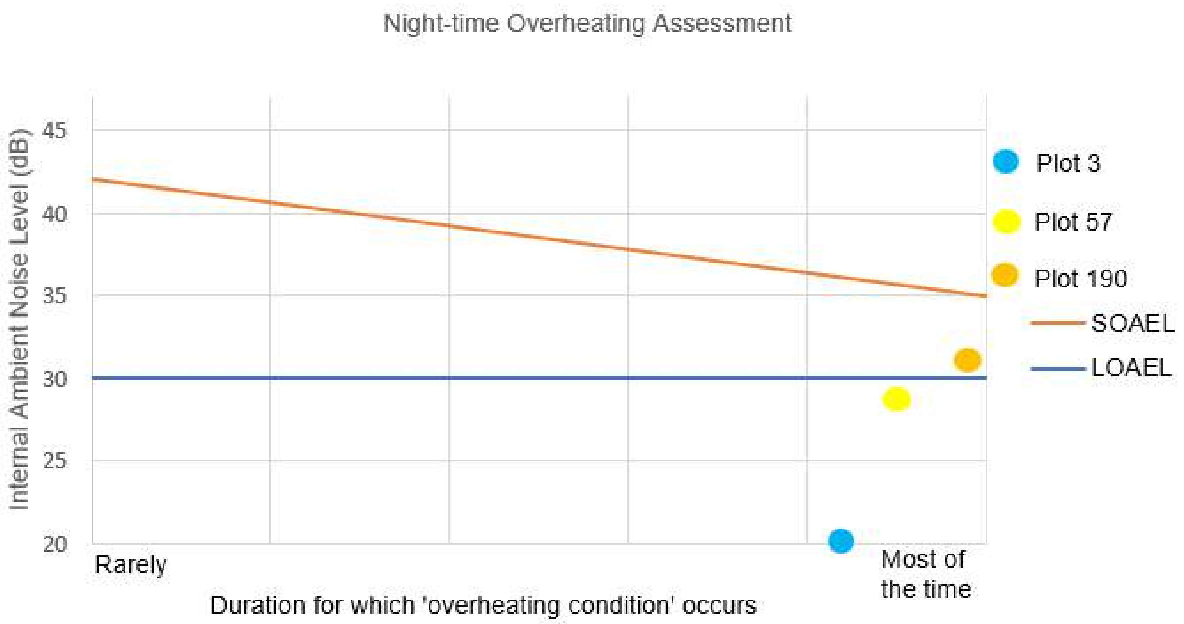


Figure 7.2: AVOG Level 2 Assessment of Night-time Conditions



7.13 The results in Figure 7.1 and Figure 7.2 indicate that internal noise levels, when using the 'air brick', would lie below SOAEL during both the day and night-time, and, with the exception of the most exposed receptor overlooking Stonecraft, below LOAEL during both the day and night-time.

AVOG Assessment – Numerical Summary

7.14 Table 7.2 presents a summary numerical assessment for overheating conditions using passive ventilative means for the most exposed dwellings overlooking the respective noise sources.

Table 7.2: Overheating Acoustics Assessment

Plot	Parameter(a)	Criteria dB	Calculated Internal Level dB
3	Daytime Ambient $L_{Aeq,16hr}$	40	26
	Night-time Ambient $L_{Aeq,8hr}$	35	20
	Night-time Maximum $L_{AFmax,2min}$	55	37
21 – 24	Daytime Ambient $L_{Aeq,16hr}$	40	28
57	Daytime Ambient $L_{Aeq,16hr}$	40	27
	Night-time Ambient $L_{Aeq,8hr}$	35	28
	Night-time Maximum $L_{AFmax,2min}$	55	33
190	Daytime Ambient $L_{Aeq,16hr}$	40	30
	Night-time Ambient $L_{Aeq,8hr}$	35	31

a) $L_{Aeq,T}$ criteria chosen as a point on the SOAEL based upon a high risk of overheating.
(b) L_{AFmax} criterion as presented within AD-O.

7.15 The information in Table 7.2 demonstrates that, with the inclusion of an acoustically attenuated 'air brick', AVOG criteria is satisfied. However, it should be noted that the above indicative ventilation strategy is based on the qualitative GHA Toolkit, which does not take into consideration the ventilation flow rates needed to satisfy CIBSE TM59[13].

7.16 Therefore, the mitigation schedule may be subject to change at Building Control stage based upon the outcome of any DTM undertaken to satisfy the requirements of AD-O. Should DTM indicate that an acoustically attenuated 'air brick' is not sufficient from an overheating standpoint, the option remains for an MV system to be employed within affected rooms.

7.17 Nevertheless, this should not influence the planning decision due to the fact that, as shown in this assessment, acoustics conditions have been considered during periods of overheating, and Environmental Health matters will be satisfied with an appropriate ventilation strategy.

[13] Design Methodology for the Assessment of Overheating Risk in Homes, TM59:2017.

8.0 MITIGATION

External Sound Levels

8.1 Based on the presentation layout, BS 8233's lower-level criterion of 50 dB $L_{Aeq,16hr}$ will be satisfied across the Site through the provision of standard 1.8m high close boarded timber fencing.

8.2 Where acoustic fencing is used in line with the mitigation scenario outlined in Section 5.0, 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 mass of 10 to 15kg/m^2.

Internal Sound Levels

8.3 Acoustic modelling has demonstrated potential façade sound levels and, in accordance with BS 8233, ProPG and AVOG, sound reduction performance requirements of the façade have been determined.

8.4 In terms of acoustics, windows and ventilation strategies are the 'weakest' acoustics point in any façade and subsequently, the composite sound reduction performance is typically dominated by these elements. Therefore, minimum performance requirements to be provided by the glazing and ventilation elements at all dwellings are presented herein.

8.5 It should be noted that the following mitigation is based on worst case sound levels, i.e., with no boundary mitigation in place, to provide a robust assessment scenario.

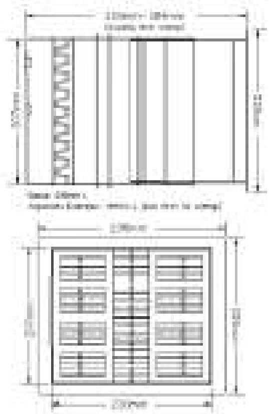
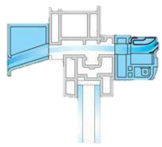
8.6 Drawing on the above, and the acoustic modelling undertaken, Table 8.1 provides typical reduction requirements and potential glazing and ventilation solutions across the Site in order to demonstrate compliance with the internal sound level criteria outlined in BS 8233 and ProPG during typical conditions; internal sound level criteria outlined in AVOG during overheating conditions; whilst adhering to the ventilation requirements of AD-F[14].

8.7 This table should be read in conjunction with the drawings in **Appendix F**, whereby drawing 29158_04_120_08 demonstrates the required reduction for bedrooms and drawing 29158_04_120_09 demonstrates the required reduction for all other habitable rooms.

8.8 For the reference in Table 8.1, the sound reduction performance requirements, in octave band and weighted reduction format, are presented in **Appendix G**.

[14] The Building Regulations 2010, Ventilation, Approved Document F, 2021 Edition.

Table 8.1: Suggested Internal Mitigation Measures

Mitigation Ref.	Example Glazing Solution	Example Whole-Dwelling Ventilation Solution[a]	Example Overheating Ventilation Solution[b]
Ref. A-1	4mm glass panel 12mm air gap 4mm glass panel Approx. 27 dB $R_w + C_{tr}$	Standard Trickle Vent Direct airpath trickle vent located in the top of the window frame  Approx. $D_{n,e,w} + C_{tr}$ = 32 dB	No Overheating Mitigation Required. Opening windows can be used to combat overheating and provide purge ventilation.
Ref. A-2			Air Brick Internal hit & miss grille manually adjusted with a sliding action allowing ventilation to be controlled as required.  Approx. $D_{n,e,w} + C_{tr}$ = 36 dB or MV System Mechanical Ventilation Systems to provide room specific, or whole dwelling, extract and purge ventilation.  ***Overheating mitigation subject to change based upon the outcome of any future Dynamic Thermal Modelling.***
Ref. B	8mm glass panel 12mm air gap 10mm glass panel Approx. 33 dB $R_w + C_{tr}$	Acoustically Rated Trickle Vent Trickle vent with torturous airpath located in the top of the window frame  Approx. $D_{n,e,w} + C_{tr}$ = 36 dB	

[a] Where a suitable 'air brick' is used, or if a whole dwelling MVHR system is to be installed, this would negate the need to install whole dwelling ventilation solutions for typical conditions (window mounted trickle vents).
[b] Indicative overheating solution capable of achieving both SOAEL and LOAEL – subject to change at Building Control stage based upon the outcome of any Dynamic Thermal Modelling undertaken to satisfy the requirements of AD-O.

Glazing and Ventilation Summary

8.9 For the avoidance of doubt, each reference is summarised below, and the required glazing and ventilation specifications are identified in **Appendix F**. All bedrooms should follow the mitigation specifications in drawing reference 29158_04_120_08 and all other habitable rooms should follow the mitigation specifications in drawing reference 29158_04_120_09.

Reference A-1

- Glazing – 27 dB $R_w + C_{tr}$ (typically 4mm-12mm-4mm);
- Whole-Dwelling Ventilation – 32 dB $D_{n,e,w} + C_{tr}$ (typically a direct airpath trickle vent); and
- Overheating Ventilation – none required.

Reference A-2

- Glazing – 27 dB $R_w + C_{tr}$ (typically 4mm-12mm-4mm); and
- Whole-Dwelling and Overheating Ventilation – 36 dB $D_{n,e,w} + C_{tr}$ (hit and miss air brick).

Reference B

- Glazing – 33 dB $R_w + C_{tr}$ (typically 8mm-12mm-10mm); and
- Whole-Dwelling and Overheating Ventilation – 36 dB $D_{n,e,w} + C_{tr}$ (hit and miss air brick).

9.0 CONCLUSIONS

9.1 MEC has been commissioned by Bellway Homes Limited, to undertake an Acoustics Assessment aimed at discharging the planning condition pertaining to the planning permission for the proposed residential development on Land off Desford Lane, Ratby.

9.2 Assessment has been undertaken in accordance with BS 4142, with consideration given to the guidance contained in BS 8233, ProPG and AVOG.

9.3 The Rating Level due to operational noise from Benlowe on the most exposed receptor of Plot 57 exceeds the background sound level by +8 dB during the daytime, and +14 dB during the night-time, which is an indication of the specific sound source having an Adverse to Significant Adverse impact respectively in accordance with BS 4142, depending on context.

9.4 The Rating Level due to operational noise from Stonecraft on the most exposed receptor of Plot 190 exceeds the background sound level by +14 dB during the daytime, and +20 dB during the night-time. Therefore, the overall conclusion in accordance with BS 4142 is that this is likely an indication of a Significant Adverse Impact, depending on context.

9.5 Testing of boundary screening has been undertaken to determine the attenuation benefits of varying fence heights. The tests indicate that additional screening adjacent to Benlowe made no difference to the modelled sound levels, with a 4m high acoustic fence determined to be the most viable option adjacent to Stonecraft to reduce the modelled sound levels. However, while the Rating Level due to operational noise from Stonecraft reduces slightly with mitigation in place, the overall conclusion in accordance with BS 4142 remains one of a Significant Adverse impact during both the day and night, depending on context.

9.6 Nevertheless, it is important to note that BS 4142 recognises that where a new noise sensitive receptor is introduced, the industrial sound forms part of the acoustic environment and, in such circumstances, other guidance and criteria in addition to BS 4142 is applicable.

9.7 BS 4142 emphasises the need for matters to be placed into context, and in this respect, it mentions several matters for consideration, which include whether dwellings or other premises used for residential purposes will incorporate design measures that secure good internal and/or outdoor acoustic conditions.

9.8 Therefore, when considering context and, internal and external acoustic conditions, residential amenity can be protected through pragmatic mitigation measures.

<u>BS 8233 and ProPG</u>

9.9 Acoustic modelling has demonstrated that, based on the presentation layout, BS 8233's lower-level criterion of 50 dB $L_{Aeq,16hr}$ will be satisfied across the Site through the provision of standard 1.8m high close boarded timber fencing.

9.10 With regards to internal acoustic conditions, embedded façade mitigation measures have been suggested in order to achieve internal noise level criteria in line with BS 8233 and ProPG which, for the majority of the

Site, would require standard thermal double glazing and standard direct airpath trickle ventilators. However, for the most exposed dwellings, high performance glazing combined with high-performance acoustic through wall ventilators will likely be required.

AVOG

9.11 The outcome of the AVOG assessment demonstrated that, an acoustic airbrick a viable solution from an acoustic perspective for the most exposed dwellings overlooking the respective sources. However, any overheating mitigation measures presented within this report are presented to satisfy internal acoustic conditions only. The exact ventilation requirements to combat overheating will need to be considered during the Building Control process of the Site, nevertheless, matters relating to noise in respects of Environmental Health have been fully considered within this report.

Summary

9.12 It is therefore considered that with the implementation of the recommended mitigation strategy, internal and external noise levels can be attenuated to achieve the requisite criteria, and condition 23 of the planning permission will be fully satisfied.

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APPENDICES

APPENDIX A

LAND OFF DESFORD LANE, RATBY

SCHEDULE OF ACCOMMODATION

Housetype	Description	Qty	Floor Area - structure *		Floor Area - finish #	
Private Houses			Sq FT	Total	Sq FT	Total
WO	The Woodcarver - 2 Bed Bungalow - 2B3P	4	828	3312	818	3272
BM	The Blemmere - 3 Bed House - 3B5P - M4(2)	20	1026	20520	1010	20200
MA	The Mason - 3 Bed House - 3B4P	13	1059	13767	1043	13559
SY	The Sawyer - 3 Bed House - 3B4P	7	1093	7651	1069	7483
CS	The Coppersmith - 3 Bed House - 3B4P - M4(2)	9	1026	9234	1011	9099
SP	The Spinner - 3 Bed House - 3B4P	18	1225	22050	1207	21726
SC	The Scrivener - 4 Bed House - 4B5P - M4(2)	10	1207	12070	1190	11900
BO	The Bowyer - 4 Bed House - 4B5P	7	1356	9492	1338	9366
PH	The Philosopher - 4 Bed House - 4B5P	11	1507	16577	1489	16379
LO	The Lorimer - 4 Bed House - 4B7P - M4(2)	7	1550	10850	1530	10710
WE	The Weaver - 4 Bed House - 4B5P	6	1688	10128	1667	10002
WA	The Watchmaker - 5 Bed House - 5B6P	14	1901	26614	1880	26320
DR	The Draper - 5 Bed House - 5B6P	9	2243	20187	2211	19899
Private Total		135		182452		179915
% of Total (Private)		60%		68%		68%
			Floor Area - structure *		Floor Area - finish #	
Affordable Houses			Sq FT	Total	Sq FT	Total
FD	The Foundryman - 2 Bed Bungalow - 2B3P - M4(2)	1	718	718	709	709
BA	The Baker - 2 Bed House - 2B4P - M4(2)	35	876	30660	861	30135
TI	The Tillman - 3 Bed House - 3B5P - M4(2)	40	1026	41040	1010	40400
PW	The Ploughwright - 3 Bed House - 3B5P - M4(2)	10	1026	10260	1010	10100
CT	The Cartographer - 4 Bed House - 4B5P - M4(2)	4	1096	4384	1081	4324
Affordable Total		90		87062		85668
% of Total (Affordable)		40%		32%		32%
Overall Total		225		269514		265583

082404-BEL EM-AP02-225 UNITS-28.08.24-SM-PW

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land off desford lane, ratby

Presentation Layout

rev date by details

28.08.2024 created
1:500 @ A0 scaling
SM/TP contact

reference 082404-BEL-EM-PL02 - revision

APPENDICES

APPENDIX B

GLOSSARY OF TECHNICAL TERMS

Noise

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

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

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

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

Typical sound levels found in the environment

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

Descriptor	Terminology
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting (dB(A))	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq, T}$	A noise level index called the equivalent continuous noise level over the time period, *T*. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{AFmax, T}$	A noise level index defined as the maximum noise level during the measurement period. L_{Max} is sometimes used for the assessment of discrete loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. It is typically measured using the 'fast' sound level meter response.
$L_{90, T}$	A noise level index. The noise level exceeded for 90% of the time over the period, *T*. *L*90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10, T}$	A noise level index. The noise level exceeded for 10% of the time over the period, *T*. *L*10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
Façade	At a distance of 1m in front of a large sound reflecting object such as a building facade.
Fast/Slow Time Weighting	Averaging times used in sound level meters.
Octave Band	A range of frequencies whose upper limit is twice the frequency of the lower limit
One-third Octave Band	A frequency band in which the upper limit is 21/3 times the frequency of the lower limit.
Rating Level	The specific sound level, plus any adjustment for characteristic feature of sound in BS 4142.
Specific Sound Level	The A-weighted L_{eq} sound level produced by a sound source during a specified period of time. Commonly known as the sound source under investigation as defined in BS 4142.
Typical Maximum Level	The 90^{th} percentile maximum event level (L_{AFmax}) measured during a period. Used for assessing night-time maximum levels under typical and overheating conditions.

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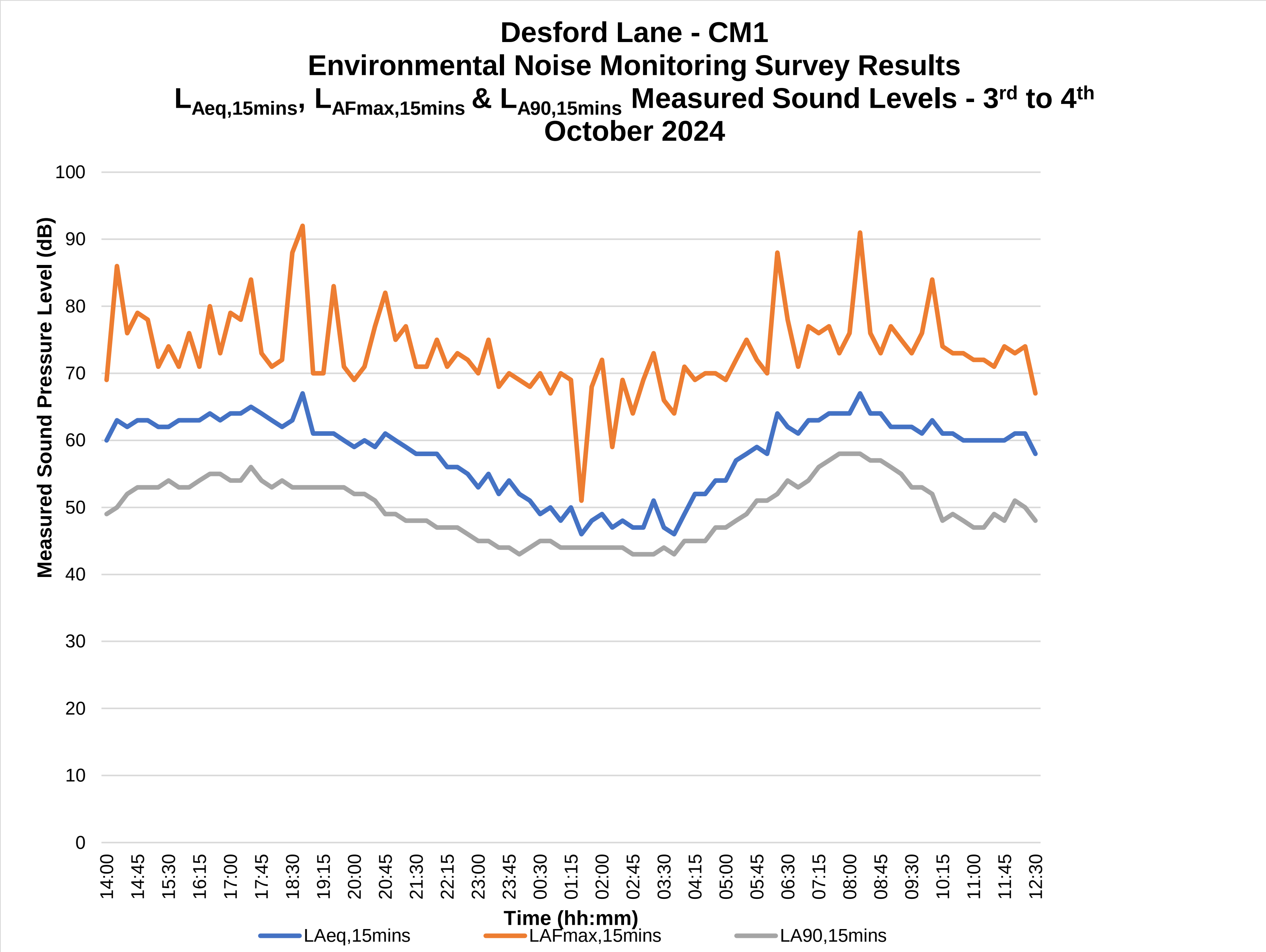
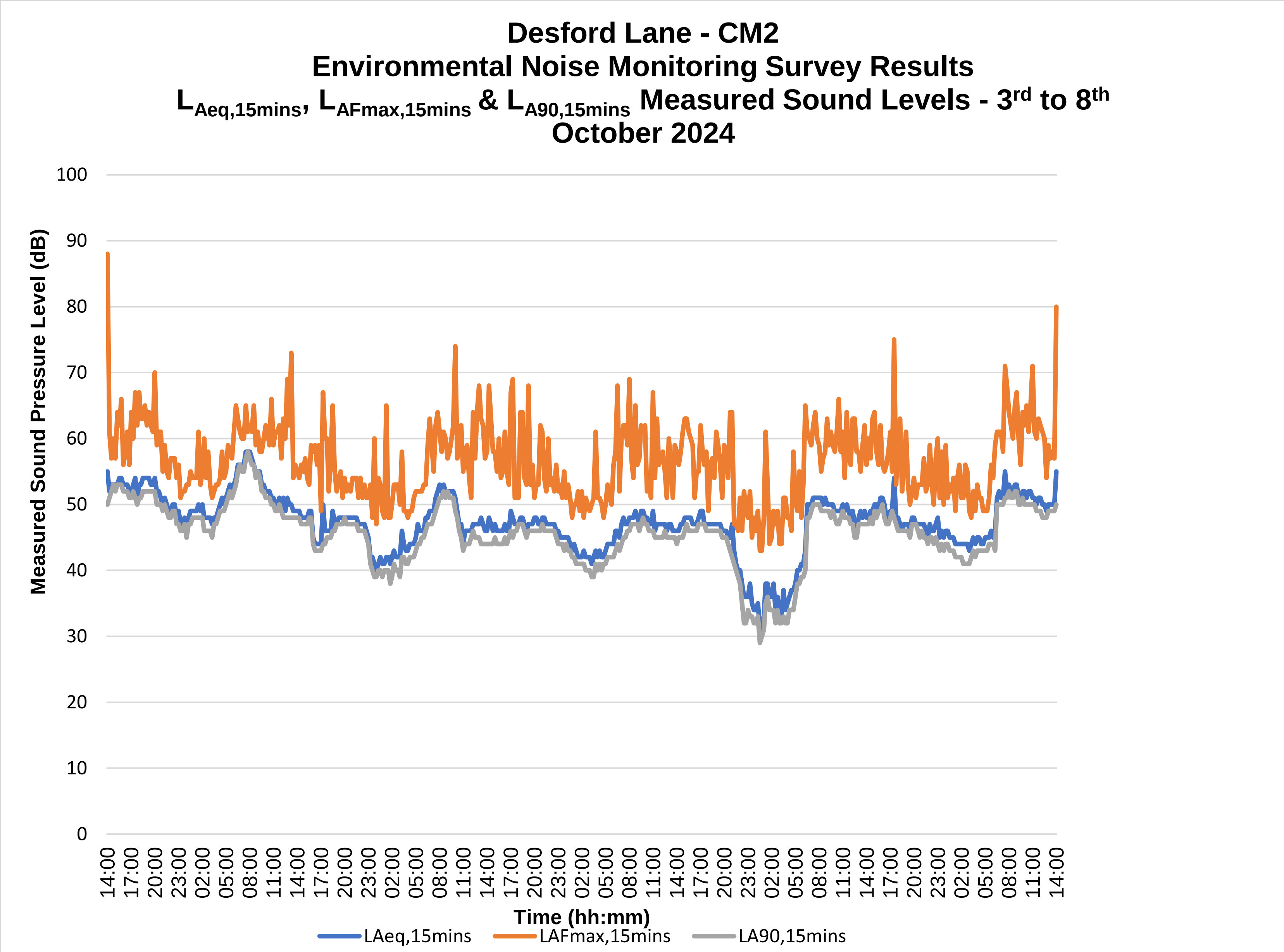
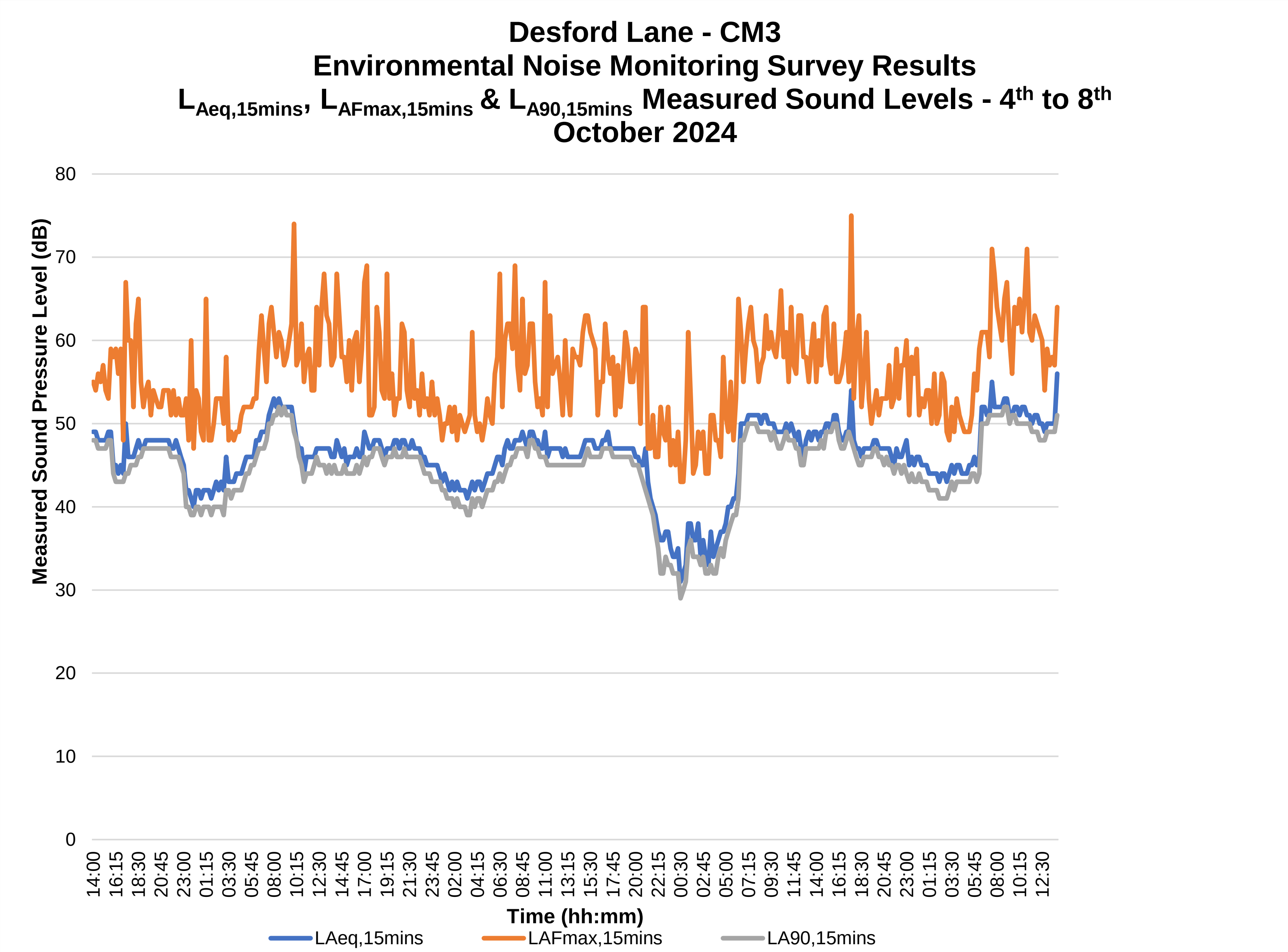
APPENDICES

APPENDIX C


Desford Lane - CM1
Environmental Noise Monitoring Survey Results
LAeq,15mins, LAFmax,15mins & LA90,15mins Measured Sound Levels - 3rd to 4th October 2024
Measured Sound Pressure Level (dB)
100
90
80
70
60
50
40
30
20
10
0
14:00
14:45
15:30
16:15
17:00
17:45
18:30
19:15
20:00
20:45
21:30
22:15
23:00
23:45
00:30
01:15
02:00
02:45
03:30
04:15
05:00
05:45
06:30
07:15
08:00
08:45
09:30
10:15
11:00
11:45
12:30
Time (hh:mm)
LAeq,15mins
LAFmax,15mins
LA90,15mins

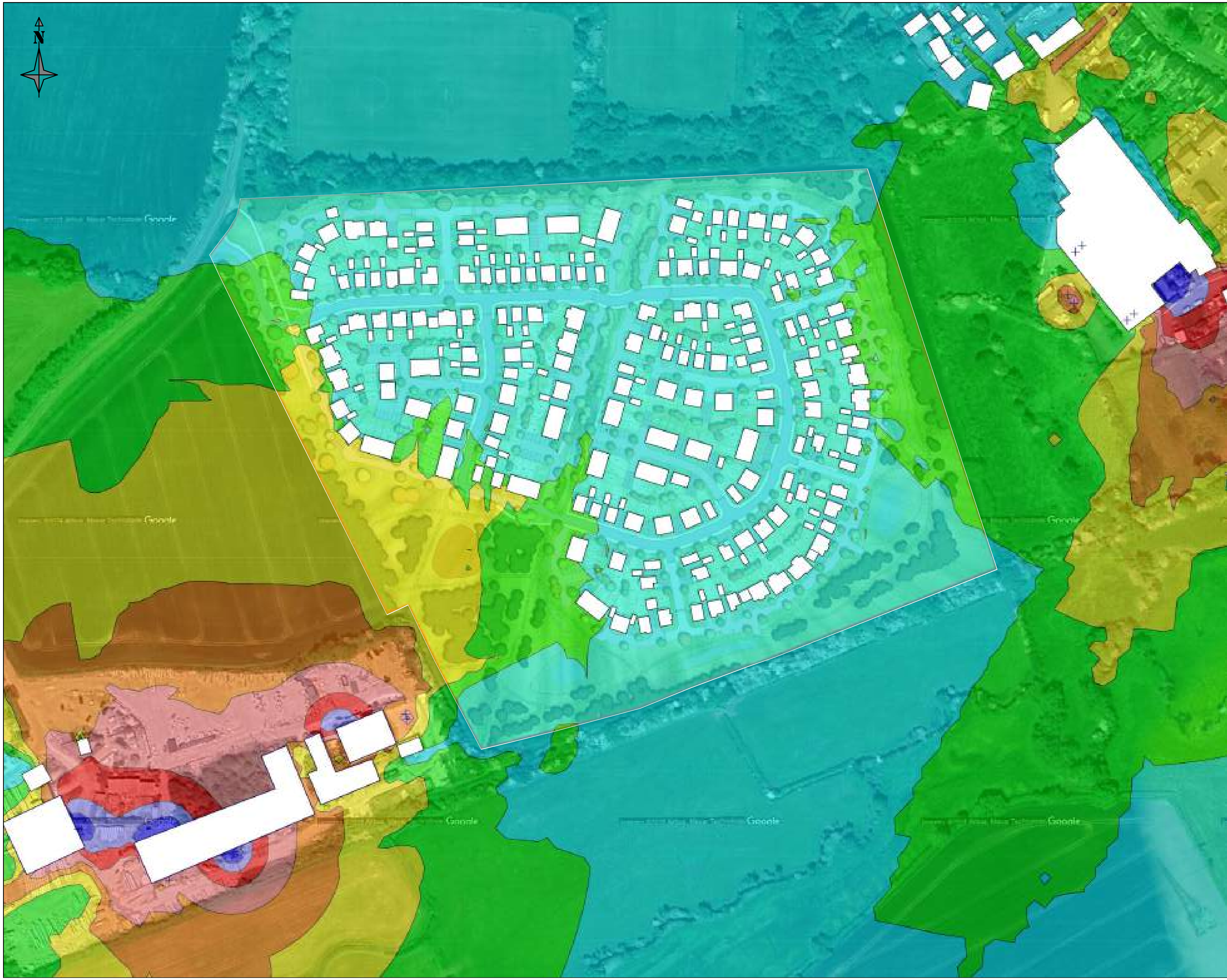

Desford Lane - CM2
Environmental Noise Monitoring Survey Results
LAeq,15mins, LAFmax,15mins & LA90,15mins Measured Sound Levels - 3rd to 8th October 2024
Measured Sound Pressure Level (dB)
100
90
80
70
60
50
40
30
20
10
0
14:00
17:00
20:00
23:00
02:00
05:00
08:00
11:00
Time (hh:mm)
LAeq,15mins
LAFmax,15mins
LA90,15mins



Desford Lane - CM3
Environmental Noise Monitoring Survey Results
$L_{Aeq,15mins}$, $L_{AFmax,15mins}$ & $L_{A90,15mins}$ Measured Sound Levels - 4th to 8th October 2024
Measured Sound Pressure Level (dB)
80
70
60
50
40
30
20
10
0
14:00
16:15
18:30
20:45
23:00
01:15
03:30
05:45
08:00
10:15
12:30
14:45
17:00
19:15
21:30
23:45
02:00
04:15
06:30
08:45
11:00
13:15
15:30
17:45
20:00
22:15
00:30
02:45
05:00
07:15
09:30
11:45
14:00
16:15
18:30
20:45
23:00
01:15
03:30
05:45
08:00
10:15
12:30
Time (hh:mm)
LAeq,15mins
LAFmax,15mins
LA90,15mins

APPENDICES

APPENDIX D



NOTES:

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- 50–55dB(A)
- 55–60dB(A)
- 60–65dB(A)
- 65–70dB(A)
- 70–75dB(A)
- 75–80dB(A)
- >80dB(A)

REV:	AMENDMENTS:	DRN:	CHK:	APP:	DATE:
-		EW	NF	AB	09.11.24

PROJECT:
LAND OFF DESFORD LANE, RATBY

DRAWING TITLE:
DAYTIME SOUND PRESSURE LEVELS FOR BS 4142 ASSESSMENT

CLIENT:
BELLWAY HOMES LIMITED

DRAWING NUMBER:
29158_04_120_01

REVISION:	SHEET SIZE:	SCALE:
-	A3	NFS

STATUS:
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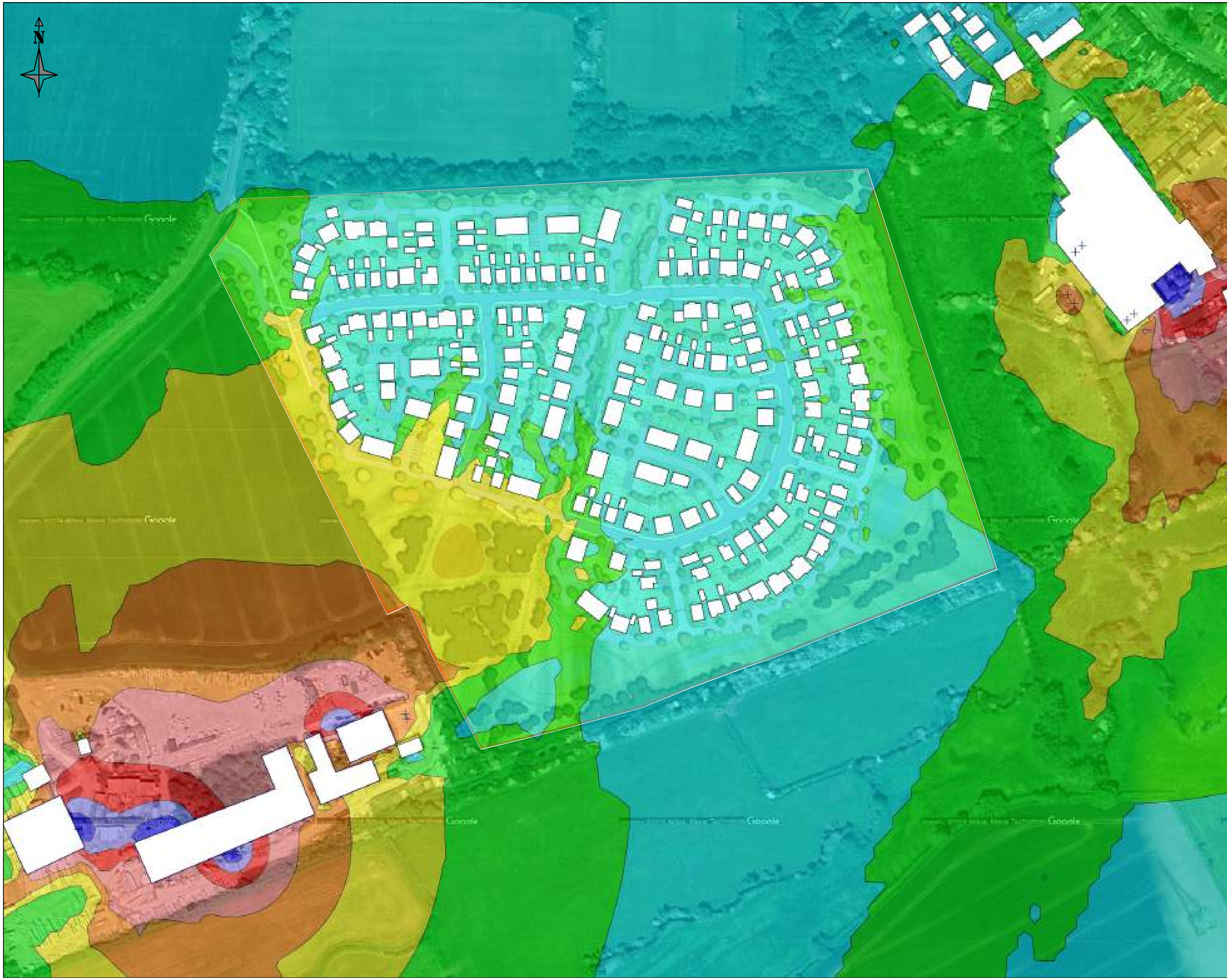

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- 65–70dB(A)
- 70–75dB(A)
- 75–80dB(A)
- >80dB(A)

REV:	AMENDMENTS:	DRN:	CHK:	APP:	DATE:
-		EW	NF	AB	09.11.24

PROJECT: LAND OFF DESFORD LANE, RATBY

DRAWING TITLE: NIGHT-TIME SOUND PRESSURE LEVELS FOR BS 4142 ASSESSMENT

CLIENT: BELLWAY HOMES LIMITED

DRAWING NUMBER: 29158_04_120_02

REVISION: - | SHEET SIZE: A3 | SCALE: NFS

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KEY

(cyan)	0–50dB(A)
(green)	50–55dB(A)
(yellow)	55–60dB(A)
(orange)	60–65dB(A)
(pink)	65–70dB(A)
(red)	70–75dB(A)
(light blue)	75–80dB(A)
(blue)	>80dB(A)
(magenta line)	4m Acoustic Barrier

REV:	AMENDMENTS:	DRN:	CHK:	APP:	DATE:
-		EW	NF	AB	09.11.24

PROJECT:
LAND OFF DESFORD LANE, RATBY

DRAWING TITLE:
DAY-TIME SOUND PRESSURE LEVELS FOR BS 4142 ASSESSMENT WITH MITIGATION

CLIENT:
BELLWAY HOMES LIMITED

DRAWING NUMBER:
29158_04_120_03

REVISION:	SHEET SIZE:	SCALE:
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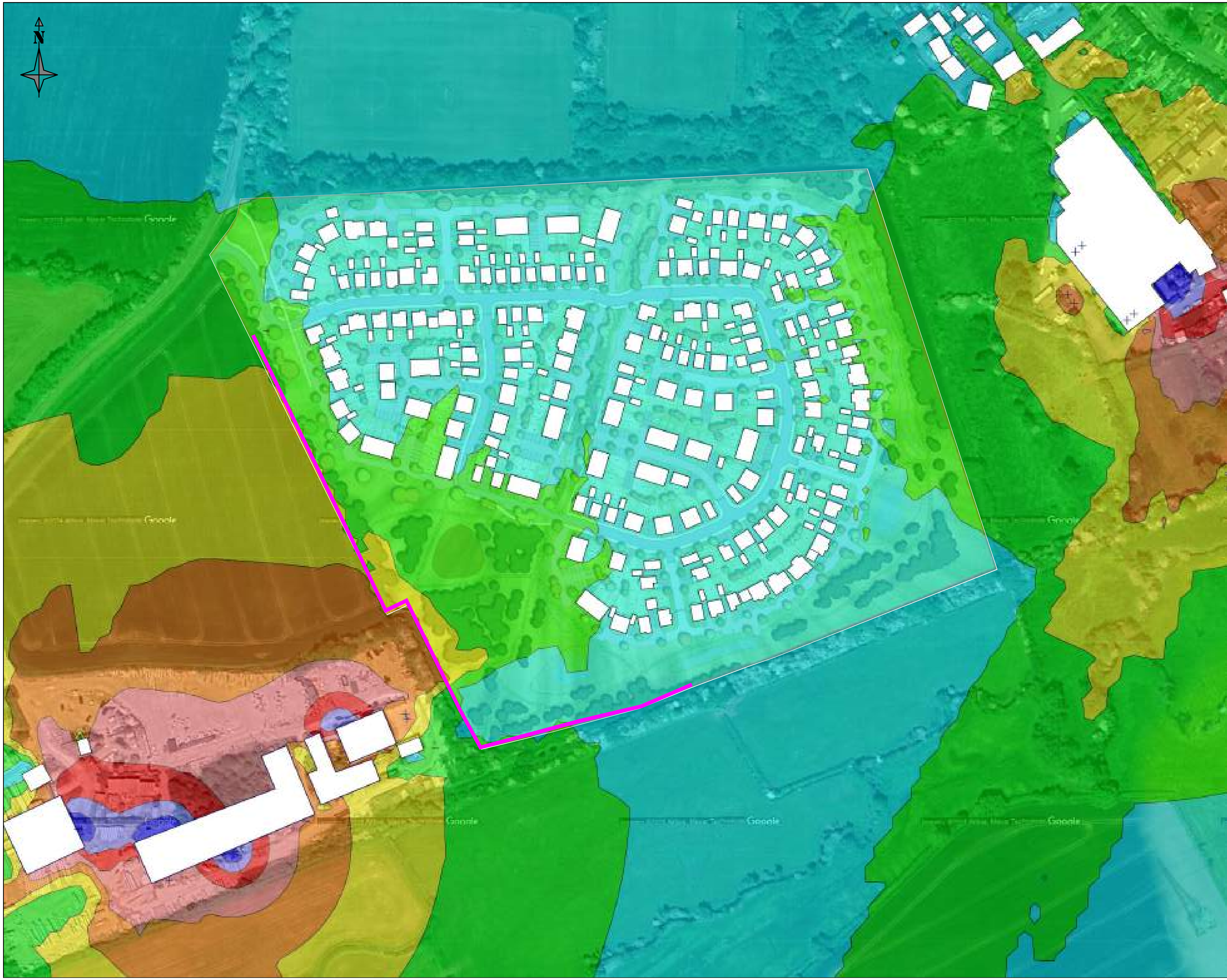

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- 50–55dB(A)
- 55–60dB(A)
- 60–65dB(A)
- 65–70dB(A)
- 70–75dB(A)
- 75–80dB(A)
- >80dB(A)
- 4m Acoustic Barrier

REV:	AMENDMENTS:	DRN:	CHK:	APP:	DATE:
-		EW	NF	AB	09.11.24

PROJECT:
LAND OFF DESFORD LANE, RATBY

DRAWING TITLE:
NIGHT-TIME SOUND PRESSURE LEVELS FOR BS 4142 ASSESSMENT WITH MITIGATION

CLIENT:
BELLWAY HOMES LIMITED

DRAWING NUMBER:
29158_04_120_04

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- 60–65dB(A)
- 65–70dB(A)
- 70–75dB(A)
- 75–80dB(A)
- >80dB(A)
- Area Source

REV:	AMENDMENTS:	DRN:	CHK:	APP:	DATE:
-		EW	NF	AB	09.11.24

PROJECT: LAND OFF DESFORD LANE, RATBY

DRAWING TITLE: DAYTIME AMBIENT SOUND LEVELS, LAeq,16hour

CLIENT: BELLWAY HOMES LIMITED

DRAWING NUMBER: 29158_04_120_05

REVISION:	SHEET SIZE:	SCALE:
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- 65–70dB(A)
- 70–75dB(A)
- 75–80dB(A)
- >80dB(A)

REV:	AMENDMENTS:	DRN:	CHK:	APP:	DATE:
-		EW	NF	AB	09.11.24

PROJECT: LAND OFF DESFORD LANE, RATBY

DRAWING TITLE: NIGHT-TIME AMBIENT SOUND LEVELS, LAeq,8hour

CLIENT: BELLWAY HOMES LIMITED

DRAWING NUMBER: 29158_04_120_06

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- 65–70dB(A)
- 70–75dB(A)
- 75–80dB(A)
- >80dB(A)

REV:	AMENDMENTS:	DRN:	CHK:	APP:	DATE:
-		EW	NF	AB	09.11.24

PROJECT: LAND OFF DESFORD LANE, RATBY

DRAWING TITLE: NIGHT-TIME MAXIMUM SOUND LEVELS, LAFmax,T

CLIENT: BELLWAY HOMES LIMITED

DRAWING NUMBER: 29158_04_120_07

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APPENDICES

APPENDIX E

Question	Answer	Points
#1 Where is the scheme in the UK?	Rest of England and Wales	2
#2 Is the site likely to see an Urban Heat Island effect?	No	0
#3 Does the site have barriers to windows opening?	Day	8
	Night	8
#4 Are the dwellings flats?	No	0
#5 Does the scheme have community heating?	No	0
#6 What is the estimated average glazing ratio for the dwellings	>35%	4
#7 Are the dwellings single aspect?	No	0
#8 Do the site surroundings feature significant blue/green infrastructure?	No	-1
#9 Are immediate surrounding surfaces in majority pale in colour, or blue green?	Yes	-1
#10 Does the site have existing tall trees or buildings that will shade solar-exposed glazed areas?	No	0
#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation?	No	0
#12 Do floor-to-ceiling heights allow for ceiling fans now, or in the future?	No	0
#13 Is there useful external shading?	No	0
#14 Do windows & opening support effective ventilation?	Part F Only	0
Total		20
Overheating Risk		High
Note – Calculations have been undertaken for the most exposed plots to determine the average glazing ratio for the development.		

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APPENDICES

APPENDIX F

NOTES:

1. DO NOT SCALE THIS DRAWING.
2. Please refer to report reference 29158-ENV-0401 for the details on the proposed glazing and ventilation references.

KEY

- Ref. A-1 (blue)
- Ref. A-2 (green)
- Ref. B (yellow)

REV:	AMENDMENTS:	DRN:	CHK:	APP:	DATE:
-		EW	NF	AB	09.11.24

PROJECT: LAND OFF DESFORD LANE, RATBY

DRAWING TITLE: MITIGATION REFERENCE FOR HABITABLE BEDROOMS

CLIENT: BELLWAY HOMES LIMITED

DRAWING NUMBER: 29158_04_120_08

REVISION:	SHEET SIZE:	SCALE:
-	A3	NFS

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2. Please refer to report reference 29158–ENV–0401 for the details on the proposed glazing and ventilation references.

KEY

- Ref. A–1 (blue)
- Ref. A–2 (green)

REV:	AMENDMENTS:	DRN:	CHK:	APP:	DATE:
-		EW	NF	AB	09.11.24

PROJECT: LAND OFF DESFORD LANE, RATBY

DRAWING TITLE: MITIGATION REFERENCE FOR ALL OTHER HABITABLE ROOMS (NON-BEDROOMS)

CLIENT: BELLWAY HOMES LIMITED

DRAWING NUMBER: 29158_04_120_09

REVISION:	SHEET SIZE:	SCALE:
-	A3	NFS

STATUS: FOR INFORMATION / APPROVAL

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APPENDICES

APPENDIX G

Reference A-1 Performance Requirements

Façade Element	Sound Insulation Performance Requirements (dB) in Octave Band Centre Frequencies (Hz)						R_w / $D_{ne,w}$ (dB)	C_{tr} (dB)
	125	250	500	1k	2k	4k		
Glazing	22	20	26	36	39	31	31	-4
Ventilation (Trickle)	32	32	31	33	31	31	32	0
Ventilation (Overheating)	-	-	-	-	-	-	-	-

The glazing reduction requirements can typically be found in a configuration of 4/12/4, where the information is presented in terms of the thickness of one pane of glass in mm, followed by the size of the air gap in mm, followed by the thickness of the second pane of glass in mm.

The background ventilation requirements can be found in standard window mounted non-acoustic trickle ventilators.

Reference A-2 Performance Requirements

Façade Element	Sound Insulation Performance Requirements (dB) in Octave Band Centre Frequencies (Hz)						R_w / $D_{ne,w}$ (dB)	C_{tr} (dB)
	125	250	500	1k	2k	4k		
Glazing	22	20	26	36	39	31	31	-4
Ventilation (Trickle)	32	32	31	33	31	31	32	0
Ventilation (Overheating)	37	30	33	39	45	53	38	-2

The glazing reduction requirements can typically be found in a configuration of 4/12/4.

The background ventilation requirements can be found in standard window mounted non-acoustic trickle ventilators.

The overheating ventilation requirements can be found in a hit and miss acoustic 'air brick'.

Reference B Performance Requirements

Façade Element	Sound Insulation Performance Requirements (dB) in Octave Band Centre Frequencies (Hz)						R_w / $D_{ne,w}$ (dB)	C_{tr} (dB)
	125	250	500	1k	2k	4k		
Glazing	29	27	35	37	36	45	36	-3
Ventilation (Trickle)	40	38	30	49	52	48	40	-4
Ventilation (Overheating)	37	30	33	39	45	53	38	-2

The reduction requirements can typically be found in a configuration of 8/12/10.

The background ventilation requirements can be found in standard window mounted acoustic trickle ventilators.

The overheating ventilation requirements can be found in a hit and miss acoustic 'air brick'.

It is appreciated that it is impractical to achieve every octave band minimum performance requirement, therefore, during procurement of solutions, the R_w + C_{tr} or $D_{ne,w}$ + C_{tr} should be adhered to at a minimum.

Minimum performance requirements for overheating ventilation only applicable if passive ventilation is used. If mechanical ventilation is chosen, the system should adhere to the following noise limits:

Room Type	**Typical Conditions Limit[a]** **$L_{Aeq,\,T}$ dB**	**Overheating Conditions Guidance Value[b]** **$L_{Aeq,\,T}$ dB**
Noise Sensitive Rooms	30	30 (±5)
Less Sensitive Rooms	45	35 (±5)

[a] Taken from section 1.7 of Approved Document F, Volume 1, 2021 Edition.

[b] Taken from AVOG.

'Noise Sensitive Rooms' are defined as bedrooms and living rooms, with the likes of kitchens and bathrooms defined as 'Less Sensitive Rooms'.

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