Land South of Saffron Walden,
CB10 2UR

Planning Noise Assessment

On behalf of

KIER

Project Reference: 90582 | Revision: 2 | Date: 4th November 2022
Revised 23rd November 2022

T: [redacted]
W: [redacted]
E: [redacted]
Noise Solutions Ltd, 5 Oriel Court, Omega Park, Alton, GU34 2YT Reg no. 3483481

Document Information

Project Name	:	**Land South of Saffron Walden**
Project Reference	:	**90582**
Report Title	:	**Planning Noise Assessment**
Doc Reference	:	**90582/PNA/Rev2**
Date	:	**4th November 2022**

	Name	Qualifications	Initials	Date
Prepared by:	Nicholas Haigh	PhD, MPhys, DipIOA, AMIOA	NJH	4th November 2022
Reviewed and approved by:	Nigel Chandler	BSc(Hons), MIOA	NAC	4th November 2022
For and on behalf of Noise Solutions Ltd				

Revision	Date	Description	Prepared	Reviewed/Approved
1	15th November 2022	Updated to final layout.	NJH	NAC
2	23rd November 2022	Updated to final layout.	NJH	NAC

Reg no. 3483481 Trading office, 5 Oriel Court, Omega Park, Alton, GU34 2YT

Contents

Appendices

Executive Summary

This detailed noise impact assessment has demonstrated that noise should not be viewed as a constraint to the granting of planning permission in full accordance with the aims in the National Planning Policy Framework (NPPF).

The local planning authority may choose to impose certain conditions in order to ensure that amenity is protected. The noise impact assessment has demonstrated that conventional construction methods can ensure compliance with a relevant condition which complies with the six tests in the NPPF.

1.0 Context

1.1. It is proposed to develop the site known as Land South of Saffron Walden CB10 2UR, to provide up to 170 dwellings.

1.2. Noise Solutions Ltd has been appointed by Kier to undertake a noise impact assessment to determine the suitability of the development proposals for residential use.

1.3. This report presents the results of the environmental noise survey, the applicable policy/ guidance and the noise impact assessment demonstrating the suitability of the site for residential development, in support of an outline planning application.

1.4. To assist with the understanding of this report a brief glossary of acoustic terms can be found in **Appendix A**. A more in-depth glossary of acoustic terms can be assessed at the following web address [redacted]

2.0 Site Description

2.1. The approximately 7.8ha site is situated to the south-west of Thaxted Road, Saffron Walden. The site is defined to the north and west by existing residential settlement including dwellings, open space, a leisure centre and a skatepark, to the east by Thaxted Road, and to the south hedgerow field boundaries along arable agricultural land. The site is currently in agricultural use and is in use for arable farming.

2.2. **Appendix B** contains an aerial photograph showing the site and surrounding area.

2.3. The sketch site layout (3118-C-1005-SK-G, Rev A, received 23rd November 2022) is shown in **Appendix E**.

3.0 Policy Context

Noise Policy Statement for England

3.1. The Noise Policy Statement for England (NPSE[1]), published in March 2010, sets out the long-term vision of Government noise policy. The Noise Policy aims, as presented in this document, are: "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

[1] Noise Policy Statement for England, Defra, March 2010

- *avoid significant adverse effects on health and quality of life;*
- *mitigate and minimise adverse effects on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

3.2. The NPSE makes reference to the concepts of NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level) as used in toxicology but applied to noise impacts. It also introduces the concept of SOAEL (Significant Observed Adverse Effect Level) which is described as the level above which significant adverse effects on health and quality of life occur.

3.3. The first aim of the NPSE is to avoid significant adverse effects, taking into account the guiding principles of sustainable development (as referenced in Section 1.8 of the NPSE). The second aim seeks to provide guidance on the situation that exists when the potential noise impact falls between the LOAEL and the SOAEL, in which case: "…all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development."

3.4. Importantly, the NPSE goes on to state: "This does not mean that such adverse effects cannot occur."

3.5. The NPSE does not provide a noise-based measure to define SOAEL, acknowledging that the SOAEL is likely to vary depending on the noise source, the receptor and the time in question. NPSE advises that: *"Not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

3.6. It is therefore likely that other guidance will need to be referenced when applying objective standards for the assessment of noise, particularly in reference to the SOAEL, whilst also taking into account the specific circumstances of a proposed development.

National Planning Policy Framework

3.7. A new edition of NPPF was published in July 2021 and came into effect immediately. The original National Planning Policy Framework (NPPF[2]) was published in March 2012, with revisions in July 2018 and February 2019 - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The 2021 revised edition contains no new directions or guidance with respect to noise, and hence, all previous references remain extant. The paragraph references quoted below relate to the July 2021 edition.

[2] National Planning Policy Framework, DCLG, March 2012

3.8. Paragraph 174 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by (amongst others) *"preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land stability."*

3.9. The NPPF goes on to state in Paragraph 185:

"planning policies and decisions should ...

a) 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;
b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason ...

3.10. The NPPF document does not refer to any other documents or British Standards regarding noise other than the Noise Policy Statement for England (NPSE[3]).

3.11. Paragraph 2 of the NPPF states that "planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise."

3.12. Paragraph 12 of the NPPF states that "The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed".

3.13. Paragraph 119 states that "Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land".

[3] Noise Policy Statement for England, DEFRA, March 2010

Planning Practice Guidance – Noise

3.14. An updated Planning Practice Guidance (PPG[4]) for noise was published on 22 July 2019 and provides additional guidance and elaboration on the NPPF. It advises that when plan-making and decision-taking, the Local Planning Authority should consider the acoustic environment in relation to:

- 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.

3.15. This guidance introduced the concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). NOAEL differs from NOEL in that it represents a situation where the acoustic character of an area can be slightly affected (but not such that there is a perceived change in the quality of life). UAEL represents a situation where noise is 'very disruptive' and should be 'prevented' (as opposed to SOAEL, which represents a situation where noise is 'disruptive', and should be 'avoided').

3.16. As exposure increases above the LOAEL, the noise begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.

3.17. The LOAEL is described in PPG[5] as the level above which "noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard".

3.18. PPG identifies the SOAEL as the level above which "noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present."

[4] Planning Practice Guidance – Noise, https://www.gov.uk/guidance/noise--2, 22 July 2019
[5] Paragraph: 005 Reference ID: 30-005-20190722

3.19. In line with the Explanatory Note of the NPSE, the PPG goes on to reference the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG[6] acknowledges that *"...the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation."*

3.20. The relevant guidance in the PPG in relation to the adverse effect levels is summarized below:

Table 1: PPG Effects Table

Response	Examples of Outcomes	Effect Level	Action
No Observed Effect Level			
Not Present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not Intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and Intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum

[6] Paragraph: 006 Reference ID: 30-006-20190722

Response	Examples of Outcomes	Effect Level	Action
Significant Observed Adverse Effect Level			
Present and Disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very Disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

3.21. The Planning Practice Guidance[7] states the following in relation to mitigation measures:

> *"For noise sensitive developments, mitigation measures can include avoiding noisy locations in the first place; designing the development to reduce the impact of noise from adjoining activities or the local environment; incorporating noise barriers; and optimising the sound insulation provided by the building envelope."*

3.22. In addition, the Guide notes that it may also be relevant to consider[8]:

> *"... whether any adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time (and the effect this may have on living conditions). In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations".*

Local policy

3.23. NSL has engaged with the LPA via the pre-application process and the associated submitted document[9]. This document summarises the surveys, assessments, and choice of guidance to be used in each assessment.

[7] Paragraph: 010 Reference ID: 30-010-20190722
[8] Paragraph: 006 Reference ID: 30-006-20190722
[9] Document reference 90582/TN01/Rev1

3.24. The choice of assessment guidance for particular noise sources and receptors is standard and supported by and in line with Uttlesford's Noise Assessment Technical Guidance Document[10].

3.25. Uttlesford local plan policy ENV11 provides guidance with regard to consideration and assessment of aircraft noise, and this has been incorporated into the assessment here.

4.0 Acoustic Standards and Guidance

Institute of Acoustics Professional Practice Guidance (ProPG)

4.1. The Institute of Acoustics published a guidance document for new residential development in May 2017, in conjunction with the ANC and the Chartered Institute of Environmental Health, "*to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England*".

4.2. The document advocates a two-stage process for consideration of noise affecting new residential developments. Stage 1 is an initial risk assessment of the proposed development site, based on the ambient noise levels in the area. Stage 2 recommends consideration of four main elements:

- demonstration of a "good acoustic design process"
- observation of internal noise guidelines
- an assessment of noise affecting external amenity areas
- consideration of other relevant issues

4.3. The initial risk assessment considers the indicative day-time and night-time equivalent continuous noise levels which indicates an "*increasing risk of adverse effect*" with increasing noise levels[11].

4.4. For Stage 2, the ProPG document recommends that the guidance in BS 8233:2014 is followed.

[10] 'Noise Assessment Technical Guidance', Uttlesford District Council, June 2017
[11] Figure 1, IoA ProPG for New Residential Development, May 2017

BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

4.5. This Standard provides recommended guideline values for internal noise levels within dwellings which are similar in scope to guideline values contained within the World Health Organisation (WHO) document, Guidelines for Community Noise (1999[12]). These guideline noise levels are shown in Table 2, below:

Table 2: BS 8233 Desirable Internal Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00 hours	23:00 to 07:00 hours
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 $L_{Aeq,8h}$

4.6. BS 8233:2014 advises that: "regular individual noise events…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."

4.7. BS8233 also gives general guidance on the expected sound insulation performance of a given building façade, with details of how various elements can affect the overall performance. Concerning windows, it states[13] that:

> *"If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15dB."*

4.8. This implies that should windows on a noise affected façade be openable, a sound insulation value of 15dB should be applied to the whole façade to an internal room being assessed. It should be noted that a sound insulation performance of much greater than 15dB is expected for non-openable standard double glazed windows. However in order to assess the worst case scenario, this report assume that windows may be opened if desired.

4.9. The standard also provides advice in relation to design criteria 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*

[12] World Health Organisation Guidelines for Community Noise, 1999
[13] Paragraph G1 in BS8233:2014

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.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate.

Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation.

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."

Building Regulations – Parts L and F

4.10. Part L of the Building Regulations mandates that buildings become more airtight, and Part F stipulates ventilation requirements. Even though there appears to be a contradiction in this, Part L limits uncontrollable ventilation, while Part F ensures that ventilation requirements are provided in a controlled manner.

Background ventilation

4.11. Three types of ventilation are required under Part F. Whole building ventilation provides nominally continuous air exchange which may be reduced or ceased when the building is not occupied. It can be provided via background ventilators operating alone, or together with:

- passive stack ventilators;
- continuous mechanical extract; or

- continuous mechanical supply and extract with heat recovery.

4.12. Extract ventilation is applicable to rooms where most water vapour and/or pollutants are released (e.g. kitchens and bathrooms). It can be provided by intermittent fans, passive stack or continuous mechanical extract with or without mechanical supply and heat recovery.

4.13. The four systems described in Part F do not present solutions which utilise the use of opening windows for background ventilation. Opening windows do not provide a controllable means of ventilation and also pose security risks.

Purge ventilation

4.14. Purge ventilation is required throughout the building to aid the removal of high concentrations of pollutants and water vapour. It is commonly provided simply by opening windows and doors.

4.15. Even though purge ventilation is recommended via opening windows, the temporary and intermittent occurrence of this does not normally result in an unacceptable increase of internal noise levels.

4.16. Part F goes on to say[14] that "Purge ventilation provisions may also be used to improve thermal comfort, although this is not controlled under the Building Regulations."

Summary in relation to ventilation

4.17. In summary, background ventilation for new residential dwellings should be provided via one of the four systems in Approved Document F. The composite external building fabric should be designed to ensure that appropriate internal noise levels due to external incident noise are met during background ventilation.

4.18. Purge ventilation for new residential dwellings should be provided via open windows. The slight increase of internal noise levels should be considered acceptable.

Building Regulations – Part O

4.19. Approved Document *O1: Overheating mitigation* of the Building Regulations 2010, came into force on 15 June 2022. Section 3 in the Approved Document includes the following:

> *Noise*
> *3.2 In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).*

[14] Paragraph 4.15 in Approved Document F

3.3 Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.
a. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).
b. 55dB L_{AFmax}, more than 10 times a night (between 11pm and 7am).
3.4 Where in-situ noise measurements are used as evidence that these limits are not exceeded, measurements should be taken in accordance with the Association of Noise Consultants' Measurement of Sound Levels in Buildings with the overheating mitigation strategy in use.

NOTE: Guidance on reducing the passage of external noise into buildings can be found in the National Model Design Code: Part 2 – Guidance Notes (MHCLG, 2021) and the Association of Noise Consultants' Acoustics, Ventilation and Overheating: Residential Design Guide (2020)

The AVO guide

4.20. The Residential Design Guide on Acoustics Ventilation and Overheating (version 1.1) ("the AVO Guide") was published in January 2020 by the Association of Noise Consultants (ANC) and the Institute of Acoustics (IoA).

4.21. The AVO Guide states that it "is intended to be used by acoustics practitioners as well as all those involved in the planning, development, design and commissioning of new dwellings. It recommends an approach to acoustic assessments for new residential development that take due regard of the interdependence of provisions for acoustics, ventilation, and overheating".

4.22. For a full description of the AVO guide, see **Appendix D**.

World Health Organisation, Guidelines for Community Noise, 1999 (WHO)

4.23. The World Health Organisation (WHO) Guidelines for Community Noise (1999) recommends suitable internal and external noise levels based on dose response research. The levels recommended in this guidance could be correlated to the LOAEL. Relevant guidance from this document is presented below.

- Sleep Disturbance (Night-time internal LOAEL): If negative effects on sleep are to be avoided, the equivalent sound pressure level should not exceed 30dBA indoors for continuous noise.

- Interference with Communication (Daytime internal LOAEL): Noise tends to interfere with auditory communication, in which speech is a most important signal. However, it is also vital to be able to hear alarming and informative signals such as door bells, telephone signals, alarm clocks, fire alarms etc., as well as sounds and signals involved in occupational tasks. The effects of noise on speech discrimination have been studied extensively and deal with this problem in lexical terms (mostly words but also sentences). For communication distances beyond a few metres, speech interference starts at sound pressure levels below 50 dB for octave bands centred on the main speech frequencies at 500, 1 000 and 2 000 Hz. It is usually

possible to express the relationship between noise levels and speech intelligibility in a single diagram, based on the following assumptions and empirical observations, and for speaker-to-listener distance of about 1 metre:

a) Speech in relaxed conversation is 100% intelligible in background noise levels of about 35dBA, and can be understood fairly well in background levels of 45dBA.

b) Speech with more vocal effort can be understood when the background sound pressure level is about 65dBA.

World Health Organisation (WHO) 2009

4.24. The introduction of the Directive on Environmental Noise, obliges Member States to assess and manage noise levels. With the support of the European Commission, the WHO Regional Office for Europe has developed night noise guidelines for Europe to help Member States develop legislation to control noise exposure.

4.25. The guidelines are based on scientific evidence on the effects of noise and the thresholds above which these effects appear to harm human health.

4.26. There is limited evidence that night noise is related to hypertension, heart attacks, depression, changes in hormone levels, fatigue and accidents.

4.27. The WHO report summarises the threshold levels of night noise above which a negative effect starts to occur or above which the impact becomes dependent on the level of exposure. For example, the threshold level for waking in the night and/or too early in the morning was 42 dB.

4.28. It also establishes that there are differences in the intensity and frequency of noise depending on the source, which lead to different impacts. Road traffic is characterised by low levels of noise per event, but as there are a high number of events, on average it has a greater effect on awakenings than air traffic, which has high levels of noise per event but fewer events.

4.29. Integrating these findings, the report proposed a guideline target limit of outdoor night noise of 40 dB (annual average defined as 'L_{night}' in the Environmental Noise Directive). There is not sufficient evidence that the biological effects observed below this level are harmful to health but adverse effects are observed above 40 dB.

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

4.30. BS 4142:2014+A1:2019 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014 includes *"sound from fixed plant installations which comprise mechanical and electrical plant and equipment"*.

4.31. The procedure contained in BS 4142:2014 is to quantify the *"specific sound level"*, which is the measured or predicted level of sound from the source in question over a one hour period for the daytime and a 15 minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.

4.32. The specific sound level is converted to a rating level by adding penalties on a sliding scale to account for either potentially tonal or impulsive elements. The standard sets out objective methods for determining the presence of tones or impulsive elements, but notes that it is acceptable to subjectively determine these effects.

4.33. The penalty for tonal elements is between 0dB and 6dB, and the standard notes: "*Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible."*

4.34. The penalty for impulsive elements is between 0dB and 9dB, and the standard notes: *"Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."*

4.35. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

- *Typically, the greater this difference, the greater the magnitude of the 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;*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*

4.36. The standard does state that *"adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."*

4.37. The standard goes on to note that: *"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."*

4.38. In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

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

4.39. BS 4142:2014 requires uncertainties in the assessment to be considered, and where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

5.0 Survey details

Road traffic Noise Survey (NMP1)

5.1. An environmental noise survey was undertaken to establish the typical incident environmental noise levels close to the road edge, and statistical parameters relating to it. The survey was primarily intended for measurement of road traffic noise.

5.2. Data are free-field. Full details of the survey (NMP1) are provided in **Appendix C** alongside a time history graph of the measurement results.

5.3. The following table summarises the overall daytime and night-time noise level parameters as required for BS8233:2014 and WHO assessments, as measured at the survey location.

Table 3: Summary of calculated daytime and night-time environmental noise levels for NMP1, Thaxted Road

Period	Parameter	Level (dB)
Overall daytime level (dB)	$L_{Aeq,\ 16\ hours}$	69.6
Overall night-time level (dB)	$L_{Aeq,\ 8\ hours}$	59.6
	[1]$L_{AMax,f}$	83.3
[1]10th highest value measured during the night-time survey period; data binned to 30-second samples.		

5.4. Measured octave band sound pressure levels for the survey period are given in the Table below. Spectra are presented for daytime, night-time and 10th-highest L_{AMax} event.

Table 4 Measured octave band sound pressure levels at the measurement location

Parameter	Incident sound pressure levels (dB) at Octave Band Centre Frequencies (Hz)								dBA
	63	125	250	500	1000	2000	4000	8000	
$L_{Zeq,\ 16hr}$ (day)	71	65	63	63	68	66	63	59	70
$L_{Zeq,\ 8hr}$ (night)	58	54	52	51	57	54	44	38	60
L_{ZMax} (night)	80	76	75	75	81	77	65	59	83

5.5. Further key results of the survey are summarised in Table 5 below.

Table 5: Summary of survey results – ranges of measured statistics

Position	Measurement period	Range of recorded sound pressure levels (dB)			
		$L_{Aeq(15mins)}$	$L_{Amax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
NMP1	Daytime (07.00 – 23.00 hours)	64-71	80-93	65-76	40-60
	Night-time (23.00 – 07.00 hours)	31-65	46-87	33-69	29-41

5.6. Background sound pressure levels are further illustrated in the histograms below.

Figure 1 Histogram of daytime L_{A90} background sound pressure levels

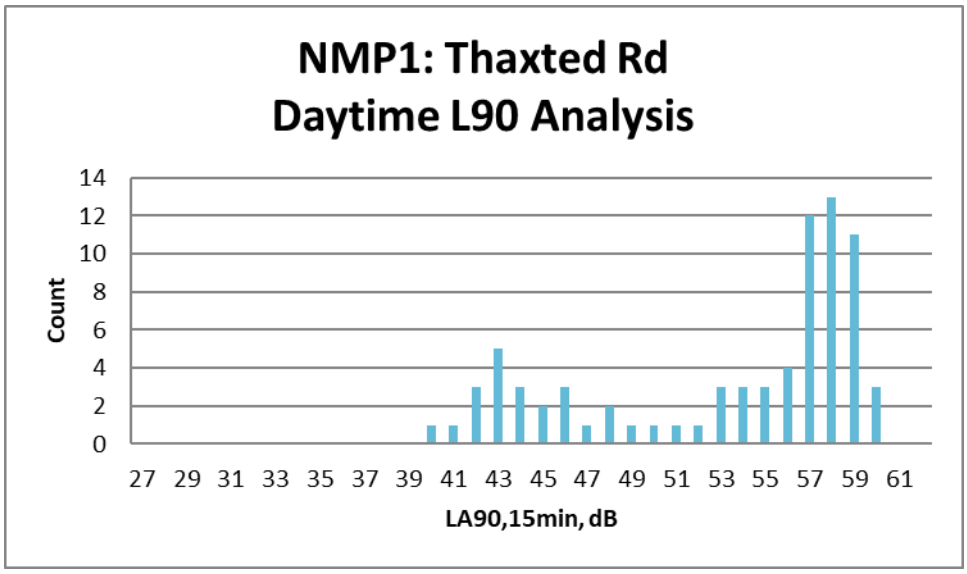
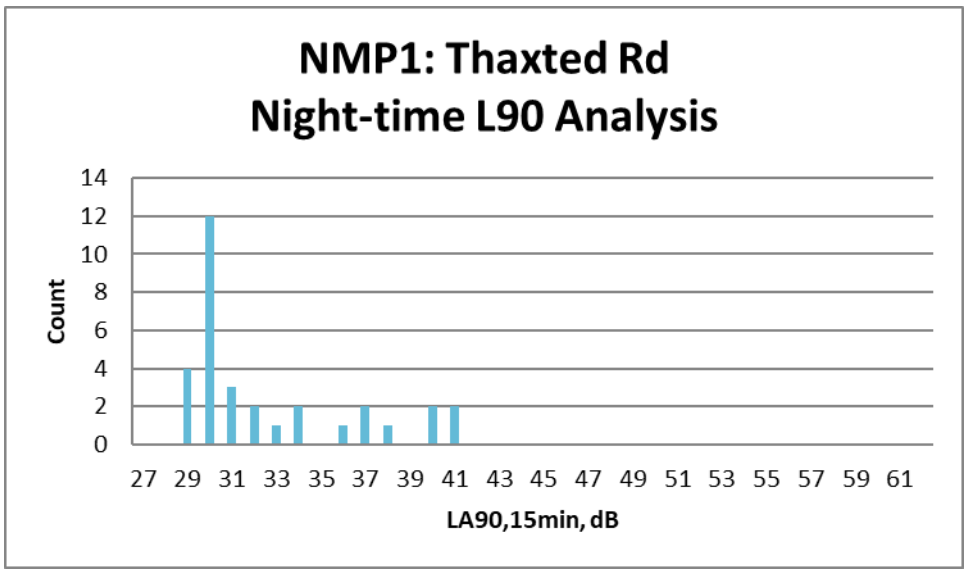


Figure 2 Histogram of night-time L_{A90} background sound pressure levels



5.7. The following values are therefore considered to be robustly representative of the existing background sound pressure levels at proposed noise sensitive receptors close to the survey location:

- 43 dB L_{A90} during the daytime period; and
- 30 dB L_{A90} during the night-time period.

Background Noise Survey (BG1)

5.8. An environmental noise survey was undertaken to establish the typical incident environmental noise levels at the proposed residential development in the area of the measurement location, and statistical parameters relating to it.

5.9. Data are free-field. Full details of the survey (BG1) are provided in **Appendix C** alongside a time history graph of the measurement results.

5.10. The following table summarises the overall daytime and night-time noise level parameters as used for BS8233:2014 and WHO assessments, as measured at the survey location. Only weekday data have been used to inform a worst case.

5.11. With regard to the measurement of $L_{AMax,f}$, the time history shows a very clear dawn chorus between 05.15 and 06.15, as expected for the time of year, and this section of the data has been omitted as localised birdsong is not likely to be considered objectionable or disturbing.

Table 6: Summary of calculated weekday daytime and night-time environmental noise levels at BG1

Item	Parameter	Level (dB)
Overall daytime level	$L_{Aeq,\ 16\ hours}$	51.7
Overall night-time level	$L_{Aeq,\ 8\ hours}$	42.2
	[1]$L_{AMax,f}$	58.2
[1]10th highest value measured during the night-time survey period; data binned to 30-sec samples.		

5.12. Further key results of the survey are summarised in Table 7 below. The data include both weekdays and the weekend period.

Table 7: Summary of survey results at BG1 – ranges of measured statistics

Position	Measurement period	Range of recorded sound pressure levels (dB)			
		$L_{Aeq(15mins)}$	$L_{Amax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
NMP1	Daytime (07.00 – 23.00 hours)	35-62	51-92	37-64	31-49
	Night-time (23.00 – 07.00 hours)	27-52	33-73	28-57	25-46

5.13. Measured octave band sound pressure levels for the survey period are given in the Table below. Spectra are presented for daytime, night-time and 10th-highest L_{AMax} event.

Table 8 Measured octave band sound pressure levels at measurement location BG1

Parameter	Incident sound pressure levels (dB) at Octave Band Centre Frequencies (Hz)								dBA
	63	125	250	500	1000	2000	4000	8000	
$L_{Zeq,\ 16hr}$ (day)	58	54	51	49	47	43	40	36	52
$L_{Zeq,\ 8hr}$ (night)	49	43	41	40	36	33	32	26	42
L_{ZMax} (night)	60	52	50	50	52	49	54	46	58

5.14. Background sound pressure levels are further illustrated in the histograms below.

Figure 3 Histogram of daytime L_{A90} background sound pressure levels

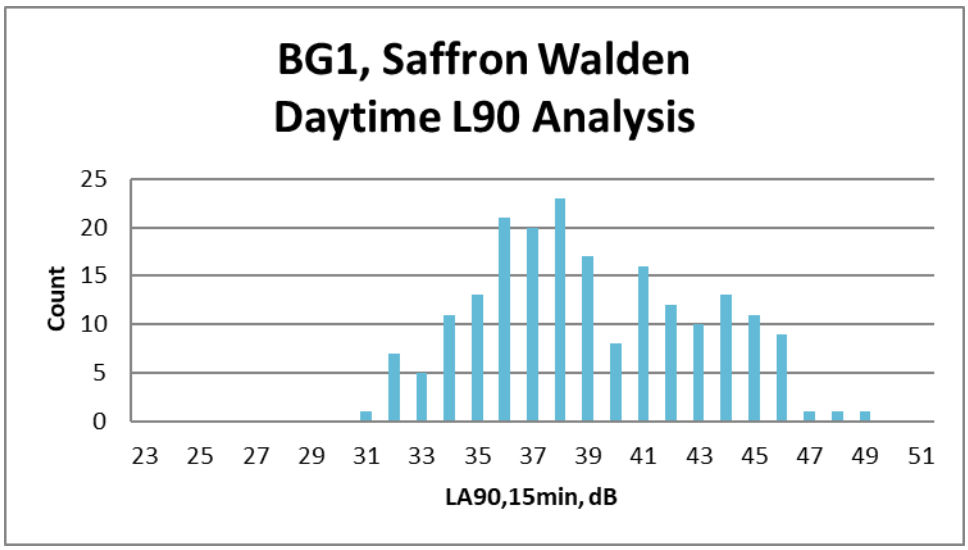
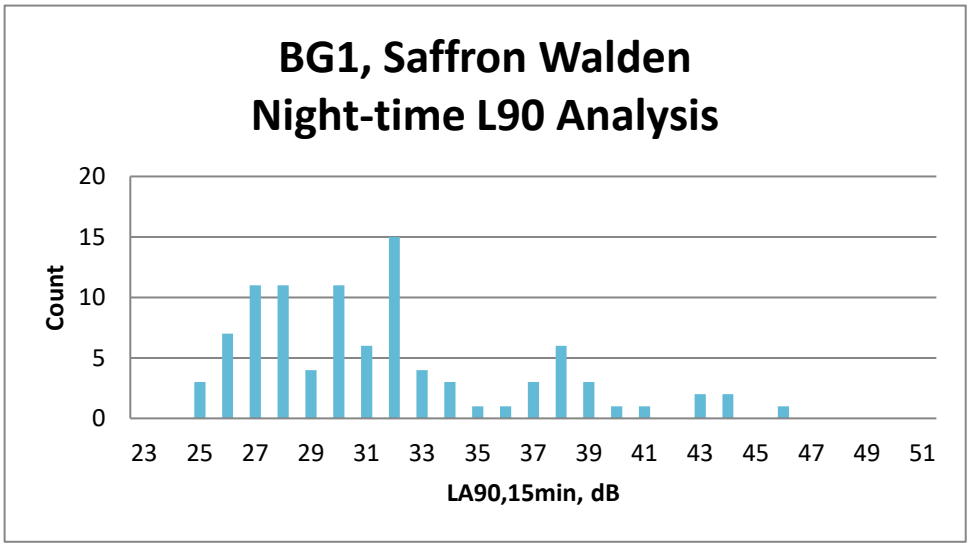


Figure 4 Histogram of night-time L_{A90} background sound pressure levels



5.15. The following values are therefore considered to be robustly representative of the existing background sound pressure levels at proposed noise sensitive receptors close to the survey location:

- 34 dB L_{A90} during the daytime period; and
- 26 dB L_{A90} during the night-time period.

Recycling Centre Survey – COM1

5.16. An attended environmental sound pressure level survey was undertaken at location COM1 across four days, throughout the operational hours of the recycling centre (0700 until 1700).

5.17. The SLM marker functions were used taken in order to separate noise due to the recycling centre from other sources such as aircraft and construction. Nonetheless for much of the time, the recycling centre was dominant. Full details are presented in **Appendix B** (locations) and **Appendix C** (survey details).

Skatepark Survey – COM2

5.18. An attended environmental sound pressure level survey was undertaken at location COM2 for two one hour long periods on a warm sunny Saturday afternoon.

5.19. During the survey, around 10 youths were present, intermittently using the skating surfaces with a variety of skateboards, scooters and other wheeled devices. However the dominant noise arising from the skatepark was due to voices.

5.20. The SLM marker functions were used taken in order to separate noise due to the skate park from other sources such as aircraft. Full details are presented in **Appendix B** (locations) and **Appendix C** (survey details).

Covid-19

5.21. It should be noted that the environmental noise surveys discussed in this report were undertaken in April 2022, at a time when the coronavirus pandemic was causing no significant disruption to typical working patterns and other activity.

6.0 Residential Noise Assessments

Aircraft noise.

6.1. Local plan policy ENV11 requires reference to noise contours for Stansted airport, which are published by the CAA[15].

6.2. Only the northern flight path BKY approaches the site, passing 4 km to its south. The southern BKY path and all others (CLN,DET,LAM and LYD) lie a considerable distance to the south of the site, mostly south and east of Stansted airport.

6.3. The most recent published report is from 2019, and shows that the site is approximately 9 km outside the lowest published noise contours (54 dBA daytime, 48 dBA night-time). In view of the distance from these contours, noise levels some tens of dB lower would be expected. Therefore BS8233:2014 L_{Aeq} criteria for internal and external noise levels will be comfortably met.

6.4. Additionally, the background and ambient noise surveys by their nature include noise due to aircraft. Wind conditions on 3 of the 4 survey days were dominated by NW to NE winds when the northern take-off routes would be expected to have been used, leading to a worst-case measurement of aircraft noise during the background survey.

6.5. Night-time noise events, which include those from aircraft, are therefore considered in the following sections as a component of the overall night-time L_{AMax} assessment.

Initial risk assessment

6.6. Noise modelling in the package iNoise has been used to determine noise levels across the undeveloped site as per the requirements of ProPG. Noise levels have been calibrated to the daytime and night-time measurements obtained at NMP1 and described in Section 5. The software uses ISO9613 (industry standard) to determine noise levels across the site, using full topography and standard attenuation mechanisms.

6.7. The chosen colour scheme corresponds to that used in ProPG figure 1 to enable comparison. Results for daytime and night-time are shown in **Appendices F and G** respectively. These figures also show the risk assessment scale from the ProPG document.

[15] Noise Exposure Contours for Stansted Airport 2019, ERCD REPORT 2003, published by the CAA.

6.8. Results for both daytime and night-time range from negligible in the west (approximately half of the site), through low across approximately half of the site, and reaching medium for a very narrow strip closest to the Thaxted Road. However this part of the site will not contain any dwellings, being extremely close to the boundary (see draft site layout **Appendix E**).

6.9. With reference to the 'negligible' category (approximately half of the site), the ProPG document notes that:

> *These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.*

6.10. With reference to the 'low' category (approximately half of the site), the ProPG document notes that:

> *At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.*

6.11. Note that this initial indication of risk "*is not the basis for the eventual recommendation to the decision maker*" but instead should inform the assessment and design process.

Building fabric assessment

6.12. In order to assess the suitability of the site for the proposed dwellings it is important to predict the internal noise levels within habitable rooms.

6.13. The composite acoustic performance required of any portion of the building envelope will depend on its location relative to the principal noise sources around the site and the nature of the spaces behind it (noise criteria, size, room finishes etc.).

6.14. The variation in incident noise levels on the different façades, along with differences in internal layouts and size of glazed areas, implies that a number of different sound insulation performance levels may be required in order for a specific internal ambient noise level to be reached. Logistically, this could result in increased costs for the development due to bespoke solutions, effects on programme and increase of errors during construction.

6.15. Therefore, it is not practical to specify a large number of different external building fabric constructions and this is also not supported by national policy on noise.

6.16. Worst-case receptors closest to the road are considered (R1 and R2), as well as a more typical receptor in the centre of the site (R3). In all cases, no attenuation due to intervening buildings is considered, though this will amount to 5-10 dBA for typical dwellings within the site. Receptors are marked up in **Appendix E**.

6.17. The detailed calculation methodology described in BS 8233:2014 has been used in the assessment. Table 9 below presents the input data used to predict the resultant internal noise level in the habitable rooms.

6.18. Typical construction types have been assumed, though it should be noted that the information used is considered to be pessimistic and therefore the resulting assessment errs on the side of caution.

Table 9: Source data for the noise break-in assessment for a typical dwelling

Unit type	Parameter	Bedroom	Living Room
Flat (R1)	Room Volume (m^3)	30	47
	Room Furnishings	Bed, carpet, curtains	Suite, part-carpeted floor, curtains
	Area of window (m^2)	5	8
	Area of external wall (m^2)	8	26
House (R2, R3)	Room Volume (m^3)	25	44
	Room Furnishings	Bed, carpet, curtains	Suite, part-carpeted floor, curtains
	Area of window (m^2)	4	4
	Area of external wall (m^2)	16	21

6.19. Noise levels for R1 and R2 are distance corrected from the road traffic noise survey at NMP1, while noise levels for R3 are based upon measured levels at BG1.

6.20. Based on the information above, the noise spectrum data shown in Tables 4 and 8, and using distance corrections as appropriate, the resulting internal sound levels may be calculated.

6.21. The results of the assessment are shown below.

Table 10: Predicted internal sound pressure levels (closed windows)

Plot location	Room Type	Reference*	External level (dB)	Predicted internal level (dB)	Proposed LOAEL (dB)	Difference (dB)
R1	Living room	Daytime $L_{Aeq\ 16hr}$	69	33	35	-2
	Bedroom	Daytime $L_{Aeq\ 16hr}$	69	33	35	-2
		Night-time $L_{Aeq\ 8hr}$	57	21	30	-9
		Night-time $L_{Amax,f}$	77	41	45	-4

Plot location	Room Type	Reference*	External level (dB)	Predicted internal level (dB)	Proposed LOAEL (dB)	Difference (dB)
R2	Living room	Daytime $L_{Aeq\ 16hr}$	66	31	35	-4
	Bedroom	Daytime $L_{Aeq\ 16hr}$	66	32	35	-3
		Night-time $L_{Aeq\ 8hr}$	54	21	30	-9
		Night-time $L_{Amax,f}$	75	42	45	-3
R3	Living room	Daytime $L_{Aeq\ 16hr}$	52	24	35	-11
	Bedroom	Daytime $L_{Aeq\ 16hr}$	52	26	35	-9
		Night-time $L_{Aeq\ 8hr}$	42	16	30	-14
		Night-time $L_{Amax,f}$	58	29	45	-16
**Uses daytime $L_{Aeq,16hr}$, night-time $L_{Aeq,8hr}$, typical highest night-time maximum noise level (see Section 3).*						

6.22. These calculations are based on the following (Table 11) glazing and ventilation constructions (with further details provided in Table 12) in order to meet internal noise criteria:

Table 11: Required construction to meet internal noise criteria

Plot location	Room Type	Mitigation requirement	
R1	Living room	'Type B' Standard Glazing	High-performance trickle ventilators
	Bedroom	'Type B' Standard Glazing	High-performance trickle ventilators
R2	Living room	'Type A' Standard Glazing	High-performance trickle ventilators
	Bedroom	'Type A' Standard Glazing	High-performance trickle ventilators
R3	Living room	'Type A' Standard Glazing	Standard trickle ventilators
	Bedroom	'Type A' Standard Glazing	Standard trickle ventilators

6.23. These higher specifications set out for R1 and R2 apply only to facades housing habitable rooms with line-of-sight to the Thaxted Road. The higher specifications given for R1 apply only where facades are closer to the road than those of the houses at R2.

6.24. The minimum airborne sound insulation performance of each of these constructions is as set out as follows:

Table 12: Proposed building envelope specifications

Item	Spec.	Attenuation (dB) at Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Type A' Standard Glazing [typically 4mm glass /16mm cavity /4 mm glass]	SRI	21	24	20	25	34	37	40	40
'Type B' Standard Glazing [typically 10mm glass /16mm cavity /6 mm glass]	SRI	19	24	24	31	39	39	43	43
Standard trickle ventilator	D_{ne}	30	32	32	31	33	31	31	31
High-performance trickle ventilator	D_{ne}	33	35	35	43	45	45	45	45
Non-vision wall – all areas Cavity brick-block construction (or cladding with dry-lining with similar acoustic performance)	SRI	35	41	45	45	54	58	55	55

6.25. It should be noted that glazing configurations and other constructions described above are for guidance and costings purposes only. It will be the responsibility of the manufacturer to provide evidence of compliance with the required octave band sound reduction performances.

6.26. The assessment shows that with typical building constructions and glazing and ventilators, internal noise levels will be satisfy the guidance value criteria in BS 8233:2014 and WHO guidance.

Mitigation of overheating

6.27. It is important to note that the building envelope sound insulation specifications and associated advice given in this report are based on meeting the design criteria under the "Whole Dwelling Ventilation" conditions set out in Approved Document F (and formerly referred to as "background ventilation" in previous editions of the AD), as distinct from "Extract Ventilation" or "Purge Ventilation" conditions within the AD, and from the overheating condition (which is only briefly mentioned in AD F).

6.28. In January 2020 the Association of Noise Consultants (ANC) and Institute of Acoustics (IoA) published a Residential Design Guide on Acoustic Ventilation and Overheating ("the AVO Guide"), which sets out some of the acoustic design issues associated with the control of overheating. The night-time thresholds suggested in the AVO Guide have been superseded by the limits set out in Approved Document O.

6.29. The AVO guide suggests that a value of 13dB(A) is used for the noise reduction provided by an open window. Resulting internal noise levels would therefore be as shown in Table 13.

6.30. It should be noted that these are worst-case values assuming that windows are open continuously to control overheating.

Table 13 Predicted internal sound pressure levels (open windows)

Plot location	Room type	Period/ Parameter	External sound level, dB	Internal sound level, dB	Proposed criterion, dB	Excess, dB
R1	Living room	Daytime $L_{Aeq\ 16hr}$	69	56	50 (AVO guidance)	**6**
	Bedroom	Daytime $L_{Aeq\ 16hr}$	69	56	50 (AVO guidance)	**6**
		Night-time $L_{Aeq\ 8hr}$	57	44	40 (Part O requirement)	**4**
		Night-time $L_{Amax,f}$	77	64	55 (Part O requirement)	**9**
R2	Living room	Daytime $L_{Aeq\ 16hr}$	66	53	50 (AVO guidance)	**3**
	Bedroom	Daytime $L_{Aeq\ 16hr}$	66	53	50 (AVO guidance)	**3**
		Night-time $L_{Aeq\ 8hr}$	54	41	40 (Part O requirement)	**1**
		Night-time $L_{Amax,f}$	75	62	55 (Part O requirement)	**7**
R3	Living room	Daytime $L_{Aeq\ 16hr}$	52	39	50 (AVO guidance)	-11
	Bedroom	Daytime $L_{Aeq\ 16hr}$	52	39	50 (AVO guidance)	-11
		Night-time $L_{Aeq\ 8hr}$	42	29	40 (Part O requirement)	-11
		Night-time $L_{Amax,f}$	58	45	55 (Part O requirement)	-10

6.31. Where windows are only open for a proportion of the time the internal noise levels will be lower.

6.32. It should be noted that these are worst-case values assuming that windows are open continuously to control overheating. Where windows are only open for a proportion of the time the internal noise levels will be lower.

6.33. For the worst-case facades, levels are exceeded where windows are open continuously. Exceedances are found for facades with direct line-of-sight to the road out to ~100m from the Thaxted Road, ie those in the vicinity of R1 and R2. Note that as these facades are North-east facing, they are unlikely to be prone to significant overheating, and therefore no adverse impacts are concluded.

6.34. Internal noise levels across the remainder of the site with windows open are found to meet the criteria recommended in the guidance and should therefore be acceptable.

6.35. Additionally, as the worst exceedances are where facades contain bedrooms, it would be desirable to place bedrooms on facades preferentially facing away from the Thaxted Road.

6.36. **Appendix D** contains a narrative summary of the AVO guidelines, and also some potential mitigation solutions for modest exceedances of the guideline values such as those here.

External Amenity noise levels

6.37. Worst-case noise levels are considered for plots facing onto the Thaxted Road, as well as a more typical plot in the centre of the site.

6.38. **Appendix H** shows daytime external amenity levels for the most exposed area of the undeveloped site with the proposed draft layout.

6.39. Standard 1.8m garden fencing is assumed to be used for garden boundaries, providing 5dBA of attenuation. Note that in the layout considered here, almost all gardens across the site will benefit from considerable additional shielding by houses, resulting in lower noise levels.

Table 14 Predicted external sound pressure levels

Plot	Daytime free-field sound level $L_{Aeq,16hr}$ (dB)	Level with fencing attenuation $L_{Aeq,16hr}$ (dB)	Criterion $L_{Aeq,16hr}$ (dB)	Comparison with criterion $L_{Aeq,16hr}$ (dB)	Comment
R1	-	-	-	-	No external amenity.
R2	60	55	55	0	Worst-case for site.
R3	48	43	55	-12	Typical mid-site dwelling.

6.40. **Appendix H** shows that all gardens lie either on, or behind the 60 dBA daytime noise contour. Allowing for 5 dBA of attenuation by standard 1.8m close-boarded fencing will ensure that the BS8233:2014 criterion of 55dBA is met for all gardens. Beyond the 55 dBA criterion as shown in the figure (which includes all of the site with the exception of the gardens around R2), no fencing is required to meet the criterion.

7.0 Assessment of Recycling Centre noise

BS4142:2014 assessment

7.1. Four continuous days of noise monitoring have been undertaken adjacent to the recycling centre.

7.2. The marker function on the Sound Level Meter was used to flag different audible sources within the measured data, and subsequently to separate these out during analysis. This process also provides 'on-times' for the sources. The residual noise level was extracted from periods where no commercial sources were marked as being audible.

7.3. The dominant measured noise source came from vehicle movements and impact noises associated with the movement of the large recycling bins. This was observed to occur at least daily, with the whole process taking around 50 minutes. However intermittent commercial noise sources were audible frequently throughout the day. Measured noise levels while commercial sources were audible have been corrected for residual noise. Levels were determined for hourly intervals between 0700 and 1700 for the four survey days, including all of the opening hours.

7.4. In order to correct for acoustic features which may increase the subjective impact of a commercial noise source, penalties are added as described in the following table.

Table 15 BS4142:2014 penalties

Characteristic	Penalty	Comment
Tonality	0	No audible tonality
Impulsivity	6	Clearly impulsive

Intermittency	3	Source is intermittent
Other	0	Other penalties added
Total	**9**	

7.5. Note that this informs a highly worse-case assessment, as noise at the site will be much less audible than at the survey location, and penalties could reasonably be lower.

7.6. The measured commercial L_{Aeq} was corrected for the above penalty to give the rating level at the survey location.

7.7. To account for distance propagation, the noise model for the site generated in the software iNoise (see para. 6.6) was used to determine the differential between noise levels at the closest point on the site and the measurement location; this was determined to be -24 dB.

7.8. Finally, for each hourly period, the determined rating level was compared to the measured background sound pressure level at NMP1 for that hour; NMP1 was used for the background as the closest parts of the site to the recycling centre are close to the road. The following table shows the results of this comparison. Rather than tabulate values for each hour throughout each day, the minimum and maximum values are shown for each survey day.

Table 16: Commercial sound measurements and assessment

Day	Measured L_{Aeq} (dB)		Rating level at survey location (dB)		Rating level at site (dB)		Difference from applicable background level (dB)	
	Min	Max	Min	Max	Min	Max	Min	Max
1	43	59	52	68	28	44	-29	-4
2	43	59	52	68	28	44	-29	-15
3	47	61	56	70	32	46	-25	-4
4	44	59	53	68	29	44	-28	-3

7.9. For each of the four survey days, the assessment shows a sound rating level significantly below the background sound level. In this case, BS4142:2014 states:

'*Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*'

7.10. The following should also be taken into consideration when determining the potential impact that may be experienced:

- The assessment is undertaken at the worst-affected residential windows. The impact on other residential windows will be lower due to distance/screening losses.
- The assessment has assumed the worst-case scenario in terms of the levels of noise produced having used the assessment period with the highest measured levels.
- Robust rating penalties have been added to the measured source level.

Discussion of Results and Uncertainties

7.11. Where possible uncertainty in the above assessments has been minimised by taking the following steps:

- Measurements of environmental background sound levels were taken over a robust 72-hour period.
- Measurements of commercial sound levels were taken over a robust 4-day period.
- The meters and calibrators used have a traceable laboratory calibration and the meter was field calibrated before and after the measurements.

- Uncertainty in the calculated impacts has been reduced by the use of well-established calculation methods.

8.0 Assessment of skatepark noise

BS4142:2014 assessment

8.1. Surveys have been undertaken close to the north-western site boundary with the skatepark. Measurements were undertaken on a warm sunny Saturday afternoon, conducive to use of the park by the local population.

8.2. Signage present at the skatepark confirms that it is open between 8am and 10pm, and so a daytime assessment only is required.

8.3. During the survey, around 10 youths were present, intermittently using the skating surfaces with a variety of skateboards, scooters and other wheeled devices. However the dominant noise arising from the skatepark was due to voices. The typical distance between the sound level meter and the noise sources is considered to be 20m.

8.4. As described above for the recycling centre noise survey, the marker function on the Sound Level Meter was used to flag different audible sources within the measured data, and subsequently to separate these out for separate analysis. The residual noise level was extracted from periods where no sources were marked as being audible. This process also provides 'on-times' for the sources, which enables a time correction to the corrected level to yield an overall, average, source level over the assessment period.

8.5. Sound from the skatepark was sporadically present throughout the 2 hour survey period, and so has been assumed to have the same fractional 'on-time' in the 1 hour daytime assessment period as during the overall survey period.

8.6. It was noted that only a few times during the survey period was any noise audible at a level subjectively estimated to be above the residual noise level (the level due to other sources, such as road traffic). Therefore the noise level due to the skate park was subjectively estimated to be significantly below the residual noise level.

8.7. As prescribed in BS4142:2014+A1:2019, in order to correct for acoustic features which may increase the subjective impact of a commercial noise source, penalties are added as described in the following table.

Table 17 BS4142:2014 penalties

Characteristic	Penalty	Comment
Tonality	0	Not significantly tonal
Impulsivity	3	Occasionally impulsive
Intermittency	3	Source is intermittent
Other	0	Other penalties added
Total	**6**	

8.8. As the calculations were performed on second long intervals basis throughout the survey period, it is not desirable to tabulate the full data here. The following table presents the results, including a propagation correction to the closest façade at 51m, and assessment against BS4142:2014+A1:2019. The background as measured at NMP1 is used, as the receptors are close to the Thaxted Road.

Table 18 : BS4142:2014+A1:2019 assessment

Residual corrected SEL (dB)	On-time (secs)	Time and residual corrected measured L_{Aeq} (dB)	Distance correction (dB)	Penalty (dB)	Rating level at receptor (dB)	L_{A90} measured at NMP1 (dBA)	Difference (dB)
70.7	92	34.9	-8.1	6.0	32.8	43.0	-10.2

8.9. The assessment shows a sound rating level significantly below the background sound level. In this case, BS4142:2014 states: '*Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*'

8.10. The following should also be taken into consideration when determining the potential impact that may be experienced:

- The assessment is undertaken at the worst-affected residential windows. The impact on other residential windows will be lower due to distance/screening losses.
- The assessment has assumed the worst-case scenario in terms of the levels of noise produced.
- Robust rating penalties have been added to the measured source level.

Discussion of Results and Uncertainties

8.11. Where possible uncertainty in the above assessments has been minimised by taking the following steps:

- Measurements of environmental background sound levels were taken over a robust 24-hour period.
- Measurements of source sound levels were taken over a worst-case period in good weather on a sunny Saturday.
- The meters and calibrators used have a traceable laboratory calibration and the meter was field calibrated before and after the measurements.
- Uncertainty in the calculated impacts has been reduced by the use of well-established calculation methods.

9.0 Summary

9.1. Noise Solutions Ltd has been appointed to review the acoustic suitability of a proposed new residential development on the site known as Land South of Saffron Walden CB10 2UR.

9.2. Environmental noise surveys at the site have been undertaken in order to establish the typical and maximum incident road traffic noise levels incident upon the proposed development.

9.3. Surveys have also been undertaken of existing commercial sources and background noise. An assessment of noise from the existing recycling centre and skatepark indicates no adverse impacts according to the method described in BS 4142:2014.

9.4. The assessment has demonstrated that, taking into consideration the provision of reasonable practicable measures (i.e. the provision of good quality thermal double glazing and, for some facades, high-performance trickle ventilators) adverse effects of noise can be minimised for the development proposals. Consideration should also be given to using specified facades close to the Thaxted Road preferentially for non-habitable rooms such as kitchens/bathrooms.

9.5. Acceptable external amenity noise levels are found for the entire site, with standard 1.8m garden fencing required only for the closest dwellings to the road.

9.6. Therefore, the assessment has demonstrated that incident ambient noise levels around the proposed residential development should not be viewed as a constraint for the planning application.

Appendix A Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
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 $\log_{10}$ (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. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	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.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	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. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.

Appendix B Aerial photograph of site with approximate location of noise measurement positions

Appendix C Environmental Sound Surveys

Details of environmental sound surveys

C.1 Specific details of each of the four surveys are contained in the tables and figures below.

C.2 The sound level meters were programmed to record the A-weighted L_{eq}, L_{90}, L_{10} and L_{max} noise indices for consecutive 15-minute sample periods for the duration of the survey.

C.3 Where useful for attended surveys, the marker function was used to demarcate certain events, such as aircraft.

Measurement positions

C.4 The sound level meters were located as indicated in **Appendix B** and described in the survey summary table below.

C.5 In accordance with BS 7445-2:1991 'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use', the measurements were undertaken under free-field conditions.

Equipment

C.6 Details of the equipment used during the survey are provided in the tables describing each specific survey. The sound level meters were calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

Weather Conditions

C.7 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for the environmental noise measurements. The survey summary tables below present the weather conditions recorded on site at the beginning and end of the survey.

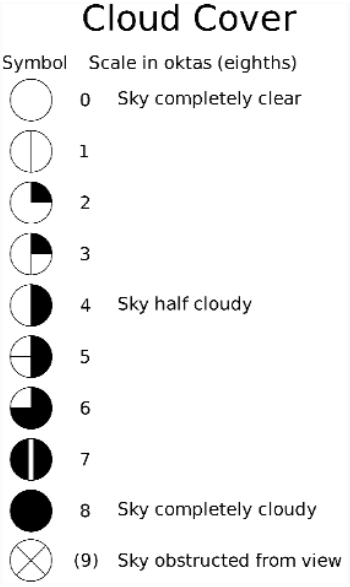
Results

C.8 The results of the survey are considered to be representative of the typical incident noise levels at the proposed site.

C.9 The results of the surveys are presented in the time history graphs which follow and in the main body of the report.

NMP1: Thaxted Road

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977/ 69747	20/08/2020	14015672
Condenser microphone	ACO Pacific 7052E / 70829		
Preamplifier	Svantek SV12L / 73687		
Calibrator	Svantek SV 40A / 10843	29/07/2021	1500732-1

Weather Conditions				
Measurement Location	**Date/Time**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B; 8.5m from centre of road, 2.5m height.	11.30 1 Apr - 14.45 2 Apr 2022	Temperature (°C)	-	-
		Precipitation:	None	None
		Cloud cover (oktas – see guide)	8	3
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	No
		Wind Speed (m/s)	n/a	n/a
		Wind Direction	n/a	n/a
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No
Noise sources noted at setup and collection:		Local road traffic dominates – occasional aircraft and birdsong also audible.		

BG1: Background noise survey

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 971 / 111624	18/06/2021	Factory conformation certificate
Condenser microphone	ACO Pacific 7052E / 80036		
Preamplifier	Svantek SV 18 / 112639		
Calibrator	Svantek SV 33B / 83850	20/10/2021	1501134-1

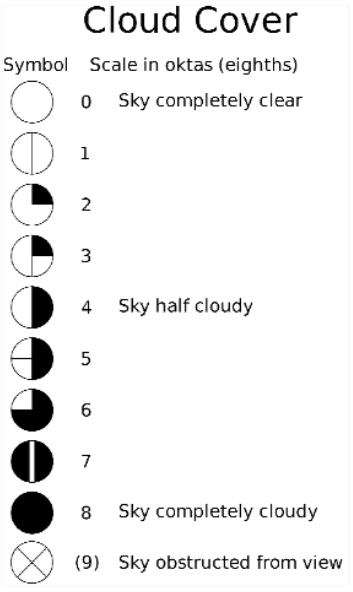
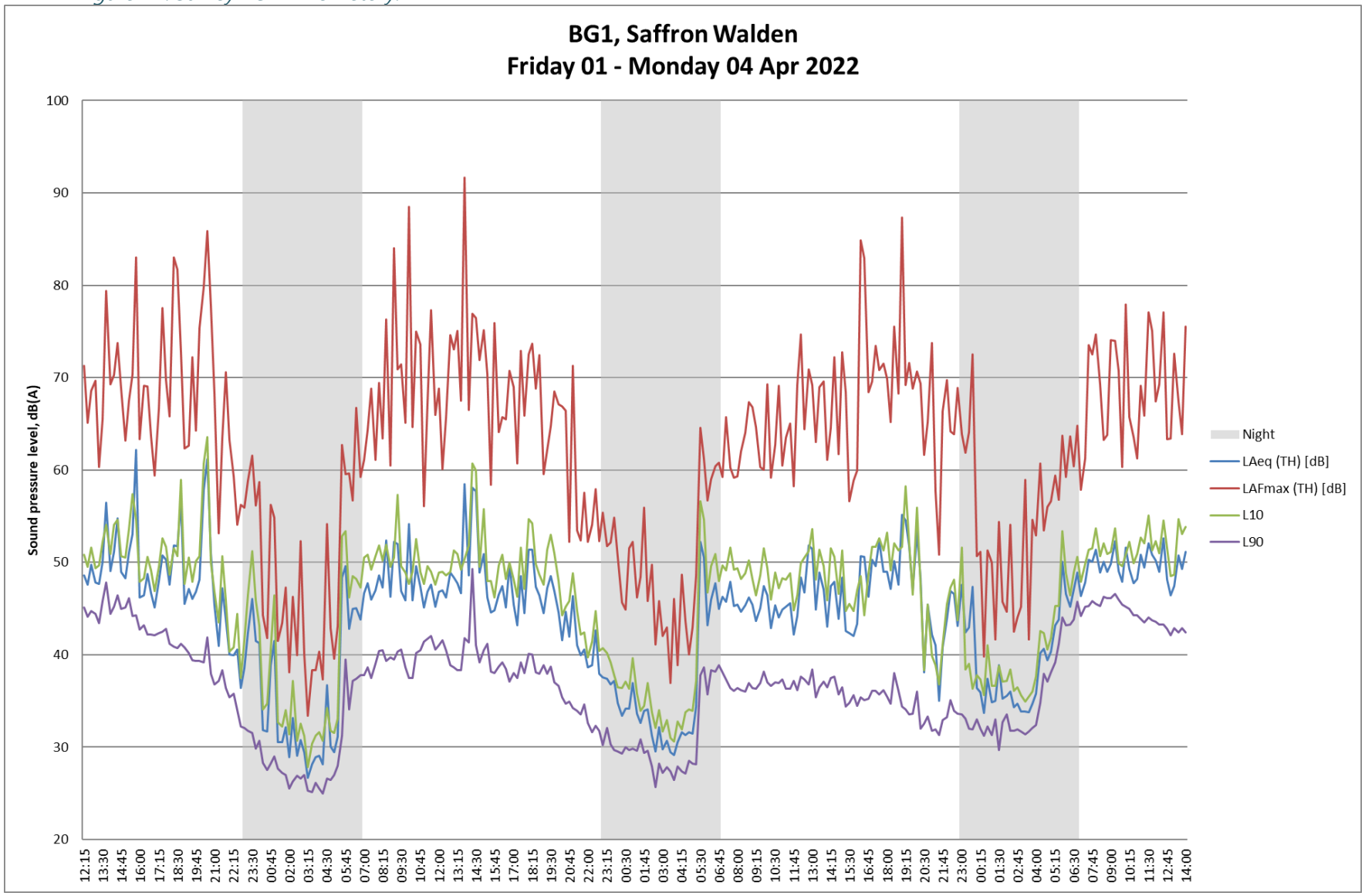
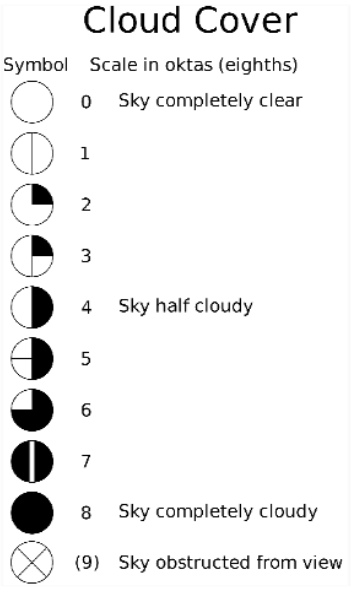
Weather Conditions				
Measurement Location	**Date/Time**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B; lamp-post on Peal Rd.	12.15 1/4/22 - 14.15 4/4/22	Temperature (°C)	n/a	12
		Precipitation:	n/a	None
		Cloud cover (oktas – see guide)	n/a	8
		Presence of fog/snow/ice	n/a	No
		Presence of damp roads/wet ground	n/a	Damp
		Wind Speed (m/s)	n/a	2
		Wind Direction	n/a	W
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	n/a	No
Noise sources noted:		Nearby road traffic, hedge cutter, bird calls, aircraft.		

Figure A1: Survey BG1 Time history.



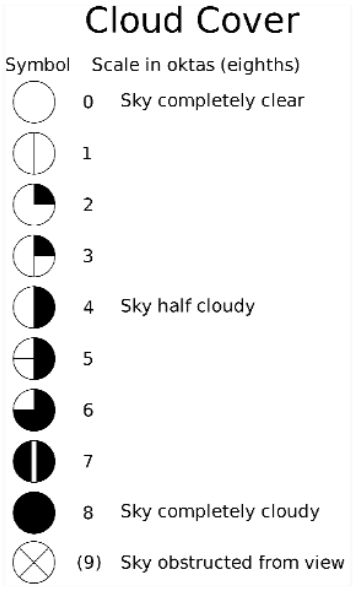
COM1: Recycling centre noise survey

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977/ 69747	20/08/2020	14015672
Condenser microphone	ACO Pacific 7052E / 70829		
Preamplifier	Svantek SV12L / 73687		
Calibrator	Svantek SV 40A / 10843	29/07/2021	1500732-1

<table>
<tr><th colspan="4">Weather Conditions</th></tr>
<tr><th>Measurement Location</th><th>Date/Time</th><th>Description</th><th>Throughout Survey</th></tr>
<tr><td>As indicated on Appendix B.</td><td>07:00 to 17:00
25th to 28th Apr 2022</td><td>Temperature (°C)</td><td>variable</td></tr>
<tr><td colspan="2" rowspan="8"> 
</td><td>Precipitation:</td><td>Occasional, light</td></tr>
<tr><td>Cloud cover
(oktas – see guide)</td><td>variable</td></tr>
<tr><td>Presence of fog/snow/ice</td><td>No</td></tr>
<tr><td>Presence of damp roads/wet ground</td><td>Occasionally</td></tr>
<tr><td>Wind Speed (m/s)</td><td>variable</td></tr>
<tr><td>Wind Direction</td><td>variable</td></tr>
<tr><td>Conditions that may cause temperature inversion (i.e. calm nights with no cloud)</td><td>No</td></tr>
<tr><td>Noise sources noted:</td><td colspan="2">Recycling centre dominant when present. Also aircraft audible, distant road traffic, construction work from Bellway site to north.</td></tr>
</table>

COM2: Skate park noise survey

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977/ 97446	12/02/2021	Factory conformation certificate
Condenser microphone	Microtech MK255 / 20194		
Preamplifier	Svantek SV12L / 106487		
Calibrator	Svantek SV 30A / 10847	30/06/2021	1500577-1

Weather Conditions				
Measurement Location	**Date/Time**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B; approx. 2m within site from boundary	13:31 to 14:33 2nd Apr 2022	Temperature (°C)	-	-
		Precipitation:	None	None
		Cloud cover (oktas – see guide)	2	2
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	Dry	Dry
		Wind Speed (m/s)	n/a	n/a
		Wind Direction	n/a	n/a
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No
Noise sources noted:		Road traffic, occasional aircraft audible, birdcalls, distant construction work.		

Appendix D Narrative on AVO Guide

D.1 The *Residential Design Guide on Acoustics Ventilation and Overheating (version 1.1)* ("the AVO Guide") was published in January 2020 by the Association of Noise Consultants (ANC) and the Institute of Acoustics (IoA).

D.2 The AVO Guide states that it "*is intended to be used by acoustics practitioners as well as all those involved in the planning, development, design and commissioning of new dwellings. It recommends an approach to acoustic assessments for new residential development that take due regard of the interdependence of provisions for acoustics, ventilation, and overheating*".

D.3 It seeks to "assist in educating clients, environmental health/planning officers and other stakeholders of the interdependence of design for acoustics, ventilation and overheating" and recognises that:

> *To enable designers and planners to make fully informed decisions, however, requires two further pieces of information. The first is to know how long windows will need to be open, which may be determined from a dynamic thermal model, or more qualitatively from the GHA Overheating Risk Tool. The second requires a better understanding of the potential adverse impact of combined exposure to noise and overheating. Crucially, how long will people tolerate higher noise levels in order to stay cool? One suggestion is to consider the overall average day (16h) and night (8h) time average noise levels.*

D.4 It notes that there "... is a need to address how ... the strategy for mitigating overheating impacts on the acoustic conditions, and whether a more detailed overheating assessment is required to inform this".

D.5 Section 2 of the AVO Guide sets out the relevant legislation and guidance and notes that "*it is important to differentiate between the need to provide 'purge ventilation' as required occasionally under ADF (i.e. to remove smoke from burnt food etc.); against the provision of ventilation to help control overheating, which is not covered by The Building Regulations*".

D.6 On the subject of overheating it states:

> *2.7 There are no specific requirements relating to overheating in The Building Regulations. Both ADF and Approved Document L1A of The Building Regulations briefly mention overheating but do not provide details on what constitutes overheating*
>
> *2.13 Developments will normally (but not always) require additional ventilation (above ADF whole dwelling ventilation provisions) in order to mitigate overheating. Where*

an overheating assessment is undertaken, it should provide details as to the duration and rate of any additional ventilation required to meet overheating compliance criteria. Where this additional ventilation is provided passively, the overheating assessment should also provide information about the required size of façade openings

2.16 An overheating assessment might not always be undertaken for a project and without this information it is difficult to identify noise impacts that may occur during the overheating condition.

D.7 With regard to acoustic criteria it notes that "*where a development is considered necessary or desirable, the levels in [BS 8233:2014, Table 4] may be relaxed by up to 5dB and reasonable internal conditions still achieved.*" It should be noted that this approach is not accepted by most local authorities, who require the guidance in BS 8233:2014 to be met.

D.8 Section 3 sets out guidance for internal ambient noise levels and recommends that a two-stage process is followed. The Level 1 assessment assumes that opening windows is the primary means of mitigating overheating, while a Level 2 assessment "considers the potential for adverse effect on occupants based on internal ambient noise level".

D.9 The AVO Guide notes:

3.9 It is suggested here that the desirable internal noise standards within Table 4 of BS 8233:2014 should be achieved when providing adequate ventilation as defined by ADF whole dwelling ventilation. However, it is considered reasonable to allow higher levels of internal ambient noise from transport sources when higher rates of ventilation are required in relation to the overheating condition.

D.10 Table 3-3 in the AVO Guide, reproduced below, identifies the suggested highest permissible internal noise levels in the overheating condition:

Table 3-3 Guidance for Level 2 assessment of noise from transport noise sources[Note 1] relating to overheating condition

Internal ambient noise level [Note 2]			Examples of Outcomes [Note 5]	
$L_{Aeq,T}$ [Note 3] during 07:00 – 23:00 [Note 6]	$L_{Aeq,8h}$ during 23:00 – 07:00	Individual noise events during 23:00 – 07:00 [Note 4]		
> 50 dB	> 42 dB	Normally exceeds 65 dB $L_{Af,max}$	Noise causes a material change in behaviour e.g. having to keep windows closed most of the time	Avoiding certain activities during periods of intrusion. Having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.
			Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night	At higher noise levels, more significant behavioural change is expected and may only be considered suitable if occurring for limited periods. As noise levels increase, small behaviour changes are expected e.g. turning up the volume on the television; speaking a little more loudly; having to close windows for certain activities, for example ones which require a high level of concentration. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in quality of life. At lower noise levels, limited behavioural change is expected unless conditions are prevalent for most of the time. [Note 8]
≤ 35 dB	≤ 30 dB	Do not normally exceed $L_{Af,max}$ 45 dB more than 10 times a night	Noise can be heard, but does not cause any change in behaviour	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response[Note 9]. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.

Note 1 The noise levels suggested in Tables 3-2 and 3-3 assume a steady road traffic noise source but may be adapted for other types of transport.

D.11 The explanatory notes include:

3.15 For the daytime period, the upper category in Table 3-3 is defined on the basis that $L_{Aeq,T}$ 50 dB represents the upper end of the range for reliable speech communication.

3.16 For the night-time period, the upper category in Table 3-3 is defined with reference to the WHO Night Noise guidelines, which state that for external levels above $L_{Aeq,T\ 55\ dB}$: "adverse health effects occur frequently and a sizeable proportion of the population is highly annoyed and sleep-disturbed".

3.18 In the case of the overheating condition, the effect of increased internal ambient noise from external noise sources will depend both on the absolute noise level and the amount of time for which the overheating condition occurs. A good design process should therefore, as a priority, seek to minimise heat gains thereby reducing the amount

and duration of ventilation required to control overheating and the consequential effect from increased ingress of noise.

D.12 Paragraph 3.26 notes that "The Level 2 assessment suggests that assessment of the adverse effect from noise exposure should include an estimate of how frequently and for what duration the overheating condition occurs.".

D.13 Appendix B in the AVO Guide sets out an example application of the guide, and includes examples of passive ventilation solutions and the attenuation each provides. This is set out in Table B-5, reproduced overleaf. It should be noted that in the majority of cases there is a wide range of potential performance values and the actual performance achieved will be depend on the precise design used.

Table B-5 Examples of passive ventilation solutions providing enhanced sound insulation

Design option	Description and references	Approximate Level Difference (external free field level – internal reverberant level)	Improvement relative to a window providing a similar amount of ventilation
Standard opening windows	Window(s) open sufficiently to provide a ventilation free-area equivalent to 2% of the floor area. [42]	13 dB	0 dB
Open windows with sound attenuating balconies	Window(s) as above. Balconies may have a solid balustrade or be enclosed to a further degree (maintaining an open area for ventilation). Absorption may be provided to the balcony soffit or potentially to other surfaces. [49, 50, 51]	17 – 23 dB	4 – 10 dB
Attenuated or plenum windows	Dual windows (spaced by around 200mm) with staggered openings and absorptive linings to the cavity reveals. Various other configurations also possible in principle. [52, 53]	17 – 24 dB	4 – 11 dB
Attenuated vents/ louvres	Ventilation openings with integral means of attenuating sound. Typically this may be acoustic louvres or acoustically lined ducts/plena. [54, 55]	17 – 29 dB	4 – 16 dB
Attenuated windows or vents/ louvres with sound attenuating balconies	Combined use of balconies to provide screening and acoustically attenuated windows or vents. Refer to above for description of each element.	21 – 39 dB	8 – 26 dB

Appendix E Sketch site layout, with addition of NSL assessment receptors

Appendix F ProPG initial risk assessment (Daytime)

Appendix G ProPG initial risk assessment (Night-time)

Appendix H Daytime external amenity noise levels