



Land East of Rayleigh Road, Thundersley

Noise Impact Assessment

On behalf of **This Land Development Ltd**

Project Ref: 332210105/3001 | Rev: 2 | Date: November 2022

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1 Introduction

1.1 Background

1.1.1 This Land Development Ltd (the 'Applicant') has commissioned Stantec to undertake a noise impact assessment to support an outline planning application for the Proposed Development at land east of Rayleigh Road, Thundersley, located adjacent to the A129 (the 'Site'). The Site is located within the administrative boundary of Castle Point Borough Council (CPBC).

1.1.2 The description of the Proposed Development is as follows:

The development of up to 455 new homes, a multi-use community hall, land for the provision of a healthcare facility, land for a stand-alone early years and childcare nursery, new vehicular/pedestrian access points from Stadium Way in the north and Daws Heath Road in the south, new greenways and green links, multi-functional open space, green infrastructure, surface water attenuation, landscaping and associated infrastructure. All matters reserved except access.

1.1.3 The site was included in CPBC's now withdrawn Local Plan (2018-2023) as allocation site HO13 and was identified as a suitable site for delivering up to 455 dwellings.

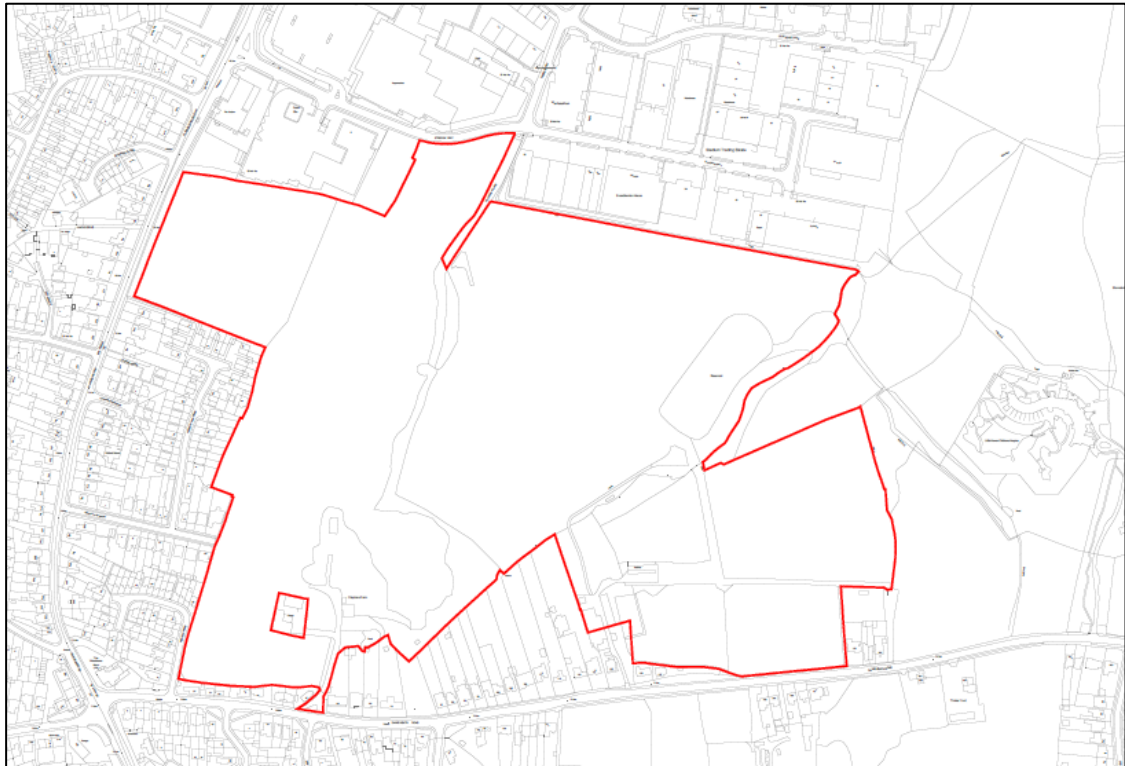
1.1.4 An environmental sound survey has been undertaken to support the assessment of the site. Based on the results of the environmental sound survey, a computer acoustic model has been produced to assist with assessment.

1.1.5 This report presents the results of the environmental sound survey undertaken and details the results of our assessment of the potential noise impacts on the proposed development site.

1.2 Site Location and Description

1.2.1 The site comprises existing agricultural land and is located adjacent to the A129. The site is bound to the north by Rayleigh Retail Park, to the east by open grassland and to the south by existing residential dwellings on Daws Heath Road. The site location is presented in **Figure 1**.

Figure 1: Site Location



(Image from Broadway Malyan)

1.3 Scope of Assessment

1.3.1 The scope of the noise impact assessment is as follows:

- i. Present the methodology and results of the environmental sound survey undertaken by Stantec UK and describe the existing sound climate at the site.
- ii. Assess the suitability of the site for the proposed development in accordance with national and local policy and standards.
- iii. Comment on appropriate mitigation measures where appropriate.

1.3.2 An explanation of the terminology used in this report is contained in **Appendix A**.

2 Policy, Standards, Guidance and Criteria

2.1 Local Authority Consultation

- 2.1.1 Consultation was undertaken with the Environmental Health Office (EHO) of Castle Point Borough Council between the 25 November 2021 and 23 December 2021 to confirm suitability of the environmental sound survey and assessment methodology. The EHO confirmed suitability of the approach.
- 2.1.2 Internal noise levels of 35 $L_{Aeq,16\text{ hour}}$ during the day and 30 $L_{Aeq,8\text{ hour}}$ at night were requested with 50 $L_{Aeq,16\text{ hour}}$ during the day in private external amenity areas.

2.2 Local Planning Policy

Castle Point Local Plan, 1998

- 2.2.1 The Local Plan states the following in relation to noise:

“Policy EC3 Residential Amenity

Development proposals which would have a significant adverse effect upon the residential amenity of the surrounding area by reason of traffic, noise, fumes or other forms of disturbance will be refused.

Policy EC4 Pollution

Development which would have a significant adverse effect on health, the natural environment, or general amenity by reason of releases of pollutants to water, land or air, or by reason of noise, dust, vibration, light or heat, will be refused.”

Withdrawn Castle Point Local Plan 2018 -2033

- 2.2.2 The now withdrawn Local Plan stated the following in relation to noise:

“Policy NE 7

Pollution Control

1. Development proposals should be designed to manage and reduce pollution through energy and water efficient design, the installation of sustainable drainage systems, and the delivery or enhancement of green infrastructure.

2. Development proposals should be located, designed and constructed in such a manner as to not cause a significant adverse effect upon the environment, the health of new and existing residents or surrounding residential amenity by reason of pollution to land, air or water, or as a result of any form of disturbance including, but not limited to, noise, light, odour, heat, dust and vibrations.

3. Development proposals adjacent to, or in the vicinity of, existing businesses or community facilities will need to demonstrate that the ongoing use of the existing businesses or community facilities would not be prejudiced by the proposed development, and that the impact of the continuing operation of the existing businesses or community facilities on the amenity of occupiers of the new development can be satisfactorily mitigated through the development proposals.

4. All major development proposals must be accompanied by a Construction Environment Management Plan prepared with regard to pollution prevention guidance. These plans shall include details of the proposed mitigation measures that will be implemented to prevent undue noise and disturbance to adjoining occupiers and Habitat sites and the entry of pollutants into the environment by all potential pathways including, but not limited to watercourses (including when dry). Where necessary, seasonal working may be required to avoid any adverse effects on the integrity of Habitats sites.

5. Where necessary, the Council will seek to manage and mitigate the effects of pollution and/or disturbance arising from development, (including during site clearance and construction) by means of appropriate planning conditions. Exceptionally, a Section 106 Agreement may be used to secure measures to control pollution and/or disturbance necessary to make the impacts of development acceptable.”

2.3 National Planning Policy

Revised National Planning Policy Framework (NPPF)

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

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

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

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

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and quality of life;*
- Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason...”*

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

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

Noise Policy Statement for England (NPSE)

2.3.4 The Noise Policy Statement for England (NPSE) was published in March 2010 and clarifies the underlying principles and aims of existing policy documents that relate to noise. It also sets out the long-term vision of Government noise policy which is: *“to promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development”*.

2.3.5 The NPSE states that noise should not be considered in isolation of the wider benefits of a scheme or development, and that the intention is to minimise noise and its effects as far as is reasonably practicable having regard to the underlying principles of sustainable development.

2.3.6 Paragraphs 2.20 and 2.21 define ‘significant adverse’ and ‘adverse’ impacts as applied to noise as follows:

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

NOEL – No Observed Effect Level

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

LOAEL – Lowest Observed Adverse Effect Level

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

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

SOAEL – Significant Observed Adverse Effect Level

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

2.3.7 Paragraph 2.22 clarifies that:

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

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

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

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

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

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

Planning Practice Guidance (2014)

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

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

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

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

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

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

- 2.3.14 It provides more descriptive detail for the definitions of NOEL, LOAEL and SOAEL but refrains from using numerical values. A summary of the advice is provided within the noise exposure hierarchy table in Paragraph: 005 Reference ID: 30-005-20190722 and reproduced in Table 2.1.

Table 2.1: Noise Exposure Hierarchy Table

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level (NOEL)			
Not present	No effect	No observed effect	No specific measures required
No Observed Adverse Effect Level (NOAEL)			

Response	Examples of Outcomes	Increasing Effect Level	Action
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 change in the quality of life.	No observed adverse effect	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
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
Significant Observed Adverse Effect Level (SOAEL)			
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

2.3.15 Paragraph: 006 Reference ID: 30-006-20190722 provides guidance factors which influence whether noise could be a concern. It states that “*The subjective nature of noise means there is not a simple relationship between noise levels and the impact on those affected.*”

2.3.16 It goes on to state that the impact will depend on how various factors combine in any particular situation. These factors include:

- Source and absolute level of the noise together with the time of day it occurs.
- How new noise making source relates to the existing sound environment.
- Number and pattern of noise events (for non-continuous sound).
- Frequency content (i.e. whether the noise contains particular high or low frequency content) and general character of the noise (i.e. whether or not the noise contains particular tonal characteristics or other particular features).

- The extent to which the local arrangement of buildings, surfaces and green infrastructure reflects or absorbs noise.

2.3.17 PPG provides more specific factors to consider, when relevant, including:

- The cumulative impact of multiple sources of noise.
- The provision of alternative ventilation if proposed mitigation relies on closed windows most of the time.
- In situations where noise sensitive locations are already subject to high noise levels, a development which is expected to cause even a small increase in the overall noise level may result in a significant adverse effect, even though little to no change in behaviour would be likely to occur.
- Noise Action Plans and Important Areas (as defined in the Environmental Noise Directive) should be taken into account.
- The effect of noise on wildlife. Consideration should be given to the potential effects of noisy development on international, national and locally designated sites of importance for biodiversity.
- Some commercial developments can have particular impacts in the evening and at night, when they are trading at their peak (e.g. restaurants, hot food takeaways, night clubs and public houses). This includes noise generated within the premises as well as noise that may be made by customers within the vicinity.

2.3.18 Paragraph: 009 Reference ID: 30-009-20190722 advises on how the risk of conflict between new development and existing businesses of facilities can be addressed. It states that:

“Development proposed in the vicinity of existing businesses, community facilities or other activities may need to put suitable mitigation measures in place to avoid those activities having a significant adverse effect on residents or users of the proposed scheme.

In these circumstances the applicant (or ‘agent of change’) will need to clearly identify the effects of existing businesses that may cause a nuisance (including noise, but also dust, odours, vibration and other sources of pollution) and the likelihood that they could have a significant adverse effect on new residents/users. In doing so, the agent of change will need to take into account not only the current activities that may cause a nuisance, but also those activities that businesses or other facilities are permitted to carry out, even if they are not occurring at the time of the application being made.

The agent of change will also need to define clearly the mitigation being proposed to address any potential significant adverse effects that are identified. Adopting this approach may not prevent all complaints from the new residents/users about noise or other effects, but can help to achieve a satisfactory living or working environment, and help to mitigate the risk of a statutory nuisance being found if the new development is used as designed (for example, keeping windows closed and using alternative ventilation systems when the noise or other effects are occurring).

It can be helpful for developers to provide information to prospective purchasers or occupants about mitigation measures that have been put in place, to raise awareness and reduce the risk of post-purchase/occupancy complaints.”

2.3.19 Paragraph: 010 Reference ID: 30-010-20190722 provides advice on how the adverse effects of noise can be mitigated which are dependent on the type of development being considered

and the character of the proposed location. Four broad classifications of mitigation are defined as follows:

- Engineering: reducing the noise generated at source and/or containing the noise generated;
- Layout: where possible, optimising the distance between the source and noise-sensitive receptors and/or incorporating good design to minimise noise transmission through the use of screening by natural or purpose built barriers, or other buildings;
- using planning conditions/obligations to restrict activities allowed on the site at certain times and/or specifying permissible noise levels differentiating as appropriate between different times of day, such as evenings and late at night, and
- mitigating the impact on areas likely to be affected by noise including through noise insulation when the impact is on a building.

2.3.20 Paragraph: 011 Reference ID: 30-011-20190722 advises that the impact of noise may be partially offset if the residents of those dwellings have access to one or more of the following:

- A relatively quiet façade (containing windows to habitable rooms) as part of their dwelling.
- A relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced if this area is exposed to noise levels that in significant adverse effects.
- A relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings.
- A relative quiet, protected, external publicly accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance).

2.4 Standards

British Standard 8233:2014 'Guidance on Sound Insulation and noise reduction for buildings'

- 2.4.1 BS 8233, in relation to this development, sets out desirable guideline values in habitable rooms, such as living rooms and bedrooms.
- 2.4.2 The guideline values relate to steady external noise without a specific character, previously termed 'anonymous noise'. According to the standard, noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate. Examples of noise with a character may include tonal/intermittent plant noise emissions, music playback, and workshop noise. Examples of external steady noise sources may include environmental noise sources such as busy road traffic.
- 2.4.3 The desirable internal ambient noise levels for dwellings are presented in **Table 2.2**.

Table 2.2: BS 8233 Desirable Internal Ambient Noise Levels for Dwellings

Activity	Location	Desirable Internal Ambient Noise Level	
		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 $L_{Aeq,8h}$
<p>*Note 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,f}$, depending on the character and number of events per night. Sporadic noise events could require separate values.</p>			
<p>Note 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative source of ventilation that does not compromise the façade insulation or the resulting noise levels.</p>			
<p>Note 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved.</p>			
<p>*A selection of the available notes</p>			

2.4.4 The Standard also provides advice in relation to desirable levels for external noise. It states that:

“For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable.

In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

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.”

2.5 Guidance

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

- 2.5.1 The World Health Organisation (WHO) 'Guidelines for Community Noise' (1999) details guidance on suitable internal and external sound levels in and around residential properties. The following internal sound levels are recommended by the WHO:
- 35 dB $L_{Aeq,16hours}$ in living rooms during the daytime (07:00 to 23:00 hours); and
 - 30 dB $L_{Aeq,8hours}$ in bedrooms during the night-time (23:00 to 07:00 hours).
- 2.5.2 With respect to maximum sound levels during the night-time, the guidelines state:
- "For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night."*
- 2.5.3 In addition to the above, the guidelines suggest that daytime sound levels of above 50 dB $L_{Aeq,16hours}$ are of 'moderate annoyance' in the community with daytime sound levels above 55 dB $L_{Aeq,16hours}$ of 'serious annoyance'.
- 2.5.4 The above levels are in-line with guidance detailed in BS8233:2014 and ProPG Planning and Noise.

Professional Practice Guidance on Planning and Noise, 2017

- 2.5.5 The Professional Practice Guidance on Planning and Noise (ProPG) provides guidance on a recommended approach to the management of noise within the planning system in England.
- 2.5.6 The scope of ProPG is limited to new residential development that will be predominantly exposed to airborne noise from transport sources.
- 2.5.7 The guidance is mostly focused on new flats and houses, although there is some relevant content in regard to other types of residential units, such as care homes and residential institutions.
- 2.5.8 Noise sources other than airborne transport (i.e. industrial, commercial, entertainment, etc.) and ground-borne noise and vibration fall outside of the scope of ProPG.
- 2.5.9 ProPG details a two-stage approach to the consideration of noise issues including:
- Stage 1 – an initial noise risk assessment of the proposed development site; and
 - Stage 2 – a systematic consideration of four key elements.
- 2.5.10 Table 2.3 summarises the noise risk categories as defined in ProPG for Stage 1 of the assessment process.

Table 2.3: Stage 1 ProPG Risk Categories

Site Noise Risk Level	Indicative Noise Levels excluding Mitigation (dB $L_{Aeq,T}$)		Pre-Planning Application Advice
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	
High	> 70	> 60	Increased risk that development may be refused on noise grounds. The risk may be reduced by following a good acoustic design process

Medium	60 – 70	50 - 60	The site is likely to be less suitable from a noise perspective and an application may be refused unless a good acoustic design process is followed
Low	50 – 60	40 – 50	The site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed
Negligible	< 50	< 40*	The site is likely to be acceptable from a noise perspective
* Site Noise Risk Level should not be considered negligible where there could be more than 10 noise events with $L_{Amax,f} > 60$ dB			

2.5.11 Stage 2 comprises 4 key elements which are undertaken in parallel:

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

2.5.12 Following a good acoustic design process involves considering acoustics at an early stage in the design process; avoid ‘unreasonable’ acoustic conditions and prevent ‘unacceptable’ acoustic conditions; and achieve an integrated, optimum solution without overdesign.

2.5.13 With respect to internal noise levels, ProPG recommends that noise levels set out in BS 8233 are used for residential development. However, an additional criterion is proposed by ProPG for night-time L_{Amax} levels as follows:

“[...] In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB $L_{Amax, F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events.”

2.5.14 With respect to external noise levels, ProPG again makes reference to the guideline levels detailed in BS8233 stating that:

“The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq, 16hr}$.”

BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

2.5.15 BS4142:2014+A1:2019 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in the standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

2.5.16 The standard is used to determine the rating levels for sources of sound of an industrial and/or commercial nature and the ambient, background and residual sound levels at outdoor locations. These levels could be used for the purposes of investigating complaints; assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and assessing sound at proposed new dwellings or premises used for residential purposes. However, the determination of noise amounting to a nuisance is beyond the scope of the standard.

- 2.5.17 The procedure contained in BS4142 assesses the significance of sound which depends upon the margin by which the rating level of the specific sound sources exceeds the background sound level and the context in which the sound occurs/will occur.
- 2.5.18 An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level and considering the following:
- 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.
- 2.5.19 Where the initial estimate of the impact needs to be modified due to the context, the following factors should be considered:
- The absolute level of sound;
 - The character and level of the residual sound compared to the character and level of the specific sound; and
 - The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions such as:
 - Façade insulation treatment;
 - Ventilation and/or cooling that will reduce the need to have windows open to provide rapid or purge ventilation; and
 - Acoustic screening.

2.6 Assessment Criteria

- 2.6.1 An initial noise risk assessment of the proposed development site has been undertaken, in accordance with Stage 1 of ProPG, to assess the suitability of the site for the proposed use.
- 2.6.2 Following the initial Stage 1 review, internal and external noise levels have been assessed based on relevant guidance documents as per Stage 2 of ProPG. **Table 2.4** details the proposed LOAEL and SOAEL for internal and external noise levels for the proposed residential dwellings.

Table 2.4: Proposed LOAEL and SOAEL for Internal and External Noise Levels for Residential Use

Location	Effect Level	Time Period	
		Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
Inside Residential Dwellings	LOAEL	35 dB $L_{Aeq,T}$	30 dB $L_{Aeq,T}$ 45 dB L_{AFMax}
	SOAEL	50 dB $L_{Aeq,T}$	45 dB $L_{Aeq,T}$
External Amenity Areas	LOAEL	50 - 55 dB $L_{Aeq,T}$	N/A
	SOEAL	65 dB $L_{Aeq,T}$	

3 Environmental Sound Survey

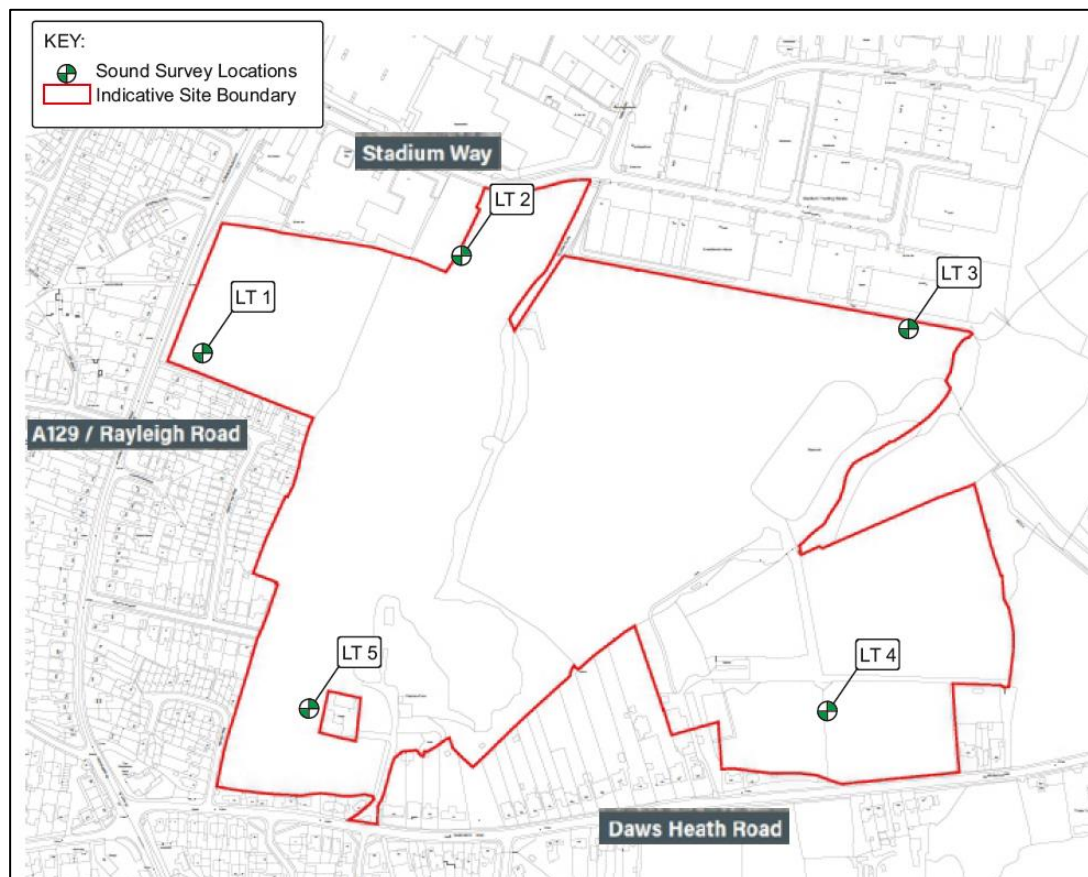
3.1 Procedure

- 3.1.1 An unattended environment sound survey was undertaken between approximately 11:45 on Tuesday 25 January 2022 and 12:30 on Wednesday 26 January 2022 in order to determine the existing sound climate at locations considered representative of the nearest noise sensitive receptors.
- 3.1.2 The survey was undertaken over a 24-hour weekday period. Measurements were made over 15-minute periods of the L_{Aeq} , L_{A90} and L_{AFMax} sound levels.
- 3.1.3 The sound level meters were located in environmental cases. The microphone was connected to the meters via an extension cable and fitted with the manufacturer's windshield.
- 3.1.4 The instrumentation used in the survey (including calibration information is listed in **Appendix B**). Field calibrations were performed before and after the measurements with no significant fluctuations recorded (0.5 dB). Calibration certificates are available upon request.

3.2 Measurement Locations

- 3.2.1 Environmental sound measurements were undertaken at five positions at the site. The measurement positions are detailed in **Figure 2** and described in **Table 3.1**.

Figure 2: Environmental Sound Measurement Locations



(Image courtesy of Broadway Malyan)

Table 3.1: Environmental Sound Measurement Locations

Position	Description
LT1	The microphone was located in a free-field position on the west site boundary. The microphone was located approximately 20 m from the A129 at a height of 1.5 m above ground level.
LT2	The microphone was located in a free-field position to the north of the site. The microphone was located approximately 40 m to the south of Stadium Way and approximately 220 m to the east of the A129 at a height of 1.5 m above ground level.
LT3	The microphone was located in a free-field position to the northeast of the site. The microphone was located approximately 5 m from the boundary of the Rayleigh Retail Park at a height of 1.5 m above ground level.
LT4	The microphone was located in a free-field position to the southeast of the site. The microphone was located in approximately 50 m to the north of Daws Heath Road at a height of 1.5 m above ground level.
LT5	The microphone was located in a free field position to the southwest of the site on the western boundary of the existing storage yard approximately 90 m to the east of Firfield Road and approximately 75 m to the north of Daws Heath Road at a height of 1.5 m above ground level.

3.3 Meteorological Conditions

- 3.3.1 Due to the nature of the survey (i.e. unattended), it is not possible to accurately comment on the meteorological conditions throughout the entire survey period. However, based on a review of publicly available weather forecasts and observations at the beginning and end of the survey period, the weather conditions are detailed in **Table 3.2**.

Table 3.2: Meteorological Conditions

Description	25/01/2022 to 26/01/2022
Temperature (°C)	9
Precipitation (mm)	0
Cloud Cover (%)	100
Wind Description	Light breeze
Wind Speed (m/s)	< 3
Wind Direction	South

- 3.3.2 These conditions are considered suitable for obtaining representative sound level measurements.

3.4 Assumptions/Limitations

- 3.4.1 The engineer noticed nothing unusual in terms of the sound climate at the time of the survey. This report refers, within the limitations stated, to the environment of the site in the context of the surrounding area at the time of the inspections. Environmental conditions can vary. No warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times.

3.5 Environmental Sound Climate

- 3.5.1 Due to the nature of the survey (i.e. unattended), it is not possible to accurately comment on the dominant noise sources or specific noise events during the entire survey period. However, at the beginning and end of the survey period it was noted that on-site sound levels were dominated by vehicle motion on the surrounding road network, specifically the A129 to the east, Daws Heath Road to the south and the Southend Arterial Road (A127) to the north.
- 3.5.2 The majority of retail units at Rayleigh Retail Park are furniture and homeware show rooms. The main sources of noise associated with these uses is likely to be from deliveries to the units, customer cars and any building services plant.
- 3.5.3 The orientation of the existing show rooms shields the proposed development site from noise generating activities from the retail park. Vehicular movements were just perceptible on the northeast boundary of the site however the road noise from the local road network was still dominant.

3.6 Environmental Sound Survey Results

- 3.6.1 The results of the survey are presented in the time-history graphs in 0.A summary of the environment sound survey results is detailed in **Table 3.3**.

Table 3.3: Summary of Environmental Sound Survey Results

Location	Period, T	Measured Sound Level (dB)		
		L _{Aeq,T}	Typical* L _{AFMax}	Typical** L _{A90,T}
LT1	Daytime (07:00 – 23:00 hours)	62	-	58
	Night-time (23:00 – 07:00 hours)	58	71	49
LT2	Daytime (07:00 – 23:00 hours)	54	-	47
	Night-time (23:00 – 07:00 hours)	48	59	39
LT3	Daytime (07:00 – 23:00 hours)	49	-	43
	Night-time (23:00 – 07:00 hours)	41	54	36
LT4	Daytime (07:00 – 23:00 hours)	55	-	46
	Night-time (23:00 – 07:00 hours)	48	66	34
LT5	Daytime (07:00 – 23:00 hours)	50	-	44
	Night-time (23:00 – 07:00 hours)	44	76	32

* Based on the 10th highest measured L_{AFmax} level.

** Calculated based on the statistical distribution of background sound levels during the measurement period in general accordance with guidance in BS 4142:2014 +A1:2019.

3.7 Acoustic Model

- 3.7.1 Based on the results of the environmental sound survey results and traffic data, an acoustic model of the site and the surrounding area has been prepared using computer software

SoundPLAN version 8.2. The acoustic model has been used to evaluate the likely noise climate across the site following development.

- 3.7.2 Noise from road traffic has been calculated in accordance with CRTN and considers both the speed and volume of traffic on the surrounding road network. The traffic data was provided by Stantec.
- 3.7.3 **Figures 3 and 4** show the daytime and night-time sound levels across the site, respectively.

Figure 3: Daytime Sound Levels

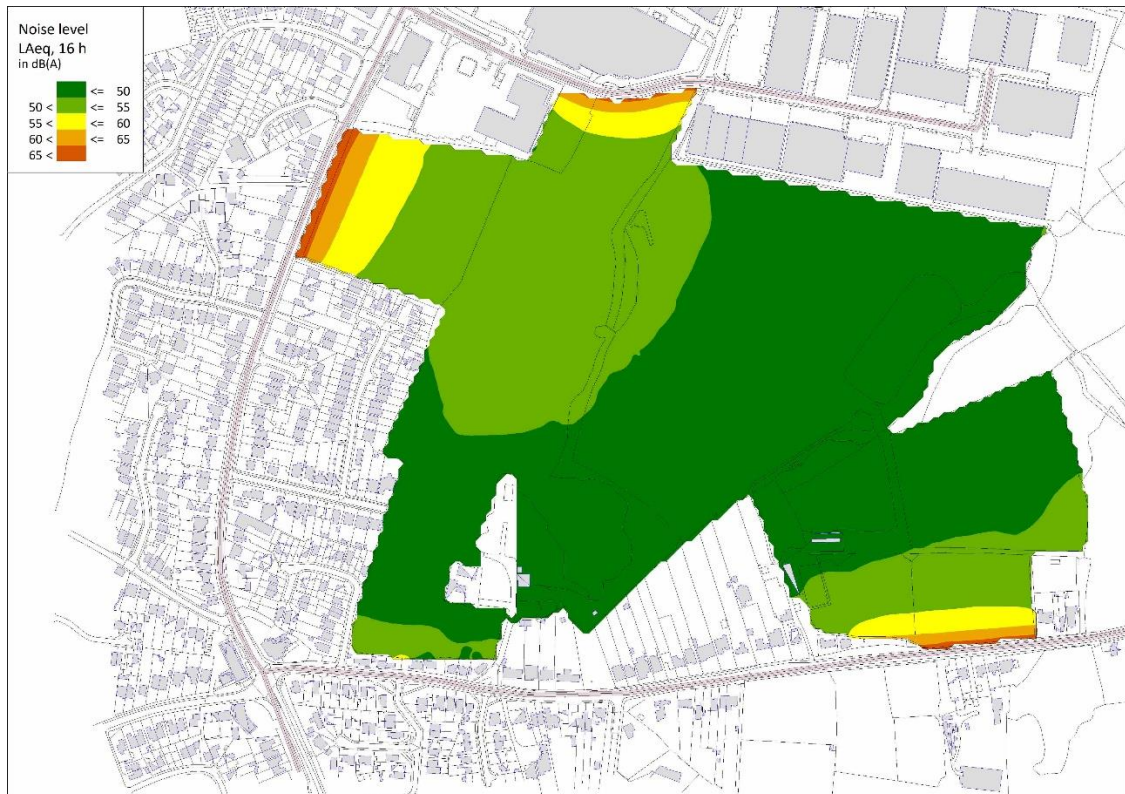
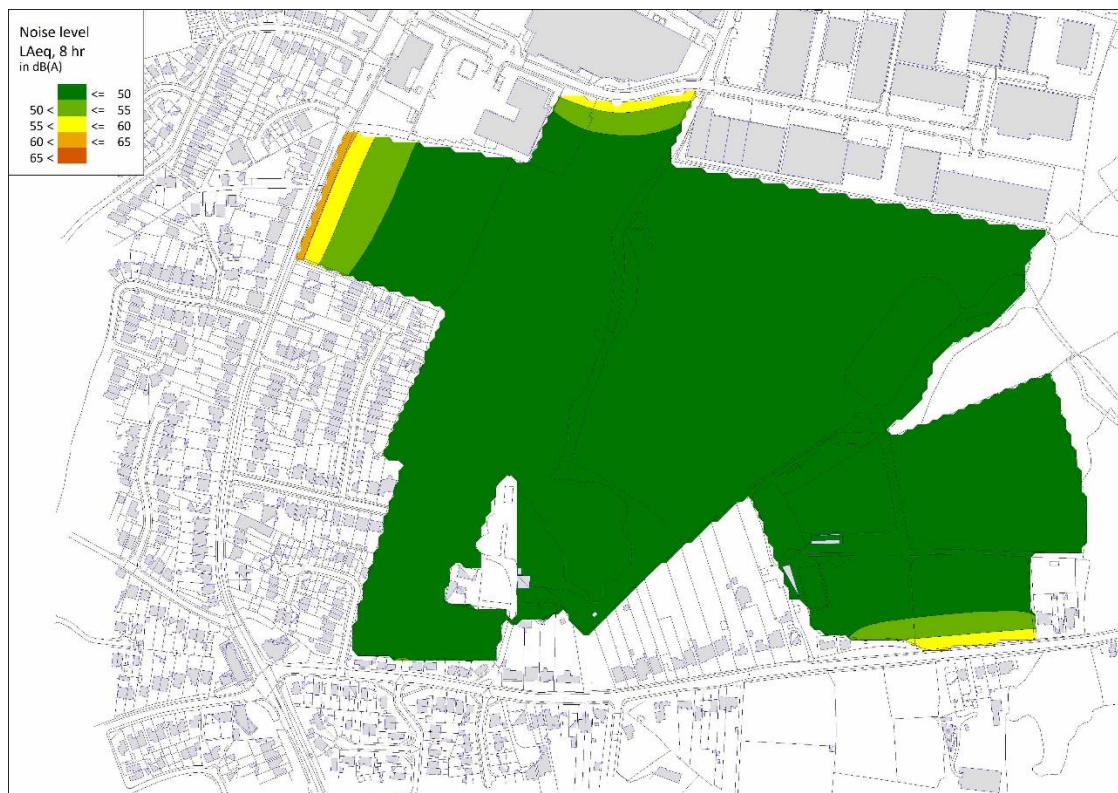


Figure 4: Night-time Sound Levels



4 Noise and Vibration Impact Assessment

Site Noise Risk Level

- 4.1.1 With reference to Pro PG (**Table 2.2**), **Figure 3 and 4** shows that the majority of the site falls within the 'low-risk' category, with areas of the site within 60 m of the road noise sources across the site falling into the 'medium risk' category with respect to sound levels.
- 4.1.2 Provided that a good acoustic design process is followed during the detailed design of the scheme this is likely to be considered acceptable from a noise perspective.
- 4.1.3 In practice, for medium risk areas of the site, this will include consideration of a number of factors including:
- Mitigation of noise sources within the site.
 - Screening opportunities provided by site layout and optional noise barriers.
 - Use of building layout to self-screen noise sensitive rooms.
 - Size and location of windows of noisy facades.

4.2 Private External Amenity Areas Noise Levels

- 4.2.1 Modelled daytime $L_{Aeq, 16hrs}$ sound level contours are shown in **Figures 3**. The results show that sound levels across the majority of the site are likely to fall within the proposed LOAEL of 50- 55 dB $L_{Aeq, 16hrs}$ during the daytime. However, as part of a good acoustic design approach and to ensure noise levels are mitigated to 50 -55 dB $L_{Aeq, 16hrs}$, additional mitigation measures are recommended.
- 4.2.2 The following noise mitigation methods should be used as part of a good acoustic design process in order to ensure that a significant noise impact can be avoided in the finished development.
- For areas of the site falling above 50 dB $L_{Aeq, 16hrs}$ orientate proposed dwellings in a way so that they shield private external amenity areas from noise due to Rayleigh Road, Stadium way and Daws Heath Road. This could include terraced dwellings to reduce the noise emissions into the site.

4.3 Internal Noise Levels

- 4.3.1 Based on the majority of the site falling into low risk category, conventional building fabric constructions are likely to be suitable to meet internal levels.
- 4.3.2 For areas of the site directly adjacent to Rayleigh Road and Daws Heath Road, uprated glazing and ventilation elements maybe required.
- 4.3.3 A further assessment should be undertaken at the detailed design stage to inform the site layout and to determine the specific external building fabric requirements in order to meet the internal noise level criteria.
- 4.3.4 Following consideration of the mitigation measures outlined above, internal noise levels can be achieved in residential dwellings supporting the use of the site for residential use

4.4 Existing Industrial and Commercial Area

- 4.4.1 The uses of the commercial units that bound the proposed development site to the north are home furniture stores and kitchen/bathroom supply stores. The layout of the industrial estate shields the proposed development site from noise generating activities in the retail park. As stated in Clause 8.5 of BS4142:2014+A1:

'Where a new noise-sensitive receptor is introduced and there is extant industrial and/or commercial sound, it should be recognized that the industrial and/or commercial sound forms a component of the acoustic environment. In such circumstances other guidance and criteria in addition to or alternative to this standard can also inform the appropriateness of both introducing a new noise-sensitive receptor and the extent of required noise mitigation.'

- 4.4.2 It was noted by the engineer during the environmental sound survey that noise levels from the retail park were barely perceptible with no particularly noticeable characteristics at the survey location LT3 on the north-eastern boundary of the site. This is a positive indication that the uses at the retail park are unlikely to have an adverse impact on the site, particularly with the open space buffer between the residential uses and the north east boundary as detailed in land use plan presented in **Appendix D**. A BS4142 assessment is not considered appropriate and no further assessment of the existing industrial and commercial area has been undertaken with no additional impact on the proposed development.

4.5 Assessment Summary

- 4.5.1 Based on the above assessments it is considered that the site is suitable for the proposed use provided a good acoustic design process is followed during the detailed design of the scheme.
- 4.5.2 It is expected that with the use mitigation measures, including orientation and building layout and acoustic screening, appropriate internal and external acoustic conditions can be achieved.

4.6 Vibration

- 4.6.1 Operational vibration impacts due to potential impacts from the surrounding road network onto the proposed development has been considered.
- 4.6.2 DMRB LA 111 states that a maintained road surface will be free of irregularities as part of general maintenance, so operational vibration will not have the potential to lead to significant adverse effect.
- 4.6.3 In support of the guidance of LA 111, research undertaken by TRL in report RR246 'Traffic induced vibration in buildings' found no evidence that traffic-induced ground-borne vibration is a source of significant damage to buildings. The report concluded that 'peak particle velocities in the structure of buildings close to heavily trafficked roads rarely exceed 2 mm/s and typically below 1mm/s. Normal use of a building such as closing doors, walking on suspended wooden floors and operating domestic appliances can generate similar levels of vibration to those from road traffic.'
- 4.6.4 Therefore, vibration impacts on the development are not considered to be significant.

5 Conclusions

- 5.1.1 Stantec UK Ltd. has been appointed by This Land Development Ltd to provide a noise impact assessment to support an outline planning application for a proposed residential development consisting of up to 455 dwellings for the Proposed Development at land east of Rayleigh Road, Thundersley, located adjacent to the A129. The Site is located within the administrative boundary of Castle Point Borough Council (CPBC).
- 5.1.2 An unattended environment sound survey was undertaken between approximately 11:45 on Tuesday 25 January 2022 and 11:45 on Wednesday 26 January 2022 in order to determine the existing sound climate at the site. Measurements were undertaken at five positions at the site, selected to be representative of incident sound levels at the site.
- 5.1.3 Based on the assessments detailed herein, it is considered that the majority of private external amenity spaces are to be located in areas where noise levels are likely to fall below BS8233 guidance levels on external noise. It is likely that the proposed criteria for internal ambient noise levels in residential areas will be readily achieved across the majority of the site with a conventional double glazing and ventilation strategy.
- 5.1.4 For areas of the site directly adjacent to Rayleigh Road and Daws Heath Road it is expected that with the use of mitigation measures, including orientation, building layout and appropriate external building fabric constructions suitable internal and external acoustic conditions can be achieved.
- 5.1.5 Based on the results of the assessments undertaken and the implementation of the recommended mitigation measures, the site should be considered suitable for residential development in relation to noise considerations.

Appendix A Glossary of Acoustic Terminology

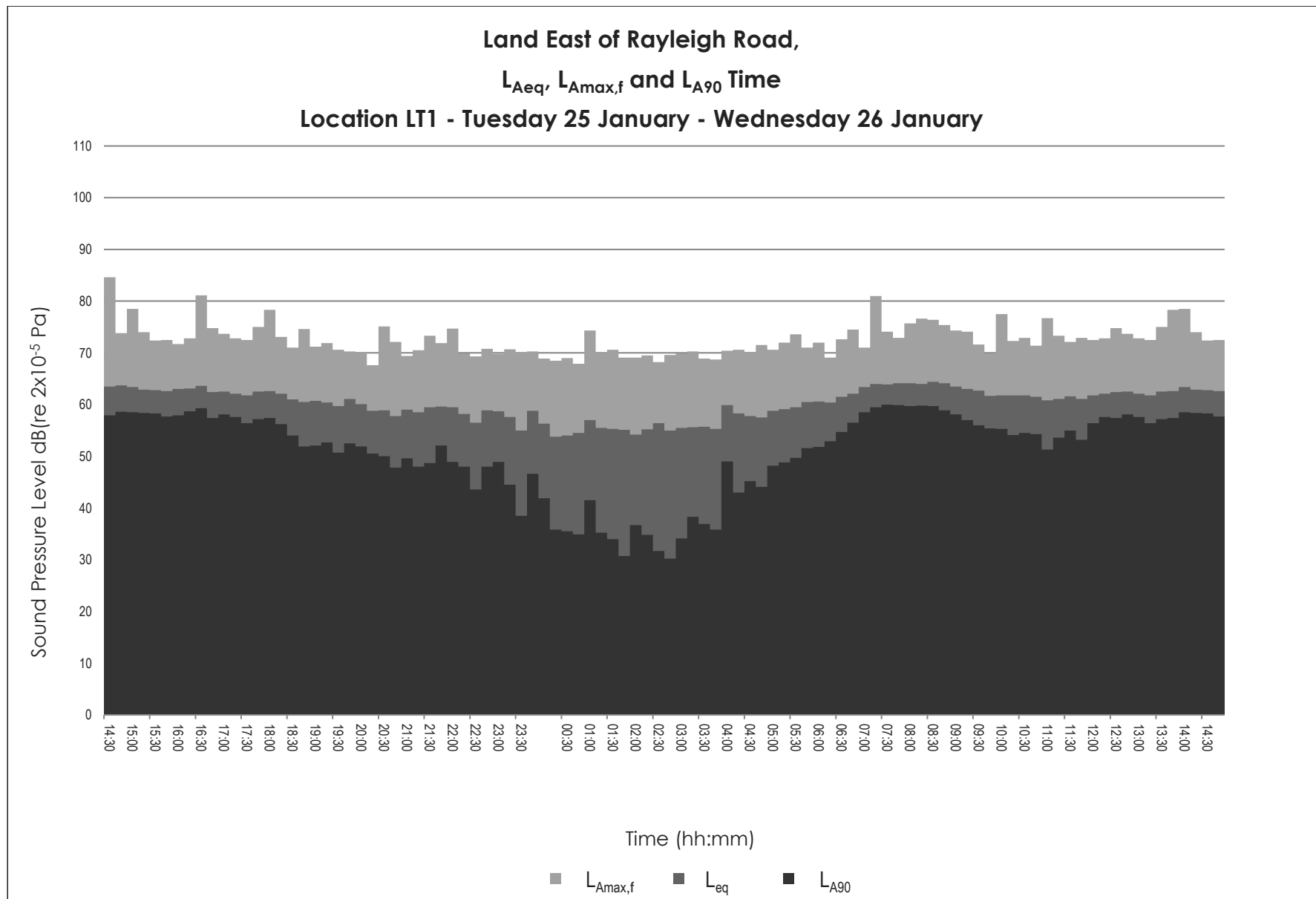
Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near (LAeq,T).
Daytime	The period 07:00-23:00 hours.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. 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 $20 \mu\text{Pa}$. 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), LAx	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.
Insertion Loss	Insertion loss is the difference in sound pressure level at a single fixed position before and after a noise control element (e.g. enclosure, barrier etc) is installed.
LAE or SEL	A noise level which, if maintained for a period of 1 second, would cause the same A-weighted sound energy to be received as is actually received from a given noise event.
LAeq,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.
Lmax,T	A noise level index defined as the maximum noise level recorded during a noise event with a period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L10,T	A noise level index. The noise level exceeded for 10% of the time over the period T. L10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. LA10,18h is the A –weighted arithmetic average of the 18 hourly LA10,1h values from 06:00-24:00.
L90,T or Background Noise Level	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
LOAEL	Lowest Observed Adverse Effect Level. This is the noise level above which adverse effects on health and quality of life can be detected.

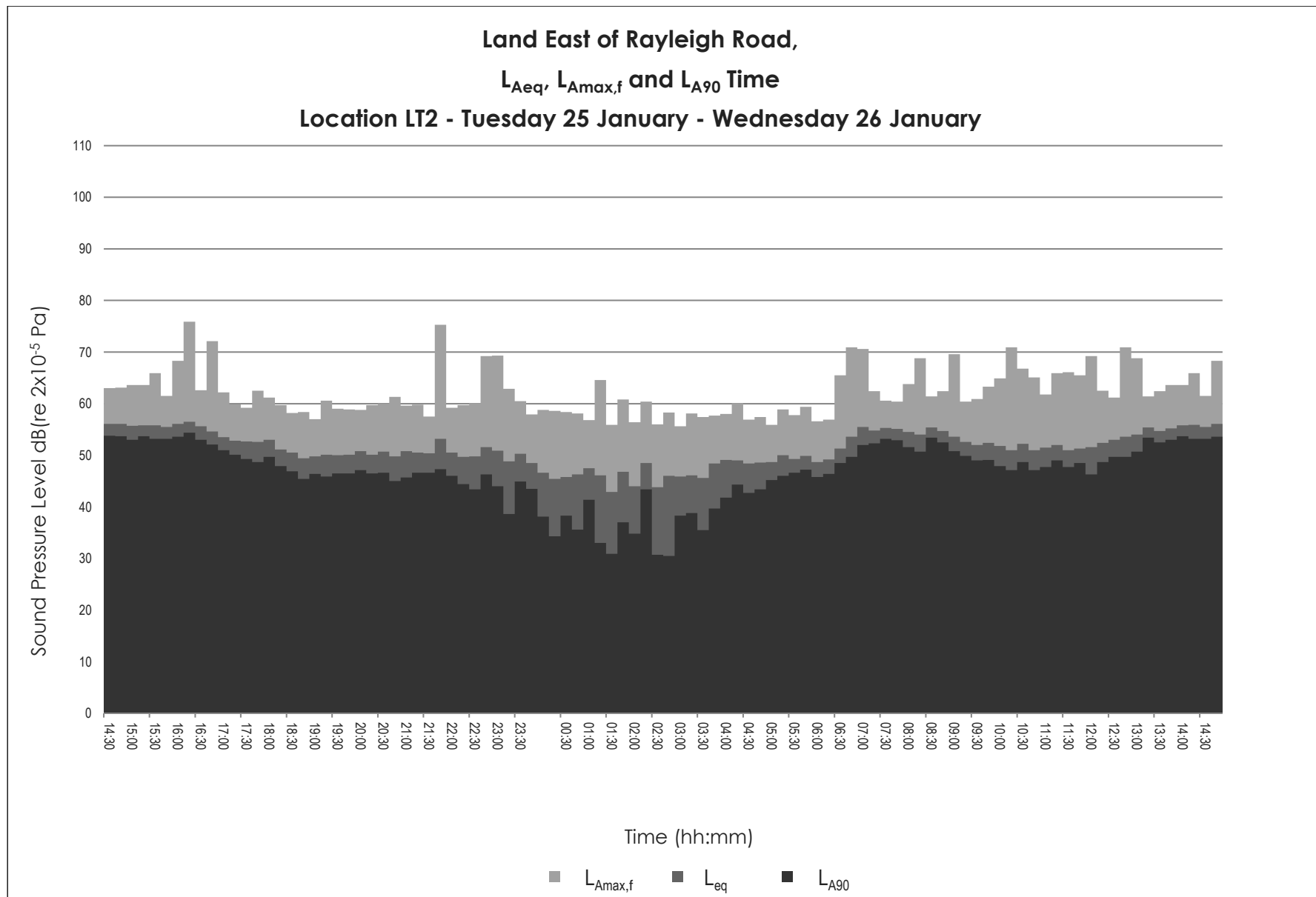
Parameter	Description
Night-time	The period 23:00-07:00 hours.
NOEL	No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
Noise Indices	Noise levels usually fluctuate 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.
SOAEL	Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level, L _p	The sound pressure level, L _p is the sound pressure relative to a standard reference pressure of 20 μ Pa (20x10 ⁻⁶ Pascals) on a decibel scale.
Specific Noise Level	The noise source under investigation for assessing the likelihood of complaints, measured as and LA _{eq,T}
Rating Noise Level	The specific noise source plus any adjustment for the characteristic features of the noise, denoted by L _{A,r,T} .

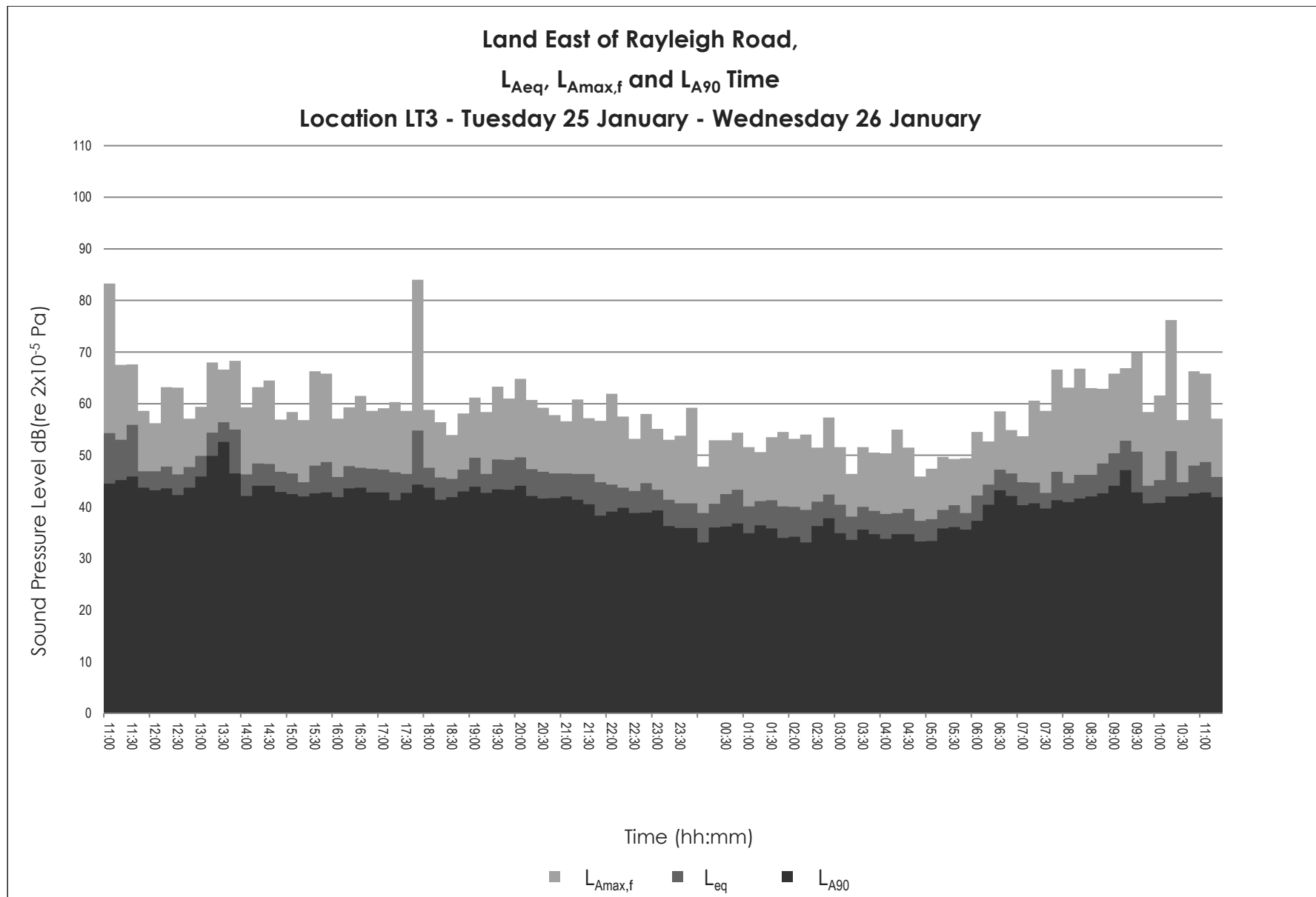
Appendix B Instrumentation

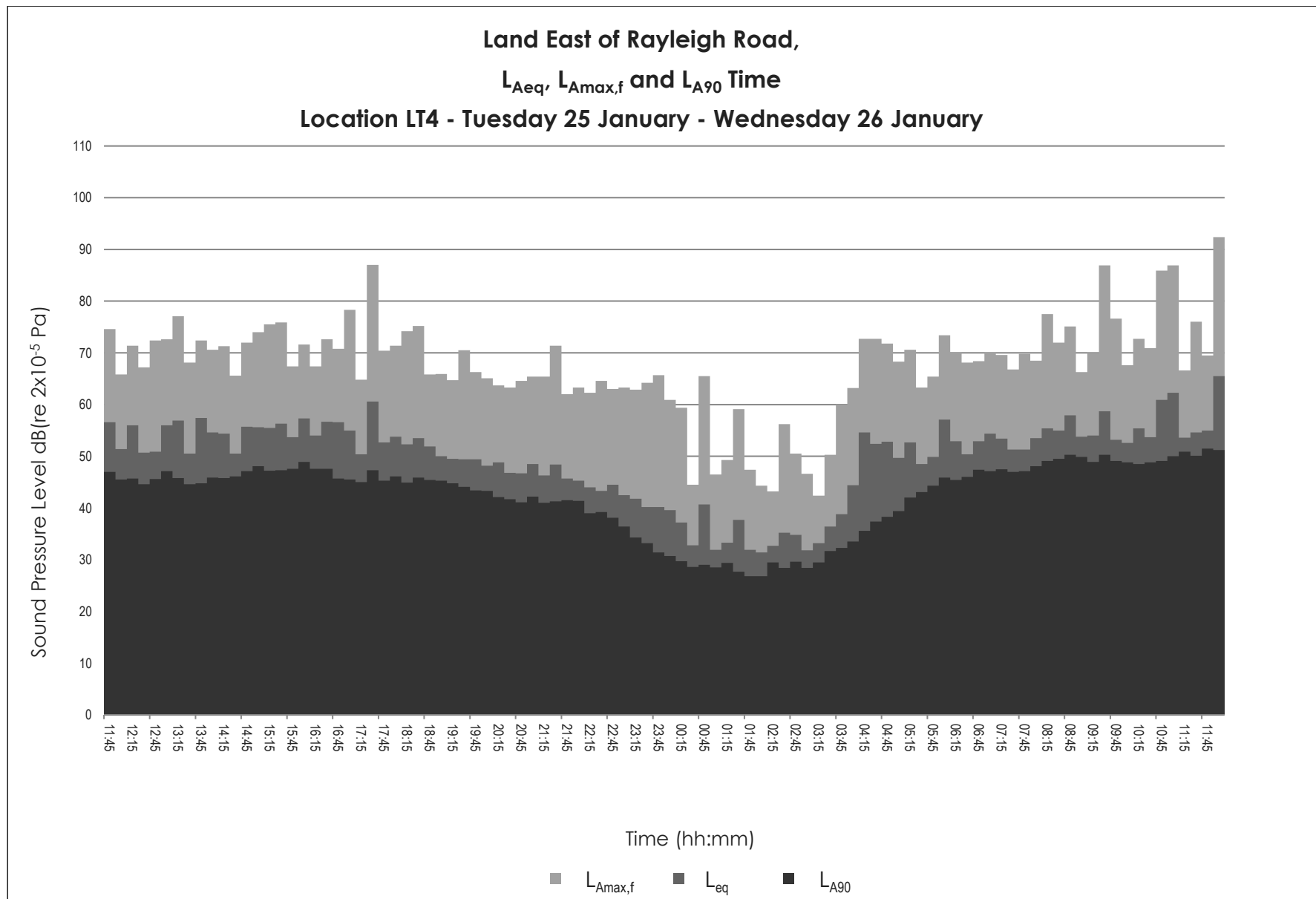
Description	Manufacturer	Type	Serial Number	Laboratory Calibration Date
Sound Level Meter	RION	NL-52	542901	07/01/2022
½" Pre-polarised microphone		UC-59	06478	07/01/2022
Pre-amplifier		NH-25	42929	07/01/2022
Sound Level Meter	RION	NL-52	542902	10/01/2022
½" Pre-polarised microphone		UC-59	07374	10/01/2022
Pre-amplifier		NH-25	43580	10/01/2022
Sound Level Meter	RION	NL-52	1043457	07/02/2021
½" Pre-polarised microphone		UC-59	07232	07/02/2021
Pre-amplifier		NH-25	43486	07/02/2021
Sound Level Meter	RION	NL-52	1043458	10/09/2021
½" Pre-polarised microphone		UC-59	07233	10/09/2021
Pre-amplifier		NH-25	43487	10/09/2021
Sound Level Meter	RION	NL-62	930517	10/01/2022
½" Pre-polarised microphone		UC-59	00598	10/01/2022
Pre-amplifier		NH-26	00559	10/01/2022
Sound Calibrator	RION	NC-74	34746691	11/08/2021

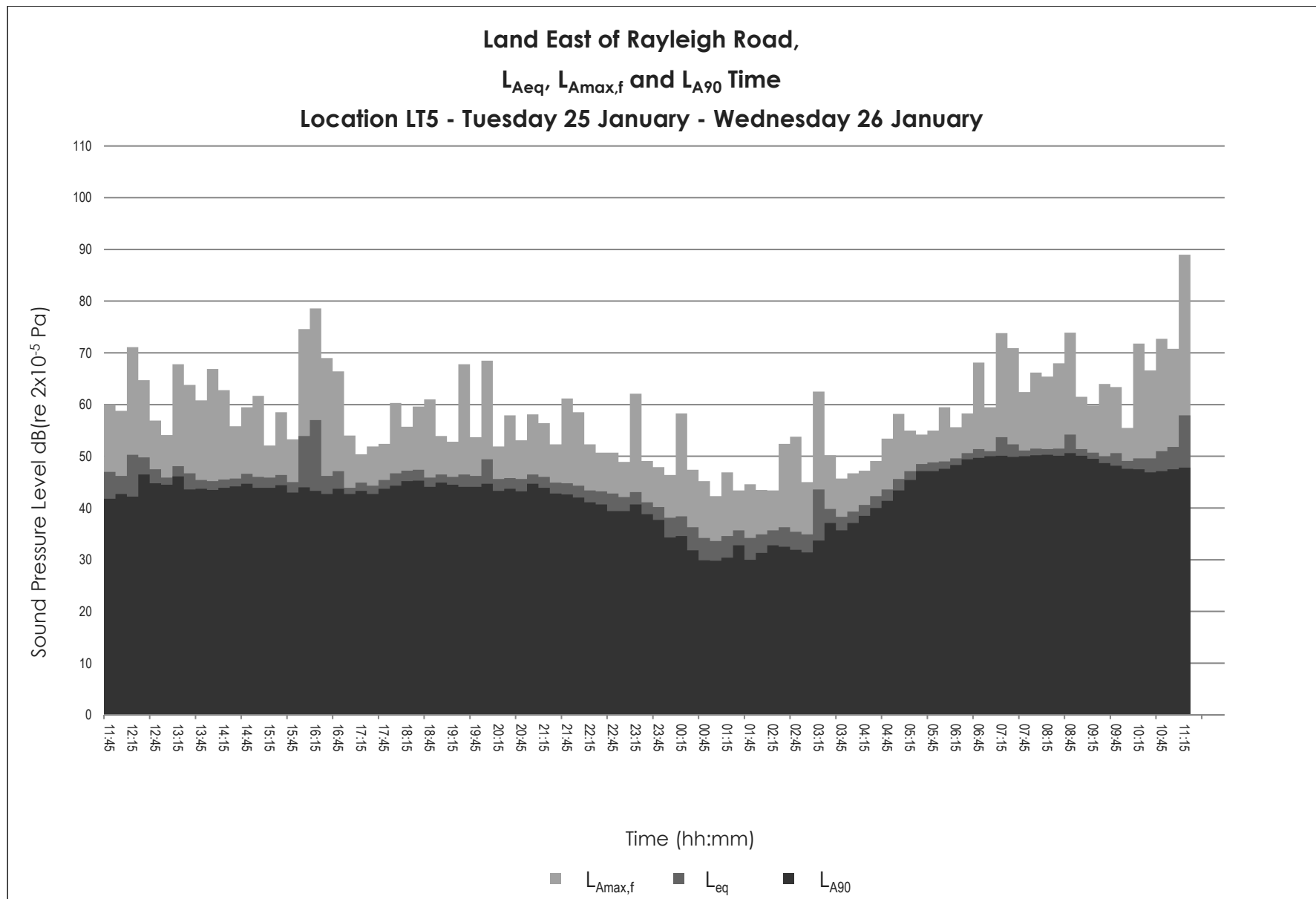
Appendix C Time-history Graphs











Appendix D Land Use Plan

