

Noise Exposure Assessment

At:

50 London Road,
Riverhead,
Sevenoaks,
Kent,
TN13 2DH

For:

Mary Reeves

Private and Confidential

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Association of Geotechnical & Geoenvironmental Specialists



Sevenoaks
Environmental
Consultancy Ltd

Executive Summary

This noise exposure assessment has been undertaken so appropriate external building fabric elements can be specified in order to meet appropriate internal noise criteria at 50 London Road, Riverhead, Sevenoaks.

The assessment adheres to the Local Authority requirements, the principles provided by the *National Planning Policy Framework: 2019* (NPPF) and internal noise criteria stated within BS 8233: 2014 '*Guidance on sound insulation and noise reduction for buildings*'.

The Institute of Acoustics' *Professional Guidance on Planning & Noise: 2017* (ProPG) recommended approach for determining site risk due to environmental noise has also been adopted.

The site currently comprises an office unit on the first and second floor above a commercial unit on the ground floor with a plant hire yard directly behind the property. Proposals include the redevelopment of the first and second floor office into 1 No. 3-bedroom residential unit, whilst retaining the existing ground floor commercial unit.

A noise survey has been undertaken as detailed in the report, in order to establish the prevailing environmental noise levels at the site.

A subsequent detailed analysis has been carried out of road traffic noise and commercial noise intrusion through the external building fabric. Sound insulation performance specifications have been proposed for glazing systems and trickle ventilators.

The assessment has demonstrated that appropriate internal noise levels should be achievable with the installation of a high-performance glazing system and acoustic trickle ventilators on all façades.

It is essential that certificated performances should be sought from the manufacturer(s) of the proposed glazing systems and trickle ventilators.

This report is designed to be suitable to discharge typical noise planning conditions, as per our original scope of work. The report should not be relied upon for further reasons, such as the detailed design of mitigation measures.

Clement Acoustics has used all reasonable skill and professional judgement when preparing this report. The report relies on the information as provided to us at the time of writing and the assumptions as made in our assessment. This report contains confidential information and should not be disclosed to third parties.

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List of Attachments

16445-SP1	Indicative Site Plans
16445-TH1 & TH2	Environmental Noise Time Histories
Appendix A	Glossary of Acoustic Terminology
Appendix B	ProPG Initial Site Risk Assessment Guidance

Document Revision	Date of Revision	Reasons for Revision	Revision By
0	01/03/2021	First Issue	Tom Price

1.0 INTRODUCTION

Clement Acoustics has been commissioned by Sevenoaks Environmental Consultancy Ltd to assess the suitability of the site at 50 London Road, Riverhead, Sevenoaks for residential development.

Proposals are to redevelop a first and second floor office unit above a commercial unit to comprise 1 No. 3-bedroom residential unit.

This report presents the results of environmental noise surveys undertaken in order to measure prevailing background levels and details the proposed internal noise level criteria.

Full details of necessary mitigation measures in order to meet the proposed criteria are also provided.

2.0 SITE DESCRIPTION

The proposed development site is currently a first and second floor office unit above a shop, with plans to comprise a 3-bedroom residential unit.

The site is in a mixed residential and commercial area facing on to the A224 London Road, a street largely populated by residential houses and commercial retail units. The site is bound by the A224 London Road to its West, a small access lane to the north of the property and residential houses at the south.

The site is located on the end of a small row of commercial shops with Rawstone's plant and machinery hire yard directly adjacent to its rear. The commercial shop and plant hire yard have operational hours between 07:30 and 17:30 on weekdays and 08:00 and 12:00 on Saturdays.

At the time of the survey, the background noise climate was dominated by road traffic from London Road and the plant and machinery hire yard.

3.0 ARCHITECTURAL ASSUMPTIONS

3.1 Drawings

The following drawings have been used in our assessment:

- 45191023-001 – Front elevation
- 45191023-002 – Left side elevation
- 45191023-003 – Right side elevation
- 45191023-004 – Rear elevation
- 45191023-005 – Proposed ground floor
- 45191023-006 – Proposed first floor
- 45191023-007 – Proposed second floor
- 45191023-008 – Existing ground floor
- 45191023-009 – Existing first floor
- 45191023-010 – Existing second floor

3.2 Room Volume and Window Dimensions

Based on the above drawings we have based our calculations on the following worst case living room and bedroom and window dimensions.

- Living Room
 - Room Volume: 67 m³
 - Window Area: 3 m²
- Bedroom
 - Room Volume: 48 m³
 - Window Area: 5.3 m²

3.3 Room Finishes

Our assessment assumes that bedrooms and living rooms will contain typical amounts of soft furnishings, including sofas, chairs, beds and curtains.

4.0 CRITERIA

4.1 Local Authority Requirements

Sevenoaks District Council have specified the following planning conditions for this development:

“The applicant should provide a noise report to demonstrate that the requirements of paragraphs 170(e) and 180(a) National Planning Policy Framework can be met.”

The paragraphs referred to in the NPPF contain the following:

“170. 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 soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans”

“180. 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:

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 the quality of life⁶⁰”

4.2 BS 8233: 2014 Internal Noise Criteria

BS 8233: 2014: ‘Guidance on sound insulation and noise reduction for buildings’ describes recommended acceptable internal noise levels for residential spaces during daytime and night-time hours. These levels are shown in Table 4.1.

Activity	Location	Design range $L_{eq,T}$	
		Daytime (07:00-23:00)	Night-time (23:00-07:00)
Resting	Living Room	35 dB(A)	-
Dining	Dining Room/Area	40 dB(A)	-
Sleeping	Bedroom	35 dB(A)	30 dB(A)

Table 4.1: BS 8233: 2014 recommended internal background noise levels

4.3 World Health Organisation Guidelines

The World Health Organisation (WHO) document on ‘Guidelines for Community Noise’ 1999 states the internal noise level guidelines as summarised in Table 4.2.

Specific Environment	Critical Health Effects	$L_{eq,T}$	$L_{max,F}$
Dwelling, Indoors	Speech Intelligibility and moderate annoyance, daytime and evening	35 dB(A)	-
Inside Bedrooms	Sleep disturbance, night-time	30 dB(A)	45 dB(A)

Table 4.2: WHO Internal noise level guidelines

The document also states ‘For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dBA L_{Amax} more than 10-15 times per night, (Vallet & Varnet 1991).’

4.4 Proposed Noise Level Criteria

On the basis of Sections 4.1 to 4.4 above, Table 4.3 presents our proposed minimum design targets to be achieved in the worst affected dwellings.

Location	Period	Design Target	
		$L_{eq,T}$	$L_{max,F}$
Living Rooms	Daytime (07:00-23:00 hours)	35 dB(A)	-
Bedrooms	Night-time (23:00-07:00 hours)	30 dB(A)	45 dB(A)*

Table 4.3: Proposed noise level criteria

*Please note that this is not an absolute limit, however, $L_{max,F}$ 45 dB(A) should not be regularly exceeded.

The external building fabric would need to be carefully designed to achieve these recommended internal levels.

4.5 Professional Guidance on Planning & Noise (ProPG)

The Institute of Acoustics' *Planning & Noise: Professional Practice Guidance on Planning and Noise: New Residential Development: 2017* (the ProPG) provides a recommended approach for dealing with noise within the planning process, specifically in relation to new residential developments.

The ProPG follows 2-stage risk assessment approach. The two stages are as follows:

- Stage 1 - an initial assessment where external noise is rated against the risk of adverse effect; and
- Stage 2 – consideration of key elements to determine the suitability of the site for a residential dwelling.

The results of the initial Site noise risk assessment will determine the appropriate risk of developing the site and therefore how appropriate it is from a noise perspective.

Appendix B presents the Initial Site Risk assessment as presented in ProPG.

Stage 2 attempts to determine that good acoustic design principals have been incorporated into the design so that suitable internal noise levels can be achieved in habitable rooms and that suitable external noise levels can be achieved in outdoor amenity space.

4.6 Guidance on Ventilation

Guidance on ventilation and associated acoustic considerations is given in *Acoustic Ventilation and Overheating – Residential Design Guide [AVO]* issued jointly by the Association of Noise Consultants and the Institute of Acoustics.

In this guide, the need for ventilation (as falls under the requirements of Approved Document F [ADF]) are covered in three main requirements as follows:

- Whole Dwelling Ventilation
 - General ventilation – continuous ventilation of rooms or spaces at a relatively low rate
- Extract Ventilation

- Removal of air from a space or spaces (typically stale air from bathrooms or kitchens) to outside
- Purge Ventilation
 - Manually controlled removal of air at a high rate to eliminate fumes and odours, e.g. during painting and decorating or from burnt food. May be provided by natural or mechanical means.

Four main template systems for providing each of the above ADF ventilation requirements are summarised in the AVO guide as shown in Table 4.4.

Ventilation System	Method of Whole Dwelling Ventilation	Method of Extract Ventilation	Method of Purge Ventilation
System 1 [Background ventilators and intermittent extract fans]	Background ventilators (trickle vents)	Intermittent extract fans	Typically provided by opening windows
System 2 [Passive Stack]	Background ventilators (trickle vents) & passive stack	Continuous via passive stack	Typically provided by opening windows
System 3 [Continuous Mechanical Extract (MEV)]	Continuous mechanical extract (low rate), trickle vents provide fresh air	Continuous mechanical extract (high rate), trickle vents provide fresh air	Typically provided by opening windows
System 4 [Continuously mechanical supply and extract with heat recovery (MVHR)]	Continuous mechanical supply and extract (low rate)	Continuous mechanical supply and extract (high rate)	Typically provided by opening windows

Table 4.4: Summary of template systems for ADF ventilation requirements

Where possible, natural forms of ventilation are typically preferred. However, in high noise areas, it may be necessary to recommend System 4, in order to minimise penetrations through the external building façade, which weaken the overall sound reduction performance.

Ventilation requirements will be assessed with consideration to the above systems.

5.0 ENVIRONMENTAL NOISE SURVEY

5.1 Unattended Noise Survey Procedure

Measurements were undertaken at two positions as shown on indicative site drawing 16445-SP1. The choice of these positions was based both on accessibility and on collecting representative noise data in relation to the identified significant noise sources.

The surroundings and position used for each monitoring location are described in Table 5.1.

Position No.	Description
1	The microphone was mounted on a tripod on a flat roof towards the front of building but screened from the road by the building itself. The microphone was positioned 1 m in front of the wall. ^[1]
2	The microphone was mounted on a tripod on a flat roof at the north side of the building at first floor level in direct line of site to the A224 London Road. The microphone position was considered free-field. ^[1]

Table 5.1: Description of unattended monitoring locations

Note [1]: The position was considered to be free-field according to guidance found in BS 8233: 2014, and a correction for reflections has therefore not been applied.

Continuous automated monitoring was undertaken for the duration of the survey between 12:00 on 18 January 2021 and 11:30 on 20 January 2021.

The measurement procedure generally complied with BS 7445: 1991: '*Description and measurement of environmental noise, Part 2- Acquisition of data pertinent to land use*'.

5.2 Attended Noise Survey Procedure

Attended noise measurements were undertaken on 20 January 2021 to provide further understanding of the prevailing noise environment.

The sound level meter was mounted on a tripod approximately 1.5 m above ground level under free-field conditions at the locations described in Table 5.2.

Position No.	Description
1	The sound level meter was located on the pavement at the front of the property approximately 1.5m from the edge of the A224 London Road.

Table 5.2: Description of attended monitoring locations

The locations of the measurement positions are shown on attached site plan 16445-SP1.

5.3 Weather Conditions

At the time of set-up and collection of the monitoring equipment and during the attended measurements, the weather conditions were mainly overcast with light rain and low winds.

Weather conditions during the survey period have been obtained from the internet resource www.worldweatheronline.com which identified Sevenoaks as the nearest weather station. Worldweatheronline.com indicates 2 days of light rainfall and some moderate winds during the survey.

It is considered that the weather conditions did not significantly adversely affect the measurements and are therefore considered suitable for the measurement of environmental noise.

5.4 Equipment

The equipment calibration was verified, by means of a field verification check, before and after use and no abnormalities were observed.

The equipment used was as follows.

- 2 No. Svantek Type 957 Class 1 Sound Level Meter
- 1 No. Svantek Type 977 Class 1 Sound Level Meter
- Svantek Type SV33B Class 1 Calibrator

6.0 RESULTS

6.1 Environmental Noise Survey

The $L_{Aeq: 5min}$, $L_{Amax: 5min}$, $L_{A10: 5min}$ and $L_{A90: 5min}$ acoustic parameters were measured throughout the duration of the survey.

Measured levels are shown as a time history in Figures 16445-TH1 and 16445-TH2. A summary of the measured noise levels are presented in Table 6.1.

Period	Ambient Noise Level	Typical Maximum Noise Level
	$L_{eq,T}$	$L_{Fmax, 5min}$
PREDICTED FRONT FAÇADE FROM ATTENDED MEASUREMENTS AND POSITION 2		
Daytime [07:00 - 23:00]	67 dB(A)	-
Night-time [23:00 - 07:00]	59 dB(A)	78 dB(A)
POSITION 2 – REAR FAÇADE		
Daytime [07:00 - 23:00]	65 dB(A)	-
Night-time [23:00 - 07:00]	57 dB(A)	75 dB(A)

Table 6.1: Site noise levels for daytime and night time

The levels presented in Table 6.1 are as expected considering the site location with the A224 London Road to the front of the property and a plant hire yard operational during the daytime to the rear. Provided adequate mitigation measures are put in place during the design and construction phase of the development, recommended internal noise levels can be achieved. Outline mitigation measures are described in Section 8.0 of this report.

Maximum noise levels shown in Table 6.1 are deemed to be ‘not regularly exceeded’ as required for maximum internal noise level specification purposes.

7.0 PROPG INITIAL SITE RISK ASSESSMENT

The environmental noise survey has determined the onsite noise levels. Table 6.1 shows the calculated day and Night-time noise levels to be used in the noise assessment.

With reference to the ProPG risk assessment guidance presented in Appendix B, Table 7.1 shows the identified risk level of this site.

Period	Measured Noise Level		ProPG Action Guidelines
	$L_{eq, T}$	ProPG Noise Risk	
POSITION 1			
Daytime [07:00 - 23:00]	59 dB(A)	Low	See Note [1]
Night-time [23:00 - 07:00]	51 dB(A)	Low to Medium	See Note [1] and [2]
POSITION 2			
Daytime [07:00 - 23:00]	66 dB(A)	Medium	See Note [2]
Night-time [23:00 - 07:00]	59 dB(A)	Medium	See Note [2]

Table 7.1: ProPG initial site risk assessment

Note [1]: Low – ‘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 Acoustic Design Statement (ADS) which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.’

Note [2]: Medium – ‘As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless 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, and which clearly demonstrates that a significant adverse noise impact will be avoided in the finished development.’

In consideration of the above, we would therefore recommend that assessing the site according to the guidance of British Standard 8233: 2014 will demonstrate that the impacts of noise can be suitably mitigated to avoid an adverse impact.

Provided adequate mitigation measures are put in place during the design and construction phase of the development, recommended internal noise levels can be achieved. Outline mitigation measures are described in Section 8.0 of this report.

8.0 NOISE EXPOSURE ASSESSMENT

8.1 Noise Impact from Commercial Unit

Due to the existing industrial unit, consideration towards BS 4142: 2014 ‘Method for rating and assessing industrial and commercial sounds’ has been given. The document states the following when introducing a new noise-sensitive receptor:

“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.”

Therefore in this instance the guidance from BS 8233 will be used. Note 2 of Section 7.7.2 states the following:

“In cases where local conditions do not follow a typical diurnal pattern... an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the levels recommended in Table 4.”

Consequently, in order to undertake a robust assessment, the representative daytime sound level for Monitoring Position 2 has been derived from a worst-case 60-minute period.

8.2 External Building Fabric - Non-Glazed Elements

It is currently assumed that the non-glazed external building fabric elements of the proposed development would be comprised of existing masonry. This would contribute towards a significant reduction of ambient noise levels in combination with a good quality window configuration, as shown in Section 8.2.

All non-glazed elements of the building facades should be designed to provide a sound reduction performance of at least the figures shown in Table 8.1 when tested in accordance with BS EN ISO 140-3: 1995.

Element	Octave band centre frequency SRI, dB					
	125	250	500	1k	2k	4k
Non glazed element SRI	41	43	48	50	55	55

Table 8.1: Minimum required sound reduction performance from non-glazed elements

8.3 External Building Fabric - Specification of Glazed Units

Sound reduction performance calculations have been undertaken in order to specify the minimum performance required from glazed elements in order to achieve recommended internal noise levels shown in Table 4.1. This specification therefore presents the most robust assessment, for BS 8233: 2014 criteria for internal noise levels in a bedroom at all affected facades.

The minimum sound reduction index (SRI) value required for all glazed elements to be installed is shown in Table 8.2. **The performance is specified for the whole window unit, including the frame and other design features.**

Type	Façade	Minimum Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)					
		125	250	500	1k	2k	4k
A	All Façades	25	22	33	40	43	44

Table 8.2: Required glazing performance

Where non-vision spandrel panels are proposed, they should provide sound reduction performance at least equal to that required of the glazing in order to maintain the acoustic integrity of the external building fabric.

It is essential that prospective cladding system suppliers can demonstrate compliance with the acoustic performance detailed in our specification rather than simply offering a generic glazing configuration. The complete cladding system should achieve the performance requirements stated in Table 8.2 when tested in accordance with BS EN 10140-2: 2010.

It is essential that the performance presented in Table 8.2 is met. However, the following typical configuration would be expected to meet the required levels of sound insulation.

- 10 mm glazing / 16 mm air gap / 4 mm glazing

N.B. This is a high-performance glazing system.

Please note that the above guidance only considers acoustic performance. Other disciplines, which consider thermal, safety, durability etc. should be consulted to ensure suitability.

8.4 External Building Fabric - Specification of Trickle Ventilators

It is understood the proposal on this site it to use System 1 ventilation as summarised in Table 4.4.

In order to comply with Building Regulations (Part F), fresh air ventilation to habitable rooms is required via trickle ventilators.

The trickle ventilators should comply with the minimum octave band normalised weighted level differences stated in Table 8.3.

Type	Façade	Minimum $D_{n,e}$ Values (dB) at Octave Band Centre Frequency (Hz)					
		125	250	500	1k	2k	4k
A	All Façades	31	33	42	43	39	44

Table 8.3: Required trickle ventilator performance

N.B. Type A performance may call for an acoustic trickle ventilator.

9.0 CONCLUSION

An environmental noise survey has been undertaken at 50 London Road, Riverhead, Sevenoaks in order to measure ambient noise levels in the area.

Measured noise levels have allowed an assessment of the level of exposure to noise of the proposed development site to be made.

Outline mitigation measures, including a glazing specification and the use of appropriate ventilation have been recommended and should be sufficient to achieve recommended internal noise levels for the proposed development according to BS 8233: 2014, WHO and the requirements of the Local Authority.

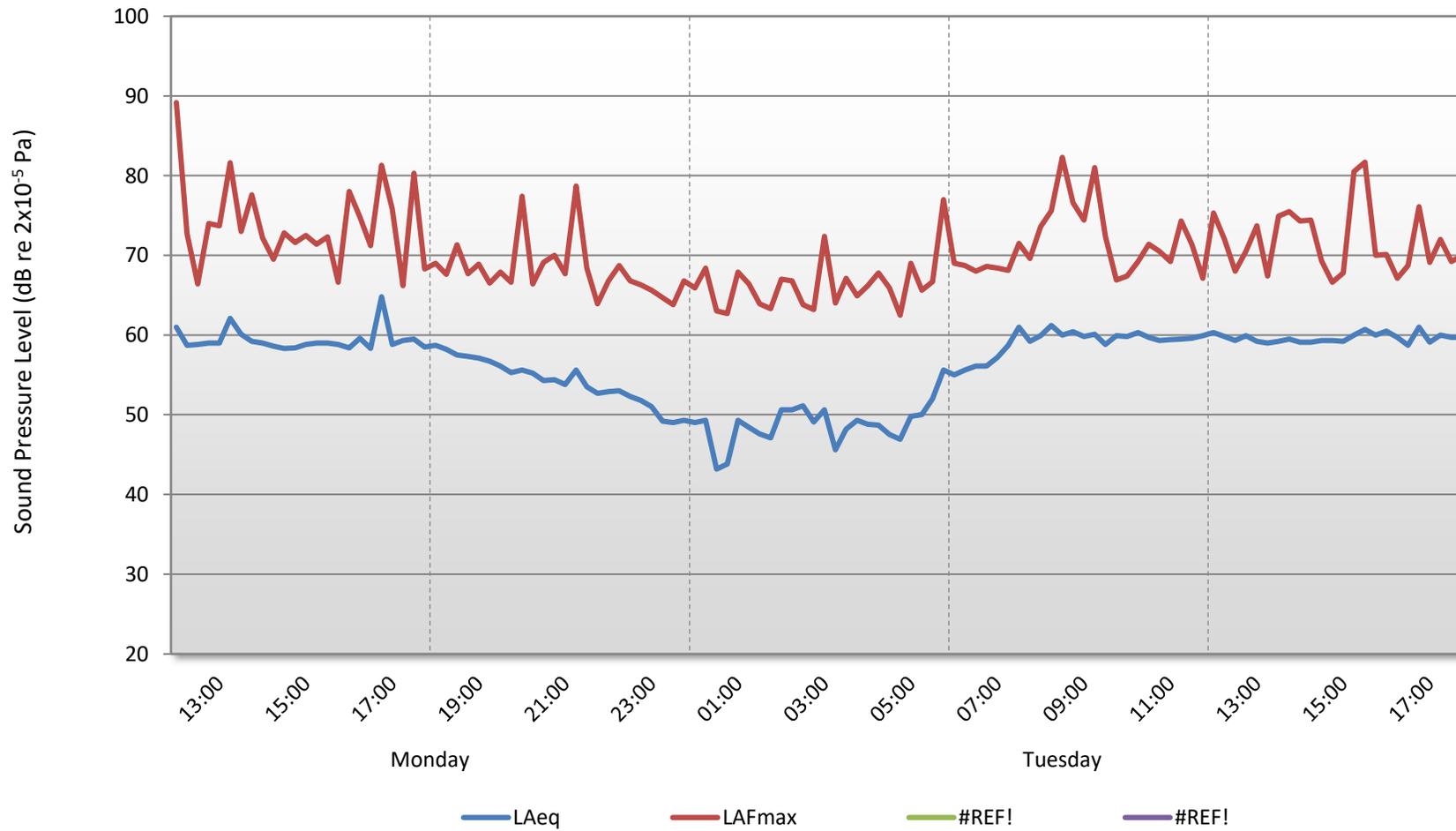
Author	Tom Price Technical Assistant BSc (Hons)		3 March 2021
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Approved	Duncan Martin Director BSc (Hons) MIOA		3 March 2021



-  Noise Survey Position
-  Attended Measurement Position

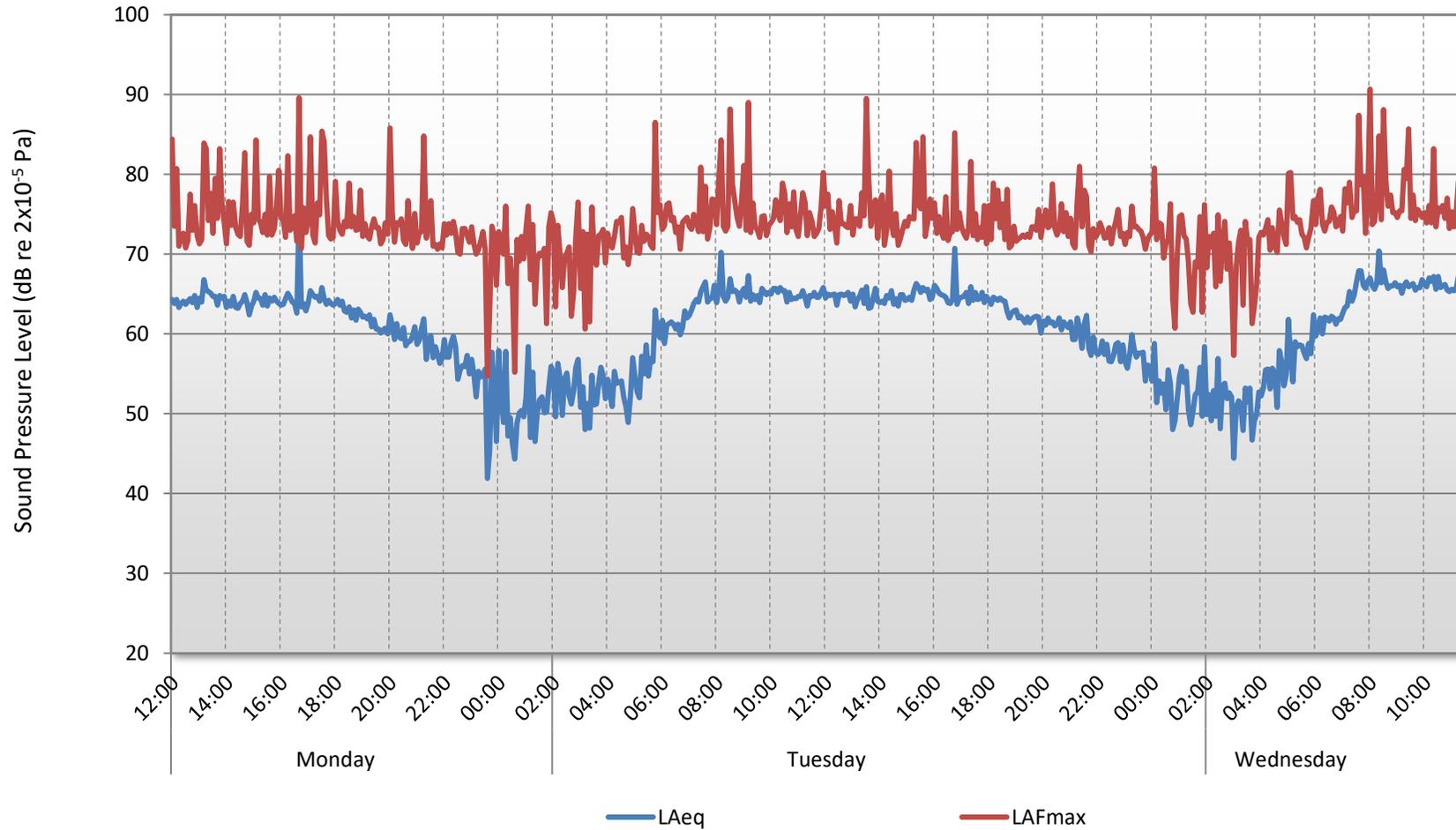
50 London Road, Riverhead, Sevenoaks - Position 1

Environmental Noise Time History
18 January 2021 to 19 January 2021



50 London Road, Riverhead, Sevenoaks - Position 2

Environmental Noise Time History
18 January 2021 to 20 January 2021



GLOSSARY OF ACOUSTIC TERMINOLOGY

dB(A)

The human ear is less sensitive to low (below 125Hz) and high (above 16kHz) frequency sounds. A sound level meter duplicates the ear's variable sensitivity to sound of different frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the ear. This is called an A-weighting filter. Measurements of sound made with this filter are called A-weighted sound level measurements and the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq}. The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L₁₀

This is the level exceeded for not more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise

L₉₀

This is the level exceeded for not more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 10 such octave bands whose centre frequencies are defined in accordance with international standards.

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than one alone and 10 sources produce a 10 dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Sound intensity is not perceived directly at the ear; rather it is transferred by the complex hearing mechanism to the brain where acoustic sensations can be interpreted as loudness. This makes hearing perception highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a reasonable guide to help explain increases or decreases in sound levels for many acoustic scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud
20	About 4 times as loud

Barriers

Outdoor barriers can be used to reduce environmental noises, such as traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and its construction.

Reverberation control

When sound falls on the surfaces of a room, part of its energy is absorbed and part is reflected back into the room. The amount of reflected sound defines the reverberation of a room, a characteristic that is critical for spaces of different uses as it can affect the quality of audio signals such as speech or music. Excess reverberation in a room can be controlled by the effective use of sound-absorbing treatment on the surfaces, such as fibrous ceiling boards, curtains and carpets.

ProPG Initial Site Risk Assessment Guidance

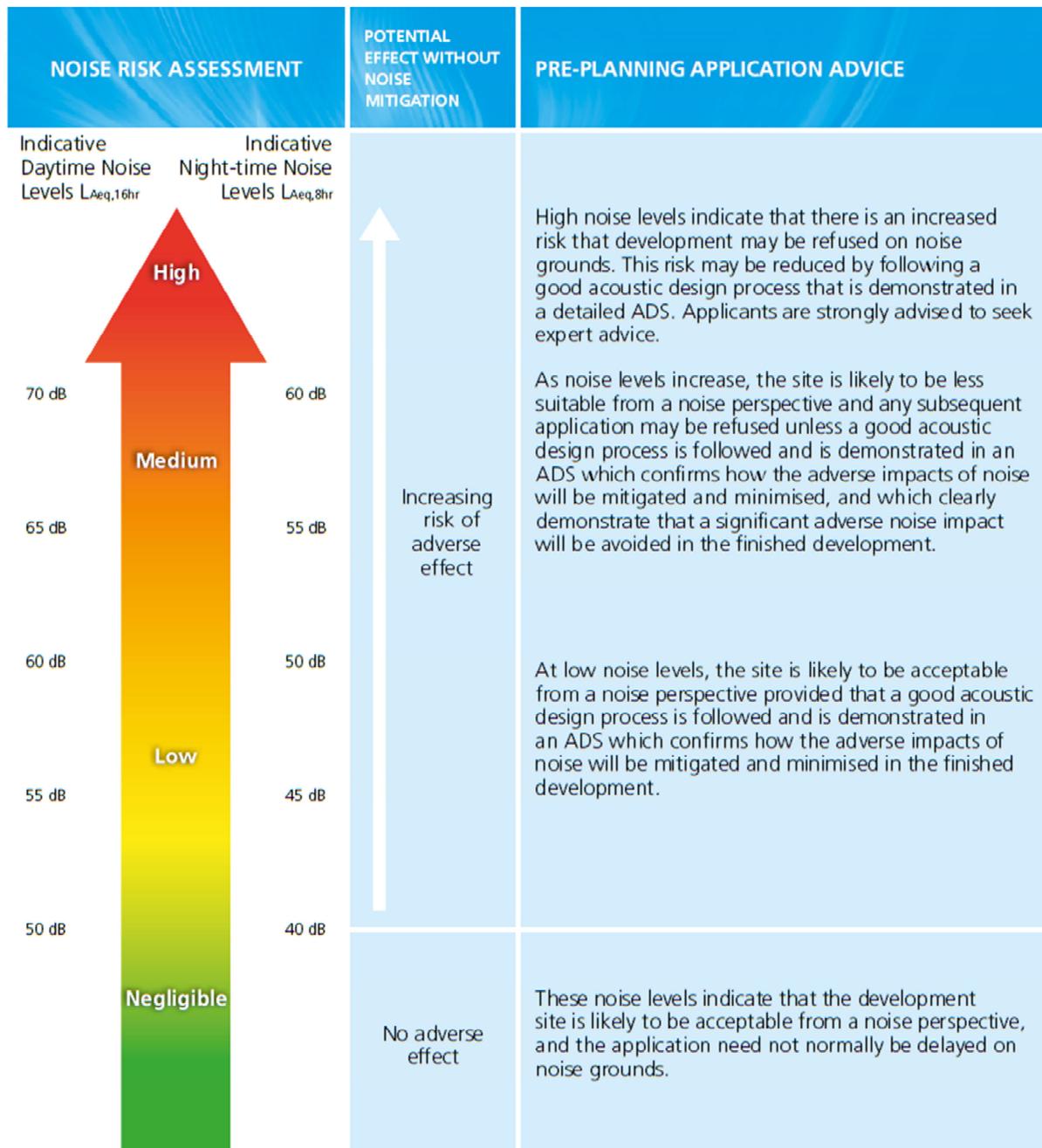


Figure 1 Notes:

- a. Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.
- b. Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".
- c. $L_{Aeq,16hr}$ is for daytime 0700 – 2300, $L_{Aeq,8hr}$ is for night-time 2300 – 0700.
- d. An indication that there may be more than 10 noise events at night (2300 – 0700) with $L_{Amax,F} > 60$ dB means the site should not be regarded as negligible risk.

Figure 1. Stage 1– Initial Site Noise Risk Assessment