LOVE
DESIGN
STUDIO

NOISE ASSESSMENT (FOR PLANNING)

27 Uxbridge Road, Hayes, UB4 0JN
by Love Design Studio

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CONTENTS

EXECUTIVE SUMMARY

Love Design Studio has been commissioned to undertake a planning stage noise assessment for a proposed new hotel block including modifications to the existing hotel building on the corner of the Uxbridge Road, and Springfield Road, Hillingdon.

In support of these assessment works, a baseline noise survey was undertaken to determine the prevailing environmental noise levels at the North and West façades of the proposed building.

The results of the assessments were analysed and reviewed in line with the aims and advice contained within the National Policy Statement for England, the National Planning Policy Framework, Planning Practice Guidance and the Institute of Acoustics Professional Practice Guidance for new residential development.

The advice in the IoA ProPG document indicates that at the worst-affected façade noise levels are in the high-risk range but that "*the risk may be reduced by following a good acoustic design process*".

The assessment has demonstrated that the requirements established in BS 8233:2014 will be met inside all hotel rooms when fitted with suitable double-glazed windows and acoustic trickle ventilators.

The airborne sound insulation of the separating slab has been assessed between the gym and the hotel rooms above. The assessment indicates that a mass barrier suspended ceiling will be required to meet the internal levels stated within the guidance of BS 8233:2014. Details of a suitable mass barrier ceiling have been proposed.

The site can, therefore, be considered suitable for the proposed use.

INTRODUCTION

Love Design Studio has been commissioned to undertake a planning stage noise assessment for a proposed new hotel blocks including modifications to the existing hotel building on the corner of the Uxbridge Road, and Springfield Road, Hillingdon.

This report presents the results of an environmental noise survey, the applicable policies and guidance, and a noise impact assessment demonstrating the suitability of the site for the proposed use. This report also includes the results of the sound insulation assessment conducted between the existing ground floor incubator rooms and the gym, and the first-floor rooms above.

To assist with the understanding of this report a brief glossary of acoustic terms can be found in Appendix A. more in-depth glossary of acoustic terms can be assessed at the following web address http://www.acoustic-glossary.co.uk/.

SITE LAYOUT AND DEVELOPMENT PROPOSALS

The site is located at 27 Uxbridge Road in Hayes, adjacent to the junction of Uxbridge Road and Springfield Road. The proposed development comprises a new hotel block along the outer perimeter of the premises. Proposed works are to the ground floor to fourteenth floor of the building.

The area surrounding the site are a mixture of commercial and residential properties.

A site plan showing the site, surrounding area and the noise monitoring location used in this assessment is presented in Appendix B.

The floor plans of the site are shown in Appendix C.

POLICY CONTEXT

A great deal of change has occurred in recent years in the assessment of noise impacts and their relationship with planning decisions. The following sections introduce the applicable policies, either national or local, which ought to be considered to support the planning application.

NOISE POLICY STATEMENT FOR ENGLAND

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:

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."

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.

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."***

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

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,

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

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."***

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

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 a revision 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.

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."***

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 …

The NPPF document does not refer to any other documents or British Standards regarding noise other than the NPSE.

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

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."***

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."***

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."***

PLANNING PRACTICE GUIDANCE – NOISE

An updated Planning Practice Guidance (PPG[3]) 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.

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*').

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

[3] Planning Practice Guidance – Noise, https://www.gov.uk/guidance/noise--2, 22 July 2019

the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.

The LOAEL is described in PPG[4] 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".***

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."***

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[5] 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."***

[4] Paragraph: 005 Reference ID: 30-005-20190722
[5] Paragraph: 006 Reference ID: 30-006-20190722

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

Table 1: ProPG Effects Table

Response	Examples of Outcomes	Increasing 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

Response	Examples of Outcomes	Increasing 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

The Planning Practice Guidance[6] 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."

In addition, the Guide notes that it may also be relevant to consider[7]:

"... 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

[6] Paragraph: 010 Reference ID: 30-010-20190722
[7] Paragraph: 006 Reference ID: 30-006-20190722

VENTILATION IS LIKELY TO BE NECESSARY. FURTHER INFORMATION ON VENTILATION CAN BE FOUND IN THE BUILDING REGULATIONS".

ACOUSTIC STANDARDS AND GUIDANCE – SITE SUITABILITY ASSESSMENT

INSTITUTE OF ACOUSTICS PROFESSIONAL PRACTICE GUIDANCE

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".***

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

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[8].

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

[8] Figure 1, IoA ProPG for New Residential Development, May 2017

BS 8233:2014 GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS.

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[9]). These guideline noise levels are shown in Table 2, below:

Table 2: BS 8233:2014 Desirable Internal Ambient Noise Levels for Dwellings

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

BS 8233:2014 advises that***: "regular individual noise events…can cause sleep disturbance. A guideline value may be set in terms of SEL or LAmax,F depending on the character and number of events per night. Sporadic noise events could require separate values."*** A typical requirement, derived from WHO guidance and previous editions of BS 8233, is that night-time internal L_{AMax} noise levels should not normally exceed 45dB.

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 50DB $L_{AEQ,T}$, WITH AN UPPER GUIDELINE VALUE OF 55DB $L_{AEQ,T}$ 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.

[9] World Health Organisation Guidelines for Community Noise, 1999

...

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 55DB $L_{AEQ,T}$ OR LESS MIGHT NOT BE POSSIBLE AT THE OUTER EDGE OF THESE AREAS, BUT SHOULD BE ACHIEVABLE IN SOME AREAS OF THE SPACE."

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[11] that:

"IF PARTIALLY OPEN WINDOWS WERE RELIED UPON FOR BACKGROUND VENTILATION, THE INSULATION WOULD BE REDUCED TO APPROXIMATELY 15DB."

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.

WORLD HEALTH ORGANISATION, GUIDELINES FOR COMMUNITY NOISE, 1999 (WHO)

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.

1. 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.
2. 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 50dB 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:

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

The WHO guidelines also propose that external sound levels for amenity use should not exceed 50-55dB $L_{Aeq,16hr}$ during daytime hours.

THE NOISE INSULATION REGULATIONS 1975

The Noise Insulation Regulations 1975 define the conditions under which dwellings are eligible for noise insulation to control internal noise levels. The conditions relate to the level of traffic noise at the façade, the increase in noise levels as a result of the highway and the contribution of the new or altered scheme to the noise level received at the façade.

Noise insulation qualification criteria must abide by a few tests which include the following two:

- The facade noise threshold of 68dB $L_{A10\ 18h}$ is met or exceeded;
- That there must be a noise increase of at least 1dB(A) compared to the prevailing noise level immediately before the construction of a highway or an additional carriageway were begun;

SOAELS FOR TRANSPORTATION AIRBORNE NOISE

Based on the noise insulation regulations a façade noise level of 69dB $L_{A10,18h}$ is therefore considered unacceptable and can trigger the provision of mitigation measures by the government. This level can therefore be used as the SOAEL in relation to transportation noise in England. This level relates to a level of 64dB $L_{Aeq,16h}$. Based on guidance[10] in BS 8233:2014, an external noise level of 64dB $L_{Aeq,16h}$ would roughly equate to an internal level of 49dB L_{Aeq16h}, with open windows. As daytime and night-time desirable target levels differ by 5dB, a night-time SOAEL could be 44dB $L_{Aeq,8h}$ with open windows.

[10] BS8233:2014 states that "If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB"

PROPOSED LOAEL AND SOAELS FOR TRANSPORTATION AIRBORNE NOISE AFFECTING RESIDENTIAL DEVELOPMENTS.

A summary of the proposed LOAEL and SOAEL values are provided in Table 3.

Table 3: Proposed LOAEL and SOAEL for transportation noise affecting dwellings

Level	Daytime (07:00 hours to 23:00 hours)	Night-time (23:00 hours to 07:00 hours)
LOAEL Internal	35 $L_{Aeq,16h}$ (dB)	30 $L_{Aeq,8h}$ (dB)
SOAEL Internal	49 $L_{Aeq,16h}$ (dB)	44 $L_{Aeq,8h}$ (dB)
LOAEL External	50 $L_{Aeq,16h}$ (dB)	40 $L_{Aeq,8h}$ (dB)
SOAEL External	65 $L_{Aeq,16h}$ (dB)	55 $L_{Aeq,8h}$ (dB)

Based on guidance in BS 8233:2014, it appears that night-time L_{Amax} events should be associated with transportation noise involving train or aircraft pass-bys and not busy road traffic. As the dominant noise source around the development is road traffic noise, LOAEL and SOAEL values for L_{Amax} events during the night-time are not presented as these are not deemed necessary.

It should be highlighted that the Secretary of State's approved assessment methodology for the HS2 project includes a SOAEL of 65dB $L_{Aeq,16h}$. The HS2 project also includes a LOAEL of 50dB $L_{Aeq,16h}$. Therefore the difference between the LOAEL and SOAEL for transportation noise in the Secretary of State approved HS2 project is 15dB.

WORLD HEALTH ORGANISATION (WHO) 2009

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.

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

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

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 42dB.

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.

Integrating these findings, the report proposed a guideline target limit of outdoor night noise of 40dB (annual average defined as 'Lnight' 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 40dB.

BUILDING REGULATIONS

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.

VENTILATION REQUIREMENTS FOR DWELLINGS

BACKGROUND VENTILATION

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.

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.

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

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.

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.

Part F goes on to say[11] 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

In summary, background ventilation for new residential dwellings, and residential dwellings formed by a material change of use, 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.

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

ACOUSTIC STANDARDS AND GUIDANCE – SOUND INSULATION ASSESSMENT

BUILDING REGULATIONS APPROVED DOCUMENT E

Building Regulations Approved Document E *Resistance to the Passage of Sound* gives minimum standards for airborne and impact sound insulation between dwellings, and between dwellings and other occupancies, and are primarily aimed at controlling domestic noise transfer.

Under the requirements of Approved Document E, the airborne sound insulation provided by the separating floor between a residential dwelling or room for residential purposes (RRP) and any other part of the same building must be at least 45 dB $D_{nT,w} + C_{tr}$.

[11] Paragraph 4.15 in Approved Document F

The Approved Document E requirements for impact sound insulation apply only when the dwelling/RRP is below the separating floor, and therefore need not be considered where residential rooms are above non-residential spaces.

Building Regulations do not give specific guidance on any enhancement to the sound insulation that may be required where, for example, noise levels in a commercial unit are higher than would be expected in a dwelling.

BS 8233:2014 GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

As noted above, the Building Regulations do not provide guidance in relation to the sound insulation performance of a partition separating residential and commercial premises, though as a minimum the performance required under the Building Regulations will have to be met. Therefore, guidance is generally sought from *BS 8233:2014 – 'Guidance on sound insulation and noise reduction for buildings'*.

Section 7.5 '*Internal Sound Insulation*' of BS 8233, states the following:

"... sound from adjacent spaces can affect the intended use, depending on the noise activity, noise sensitivity and privacy requirement. A matrix may be used to determine the sound insulation requirement of separating partitions once the noise activity, noise sensitivity and privacy requirements for each room and space. An example matrix, which can be adapted according to the specific building use, is given in Table 3. Each room may be both a source and a receiving room. Where adjacent rooms have different uses, the worst case sound insulation should be specified.

Table 3 **Example on-site sound insulation matrix (dB $D_{nT,w}$)**

Privacy requirement	Activity noise of source room	Noise sensitivity of receiving rooms		
		Low sensitivity	Medium sensitivity	Sensitive
Confidential	Very high	47	52	57 [A)]
	High	47	47	52
	Typical	47	47	47
	Low	42	42	47
Moderate	Very high	47	52	57 [A)]
	High	37	42	47
	Typical	37	37	42
	Low	No rating	No rating	37
Not private	Very high	47	52	57 [A)]
	High	37	42	47
	Typical	No rating	37	42
	Low	No rating	No rating	37

*NOTE Background noise can also influence privacy. See also **7.7.6.3**.*

[A)] $D_{nT,w}$ 55 dB or greater is difficult to obtain on site and room adjacencies requiring these levels should be avoided wherever practical.

There is an element of professional judgement required with regard to the acoustic categorisation of each space.

As a worst case, the gym and incubator rooms could be considered as spaces which are not private but with very high activity noise levels. The hotel rooms adjoined can be considered as spaces with a high level of sensitivity.

Based on these considerations, the sound insulation of the separating floor between the first-floor units and the rooms should not be lower than 57dB $D_{nT,w}$ based on the matrix table in BS 8233:2014.

This requirement is in addition to the criterion in Building Regulations.

SOUND LEVELS WITHIN HOTEL ROOMS

To avoid complaints from the occupants of the rooms, it is recommended that noise from the gym and other commercial spaces is reduced to acceptable levels in the rooms above.

BS 8233:2014 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). These guideline noise levels are shown in Table 4, below.

Table 4: Indoor 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 $L_{Aeq,8h}$

It should be noted that these target levels are typically used to assess noise from general environmental noise break-in (i.e. road traffic) rather than less anonymous sources of noise. Therefore, it is recommended to reduce the above limits by around 5dB, as the noise produced by activities in the store and back of house is likely to be intermittent.

In addition, BS 8233 also states that:

"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"

As a consequence, it also seems appropriate to use a limit in terms of $L_{Amax,F}$. WHO Guidelines for Community Noise 1999 stated that:

"IF NEGATIVE EFFECTS ON SLEEP ARE TO BE AVOIDED THE EQUIVALENT SOUND PRESSURE LEVEL SHOULD NOT EXCEED 30 DBA INDOORS FOR CONTINUOUS NOISE. IF THE NOISE IS NOT

CONTINUOUS, SLEEP DISTURBANCE CORRELATES BEST WITH L_{AMAX} AND EFFECTS HAVE BEEN OBSERVED AT 45 DB OR LESS. THIS IS PARTICULARLY TRUE IF THE BACKGROUND LEVEL IS LOW. NOISE EVENTS EXCEEDING 45 DBA SHOULD THEREFORE BE LIMITED IF POSSIBLE. FOR SENSITIVE PEOPLE AN EVEN LOWER LIMIT WOULD BE PREFERRED."

CRITERIA

Based on the considerations above, the following performance requirements are to be met for the separating floor:

Table 5: Recommended airborne sound insulation

Separating structure	Airborne sound insulation	
	$D_{nT,w} + C_{tr}$ dB (minimum value)	$D_{nT,w}$ dB (minimum value)
Floor	45	57

SITE SUITABILITY ASSESSMENT METHODOLOGY

ENVIRONMENTAL NOISE SURVEY

An unattended environmental sound pressure level survey was undertaken from Wednesday 8th June to Thursday 9th June 2022. Automatic measurement equipment was located at Uxbridge Road and Springfield Road. The survey was undertaken in order to establish the typical incident environmental noise levels at the proposed development.

Full details of the survey are provided in Appendix D alongside time history graphs of the measurement results. The relevant results of the survey have been summarised in Table 6 and Table 7.

Table 6: Summary of survey results

Position	Measurement period	Range of recorded sound pressure levels (dB)			
		$L_{Aeq(15mins)}$	$L_{Amax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Uxbridge Road	Daytime (07.00 – 23.00 hours)	67-74	78-100	70-73	58-63
	Night-time (23.00 – 07.00 hours)	60-70	74-98	64-72	47-60
Springfield Road	Daytime (07.00 – 23.00 hours)	62-72	75-99	65-73	55-61
	Night-time (23.00 – 07.00 hours)	53-69	67-91	56-70	44-57

The incident environmental noise levels at the facades of the proposed apartments are summarised below.

Table 7: Summary of free field environmental noise levels

Period	Parameter	Sound pressure level, dB	
		Uxbridge Road	**Springfield Road**
Wednesday 8th June daytime*	$L_{Aeq,T}$	69	66
8th-9th June night-time	$L_{Aeq,8hours}$	65	61
Thursday 9th June daytime*	$L_{Aeq,T}$	68	67
Overall daytime	$L_{Aeq,\ 16\ hours}$	69	66
Overall night-time	$L_{Aeq,\ 8\ hours}$	65	61

*not complete 16 hour measurements

Measured octave band sound pressure levels corresponding to the overall values above are given in Table 8.

Table 8: Measured octave band sound pressure levels at the measurement locations

Position	Period	Incident sound pressure levels (dB) at Octave Band Centre Frequencies (Hz)								dBA
		63	125	250	500	1K	2K	4K	8K	
Uxbridge Road	Daytime $L_{eq,\ 16\ hours}$	74	68	66	65	65	61	54	48	69
	Night-time $L_{eq,\ 8\ hours}$	67	62	61	60	62	59	50	45	65
	Night-time $L_{Max,F}$	92	85	80	76	77	78	68	66	83
Springfield Road	Daytime $L_{eq,\ 16\ hours}$	72	67	64	62	62	59	55	48	66
	Night-time $L_{eq,\ 8\ hours}$	64	62	58	56	57	53	49	42	61
	Night-time $L_{Max,F}$	89	83	75	73	78	76	72	68	82

The night-time $L_{Max,F}$ data relate to the sound level of the tenth-highest event, in terms of $L_{AFMax\ 10\ sec}$, measured at each position.

To determine the incident sound levels at the worst-affected hotel windows, corrections have been made for the relative distance between the road traffic and the sound level meter position and between the road traffic and the façade. A conservative reduction of 2dB to the L_{eq} values and 4dB to the L_{max} values has been made for the windows on the lower elevations. For rooms on the 6th floor and above incident sound levels will be further-reduced due to the additional distance from the road. Incident sound levels used in the assessment are therefore as shown in Table 9.

Table 9: Incident octave band sound pressure levels at windows

Façade	Period	Incident sound pressure levels (dB) at Octave Band Centre Frequencies (Hz)								dBA
		63	125	250	500	1K	2K	4K	8K	
Uxbridge Road (second floor)	Daytime $L_{eq,\ 16\ hours}$	72	66	64	63	63	59	52	46	67
	Night-time $L_{eq,\ 8\ hours}$	65	60	59	58	60	57	48	43	63
	Night-time $L_{Max,F}$	88	81	76	72	73	74	64	62	79
Uxbridge Road (sixth floor)	Daytime $L_{eq,\ 16\ hours}$	71	65	63	62	62	58	51	45	66
	Night-time $L_{eq,\ 8\ hours}$	64	59	58	57	59	56	47	42	62
	Night-time $L_{Max,F}$	86	79	74	70	71	72	62	60	77
Springfield Road (first floor)	Daytime $L_{eq,\ 16\ hours}$	70	65	62	60	60	57	53	46	64
	Night-time $L_{eq,\ 8\ hours}$	62	60	56	54	55	51	47	40	59
	Night-time $L_{Max,F}$	85	79	71	69	74	72	68	64	78

NATURE OF SOURCE NOISE

During installation and removal of the sound measurement equipment positioned on Uxbridge Road the major noise source affecting the site was observed to be due to local road traffic. Vehicles include HGVs, buses and cars.

Other audible sources of noise included music noise from cars, pedestrian noise, engine idling noise, and noise from cars driving over loose manhole cover on the road.

For Springfield Road, the major noise source affecting the site was observed to be due to local road traffic, and HGV delivery noise. Other audible sources of noise include vehicles idling and cars driving over loose manhole covers on the road.

BUILDING FABRIC NOISE IMPACT ASSESSMENT

INITIAL RISK ASSESSMENT

Results for the highest existing ambient noise levels are shown below and compared with the risk guidance values shown in Figure 1 of ProPG.

Table 10: Comparison of external sound pressure levels with ProPG guidance

Period/ Parameter	External sound level, dB	ProPG Noise Risk Assessment category
Daytime $L_{Aeq\ 16hr}$	67	Medium
Night-time $L_{Aeq\ 8hr}$	63	High
Night-time $L_{Amax,f}$	79	Non-negligible

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[12] WHICH CONFIRMS HOW THE ADVERSE IMPACTS OF NOISE WILL BE MITIGATED AND MINIMISED IN THE FINISHED DEVELOPMENT.

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 DEMONSTRATE THAT A SIGNIFICANT ADVERSE NOISE IMPACT WILL BE AVOIDED IN THE FINISHED DEVELOPMENT.

Even where noise levels are high "*the risk may be reduced by following a good acoustic design process*" which "*confirms how the adverse impacts of noise will be mitigated and minimised.*"

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.

[12] Acoustic Design Statement, i.e this report

INTRUSIVE NOISE ASSESSMENT AND EXTERNAL BUILDING FABRIC SPECIFICATIONS

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

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.). To control intrusive sound to acceptable levels the following glazing and ventilation specifications are required:

Table 11 Glazing and ventilator specifications

	Glazing Specification	Ventilator Specification
Uxbridge Road – 5th floor and below		
Bedrooms	Type C	High performance acoustic trickle ventilator (or MVHR or similar)
Uxbridge Road – 6th floor and above		
Bedrooms	Type A	High performance acoustic trickle ventilator (or MVHR or similar)
Springfield Road – all floors		
Bedrooms	Type A	High performance acoustic trickle ventilator (or MVHR or similar)

Table 12: Proposed building envelope specifications

External building fabric element	Construction element	Sound reduction indices or Normalised Level Difference (for ventilators) dB at Octave band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
Type A glazing	4mm glass/16mm cavity/4mm glass	21	24	20	25	34	37	40	40
Type B glazing	10mm glass/16mm cavity/6mm glass	19	24	24	31	39	39	43	43
Type C glazing	10.8mm glass/16mm cavity/8.8mm glass with PVB interlayer	30	27	30	37	42	45	48	48
High Performance Trickle Ventilator		33	35	35	43	45	45	45	45

External building fabric element	Construction element	Sound reduction indices or Normalised Level Difference (for ventilators) dB at Octave band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
Other building fabric elements		35	41	45	45	54	58	55	55

The detailed calculation methodology described in BS 8233:2014 has been used in the assessment.

INTERNAL NOISE LEVELS

With the proposed external building fabric elements shown in Table 11 and

Table 12, the results of the calculations show the internal noise levels given in Table 13.

The windows of each apartment been assumed to be the identical based on the drawings provided. The most affected rooms on each floor would be the smallest rooms, as the window size are identical. Units assessed below are based on their room size, the number of windows to the unit and their proximity to Springfield Rd and Uxbridge Rd. As the internal floor plans are not available, the unit is assumed to be of an open floor plan with bedroom and attached kitchen area.

The floor plans and room details are presented in Appendix C. The assessment made is for the worst-case room; internal sound levels in all other rooms would be lower than shown.

Table 13: Predicted ambient noise levels in internal areas

Area	Room	Reference*	Predicted noise levels, dB	Proposed LOAEL, dB	Difference, dB
Uxbridge Road – 2nd floor	Hotel Bedroom	L_{Aeq}, daytime	28	35	-7
		L_{Aeq}, night-time	23	30	-7
		L_{Amax}, night-time	42	45	-3
Uxbridge Road – 6th floor	Hotel Bedroom	L_{Aeq}, daytime	34	35	-1
		L_{Aeq}, night-time	29	30	-1
		L_{Amax}, night-time	45	45	0
Springfield Road – 1st floor		L_{Aeq}, daytime	32	35	-3
		L_{Aeq}, night-time	26	30	-4

Area	Room	Reference*	Predicted noise levels, dB	Proposed LOAEL, dB	Difference, dB
	Hotel Bedroom	L_{Amax}, night-time	44	45	-1

*Daytime $L_{Aeq,16hr}$, night-time $L_{Aeq,8hr}$

Internal noise levels within the hotel rooms in the existing block at the site are expected to improve due to the additional screening to Springfield Road and Uxbridge Road provided by the proposed new blocks.

The assessment has demonstrated that the typical requirements established in BS 8233:2014 will be met inside all hotel rooms when double glazing and acoustic trickle ventilators are installed with the acoustic specifications given in Table 11,

Table 12 and Appendix C.

SOUND INSULATION BETWEEN GROUND FLOOR UNITS AND HOTEL ROOMS ABOVE

As noted previously, as a minimum the separating floor between the first floor units and hotel rooms above must comply with the requirements of Building Regulations Approved Document E. The minimum permissible sound insulation of the separating floor is therefore 45dB $D_{nT,w}$ + C_{tr} **and** 57dB $D_{nT,w}$.

The construction of the separating floor is based on the drawings and typical floor build-up details provided. The following build-up is understood to be in place at the property:

FIRST FLOOR – EAST COURTYARD

- Floating layer of 50mm paving on pedestals, OR, a 230mm growing medium layer ,OR, T&G engineered timber flooring on dry screed board and acoustic battens, ABOVE
- A 100mm blue roof water attenuation layer OR a 250mm rigid insulation layer, ABOVE
- A 750mm thick concrete floor slab

FIRST FLOOR – BELOW WEST COURTYARD

- A 125mm floating tile layer on raised access floor system, ABOVE
- A 50mm mineral wool layer, ABOVE
- A 300mm thick concrete floor slab

SECOND FLOOR – WEST COURTYARD

- Floating layer of 50mm paving on pedestals OR a 300mm growing medium layer, ABOVE
- A 200mm blue roof water attenuation layer, ABOVE
- A 250mm rigid insulation layer, ABOVE
- A 750mm thick concrete floor slab

HOTEL INTERMEDIATE FLOOR

- A 150mm T&G engineered timer flooring on dry screed board and acoustic battens layer, ABOVE
- A 50mm mineral wool layer, ABOVE
- A 250mm thick concrete floor slab

To comply with the requirements of Building Regulations Part E, the “First floor – below west courtyard” and “hotel intermediate floor” will require suspended mass-layer ceilings, typically comprising at least one layer of gypsum-based board (mass at least 10kg/m^2), hung on resilient supports, with at least 25mm thick mineral/glass wool quilt in a cavity at least 75mm deep. Additional

treatment will be required where these floors separate the gym and "light industrial" spaces from hotel rooms, as described below.

EXPECTED INTERNAL SOUND LEVELS IN GYM

Love Design Studio has previously undertaken internal reference noise measurements within a typical gym during normal day-to-day operations. Dominant sources of noise within the reference survey included people talking, fan noise, kettlebell drops traffic noise breaking in from external.

The range of measured noise levels within the gym area during the course of the survey are summarised as follows;

- Range of measured $L_{Aeq(5mins)}$: 74 – 77dB;
- Range of measured $L_{Amax(5mins)}$: 86 - 98dB.

Table 14 below, provides typical spectral data for internal gym sound levels based on the results of the survey.

Table 14: Typical frequency spectra for gym activity noise

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Typical sound pressure level (dB)	71	70	73	75	72	68	63	55
Typical L_{Amax} (dB)	71	76	80	91	91	90	87	77

SOUND TRANSMISSION ASSESSMENT FOR FLOOR

It is understood that the separating floor above the gym and incubator rooms will be the same as described above for the "First floor – below west courtyard".

This is not capable of controlling sound transmission to adequate levels. An enhanced mass-layer ceiling will be required in this area, comprising two layers of SoundBloc or similar supported on resilient hangers from the existing soffit, with a minimum 300mm cavity and mineral wool loosely laid to one-half to two-thirds of the cavity depth. Please note that in all cases there should be no penetrations though the mass layer ceiling.

STRUCTURE-BORNE NOISE

There is potential for structure-borne noise and vibration generated within the gym to be transmitted into the rooms via the shared flanking walls, columns etc. This must be assessed by the tenant and addressed by mitigation at source, if necessary; it is not possible to incorporate mitigation for these potential effects within the separating floor or within the rooms.

High standards of workmanship will be required to ensure that the separating floor provides the optimum performance. The perimeter of the separating

partition must be isolated from the walls using appropriate perimeter isolation strips and ceiling fixings must not bridge the isolating elements.

CONCLUSION

Love Design Studio has been commissioned to undertake a planning stage noise assessment for proposed new hotel blocks including modifications to the existing building on the corner of the Uxbridge Road, and Springfield Road, Hillingdon.

In support of these assessment works, a baseline noise survey was undertaken to determine the prevailing environmental noise levels at the North and West façades of the proposed building.

The results of the assessments were analysed and reviewed in line with the aims and advice contained within the National Policy Statement for England, the National Planning Policy Framework, Planning Practice Guidance and the Institute of Acoustics Professional Practice Guidance for new residential development.

The advice in the IoA ProPG document indicates that at the worst-affected façade noise levels are in the high risk range but that "*the risk may be reduced by following a good acoustic design process*".

The assessment has demonstrated that the requirements established in BS 8233:2014 will be met inside all hotel rooms when fitted with suitable double-glazed windows and acoustic trickle ventilators.

The airborne sound insulation of the separating slab has been assessed between the gym and the hotel rooms above. The assessment indicates that a mass barrier suspended ceiling will be required in order to meet the internal levels stated within the guidance of BS 8233:2014. Details of a suitable mass barrier ceiling have been proposed.

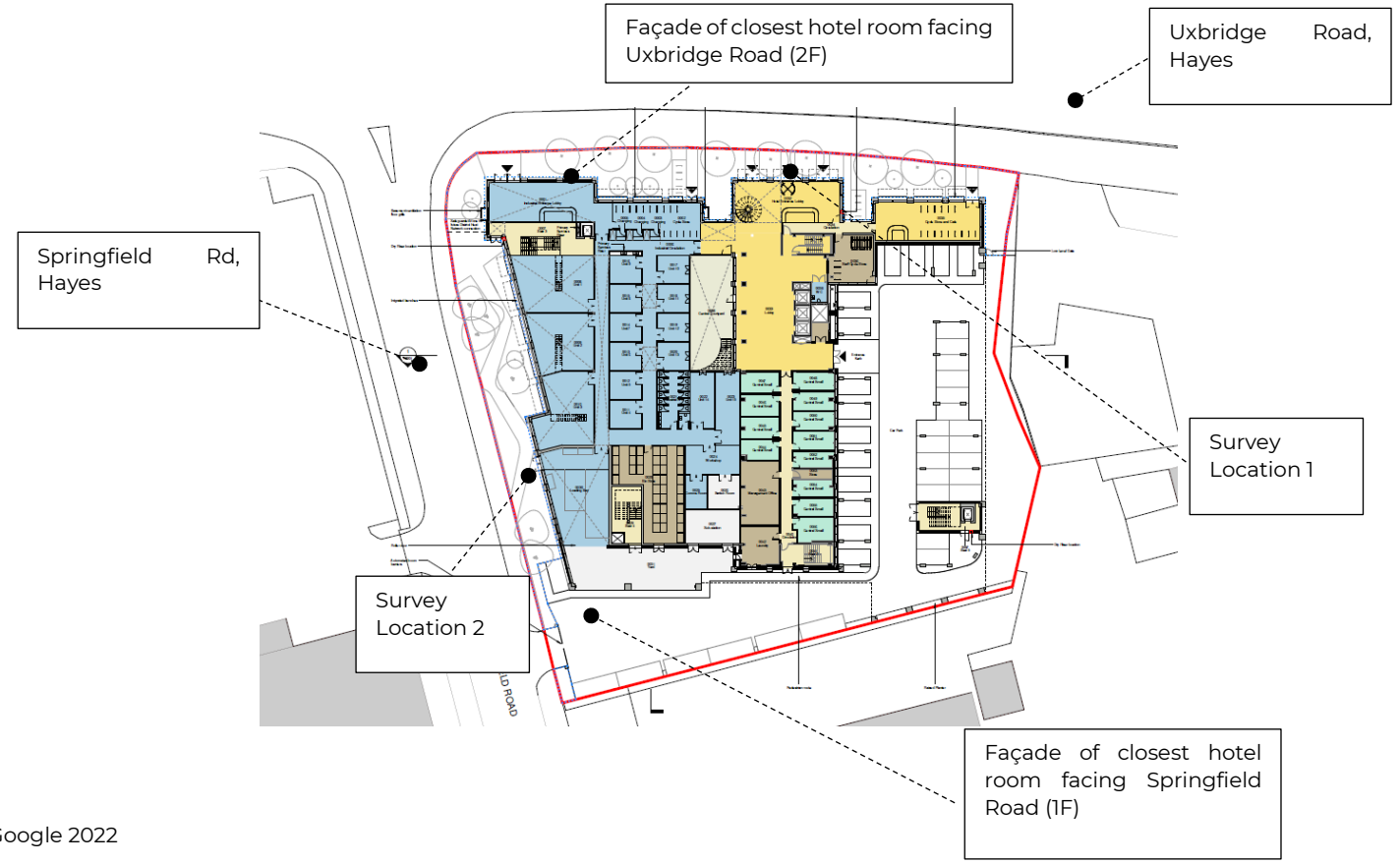
The site can, therefore, be considered suitable for the proposed use.

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 0dB and 140dB is the threshold of pain. A change of 1dB 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 3dB(A) is the minimum perceptible under normal conditions, and a change of 10dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30dB(A); normal conversation about 60dB(A) at 1 metre; heavy road traffic about 80dB(A) at 10 metres; the level near a pneumatic drill about 100dB(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.

Parameter	Description
$L_{10,T}$	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.
$L_{90,T}$	A noise level index. The noise level that is exceeded for 90% of the measurement time interval, T. It gives an indication of the lower levels of fluctuating noise. It is often used to describe the background noise level and can be considered to be the “average minimum” noise level and is a term used to describe the level to which non-specific noise falls during quiet spells, when there is lull in passing traffic for example.

APPENDIX B – PLACES OF INTEREST



Imagery © Google 2022

APPENDIX C - ENVIRONMENTAL SOUND DETAILS OF ENVIRONMENTAL SOUND SURVEY

Measurements of the existing background sound levels were undertaken between 13.45 hours on Wednesday 8 June and 14.00 hours on Thursday 9 June 2022.

The sound level meter was 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.

MEASUREMENT POSITION

The sound level meters was fixed to a lamppost within the site facing Uxbridge Road and Springfield Road. 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.

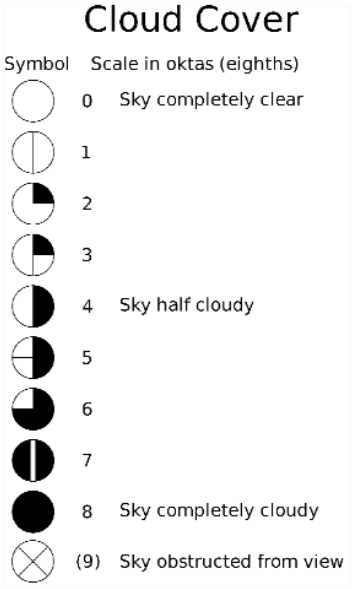
EQUIPMENT

Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2dB) in the calibration level was noted.

Position	Description	Model / serial no.	Calibration date	Calibration certificate no.
Uxbridge Road	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	06/06/2022	1500577-1
Springfield Road	Class 1 Sound level meter	Svantek 977 / 36190	25/05/2021	1500077-1
	Condenser microphone	ACO Pacific 7052E / 74975		
	Preamplifier	Svantek SV12L / 10325		
	Calibrator	Svantek SV33A / 73430	08/07/2021	1500622-1

WEATHER CONDITIONS

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

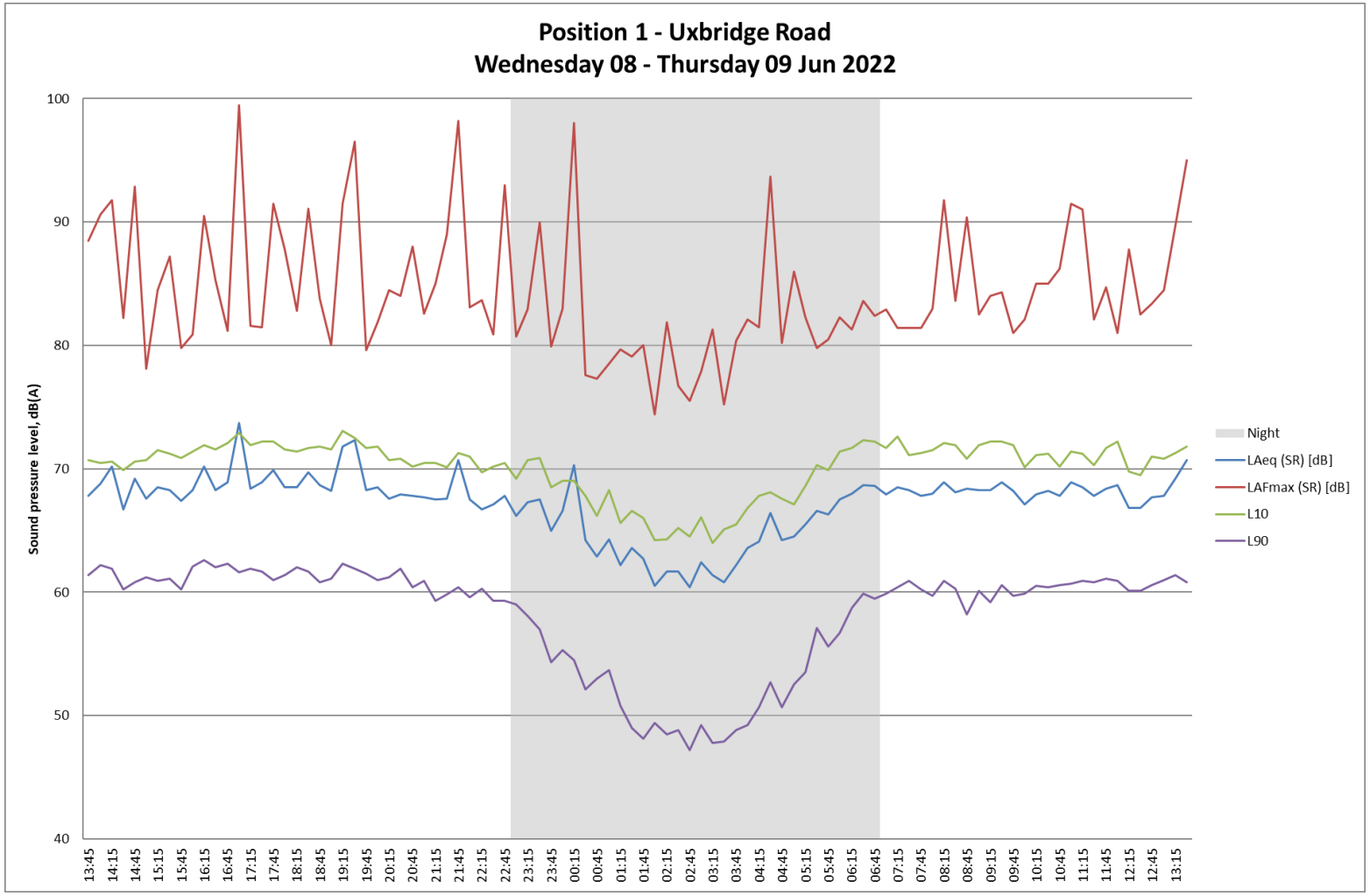
Weather Conditions				
Measurement Location	**Date/Time**	**Description**	**Beginning of Survey**	**End of Survey**
As per Appendix B	13.45 8 Jun - 14.00 9 Jun 2022	Temperature (°C)	22	21
		Precipitation:	N	N
		Cloud cover (oktas - see guide)	4	4
		Presence of fog/snow/ice	N	N
		Presence of damp roads/wet ground	N	N
		Wind Speed (m/s)	3-4	1-2
		Wind Direction	East	East
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	N	N

RESULTS

During installation and removal of the sound measurement equipment positioned on Uxbridge Road the major noise source affecting the site was observed to be due to local road traffic. Vehicles include HGV's, busses and cars. Other audible sources of noise include music noise from cars, pedestrian noise, engine idling noise, and noise from cars driving over loose manhole on the road. For Springfield Road, the major noise source affecting the site was observed to

be due to local road traffic, and HGV delivery noise. Other audible sources of noise include vehicles idling and cars driving over loose manhole on the road.

The results of the survey are presented in a time history graph overleaf.


Position 1 - Uxbridge Road
Wednesday 08 - Thursday 09 Jun 2022
Sound pressure level, dB(A)
100
90
80
70
60
50
40
13:45
14:15
14:45
15:15
15:45
16:15
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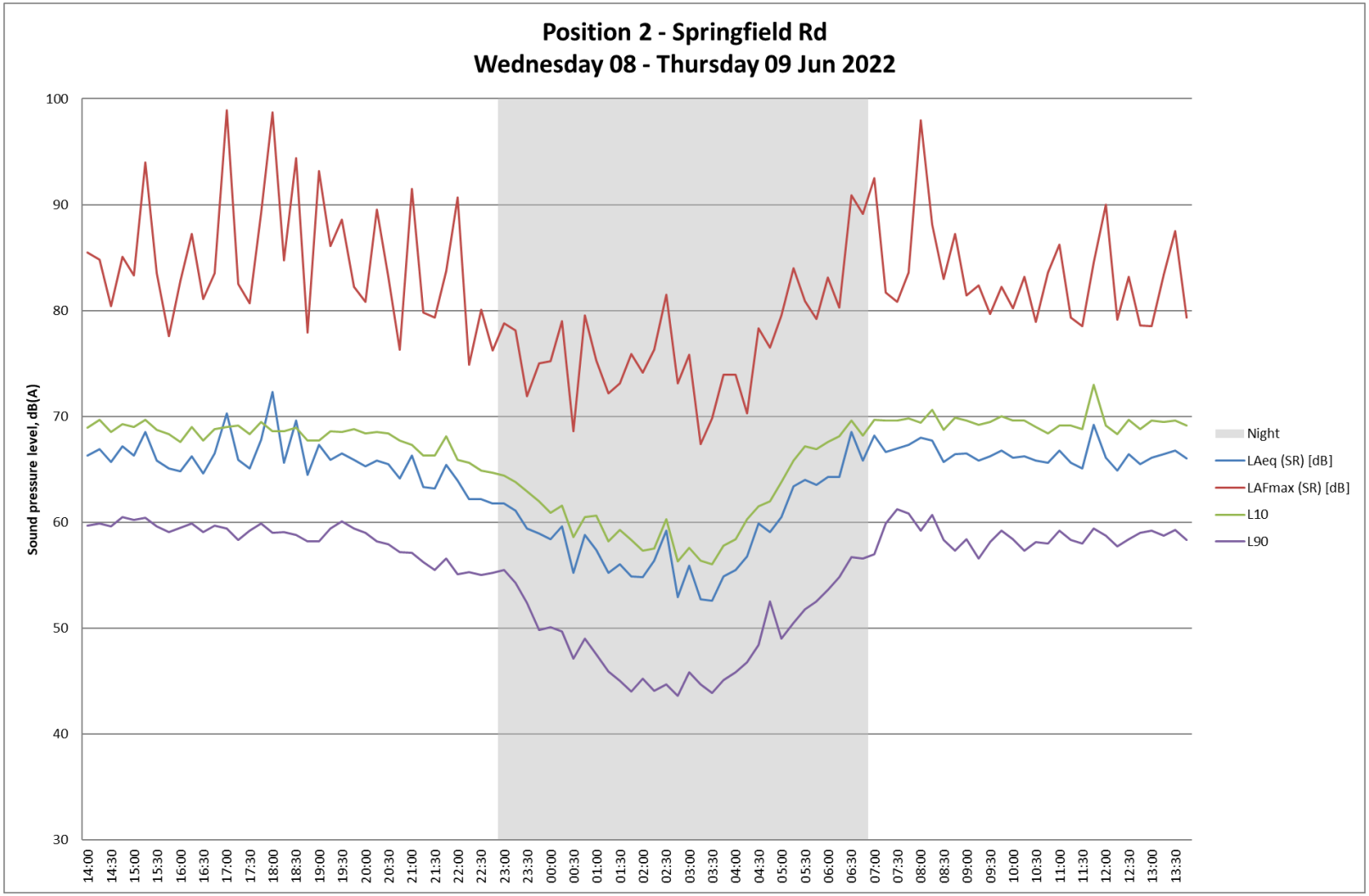
08:15
08:45
09:15
09:45
10:15
10:45
11:15
11:45
12:15
12:45
13:15
Night
LAeq (SR) [dB]
LAFmax (SR) [dB]
L10
L90


Position 2 - Springfield Rd
Wednesday 08 - Thursday 09 Jun 2022
Sound pressure level, dB(A)
100
90
80
70
60
50
40
30
14:00
14:30
15:00
15:30
16:00
16:30
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11:30
12:00
12:30
13:00
13:30
Night
LAeq (SR) [dB]
LAFmax (SR) [dB]
L10
L90

DOCUMENT INFORMATION

Authorisation and Version Control	
Report Prepared by	Kartikeyan Subramaniam, MEng(Hons), AMIOA, 30th June 2022
Report Checked by	Nigel Chandler, BSc(Hons), MIOA, NAC, 30th June 2022
Authorised:	Mr A R Love, MSc, CEENM (IOA)
Date	05/08/2022
Project Number	461 / 90772
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