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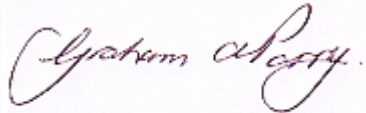
The Keen Partnership

78-80 Wokingham Road, Reading

Noise Assessment

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1. INTRODUCTION

ACCON UK Limited (ACCON) has been commissioned by The Keen Partnership to provide a noise assessment for the proposed development at 78-80 Wokingham Road, Reading. The site is located within the administrative boundary of Reading Borough Council.

The existing site comprises the Tower House Hotel and associated parking areas. The proposed development consists of the demolition of the existing building and the erection of 30 residential units in a flatted development. The site fronts onto Wokingham Road (A329).

This assessment is required to determine the impact of noise emissions from Wokingham Road and other local traffic on the proposed development.

Figure 1.1: Site Location



A Glossary of Acoustic Terminology is provided in **Appendix 1**.

2. THE NATURE, MEASUREMENT AND EFFECT OF NOISE

Noise is often defined as sound that is undesired by the recipient. Whilst it is impossible to measure nuisance caused by noise directly, it is possible to characterise the loudness of that noise. 'Loudness' is related to both sound pressure and frequency, both of which can be measured. The human ear is sensitive to a wide range of sound levels. The sound pressure level of the threshold of pain is over a million times that of the quietest audible sound. In order to reduce the relative magnitudes of the numbers involved, a logarithmic scale of decibels (dB) is normally used, based on a reference level of the lowest audible sound.

The response of the human ear is not constant over all frequencies. It is therefore usual to weight the measured frequencies to approximate the human response. The resulting 'A' weighted decibel, dB (A), has been shown to correlate closely to the subjective human response.

When related to changes in noise, a change of ten decibels, for example, from 60 dB (A) to 70 dB (A), would represent a doubling in 'loudness'. Similarly, a decrease in noise, for example, from 70 dB (A) to 60 dB (A), would represent a halving in 'loudness'. A change of 3 dB (A) is generally considered to be just perceptible¹. **Table 2.1** details typical noise levels.

Table 2.1: Typical Noise Levels

Approximate Noise Level (dB(A))	Example
0	Limit of hearing
30	Rural area at night
40	Library
50	Quiet office
60	Normal conversation at 1 m
70	In car noise without radio
80	Household vacuum cleaner at 1 m
100	Pneumatic drill at 1 m
120	Threshold of pain

¹ Institute of Environmental Management and Assessment (2014). Guidelines for environmental noise impact assessment.

3. LEGISLATIVE/POLICY BACKGROUND

In order to determine the potential constraints on the site with respect to noise it is necessary to consider the proposed land use in line with planning policy where it is related to noise.

3.1. National Planning Policy Framework

The revised National Planning Policy Framework (NPPF, February 2019 as amended in June 2019) supersedes the 2012 and 2018 versions of the NPPF. The purpose of the planning system is to contribute to the achievement of sustainable development. There are three dimensions to sustainable development: economic, social and environmental. The environmental role is to contribute to protecting and enhancing our natural, built and historic environment; and as part of this, make effective use of land, help to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate to adapt to climate change including moving to a low carbon economy.

One of the core planning principles is to contribute to conserving and enhancing the natural environment and reducing pollution. Allocations of land for development should prefer land of lesser value, where consistent with other policies in the Framework. The planning system should contribute to and enhance the natural and local environment by 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, air, water or noise pollution or land instability.

Paragraph 180 of the NPPF states:

“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 life (see Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food and Rural Affairs, 2010));*
- 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.”*

Additionally, Paragraph 182 states:

“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.”

3.2. Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) aims to *‘through the effective management and control of environmental neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life.’*

Based on concepts from toxicology, it introduces three ‘Effect Levels’ relevant to the assessment of noise. These 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; and
- SOAEL: Significant Observed Adverse Effect Level: This is the level above which significant adverse effects on health and quality of life occur.

3.3. Planning Practice Guidance

The Planning Practice Guidance for Noise (PPG-N) was published in March 2014 and most recently updated in July 2019. The PPG-N suggests that the most appropriate and cost-effective solutions to potential noise issues are best identified when good acoustic design is considered early in the planning process.

The PPG-N provides the following advice on how to determine the noise impact on development:

“Plan-making and decision making need to take account of the acoustic environment and in doing so 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.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy.” (Paragraph 003 Reference ID 30-003-20190722)

The document goes on to acknowledge the levels of noise exposure at which an effect may occur as provided in the NPSE and introduces a fourth effect level:

- UAE: Unacceptable Adverse Effect: Extensive and regular changes in behaviour and/or an inability to mitigate the effect of noise lead to psychological stress or physical effects.

Where residential development is proposed in the vicinity of existing businesses, community facilities or other activities that produce noise, the PPG-N advises that the applicant (or 'agent of change') will need to clearly identify the effects of the existing businesses that may cause a nuisance (including noise) and clearly define the mitigation measures being proposed to address any potential significant adverse effects that are identified. The agent of change needs to not only consider the current activities of the business, but the permitted activities too, even if they are not occurring at the time of the application being made. The PPG-N acknowledges that *"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."* (Paragraph 009 Reference ID 30-009-20190722).

It is important to understand that as the PPG-N does not specifically provide any advice with respect to noise levels/limits for different sources of noise, it is appropriate to consider other sources of advice and guidance documents when considering whether new developments would be sensitive to the prevailing acoustic environment and the PPG-N signposts a number of appropriate guidance documents.

3.4. Reading Borough Council

Reading Borough Council's Local Plan was adopted in November 2019. Policy EN16 *Pollution and water resources* identifies that noise sensitive developments should not be subject to high levels of noise. The relevant parts of policy EN16 have been reproduced below.

"EN16: POLLUTION AND WATER RESOURCES

Proposals for development that are sensitive to the effects of noise or light pollution will only be permitted in areas where they will not be subject to high levels of such pollution, unless adequate mitigation measures are provided to minimise the impact of such pollution."

Paragraph 4.2.90 also identifies that the Professional Practice Guidance on Planning and Noise (ProPG) provides appropriate guidance on the design of residential developments in terms of noise.

This assessment utilises the guidance within the ProPG to determine the impact of noise on the proposed development.

3.5. Professional Practice Guidance on Planning and Noise: New Residential Development

The Professional Practice Guidance (ProPG) on Planning and Noise for New Residential Development was published in May 2017 and was produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England.

The recommended approach detailed in the ProPG includes a framework to enable situations where noise is not an issue to be clearly determined, and to help identify the extent of risk at noisier sites. The recommended approach provides opportunities to incorporate effective design interventions that will enable residential development to proceed in areas that might otherwise have been considered unsuitable.

The ProPG provides advice for Local Planning Authorities and developers, and their respective professional advisers. It aims to complement Government planning and noise policy and guidance. In particular, it strives to:

- Advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;
- Encourage the process of good acoustic design in and around new residential developments;
- Outline what should be taken into account in deciding planning applications for new noise-sensitive developments;
- Improve understanding of how to determine the extent of potential noise impact and effect; and
- Assist the delivery of sustainable development.

The two sequential stages of the recommended approach are:

- Stage 1: an initial noise risk assessment of the proposed development site; and
- Stage 2: a systematic consideration of four key elements.

The four key elements to be undertaken in parallel during Stage 2 of the recommended approach are:

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

Figure 3.1 below identifies the guidance given in the ProPG when undertaking the risk assessment stage for a site.

Figure 3.1: Phase 1 – Noise Risk Assessment

Noise Risk Assessment	Potential Effect Without Noise Mitigation	Pre-Planning Application Advice
Indicative Daytime Noise Levels L_{Aeq}, 16hr Indicative Night-time Noise Levels L_{Aeq}, 8hr	Increasing risk of adverse effect	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice. 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. At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.
	No adverse effect	These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.
Notes: - Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures. - Indicative noise levels are the combined free-field noise levels from all sources of transport noise and may also include industrial/commercial noise where this is present but is “not dominant”. - L_{Aeq}, 16hr is for daytime 0700 - 2300, L_{Aeq}, 8hr is for night-time 2300 - 0700. - An indication that there may be more than 10 noise events at night (2300 - 0700) with L_{AFmax} > 60 dB means the site should not be regarded as negligible risk.		

Table 3.1 below identifies the internal noise level criteria provided in the ProPG.

Table 3.1: ProPG Noise Levels

Activity	Location	0700-2300 Hours	2300-0700 Hours
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB L_{AFmax} ^{Note 4}

Notes:

1. The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.
2. The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the internal L_{Aeq} target levels recommended in the Table.
3. These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.
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_{AFmax} , depending on the character and number of events per night. Sporadic noise events could require separate values. 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 45dB L_{AFmax} 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 (see Appendix A).
5. Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.
6. Attention is drawn to the requirements of the Building Regulations.
7. Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (see Section 3.D).

3.7. Acoustics Ventilation and Overheating Guide

The Acoustics Ventilation and Overheating Guide (AVO Guide) was published in January 2020. It is intended to be used by acoustics practitioners as well as all those involved in the planning, development, and design and commissioning of new dwellings. It aims to assist designers to adopt an integrated approach to the acoustic design within the context of the ventilation and thermal comfort requirements. The AVO Guide is intended to demonstrate good acoustic design as described in the ProPG when considering internal noise level guidelines.

For the purpose of the document, overheating is taken to mean:

“the phenomenon of excessive or prolonged high temperatures in homes, resulting from internal or external heat gains, which may have adverse effects on the comfort, health or productivity of occupants.”

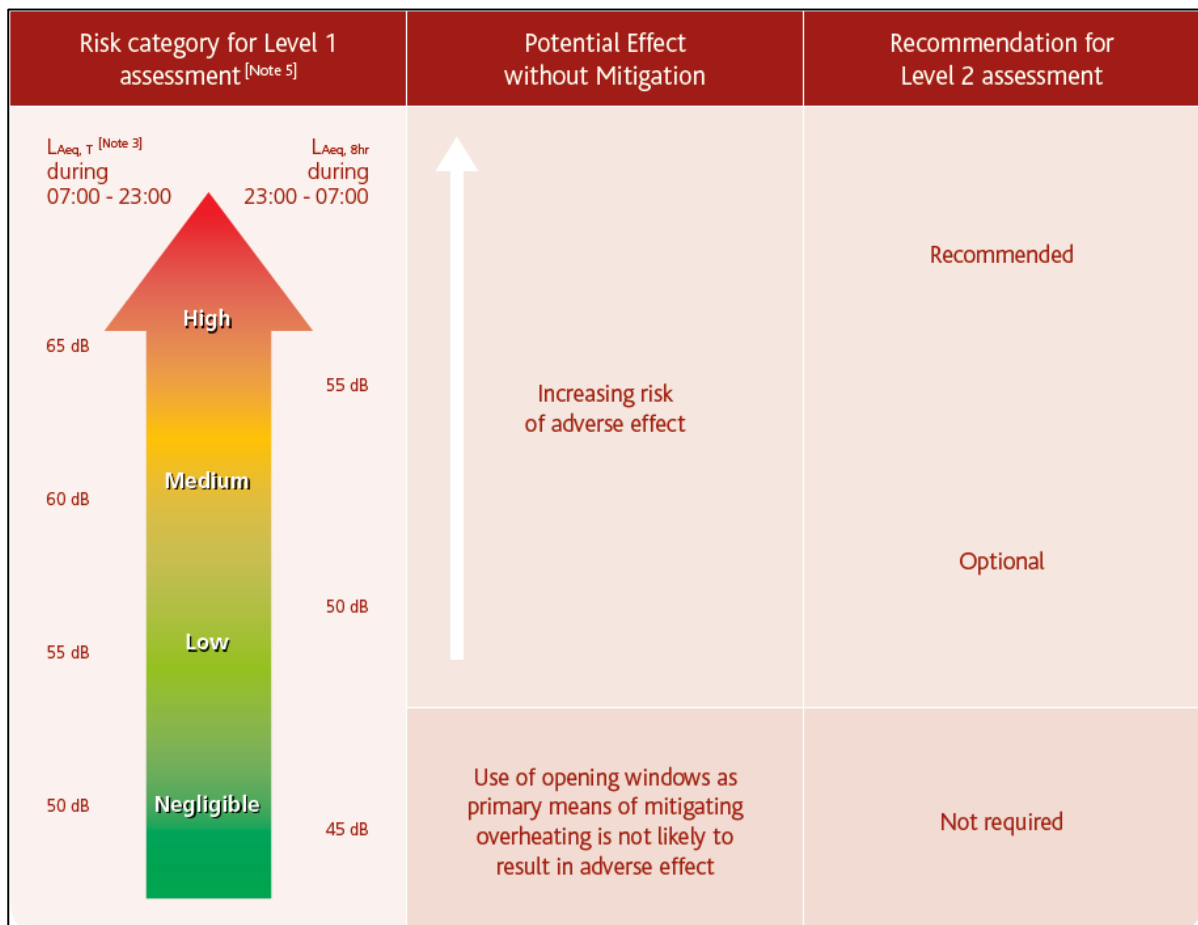
The AVO Guide is intended for new residential development predominantly exposed to transportation noise sources. The approach can also be considered for other types of residential development such as residential institutions, care homes, etc. although it needs to be remembered that some of the occupants of these types of premises can be more sensitive to indoor environmental conditions.

The AVO Guide includes:

- An explanation of the ventilation requirements under The Building Regulations as described in *Approved Document F – Means of Ventilation 2010 Edition* (ADF) along with typical ventilation strategies and associated noise considerations;
- An explanation of the overheating assessment methodology described in CIBSE *Design methodology for the assessment of overheating risk in homes* (TM59);
- A potential acoustic scale and guidance relating to different ventilation and overheating conditions, for both environmental noise ingress and building services noise; and
- A worked example of the application of the AVO Guide including indicative design constraints for different ventilation and overheating mitigation strategies.

The AVO Guide provides a two-level assessment procedure for the overheating condition. The first level assessment is a site risk assessment based on external noise levels and the assumption that the opening of windows is the primary means of mitigating overheating which is the assessment that will be carried out in this assessment. A scale is provided which is related to the ProPG initial site noise risk assessment. **Figure 3.2** replicates the AVO Guide Level 1 risk assessment scale.

Figure 3.2: AVO Guide Level 1 Risk Assessment Guidance



Note 1: The noise levels suggested assume a steady road traffic noise source but may be adapted for other types of transport. All levels are external free-field noise levels.

Note 2: The values presented in this table should not be regarded as fixed thresholds and reference can also be made to relevant dose-response relationships.

Note 3: A decision must be made regarding the appropriate averaging period to use. The averaging period should reflect the nature of the noise sources, the occupancy profile and times at which overheating might be likely to occur. Further guidance can be found within the 2014 IEMA Guidelines.

Note 4: Where 78 dB LAFmax is normally exceeded during the night-time period (2300 hrs to 0700 hrs), a level 2 assessment is recommended.

Note 5: The risk of an adverse effect occurring will also depend on how frequently and for what duration the overheating condition occurs.

Note 6: To evaluate the risk category for a dwelling, all three aspects of external noise exposure (i.e. daytime, night-time and individual noise events) should be evaluated. The highest risk category for any of these aspects applies.

4. NOISE MEASUREMENT SURVEY

In order to determine the extent to which the site is currently affected by noise from road traffic noise measurements were carried out between 1130 hrs on Tuesday 8th June 2021 and 1130 hrs on Wednesday 9th June 2021.

At the start of the measurement period the weather was dry with approximately 20% cloud cover with a daytime temperature of 23°C and a light south-westerly breeze of less than 1 m/s with occasional gusts of up to 2 m/s. The temperature dropped to approximately 7°C overnight.

At the end of the measurement period the weather was dry with approximately 10 % cloud cover with a temperature of 23 °C and a light south-westerly breeze of less than 1 m/s.

4.1. Semi-Permanent Noise Monitoring

The noise measurements utilised two Type 1 Precision Sound Level Meters, a Norsonic 118 and a Svantek 971 which both hold current certificates of calibration. Before and after the measurement period the equipment was calibrated in order to ensure that the equipment had remained within reasonable calibration limits (+/- 0.5 dB).

Semi-permanent noise measurements were carried out at two monitoring positions.

Monitoring Position 1 (MP1) was located to the north of the development facing directly onto Wokingham Road at a height of approximately 8 m, which is approximately 12 m from the kerb side of Wokingham Road. The ambient noise climate was dominated by road traffic on Wokingham Road with noise from children playing in the playground in Palmer Park to the north of the proposed development just audible when there was no traffic.

Monitoring Position 2 (MP2) was located to the rear of the proposed development at a height of approximately 4 m. The ambient noise climate was dominated by road traffic noise from Wokingham Road and College Road.

Both noise measurement positions were 1 m from the façade of the proposed development and therefore the measured noise levels have been corrected to free-field noise levels as required by the ProPG methodology.

The measured noise levels are summarised in **Tables 4.1** and **4.2**. The semi-permanent noise monitoring positions are identified on a site layout plan in **Appendix 2**. The hourly noise data is provided in **Appendix 3**.

Table 4.1: Summary of Corrected Free Field Noise Levels – MP1

Period (hours)	L _{Aeq, T} (dB)	L _{AFmax} (dB)	Mean L _{A10, 5min} (dB)	Mean L _{A90, 5min} (dB)	Modal L _{A90, 5min} (dB)
0700 – 2300	66	106	66	54	57
2300 – 0700	57	79 (73)	59	35	34

Note: The levels stated are logarithmic averages for $L_{Aeq, T}$ and arithmetic averages for $L_{A10, T}$ and average $L_{A90, T}$. The L_{AFmax} is the average of the highest hourly maximum sound levels measured during the measurement period. The L_{AFmax} level in brackets is the tenth highest L_{AFmax} noise levels measured during the measurement period.

Table 4.2: Summary of Corrected Free Field Noise Levels – MP2

Period (hours)	$L_{Aeq, T}$ (dB)	L_{AFmax} (dB)	Mean $L_{A10, 5min}$ (dB)	Mean $L_{A90, 5min}$ (dB)	Modal $L_{A90, 5min}$ (dB)
0700 – 2300	55	86	53	45	45
2300 – 0700	47	77 (67)	47	36	37

Note: The levels stated are logarithmic averages for $L_{Aeq, T}$ and arithmetic averages for $L_{A10, T}$ and average $L_{A90, T}$. The L_{AFmax} is the average of the highest hourly maximum sound levels measured during the measurement period. The L_{AFmax} level in brackets is the tenth highest L_{AFmax} noise levels measured during the measurement period.

Due to the Covid-19 health crisis, there has been disruption to traffic levels as lockdown measures have been implemented across the country. The Government has monitored the changes to the use of the transport system during this time, information for which can be found at <https://www.gov.uk/government/statistics/transport-use-during-the-coronavirus-covid-19-pandemic>.

In the document provided by the Department for Transport titled “Transport use by mode: Great Britain, since 1 March 2020” it can be identified that traffic on the roads at the time of the noise survey has returned to approximately 99% of the total traffic when compared to pre-lockdown levels. This reduction in traffic would result in a reduction of less than 0.1 dB in noise levels which is not significant enough to be taken into account within the assessment.

5. PROPG ACOUSTIC DESIGN STATEMENT

5.1. Stage 1: ProPG Initial site noise risk assessment

For the purpose of the initial site noise risk assessment, it has been assumed that the site topography will not be significantly altered from the current topography.

The daytime noise level at the front of the development, facing Wokingham Road is 66 dB $L_{Aeq, 16hr}$ and the night-time noise level is 57 dB $L_{Aeq, 8hr}$. These noise levels indicate that the front of the site is generally of a medium risk of adverse noise effect from road traffic noise during the daytime and night-time periods.

The daytime noise level at the rear of the development, facing College Road is 55 dB $L_{Aeq, 16hr}$ and the night-time noise level is 47 dB $L_{Aeq, 8hr}$. These noise levels indicate that the rear of the site is generally of a low risk of adverse noise effect from road traffic noise during the daytime and night-time periods.

5.2. Stage 2: Internal Noise Levels

5.2.1. Predicted Noise Levels

Table 5.1 presents the measured noise levels external to the habitable rooms of the proposed dwellings. The tenth highest night-time maximum noise level has been utilised to determine the impact of night-time noisy events on the occupants of proposed dwellings.

The fifth column of **Table 5.1** identifies the minimum sound reduction that the building façade (glazing, ventilation openings and external wall build up) will need to provide in order to ensure that the target internal noise levels (refer to **Section 3.9.1**) are not exceeded. Windows facing to the rear of the development would receive noise levels lower than those experienced by receptors on the front façade due to shielding effects of the buildings and therefore the minimum façade sound reduction index for the front façade would also be acceptable on the rear façade.

Table 5.1: Measured External Noise Levels and Minimum Combined Façade Sound Reduction Requirements

Receptor Location	Measured Daytime External Noise Level $L_{Aeq, 16hr}$ (dB)	Measured Night-time External Noise Level $L_{Aeq, 8hr}$ (dB)	Measured External Maximum Noise Level L_{AFmax} (dB)	Minimum Combined Façade Sound Reduction Required dB(A)
Front façade	66	57	73	31
Rear façade	55	47	67	22

Assuming that the external wall construction provides a minimum sound reduction of 50 dB R_w (typically achievable by a standard brick and block cavity wall construction, or similar), the glazing and any ventilation openings will be the weakest elements of the building façade. Therefore, double glazed windows will need to achieve a minimum required sound reduction level of 31 dB(A) to ensure that the target internal noise levels are not exceeded in bedrooms.

Ventilation to the rooms should be implemented by a ventilation system that will provide the same standard of sound insulation required by the proposed glazing system. This ventilation could be provided by appropriately chosen acoustic trickle vents.

A double-glazed window system in a 10 mm glass, 6-16 mm air gap, 6 mm glass formation would provide a sound reduction of 32 dB(A).

5.2.2. Acoustics and Ventilation

Whole dwelling ventilation is defined in the Building Regulations Approved Document F (ADF) as the dilution and removal of pollutants and water vapour not removed by extract ventilation. Extract ventilation is the removal of air directly from a space such as a bathroom or kitchen to the outside. Four systems are described in ADF which will comply with the Building Regulations for whole dwelling and extract ventilation. Open windows are not a valid means of ventilation under the Building Regulations.

Purge ventilation is typically only required for short periods of time to let out smoke or an odour. When purge ventilation is required by opening windows, exposure to noise will only increase for a very short period of time and is not considered to be a material consideration for occupiers of the proposed development.

The ventilation systems identified in ADF are summarised in **Table 5.2** for whole dwelling ventilation, extract ventilation and purge ventilation.

Table 5.2: Approved Document F Ventilation Systems

Ventilation System	Provision with ADF System/Purpose		
	Whole Dwelling Ventilation	Extract Ventilation	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 ("natural")	Background ventilators (trickle vents) and passive stack ventilation	Continuous via passive stack	Typically provided by opening windows
System 3: Continuous mechanical extract (MEV)	Continuous mechanical extract – minimum low rate	Continuous mechanical extract – minimum high rate	Typically provided by opening windows

Ventilation System	Provision with ADF System/Purpose		
	Whole Dwelling Ventilation	Extract Ventilation	Purge Ventilation
	Trickle vents provide inlet air	Trickle vents provide inlet air	
System 4: Continuously mechanical supply and extract with heat recovery (MVHR)	Continuous mechanical supply and extract – minimum low rate	Continuous mechanical supply and extract – minimum high rate	Typically provided by opening windows

For the proposed development, the ADF ventilation requirements should be achievable through the provision of a means of ventilation complying with ADF Systems 1 (using acoustic trickle ventilators), System 2, System 3 (using acoustic trickle ventilators) or System 4. However, the advice in **Section 5.2.3** below in respect of overheating should also be considered. Whichever system is adopted, windows should be openable for purge ventilation and overheating mitigation.

5.2.3. Acoustics and Overheating

The requirement to achieve the target internal noise levels with windows closed may result in unintended adverse consequences associated with thermal comfort.

In respect of thermal comfort, noise can be considered an issue as windows may otherwise need to be left open for an extended period of time, for example, on warm summer days and nights. In Britain, the requirement for keeping windows open for thermal comfort is typically limited to a relatively small number of days during the months of May to September.

BS 8233 states that “if partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB”. The WHO guidelines also state that “a slightly open window would result in a [sound] reduction from outside to inside of 15 dB”.

Utilising the measured external noise levels identified in **Table 5.1**, the corresponding internal noise levels with open windows for ventilation are presented in **Table 5.3**.

Table 5.3: Measured External Noise Levels and Calculated Internal Noise Levels

Receptor Location	Measured External Noise Level (dB)			Calculated Internal Noise Level with windows open (dB)		
	Daytime L _{Aeq,16hr}	Night-time L _{Aeq,8hr}	Night-time L _{AFmax}	Daytime L _{Aeq,16hr}	Night-time L _{Aeq,8hr}	Night-time L _{AFmax}
Front Façade	66	57	73	51 (X)	42 (X)	58 (X)
Rear Façade	55	47	67	40 (!)	34 (!)	52 (X)

Notes:

(✓) identifies that the target internal noise level is not exceeded.

(!) identifies that the target internal noise level is exceeded by no more than 5 dB (refer to ProPG Guidance Note 7 of Figure 3.2)

(X) identifies that the target internal noise level is exceeded by more than 5 dB.

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If windows to the bedrooms on the front façade (which overlook Wokingham Road) are required to be open for extended periods of time as overheating mitigation, the target internal noise level could be exceeded by up to 16 dBA during the daytime.

In order to determine the potential impact the increased noise levels may have on the occupiers of the proposed development it is important to understand how long windows will need to be open, which may be determined from a dynamic thermal model, or more qualitatively from the GHA Overheating Risk Tool. Should an assessment of overheating determine there is a low risk of overheating, it is recommended, with reference to **Table 5.3** that a system 1 or 2 ventilation system in combination with the proposed acoustic glazing identified in **Section 5.2.1** is utilised for the proposed development.

5.3. Recommendations to the Decision Maker

On the basis of the above, it is recommended that there should be no objection to granting planning consent for the proposed development on noise grounds.

APPENDICES

Appendix 1

Glossary of Acoustic Terminology

Term	Description
'A'-Weighting	This is the main way of adjusting measured sound pressure levels to take into account human hearing, and our uneven frequency response.
Decibel (dB)	This is a tenth (deci) of a bel. A decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.
Frequency	Frequency is related to sound pitch; frequency equals the ratio between velocity of sound and wavelength.
$L_{Aeq,T}$ (Ambient /Period Sound Level)	The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location. $L_{Aeq,T}$ can be measured directly with an integrating sound level meter.
$L_{A10,T}$ (Road Traffic Noise Level)	The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 10 per cent of a given time. The $L_{A10,T}$ is used to describe road traffic noise levels at a particular location.
$L_{A90,T}$ (Background Sound Level)	The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 per cent of a given time. The $L_{A90,T}$ is used to describe the background noise levels at a particular location.
L_{Amax}	The 'A'-weighted maximum sound pressure level measured over a measurement period.
Sound Power Level	The total sound energy radiated by a sound source in all directions. In decibels with a reference level of 1×10^{-12} Watts
R	The sound reduction index (SRI) or Transmission Loss (TL) of a building element, is 10x the common logarithm of the ratio of sound power incident upon a test specimen to the sound power transmitted through the specimen, when measured in the presence of flanking transmission, denoted R'.
R_w	Weighted sound reduction index, a single number quantity for the airborne sound insulation in buildings and of building elements such as wall, doors and windows. The quantity is intended for rating the airborne sound insulation and for simplifying the formulation of acoustical requirements in building codes, when measured in the presence of flanking sound transmission, denoted R'.

Appendix 2 Measurement Locations



LEGEND

- Monitoring Location
- Approximate Site Location



Client: The Keen Partnership		Description: Site Plan with Existing Receptors		Design	ML	16.06.2021		
				Drawn	ML	16.06.2021		
Rev: A	Description: FINAL	Project: 78-80 Wokingham Road, Reading		Checked	GP	16.06.2021	Appendix One	
				Approved	GP	16.06.2021	Scale	Not to Scale

Appendix 3 Hourly Measurement Data

MP1 Hourly Measurements

Time	L _{Aeq} , 1hr (dB)	L _{AFmax} (dB)	L _{A10} , 1hr (dB)	L _{A90} , 1hr (dB)
07:00-08:00	73	107	70	55
08:00-09:00	73	109	69	59
09:00-10:00	67	91	69	56
10:00-11:00	66	80	69	56
11:00-12:00	67	94	69	55
12:00-13:00	66	80	69	57
13:00-14:00	67	94	69	57
14:00-15:00	68	97	69	57
15:00-16:00	74	109	69	59
16:00-17:00	69	95	70	59
17:00-18:00	71	102	69	59
18:00-19:00	67	87	69	59
19:00-20:00	66	87	69	58
20:00-21:00	69	102	69	56
21:00-22:00	66	94	69	54
22:00-23:00	64	91	67	49
23:00-00:00	61	76	66	43
00:00-01:00	59	81	64	37
01:00-02:00	56	75	60	34
02:00-03:00	56	79	56	32
03:00-04:00	55	74	56	33
04:00-05:00	57	78	59	38
05:00-06:00	60	76	64	41
06:00-07:00	64	82	68	47
Day	69	109	69	57
Night	60	82	62	38

MP2 Hourly measurements

Time	L _{Aeq} , 1hr (dB)	L _{AFmax} (dB)	L _{A10} , 1hr (dB)	L _{A90} , 1hr (dB)
07:00-08:00	67	86	64	54
08:00-09:00	54	81	56	49
09:00-10:00	54	76	55	48
10:00-11:00	53	82	55	48
11:00-12:00	56	84	57	47
12:00-13:00	59	84	58	48
13:00-14:00	56	86	58	48
14:00-15:00	55	76	57	47
15:00-16:00	56	82	55	48
16:00-17:00	59	89	59	49
17:00-18:00	56	82	57	49
18:00-19:00	54	75	56	48
19:00-20:00	53	75	54	48
20:00-21:00	57	81	55	47
21:00-22:00	57	82	58	48
22:00-23:00	48	69	51	42
23:00-00:00	46	67	49	40
00:00-01:00	49	76	49	37
01:00-02:00	42	67	45	34
02:00-03:00	41	60	44	33
03:00-04:00	52	72	49	36
04:00-05:00	56	77	56	43
05:00-06:00	48	69	51	42
06:00-07:00	52	80	54	45
Day	58	89	56	48
Night	50	80	50	39



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