NOS. 73 - 75 WEST STREET

GRAVESEND, KENT DA11 0BS

PROPOSED RESIDENTIAL DEVELOPMENT

NOISE IMPACT ASSESSMENT

Report No. MRL/100/2162.1v1
April 2025

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NOISE IMPACT ASSESSMENT

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1.0 INTRODUCTION

1.1 MRL Acoustics Limited was commissioned by Dayal Consultants Ltd to assess the impact of noise on a proposed residential development scheme at Nos. 73 - 75 West Street, Gravesend, Kent DA11 0BS.

1.2 The scheme comprises the erection of a second-floor extension above the existing offices at the site to provide; 1 no. single occupancy, 1-bedroom flat and 1 no. double occupancy, 1- bedroom flat.

1.3 We understand that planning permission has been refused for the scheme with one of the reasons reciprocated below:-

"Insufficient detail has been submitted to allow the full impacts of the proposed development to be accurately assessed in terms of Noise Impact, given the location of the proposed flats on a busy road and fronting a car park in close proximity. The documents provided with the application do not include a Noise Impact Assessment. As such, it is not possible to make a determination as to the impacts of the proposal on residential amenity. The proposal is contrary to Policy CS19 of the Gravesham Local Plan Core Strategy September 2014 and Section 12 of the Nation Planning Policy Framework (2024)."

1.4 This aim of this noise assessment report is to support a new application for the scheme to address the above comments and has included:-

- Measurements of the existing ambient noise climate at the front elevation of the site over a full 24-hour period for road traffic noise, commercial noise and general street noise over typical weekday period;
- Assessment of the noise impact on the development in accordance with the National Planning Policy Framework; the Noise Policy Statement For England; the WHO Guidelines; BS 8233 : 2014; and ProPG : Planning & Noise – May 2017;
- Recommendation of an appropriate noise mitigation scheme for the new dwellings, if necessary.

1.5 This report outlines our findings and our recommendations.

1.6 All recommendations are given for acoustic reasons only and compliance with other requirements (e.g. fire protection/structural integrity, etc.) must be checked by other specialist members of the design team.

1.7 The noise survey and report were carried out and prepared by Matthew Lawrence who has over 30 years' experience in the acoustic industry and an MSc and Diploma in Acoustics & Noise Control, and who is a Member of the Institute of Acoustics (IOA).

1.8 MRL Acoustics Ltd is also a member of the Association of Noise Consultants (ANC).

1.9 Noise levels referred to in the text have been rounded to the nearest whole decibel (dB), as fractions of decibels are imperceptible.

1.10 An explanation of the various noise units, indices and acoustical terms used in this report is provided in Appendix I.

2.0 DESCRIPTION OF THE SITE

2.1 The site is at Nos. 73 - 75 West Street, Gravesend, Kent, and is located on the northern side of West Street, directly opposite the West Street Pay & Display car park. The building comprises a 2-storey commercial building with a small car park at the rear that is accessed via an under-croft entrance to the east side of the building.

2.2 Directly adjacent to the north, east and west of the site are existing 3-storey apartment blocks. The southern elevation faces directly onto West Street.

2.3 The ground floor and 1st floor levels of the building will remain as offices with the proposed new 2nd storey forming the 2 no. new flats.

2.4 The area is mainly residential with a few commercial properties and pubs situated along this particular section of West Street.

2.5 West Street is a fairly busy main road forming part of Gravesend's circulatory one-way road system with steady levels of road traffic throughout the daytime period, including numerous HGVs and buses. It was noted that the traffic flow was very fluid with vehicles passing the site at moderate speeds with no traffic queues forming.

2.6 As a result, it was observed whilst setting up the noise monitoring equipment, that the dominant noise source affecting the front of the development site was road traffic noise.

2.7 To the rear of the site is an existing 3-storey apartment block and there are no commercial premises or industrial noise sources present at the rear of the site.

3.0 NOISE LEVEL SURVEY

Front Elevation - Road Traffic Noise + Commercial Noise

3.1 A noise level survey was carried out at the site over a full 24-hour period from 12:45 hours on Tuesday 1st April until 12:45 hours on Wednesday 2nd April 2025 in order to establish the daytime and night-time ambient noise climate of the area in terms of road traffic, commercial noise and general street noise over typical weekday period.

3.2 The noise measurements were taken at 1st floor window level at the front elevation of the building directly overlooking West Street. This location was chosen in order to represent the windows of the proposed dwellings that will be affected by the highest levels of environmental noise and included noise from road traffic, the pay and display car park opposite, and any other commercial noise sources.

3.3 The noise monitoring location is shown on the site plan below:-



3.4 The noise survey was carried out using a Rion NA-28 Type 1 Sound Level Meter (serial no. 01291241) fitted within an environmental weather-proof case.

3.5 The calibration level of the meter was checked before and after the survey to a level of 94.0 dB with a Rion NC-74 sound calibrator (serial no. 35094450) with no variation in the levels observed.

3.6 The microphone was mounted on a metal boom at 1st floor window level approximately 1m distance away from the building façade. The microphone was fitted with a Rion WS-15 weather-proof windshield at all times.

3.7 The noise measurements consisted of consecutive 15-minute samples of noise over a continuous 24-hour period.

3.8 Details of the equipment used during the noise level survey are shown below in Table 1. Current calibration certificates for the equipment can be provided if required.

Table 1: Details of Equipment Used During Noise Survey

Equipment Description	Manufacturer	Type/Number	Serial Number	Date of Expiration of Calibration	Calibration Certification Number
Sound Level Meter	Rion	Type NA-28	01291241	01/07/2026	TCRT24/1484
Microphone	Rion	UC-59	01683	01/07/2026	TCRT24/1484
Pre-Amplifier	Rion	NH-23	81273	01/07/2026	TCRT24/1484
Calibrator	Rion	Type NC-74	35094450	01/07/2026	TCRT24/1480

3.9 The weather conditions for the survey were generally warm and dry with a light breeze throughout and are shown in Table 2 overleaf:-

Table 2: Weather Conditions During Noise Survey

Date	Temperature (°C)		Wind Speed (m/s)	Wind Direction	Rainfall (mm)	Cloud Cover (%)	Acceptable Conditions
	Day	Night					
01/04/2025	13	5	1.0	SE	0	5	Yes
02/04/2025	14	-	1.2	SE	0	5	Yes

3.10 The weather conditions were measured on-site using a Kestrel 2000 hand-held weather meter and supported by weather data from the Meteorological Office app relating to local weather conditions for this area.

3.11 The noise survey was carried out in general accordance with the requirements outlined in BS 7455 – 1 : 2003 for environmental noise surveys.

3.12 The measured results are 'facade' levels as the microphone was within 3.5m of a reflective surface (other than the ground) and therefore a -2.5 dB façade correction is applicable to the measured results to convert them to 'free-field' levels in order to assess the noise impact in accordance with BS 8233 : 2014.

Rear Elevation

3.13 It was observed whilst on site that there are no dominant noise sources or commercial noise sources at the rear of the site, except for some noise from road traffic along West Street which was effectively screened at this rear part of the site.

3.14 Therefore, it is considered that no noise survey and assessment are required for any noise impacts on the proposed residential properties at the rear of the site.

Results

3.15 The measured 'facade' levels are detailed in Appendix II at the end of this report and the corrected 'free-field' levels are summarised in Table 3 below:-

Table 3: Corrected 'Free-Field' Noise Levels

Location: 1st Floor Window Level Overlooking West Street	Time Period	Noise Levels (dB)		
		L_{Aeq}	L_{Aeq}	$L_{Amax\ (Average)}$
		Day (07:00 – 23:00)	Night (23:00 – 07:00)	Night (23:00 – 07:00)
01/04/2025 – 02/04/2025	24-Hours	64	58	69

4.0 ASSESSMENT OF NOISE IMPACT

4.1 There are a number of Standards and Guidelines to be referenced when considering potential noise impact on a proposed development. A summary of the main references is shown as follows:-

National Planning Policy Framework (NPPF)

4.2 National Government Guidance is available in the form of the National Planning Policy Framework (NPPF) – December 2024. The NPPF sets out the Government's planning policies for England and how these are expected to be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced.

4.3 Paragraph 187 of Section 15 of the NPPF, 'Conserving and enhancing the natural environment' provides general guidance regarding planning and noise. It states:-

"Planning policies and decisions should contribute to and enhance the natural and local environment by:-

a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);

b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;

c) maintaining the character of the undeveloped coast, while improving public access to it where appropriate;

d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and

f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate."

4.4 Paragraph 198 of Section 15 of the NPPF, 'Conserving and enhancing the natural environment' goes on to state:-

"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;

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; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."

The Noise Policy Statement for England 2010 (NPSE)

4.5 The NPSE sets out the long term vision for government noise policy which is to:-

"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

4.6 This is supported by the following aims:-

"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."

4.7 The first aim of the NPSE should be read in the context of Government policy on sustainable development indicating that significant adverse effects on health and quality of life should be avoided while accommodating the principles of sustainable development.

4.8 The second aim of the NPSE is applicable where the impact falls between LOAEL and SOAEL (see Section 4.9 below) requiring that all reasonable measures to mitigate and minimise adverse impacts on health and quality of life be implemented while accommodating the principles of sustainable development. This does not imply that any adverse effects cannot occur.

4.9 The third aim of the NPSE is to actively improve health and quality of life through effective management of noise within the context of Government policy on sustainable development wherever it is possible and reasonable to do so.

4.10 The NPSE applies the following concepts adapted from toxicology:-

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.

SOAEL – Significant Observed Adverse Effect Level

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

4.11 It should be noted that there are no numerical values for these concepts defined in the NPSE. There is also no single objective noise-based measure that defines Observed Effect Levels that is applicable to all sources of noise in all situations and consequently, the levels are likely to be different for different noise sources, for different receptors and at different times.

4.12 Table 4 below summarises the noise exposure hierarchy outlined above, based on the likely average response:-

Table 4: Noise Exposure Hierarchy + Likely Average Response

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
Present and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. 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

Response	Examples of Outcomes	Increasing Effect Level	Action
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, 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 perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour and/or attitude, 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 and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

4.13 It is considered that with the provision of a suitable scheme of noise mitigation measures, the noise impact from road traffic noise, commercial noise and any other environmental noise sources upon the proposed dwellings will be low enough to be classified as being of 'No Observed Adverse Effect' under the NPSE.

Professional Practice Guidance On Planning & Noise (ProPG)

4.14 The Professional Practice Guidance on Planning and Noise (ProPG) has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. The National Planning Policy Framework (NPPF) encourages improved standards of design. The CIEH, IOA and the ANC have worked together to produce this guidance which encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise.

4.15 This ProPG provides advice for Local Planning Authorities (LPAs) 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.

4.16 Based on the measured free-field indicative daytime noise level of 64 dB $L_{Aeq\ (16\text{-}Hour)}$ and the measured free-field indicative night-time noise level of 58 dB $L_{Aeq\ (8\text{-}Hour)}$, the site can be classified as being of 'Medium Risk' according to Figure 1 of the ProPG document.

4.17 Figure 1 of the ProPG document and also Figure 2 of the ProPG document indicating the internal noise level guidelines are reproduced on the following pages.

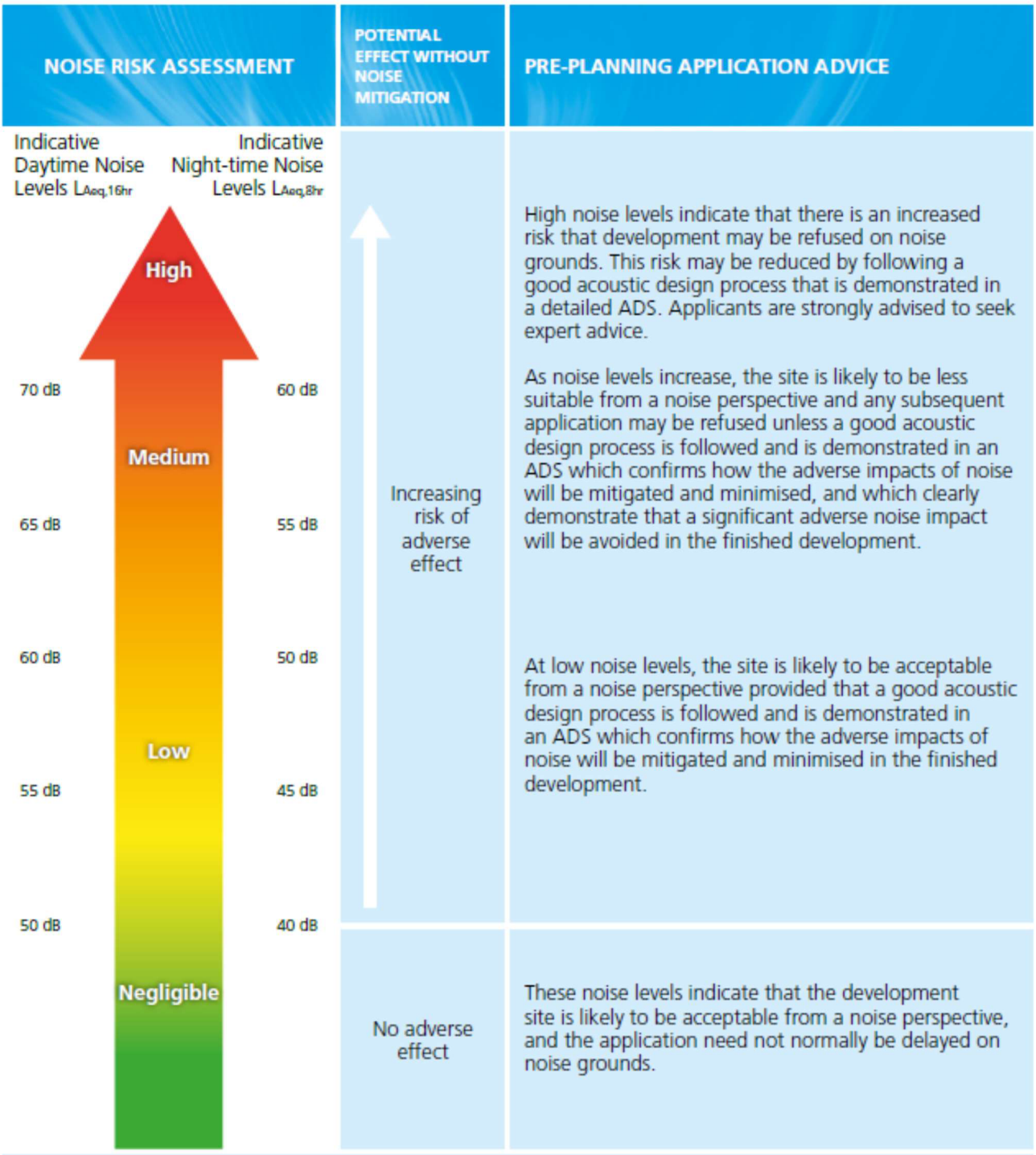


Figure 1. Stage 1– Initial Site Noise Risk Assessment

ACTIVITY	LOCATION	07:00 – 23:00 HRS	23:00 – 07:00 HRS
Resting	Living room	35 dB $L_{Aeq,16\ hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16\ hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\ hr}$	30 dB $L_{Aeq,8\ hr}$ **45 dB $L_{Amax,F}$** (Note 4)

NOTE 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.

NOTE 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.

NOTE 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.

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. 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 $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

NOTE 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.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 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)**.

Figure 2. ProPG Internal Noise Level Guidelines (additions to BS8233:2014 shown in blue)

British Standard 8233 : 2014

4.18 Guidance on acoustic design goals for new residential developments is set out in British Standard 8233 : 2014 *'Guidance on sound insulation and noise reduction for buildings'*. The World Health Organisation *'Guidelines for Community Noise'* and the ProPG guidance generally concurs with the recommendations of BS 8233 : 2014. The criteria are summarised in Table 5 below:-

Table 5: BS 8233 Recommended Acoustic Design Criteria

Location	Internal Noise Levels	
	Daytime (07:00 – 23:00)	**Night-time (23:00 – 07:00)**
Living Room	35 dB L_{Aeq}	-
Dining Room	40 dB L_{Aeq}	-
Bedroom	35 dB L_{Aeq}	30 dB L_{Aeq}
Garden	Desired Limit Not Exceeding 50 dB L_{Aeq} Upper limit of 55 dB L_{Aeq}	

Assessment of Noise Impact

4.19 The results of the noise level survey indicate that at the noise monitoring position at the front elevation of the site facing onto West Street, the site is exposed to a daytime external noise level of 64 dB L_{Aeq}.

4.20 For the night-time period, the front of the site is exposed to a noise level of 58 dB L_{Aeq} and an average maximum noise level of 69 dB L_{Amax}.

4.21 Allowing -15 dB attenuation for an open window, based on the measured daytime noise level of 64 dB L_{Aeq}, the resultant internal noise level within habitable rooms during the daytime will be 49 dB L_{Aeq} (64 dB – 15 dB).

4.22 For the night-time period, allowing -15 dB attenuation for an open window, based on the measured night-time noise level of 58 dB L_{Aeq}, the resultant internal noise level within bedrooms will be 43 dB L_{Aeq} (58 dB – 15 dB).

4.23 Therefore, with windows open, the internal noise limits outlined within BS 8233 : 2014 of 35 dB L_{Aeq} within living rooms and bedrooms and 40 dB L_{Aeq} within dining rooms during the daytime will be exceeded.

4.24 At night-time with the windows open the 30 dB L_{Aeq} criteria in bedrooms will be exceeded by around 13 dB(A).

4.25 Therefore, a scheme of noise mitigation measures is required in order to reduce both daytime and night-time internal noise levels.

4.26 Our recommendations are set out in Section 5.0.

5.0 RECOMMENDED SCHEME OF NOISE MITIGATION MEASURES

5.1 Table 6 below provides information on the typical sound insulation performance of various glazing specifications:-

Table 6: Sound Insulation of Typical Windows

Description	Weighted Sound Reduction Index, R_w
Any type of window in a facade when partially open	15
Single glazed windows (4mm glass)	29
Single glazed windows (6mm glass)	31
Double glazed units (4-16-4)	33
Double glazed units (4-16-6)	35
Double glazed units (6-16-6)	36
Double glazed units (4-16-6.4mm laminated glass)	39
Secondary glazed windows (4-100-4)	35 - 40
Secondary glazed windows (6-200-6)	40 - 45

5.2 We would therefore recommend that **all glazing on the front elevation of the building** should consist of the following configuration:-

- 6mm glass – 20mm nominal air gap – 4mm glass

5.3 We would recommend that **all glazing on the rear elevation of the building** should consist of the following configuration:-

- 4mm glass – 20mm nominal air gap – 4mm glass

5.4 Based on the measured daytime external noise levels and the typical Sound Reduction Index for the recommended glazing (6/20/4), we have calculated that the external daytime noise climate of 64 dB L_{Aeq} should be attenuated to 32 dB L_{Aeq} in living rooms, dining rooms and bedrooms on the front elevation with the windows closed.

5.5 Based on the measured night-time external noise levels and the typical Sound Reduction Index for the recommended glazing (6/20/4), we have calculated that the external night-time noise climate of 58 dB L_{Aeq} should be attenuated to 27 dB L_{Aeq} in bedrooms on the front elevation with the windows closed.

5.6 The noise break-in calculations are shown in Appendix III at the end of this report.

Night-time Maximum Noise Levels

5.7 With regard to individual event maximum noise levels BS 8233 states:-

"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."

5.8 The WHO Guidelines for Community Noise give a specific maximum internal noise level of 45 dB L_{Amax} that should not normally be exceeded more than 10 -15 times per night.

5.9 The ProPG guidance states that in noise-sensitive rooms at night, e.g. bedrooms, individual noise events (from all sources) should not normally exceed 45 dB L_{Amax} more than 10 times per night as this represents a threshold below which the effects of individual noise events on sleep can be regarded as negligible.

5.10 If we therefore remove the 10 no. highest measured L_{Amax} noise levels obtained between 23:00 – 07:00 hours for the night-time period from the results table shown in Appendix II, the 11th highest recorded night-time level is 70 dB L_{Amax} (allowing for -2.5 dB façade correction).

5.11 External maximum noise levels of 70 dB(A) would result in internal maximum levels of approximately 39 dB(A) with the bedroom windows closed (based on 6mm glass – 20mm air gap – 4mm glass configuration).

5.12 The detailed noise survey results in Appendix II indicate that for the rest of the night-time period, the maximum levels did not exceed the 11th highest recorded level of 70 dB(A).

5.13 Therefore, for this particular development scheme, the WHO criteria and ProPG guidance limits for L_{Amax} levels at night should be achieved with windows closed.

Ventilation

5.14 Since opening the windows would reduce the sound insulation of the building envelope, it is considered that an acoustically treated alternative method of ventilation should be provided for all affected living rooms, dining rooms and bedrooms.

5.15 This approach, which is recommended in BS 8233 : 2014, would provide the new residents with the option of ventilating rooms whilst maintaining the sound insulation of the building envelope.

5.16 For all **living room, dining room and bedroom windows on the front elevation facing onto West Street,** acoustically treated ventilation will be required to meet the required internal noise limits without the need to open the windows for ventilation and cooling.

5.17 Standard slot-frame trickle-vents **should not** be fitted to the windows outlined above. If trickle-vent are fitted they should be acoustically rated with a minimum sound reduction performance level **of at least 40 dB $D_{n,e,w}$ + C_{tr} with the vent open**.

5.18 We therefore recommend provision of one of the following acoustic ventilation options:-

- acoustically screened wall mounted mechanical (i.e. powered) acoustic ventilators such as Titon 'Sonair F+' or Silavent Energex SHHRV units; or
- Brink Climate Systems Air 70 (Plus) wall mounted ventilators;
- a fully ducted passive or mechanical ventilation system with appropriate sound attenuation measures incorporated into the design; or
- Xcell QVW or QVI Mechanical Ventilation with Heat Recovery Units; or

- Titon – HRV 2 Q Plus (MVHR) system 4 - This system is a 'whole house' continuous ventilation system that does not use trickle vents and is considered to be acceptable for this development; or

- Silavent HRX MVHR 'whole house' Heat Recovery Unit; or

- Domus Ventilation HXRE MVHR Unit; or

- Brink Climate Systems MVHR Units (Flair; Excellent; or Sky units); or

- Envirovent Whole House Positive Ventilation System ventilation system that does not use trickle vents and is considered to be acceptable for this development; or

- any other similar performing acoustic ventilators or ventilation system.

5.19 However, we would recommend that the ventilation requirements are checked with the Local Authority Building Control Officer at an early stage.

5.20 It is considered that provision of any one of the above ventilation schemes should provide sufficient sound insulation from road traffic noise, commercial noise and any other local external noise sources to ensure that the required internal noise limits are achieved.

5.21 Any mechanical ventilation system provided must also achieve the internal noise limits outlined in BS 8233 of 30 dB L_{Aeq} in bedrooms during the night-time period.

5.22 This can usually be easily achieved by installing the unit either in the loft space or within a cupboard with well-fitted doors which normally ensures a very quiet operating noise.

5.23 For systems that incorporate ventilation ductwork to the bedrooms, suitable in-line silencers should be fitted to attenuate any fan noise break-in to the bedrooms.

External Areas

5.24 We understand that for this development scheme, there are no private rear amenity spaces to be provided for the new flats.

5.25 Therefore, the external noise climate criteria outlined in BS 8233 : 2014 for external private amenity spaces does not need to be assessed for this particular development scheme.

6.0 SUMMARY AND CONCLUSIONS

6.1 The impact of noise has been assessed for the proposed residential development scheme at Nos. 73 - 75 West Street, Gravesend, Kent.

6.2 The results of the noise level survey and assessment indicate that the development site is exposed to high levels of external environmental noise at the front of the site during both the daytime and the night-time periods, mainly from road traffic noise.

6.3 The rear part of the site is significantly quieter and is not affected by any commercial or other noise sources except for screened road traffic noise from West Street.

6.4 An appropriate noise mitigation scheme has been recommended for the new dwellings which should provide sufficient noise attenuation to meet the required internal acoustic criteria and fully protect the amenity of future residents in accordance with the standards outlined in the WHO Guidance, BS 8233 : 2014 and the ProPG guidance document.

APPENDIX I – NOISE UNITS AND INDICES

a) Sound Pressure Level and the decibel (dB)

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

b) Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kilohertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20,000 Hz. However, the upper frequency limit gradually reduces as a person gets older.

c) A-weighting

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters and is denoted dB(A) or dBLA.

d) Glossary of Terms

When a noise level is constant and does not fluctuate over time, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The indices used in this report are described below:-

L_{Aeq} The A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. L_{Aeq} is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period.

L_{Amax} The maximum A-weighted noise level recorded during the monitoring period.

L_{A10} The A-weighted noise level exceeded for 10% of the specified time period. L_{A10} is most often used as a measure of traffic noise.

L_{A90} The A-weighted noise level exceeded for 90% of the specified time period. L_{A90} is used as a measure of 'background noise'.

SEL The 'sound exposure level' of a single event (such as a passing train) and is the L_{Aeq} value of the whole event normalised to a 1 second period level of a sound.

L_{PA} The A-weighted sound pressure level.

L_{WA} The A-weighted sound power level.

R_W The weighted laboratory measured sound reduction of an element describing the sound transmitted through that element.

NR A graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves.

RT Measured reverberation time in receiver room in seconds.

RT_0 Standard reverberation time of 0.5 seconds.

Bg The receiver room background noise level, L_{eq}

T_{mf} The reverberation time (RT60) is the time taken for the sound pressure level (SPL) to reduce by 60 dB when the sound source is instantaneously cut off. Rooms with many hard surfaces are very reverberant and have long reverberation times. Rooms with many acoustically absorbent finishes tend to have short reverberation times because the sound decays rapidly. T_{mf} is the RT60 within a space averaged across the 500 Hz, 1 kHz and 2 kHz octave bands. These are the frequencies used for speech and by controlling reverberation at these frequencies, speech intelligibility can be improved.

D Level difference, effectively D = source level - (receiver level corrected for background level).

D_{nT} Standardised level difference, standardised to a receiver room reverberation time of 0.5 seconds, $D_{nT} = D + 10 \log (RT/RT_0)$.

$D_{nT,w}$ Weighted standardised level difference, a single figure generated by comparing the D_{nT} with a reference curve. The reference curve is shifted in 1 dB steps until the sum of adverse deviation of the test curve, compared to the reference curve, is as large as possible, but no more than 32.0 dB. The value of the shifted reference curve at 500 Hz

is taken as the $D_{nT,w}$. N.B. As $D_{nT,w}$ for airborne transmission represents a level difference, an improvement generates a larger figure.

C_{tr} A 'spectrum adaptation term' used to correct the $D_{nT,w}$ in order to reflect low frequency performance of the wall or floor tested.

L Level, effectively L = receiver level corrected for background level.

L'_{nT} Standardised level, standardised to a receiver room reverberation time of 0.5 seconds, $L'_{nT} = L - 10 \log (RT/RT_0)$.

$L'_{nT,w}$ Weighted standardised level, a single figure generated by comparing the L'_{nT} with a reference curve. The reference curve is shifted in 1 dB steps until the sum of adverse deviation of the test curve, compared to the reference curve, is as large as possible, but no more than 32.0 dB. The value of the shifted reference curve at 500 Hz is taken as the $L'_{nT,w}$. N.B. As $L'_{nT,w}$ for impact transmission represents an absolute level, an improvement generates a smaller figure.

APPENDIX II – RESULTS OF NOISE LEVEL SURVEY

Date: Tuesday 1st April – Wednesday 2nd April 2025

Equipment: Rion NA-28 'Class 1' sound level meter, Rion NC-74 acoustic calibrator, environmental weather case, Rion WS-15 windshield, microphone, metal boom, tripod

Weather: Generally warm and dry with a light breeze throughout

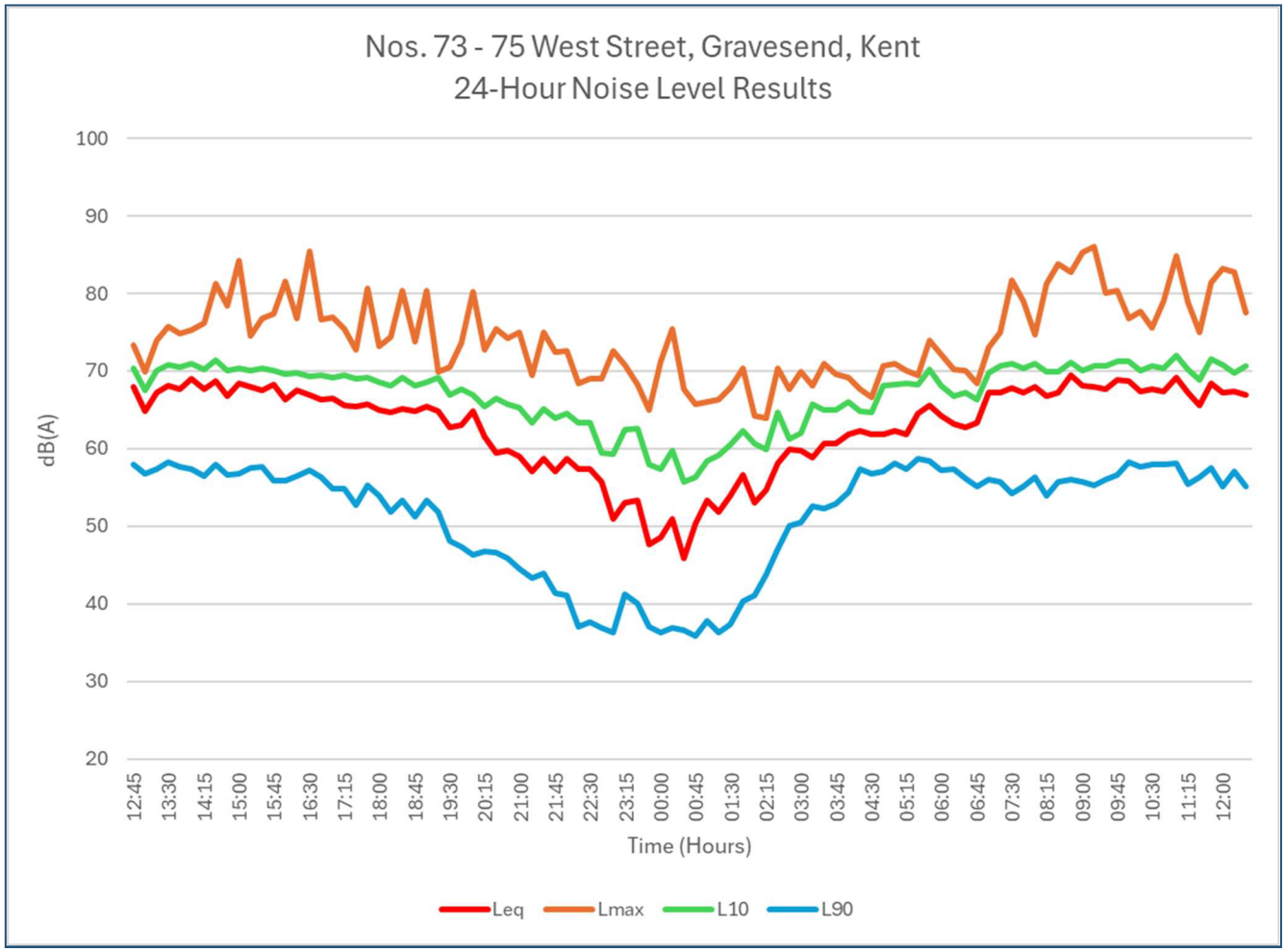
Results: All values in dB(A)

Table A1: Results of Ambient Noise Level Survey - Overlooking West Street

Date	Time	Run Time	Leq	Lmax	L10	L90	SPL Time Weighting	Frequency Weighting
01/04/2025	12:45	00:15:00	68.00	73.40	70.30	58.00	Fast	A
01/04/2025	13:00	00:15:00	64.80	69.90	67.50	56.70	Fast	A
01/04/2025	13:15	00:15:00	67.30	74.00	70.10	57.40	Fast	A
01/04/2025	13:30	00:15:00	68.10	75.70	70.80	58.30	Fast	A
01/04/2025	13:45	00:15:00	67.70	74.80	70.50	57.70	Fast	A
01/04/2025	14:00	00:15:00	69.00	75.30	70.90	57.30	Fast	A
01/04/2025	14:15	00:15:00	67.70	76.20	70.20	56.50	Fast	A
01/04/2025	14:30	00:15:00	68.70	81.30	71.40	58.00	Fast	A
01/04/2025	14:45	00:15:00	66.80	78.50	70.00	56.60	Fast	A
01/04/2025	15:00	00:15:00	68.40	84.26	70.40	56.70	Fast	A
01/04/2025	15:15	00:15:00	68.00	74.60	70.00	57.50	Fast	A
01/04/2025	15:30	00:15:00	67.50	76.80	70.30	57.70	Fast	A
01/04/2025	15:45	00:15:00	68.20	77.40	70.00	55.90	Fast	A
01/04/2025	16:00	00:15:00	66.40	81.60	69.60	55.90	Fast	A
01/04/2025	16:15	00:15:00	67.50	76.80	69.70	56.50	Fast	A
01/04/2025	16:30	00:15:00	66.90	85.46	69.30	57.20	Fast	A
01/04/2025	16:45	00:15:00	66.30	76.60	69.40	56.40	Fast	A
01/04/2025	17:00	00:15:00	66.50	76.90	69.10	54.80	Fast	A
01/04/2025	17:15	00:15:00	65.60	75.40	69.50	54.80	Fast	A
01/04/2025	17:30	00:15:00	65.50	72.80	69.00	52.70	Fast	A
01/04/2025	17:45	00:15:00	65.70	80.70	69.10	55.30	Fast	A
01/04/2025	18:00	00:15:00	65.00	73.16	68.60	53.90	Fast	A
01/04/2025	18:15	00:15:00	64.70	74.40	68.10	51.90	Fast	A
01/04/2025	18:30	00:15:00	65.10	80.40	69.10	53.30	Fast	A
01/04/2025	18:45	00:15:00	64.80	73.80	68.10	51.20	Fast	A
01/04/2025	19:00	00:15:00	65.40	80.30	68.60	53.30	Fast	A
01/04/2025	19:15	00:15:00	64.90	69.90	69.10	51.80	Fast	A
01/04/2025	19:30	00:15:00	62.70	70.46	66.90	48.10	Fast	A
01/04/2025	19:45	00:15:00	63.00	73.70	67.70	47.30	Fast	A
01/04/2025	20:00	00:15:00	64.90	80.20	67.00	46.30	Fast	A
01/04/2025	20:15	00:15:00	61.60	72.70	65.50	46.80	Fast	A
01/04/2025	20:30	00:15:00	59.40	75.50	66.50	46.60	Fast	A
01/04/2025	20:45	00:15:00	59.80	74.20	65.80	45.80	Fast	A

Date	Time	Run Time	Leq	Lmax	L10	L90	SPL Time Weighting	Frequency Weighting
01/04/2025	21:00	00:15:00	59.00	74.96	65.30	44.60	Fast	A
01/04/2025	21:15	00:15:00	57.00	69.50	63.40	43.30	Fast	A
01/04/2025	21:30	00:15:00	58.70	75.00	65.20	43.90	Fast	A
01/04/2025	21:45	00:15:00	57.10	72.40	64.00	41.40	Fast	A
01/04/2025	22:00	00:15:00	58.70	72.60	64.50	41.10	Fast	A
01/04/2025	22:15	00:15:00	57.30	68.40	63.30	37.10	Fast	A
01/04/2025	22:30	00:15:00	57.30	69.06	63.30	37.70	Fast	A
01/04/2025	22:45	00:15:00	55.80	69.00	59.50	36.90	Fast	A
01/04/2025	23:00	00:15:00	50.90	72.60	59.30	36.30	Fast	A
01/04/2025	23:15	00:15:00	53.00	70.80	62.40	41.20	Fast	A
01/04/2025	23:30	00:15:00	53.30	68.20	62.60	40.10	Fast	A
01/04/2025	23:45	00:15:00	47.60	65.00	57.90	37.00	Fast	A
02/04/2025	00:00	00:15:00	48.50	71.26	57.40	36.30	Fast	A
02/04/2025	00:15	00:15:00	50.90	75.40	59.80	36.90	Fast	A
02/04/2025	00:30	00:15:00	45.80	67.70	55.70	36.60	Fast	A
02/04/2025	00:45	00:15:00	50.40	65.70	56.30	35.90	Fast	A
02/04/2025	01:00	00:15:00	53.30	66.00	58.40	37.80	Fast	A
02/04/2025	01:15	00:15:00	51.90	66.40	59.10	36.30	Fast	A
02/04/2025	01:30	00:15:00	53.90	67.86	60.50	37.40	Fast	A
02/04/2025	01:45	00:15:00	56.60	70.40	62.30	40.30	Fast	A
02/04/2025	02:00	00:15:00	53.00	64.20	60.70	41.10	Fast	A
02/04/2025	02:15	00:15:00	54.70	64.00	59.90	43.80	Fast	A
02/04/2025	02:30	00:15:00	58.10	70.30	64.70	47.10	Fast	A
02/04/2025	02:45	00:15:00	59.90	67.70	61.20	50.10	Fast	A
02/04/2025	03:00	00:15:00	59.70	69.96	62.00	50.50	Fast	A
02/04/2025	03:15	00:15:00	58.80	68.10	65.80	52.60	Fast	A
02/04/2025	03:30	00:15:00	60.70	70.90	65.00	52.30	Fast	A
02/04/2025	03:45	00:15:00	60.70	69.60	65.00	52.90	Fast	A
02/04/2025	04:00	00:15:00	61.80	69.20	66.00	54.40	Fast	A
02/04/2025	04:15	00:15:00	62.30	67.70	64.80	57.40	Fast	A
02/04/2025	04:30	00:15:00	61.80	66.70	64.70	56.70	Fast	A
02/04/2025	04:45	00:15:00	61.90	70.70	68.10	57.00	Fast	A
02/04/2025	05:00	00:15:00	62.30	70.90	68.20	58.10	Fast	A
02/04/2025	05:15	00:15:00	61.80	70.00	68.40	57.30	Fast	A
02/04/2025	05:30	00:15:00	64.60	69.40	68.30	58.70	Fast	A
02/04/2025	05:45	00:15:00	65.60	73.90	70.20	58.40	Fast	A
02/04/2025	06:00	00:15:00	64.30	72.16	68.10	57.20	Fast	A
02/04/2025	06:15	00:15:00	63.20	70.20	66.80	57.30	Fast	A
02/04/2025	06:30	00:15:00	62.70	70.00	67.30	56.20	Fast	A
02/04/2025	06:45	00:15:00	63.40	68.40	66.40	55.20	Fast	A
02/04/2025	07:00	00:15:00	67.20	73.10	69.80	56.10	Fast	A
02/04/2025	07:15	00:15:00	67.30	75.00	70.70	55.80	Fast	A
02/04/2025	07:30	00:15:00	67.80	81.66	71.00	54.20	Fast	A
02/04/2025	07:45	00:15:00	67.30	79.00	70.40	55.20	Fast	A
02/04/2025	08:00	00:15:00	67.90	74.70	71.00	56.30	Fast	A
02/04/2025	08:15	00:15:00	66.80	81.20	69.90	54.00	Fast	A
02/04/2025	08:30	00:15:00	67.20	83.80	69.90	55.70	Fast	A
02/04/2025	08:45	00:15:00	69.40	82.70	71.10	56.10	Fast	A
02/04/2025	09:00	00:15:00	68.10	85.26	70.00	55.70	Fast	A
02/04/2025	09:15	00:15:00	67.90	86.00	70.60	55.30	Fast	A
02/04/2025	09:30	00:15:00	67.70	80.10	70.70	56.00	Fast	A

Date	Time	Run Time	Leq	Lmax	L10	L90	SPL Time Weighting	Frequency Weighting
02/04/2025	09:45	00:15:00	68.80	80.40	71.20	56.60	Fast	A
02/04/2025	10:00	00:15:00	68.70	76.80	71.20	58.20	Fast	A
02/04/2025	10:15	00:15:00	67.40	77.70	70.10	57.70	Fast	A
02/04/2025	10:30	00:15:00	67.70	75.66	70.70	57.90	Fast	A
02/04/2025	10:45	00:15:00	67.40	79.00	70.40	57.90	Fast	A
02/04/2025	11:00	00:15:00	69.10	84.90	72.00	58.10	Fast	A
02/04/2025	11:15	00:15:00	67.20	78.90	70.20	55.50	Fast	A
02/04/2025	11:30	00:15:00	65.60	75.00	68.90	56.40	Fast	A
02/04/2025	11:45	00:15:00	68.40	81.40	71.50	57.50	Fast	A
02/04/2025	12:00	00:15:00	67.30	83.16	70.80	55.20	Fast	A
02/04/2025	12:15	00:15:00	67.40	82.70	69.80	57.00	Fast	A
02/04/2025	12:30	00:15:00	67.00	77.60	70.70	55.20	Fast	A



APPENDIX III – NOISE BREAK-IN CALCULATIONS

BS8233 Calculation of Noise Break-in : Daytime

Project Number: MRL/100/2162.1v1

Description: Nos. 73 - 75 West Street, Gravesend, Kent

Consultant: Matt Lawrence

Term	Term Description	Value
S_f	Façade area (incl. window) (m^2)	15.0
S_{wi}	Area of the windows (m^2)	3.0
S_{rr}	Area of the ceiling (m^2)	20.0
S_{ew}	Area of the external wall (m^2)	12.0
S	Area of facade and roof	35.0
x	Room Dimension x	5.0
y	Room Dimension y	4.0
z	Room Dimension z	3.0
RT	Receiving Room RT	0.5
K	Façade correction	0.0

6mm - 20mm Air Gap - 4mm Double Glazing

BS8233 Result 32 dB(A)

L_{Aeq} Result 32 dB(A)

	Term	Term Description	Description	Octave Band Centre Frequency 63	125	250	500	1000	2000	4000	8000	Broadband
A	$L_{eq,ff}$	Free-field L_{eq} outside room	Enter the Octave Band L_{eq} Data	65	64	60	59	61	55	46	38	**64**
	$D_{n,e}$	Insulation of the trickle vent	Titon Type TA 5225/V75 + Standard Canopy (40 dB Dn,e,w + Ctr)	34	38	37	35	40	42	45	54	
B		$\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}}$		0.00011	0.00005	0.00006	0.00009	0.00003	0.00002	0.00001	0.00000	
	R_{wi}	SRI of the window	6:20:4 mm	20	23	22	27	38	40	41	44	
C		$\frac{S_{wi}}{S}10^{\frac{-Rwi}{10}}$		0.00066	0.00043	0.00054	0.00017	0.00001	0.00001	0.00001	0.00000	
	R_{ew}	SRI of the external wall $\frac{S_{ew}}{S}10^{\frac{-Rew}{10}}$	BS8233 Example - Brick and block external wall	37	40	44	45	51	56	58	60	
D				0.00007	0.00003	0.00001	0.00001	0.00000	0.00000	0.00000	0.00000	
	R_{rr}	SRI of roof/ceiling	Tiled/slated roof, 25mm plasterboard ceiling, 100mm quilt above ceiling	23	27	37	43	48	52	55	56	
E		$\frac{S_{rr}}{S}10^{\frac{-RT}{10}}$		0.00286	0.00114	0.00011	0.00003	0.00001	0.00000	0.00000	0.00000	
F		10log(B + C + D + E)		-24	-28	-31	-35	-43	-45	-47	-52	
	A	Equivalent Absorption Area	$\frac{0.161\ V}{RT}$ (Includes RT rise at low frequency)	19	19	19	19	19	19	19	19	
G		10log(S/A)		3	3	3	3	3	3	3	3	

$L_{eq\ Results}$

Term	Term Description	Octave Band Centre Frequency 63	125	250	500	1000	2000	4000	8000	Broadband
$L_{eq,2}$	Level in the receiver room (includes façade correction K)	46	42	34	29	24	16	4	-8	**48**
	A-weighting	-26	-16	-9	-3	0	1	1	-1	
$L_{Aeq,2}$	A-weighted Level in the receiver room	20	26	25	26	24	17	5	-9	**32**

BS8233 Calculation of Noise Break-in : Night-time

Project Number: MRL/100/2162.1v1
Description: Nos. 73 - 75 West Street, Gravesend, Kent
Consultant: Matt Lawrence

Term	Term Description	Value
S_f	Façade area (incl. window) (m^2)	15.0
S_{wi}	Area of the windows (m^2)	3.0
S_{rr}	Area of the ceiling (m^2)	20.0
S_{ew}	Area of the external wall (m^2)	12.0
S	Area of facade and roof	35.0
x	Room Dimension x	5.0
y	Room Dimension y	4.0
z	Room Dimension z	3.0
RT	Receiving Room RT	0.5
K	Façade correction	0.0

6mm - 20mm Air Gap - 4mm Double Glazing

BS8233 Result 27 dB(A)

L_{Aeq} Result 27 dB(A)

	Term	Term Description	Description	Octave Band Centre Frequency 63	125	250	500	1000	2000	4000	8000	Broadband
A	$L_{eq,ff}$	Free-field L_{eq} outside room	Enter the Octave Band L_{eq} Data	61	60	55	54	55	49	40	33	**58**
	$D_{n,e}$	Insulation of the trickle vent	Titon Type TA 5225/V75 + Standard Canopy (40 dB Dn,e,w + Ctr)	34	38	37	35	40	42	45	54	
B		$\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}}$		0.0011	0.00005	0.00006	0.00003	0.00003	0.00002	0.00001	0.00000	
	R_{wi}	SRI of the window	6:20:4 mm	20	23	22	27	38	40	41	44	
C		$\frac{S_{wi}}{S}10^{\frac{-Rwi}{10}}$		0.00066	0.00043	0.00054	0.00017	0.00001	0.00001	0.00001	0.00000	
	R_{ew}	SRI of the external wall $\frac{S_{ew}}{S}10^{\frac{-Rew}{10}}$	BS8233 Example - Brick and block external wall	37	40	44	45	51	56	58	60	
D				0.00007	0.00003	0.00001	0.00001	0.00000	0.00000	0.00000	0.00000	
	R_{rr}	SRI of roof/ceiling	Tiled/slated roof, 25mm plasterboard ceiling, 100mm quilt above ceiling	23	27	37	43	48	52	55	56	
E		$\frac{S_{rr}}{S}10^{\frac{-Rr}{10}}$		0.00286	0.00114	0.00011	0.00003	0.00001	0.00000	0.00000	0.00000	
F		10log(B + C + D + E)		-24	-28	-31	-35	-43	-45	-47	-52	
	A	Equivalent Absorption Area	$\frac{0.161\ V}{RT}$ (Includes RT rise at low frequency)	19	19	19	19	19	19	19	19	
G		10log(S/A)		3	3	3	3	3	3	3	3	

$L_{eq\ Results}$

Term	Term Description	Octave Band Centre Frequency 63	125	250	500	1000	2000	4000	8000	Broadband
$L_{eq,2}$	Level in the receiver room (includes façade correction K)	42	38	29	24	18	10	-2	-13	**44**
	A-weighting	-26	-16	-9	-3	0	1	1	-1	
$L_{Aeq,2}$	A-weighted Level in the receiver room	16	22	20	21	18	11	-1	-14	**27**