



**NO. 35 PERRY STREET  
NORTHFLEET, GRAVESEND, KENT**

**PROPOSED RESIDENTIAL DEVELOPMENT**

**NOISE IMPACT ASSESSMENT**

Report No. MRL/100/2115.1v1  
October 2024

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NORTHFLEET, GRAVESEND, KENT**

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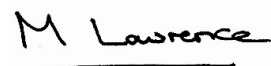
**NOISE IMPACT ASSESSMENT**

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A handwritten signature in black ink, appearing to read 'M. Lawrence', is written over a light blue rectangular background. A horizontal line is drawn beneath the signature.

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## 1.0 INTRODUCTION

- 1.1 MRL Acoustics Ltd was commissioned by Ambareen Construction Ltd to assess the impact of noise on a proposed residential development scheme at No. 35 Perry Street, Gravesend, Kent.
- 1.2 The scheme comprises the construction of a new 1<sup>st</sup> floor level on top of an existing single-storey office building to form 2 no. self-contained flats and the conversion of the existing ground floor offices into 2 no. shop units.
- 1.3 The Local Authority has raised the following concerns regarding noise:-

*“Noise impacts*

*The proximity of the residential accommodation to the nearby Public House and traffic noise in Perry Street is likely to impact on the quality of the living environment for future occupants. It is therefore recommended that a scheme of noise attenuation is submitted in respect of the actual and predicted noise levels arising from the adjacent public house, including design and installation of windows/acoustic ventilation. Reference should be made to British Standard 8233 : 2014 and BS4142 : 2014 as necessary.*

*A scheme should also be submitted taking into account the existing noise levels due to traffic at the northern facade of the building should accompany any future planning application and should include the noise attenuation provided by the construction, including design and installation of windows. Reference shall be made to British Standard 8233 : 2014 as necessary.”*

- 1.4 The Crown Public House (PH) is located at No. 31 Perry Street to the east of the site.
- 1.5 The assessment has included:-
- Measurements of the existing ambient noise climate at the site over a 24-hour period for road traffic noise, general street noise, late evening entertainment noise and any noise from the pub garden;

- 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.

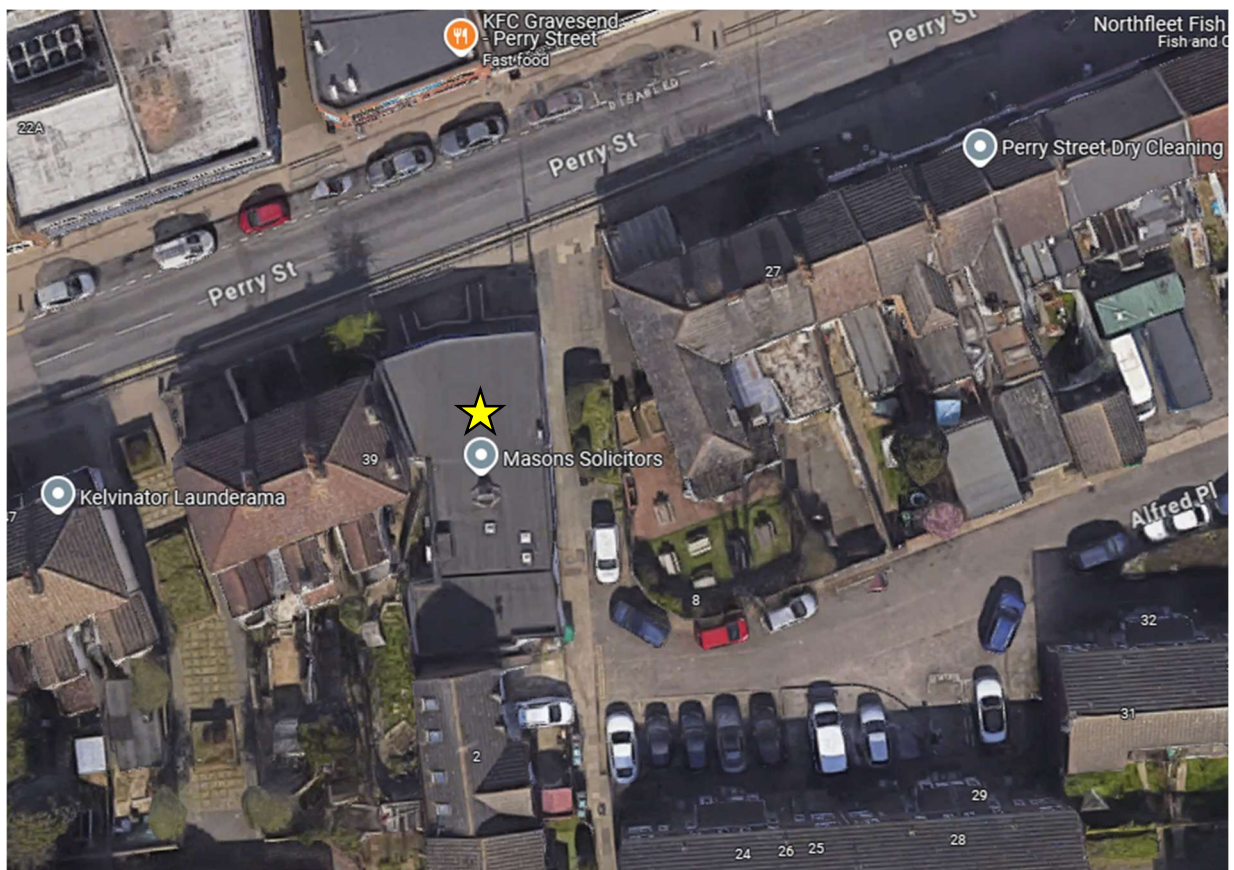
- 1.6 This report outlines our findings and our recommendations.
- 1.7 All recommendations are given for acoustic reasons only and compliance with other requirements (e.g. fire protection/structural integrity, etc.) must be checked by other specialist members of the design team.
- 1.8 The noise survey and report were carried out and prepared by Matthew Lawrence who has over 29 years' experience in the acoustic industry and is a Member of the Institute of Acoustics (IOA) and also has an MSc and Diploma in Acoustics & Noise Control.
- 1.9 MRL Acoustics Ltd is also a member of the Association of Noise Consultants (ANC).
- 1.10 Noise levels referred to in the text have been rounded to the nearest whole decibel (dB), as fractions of decibels are imperceptible.
- 1.11 An explanation of the various noise units, indices and acoustical terms used in this report is provided in Appendix I.
- 1.12 This report was completed by MRL Acoustics Ltd on the basis of a defined programme of work and terms and conditions agreed with the Client. The report has been prepared with all reasonable skill, care and diligence within the terms of the Contract with the Client and taking into account the project objectives, the agreed scope of works, prevailing site conditions and the degree of manpower and resources allocated to the project.
- 1.13 MRL Acoustics Ltd accepts no responsibility whatsoever, following the issue of the report, for any matters arising outside the agreed scope of the works.

## 2.0 DESCRIPTION OF THE SITE

- 2.1 The site is located at No. 35 Perry Street, approximately 35m distance to the east of the junction with All Saints Road and directly adjacent to the former junction (now closed off) with Alfred Place.
- 2.2 There are existing residential properties directly adjacent to the west of the site and to the east there is The Crown PH located approximately 6m distance away on the other side of Alfred Place.
- 2.3 The site consists of an existing single-storey office building with a flat roof and windows only on the front elevation. Directly opposite the site is a row of commercial properties comprising a Co-Op store, a barbers, Pizza Hut, KFC and a Tesco Express store. There are existing dwellings all along Perry Street further to the east and west of the site.
- 2.4 To the rear is Alfred Place which is a quiet residential street with no-through traffic. The Crown PH garden is at the rear of the pub and borders Alfred Place to both the west and to the south of the road.
- 2.5 It was observed whilst on site setting up and collecting the noise monitoring equipment that the dominant noise source affecting the site during the daytime period was from passing road traffic, including numerous buses, HGVs and motorbikes, along with voices of occasional pedestrians passing the site.
- 2.6 The rear of the site backs onto existing residential properties and no significant noise sources were identified at the rear of the site.
- 2.7 At the time of the visit, there were no customers using the pub garden and no noise was observed emanating from the pub.
- 2.8 The site location and development layout plans are shown at the end of this report.

### 3.0 NOISE LEVEL SURVEY

- 3.1 A noise level survey was carried out at the site from 14:00 hours on Saturday 28<sup>th</sup> September until 14:15 hours on Sunday 29<sup>th</sup> September 2024 in order to establish the noise impact from road traffic, general street noise and any entertainment noise from the pub garden.
- 3.2 The noise measurements were taken on the flat roof of the single-storey building at No. 35 Perry Street at a location that was representative of the front elevation and also of the eastern elevation of the proposed new 1<sup>st</sup> floor flats in order to represent the windows of the new dwellings that will be affected by the highest levels of environmental noise.
- 3.3 The noise monitoring location is shown on the site plan below:-



Noise Measurement Location ★

- 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. 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.

- 3.5 The microphone was mounted on a tripod on the flat roof with the microphone approximately 1.5m height above the roof level. The microphone was fitted with a Rion WS-15 weather-proof windshield at all times.
- 3.6 The noise measurements consisted of consecutive 15-minute samples of noise over a continuous 24-hour period in order to record the noise from road traffic, general street noise, late evening entertainment noise and any commercial noise activities from the pub.
- 3.7 The ambient noise climate during the daytime comprised fairly steady noise from road traffic passing the site, along with noise from voices of occasional pedestrians. No significant noise from any commercial premises was observed during the daytime period whilst setting up and collecting the noise monitoring equipment.
- 3.8 As the weather was dry, calm and mild over the Saturday afternoon and evening period, it is reasonable to assume that the pub garden would have been used by customers as per a typical busy weekend period later on that evening.
- 3.9 Details of the equipment used during the noise level survey are shown 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                      |

- 3.10 The weather conditions for the survey were generally warm, dry and calm throughout and are shown in Table 2 below:-

**Table 2: Weather Conditions During Noise Survey**

| Date       | Temperature (°C) |       | Wind Speed (m/s) | Wind Direction | Rainfall (mm) | Cloud Cover (%) | Acceptable Conditions |
|------------|------------------|-------|------------------|----------------|---------------|-----------------|-----------------------|
|            | Day              | Night |                  |                |               |                 |                       |
| 28/09/2024 | 17               | 9     | 0.7              | NW             | 0             | 10              | Yes                   |
| 29/09/2024 | 15               | -     | 1.1              | NW             | 0             | 65              | Yes                   |

- 3.11 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. 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 ‘free-field’ levels as the microphone was not within 3.5m of a reflective surface (other than the ground/flat roof) and therefore a -2.5 dB façade correction is not applicable to the results in order to assess the noise impact in accordance with BS 8233 : 2014.
- 3.13 The detailed measured ‘free-field’ levels are detailed in Appendix II at the end of this report and are summarised in Table 3 below:-

**Table 3: Summary of ‘Free-Field’ Noise Level Results**

| Location                        | Time Period | Noise Levels (dB)      |                          |                             |
|---------------------------------|-------------|------------------------|--------------------------|-----------------------------|
|                                 |             | L <sub>Aeq</sub>       |                          | L <sub>Amax</sub> (Average) |
|                                 |             | Day<br>(07:00 – 23:00) | Night<br>(23:00 – 07:00) | Night<br>(23:00 – 07:00)    |
| 1 <sup>st</sup> Floor Flat Roof | 24-Hours    | 61                     | 54                       | 68                          |

## 4.0 ASSESSMENT OF NOISE IMPACT

### National Planning Policy Framework (NPPF)

4.1 National Government Guidance is available in the form of the National Planning Policy Framework (NPPF) – December 2023. 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.

4.2 Paragraph 180 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.”

4.3 Paragraph 191 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)**

4.4 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.”

4.5 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.”

4.6 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.

4.7 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.

4.8 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.

4.9 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.

- 4.10 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.
- 4.11 Table 4 below summarises the noise exposure hierarchy outlined above, based on the likely average response:-

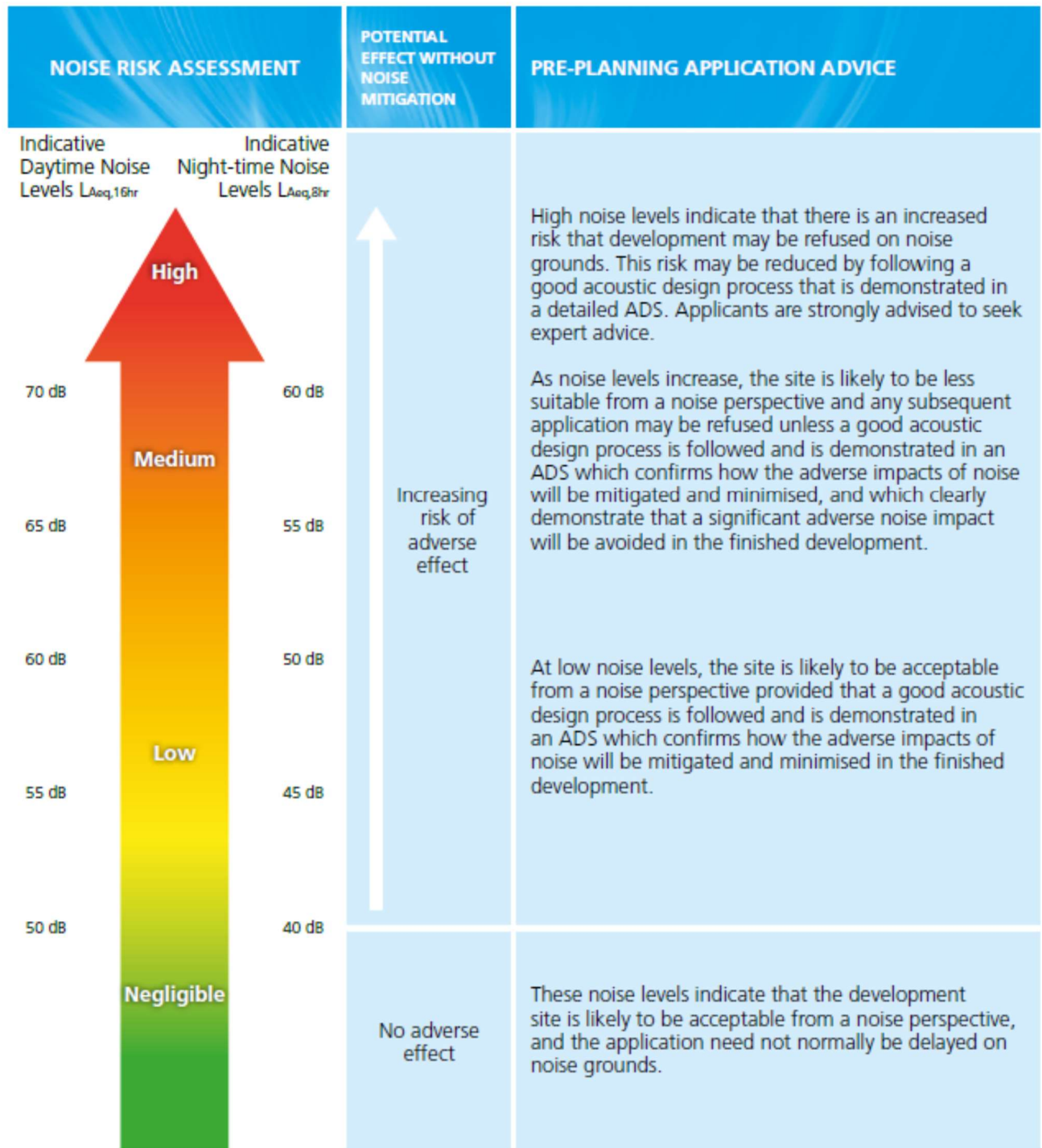
**Table 4: Noise Exposure Hierarchy + Likely Average Response**

| Response                        | Examples of Outcomes                                                                                                                                                                                    | Increasing Effect Level    | Action                        |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------|
| <b>No Observed Effect Level</b> |                                                                                                                                                                                                         |                            |                               |
| 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                           |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------|
| <b>Lowest Observed Adverse Effect Level</b>      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                     |                                  |
| 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 |
| <b>Significant Observed Adverse Effect Level</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                     |                                  |
| 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                          |

### Professional Practice Guidance On Planning & Noise (ProPG)

- 4.12 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.
- 4.13 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.
- 4.14 Based on the average measured free-field daytime noise level of 61 dB  $L_{Aeq}(16\text{-Hour})$  and the average measured free-field night-time noise level of 54 dB  $L_{Aeq}(8\text{-Hour})$ , the site can be classified as being of 'Low – Medium' Risk according to Figure 1 of the ProPG document.
- 4.15 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 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 level 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  $L_{Amax,F} > 60$  dB means the site should not be regarded as negligible risk.

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 $L_{Aeq,16\text{ hr}}$ | -                                                                            |
| Dining                        | Dining room/area | 40 dB $L_{Aeq,16\text{ hr}}$ | -                                                                            |
| Sleeping<br>(daytime resting) | Bedroom          | 35 dB $L_{Aeq,16\text{ hr}}$ | 30 dB $L_{Aeq,8\text{ hr}}$<br><b>45 dB <math>L_{Amax,F}</math> (Note 4)</b> |

*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**

- 4.16 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<br>(07:00 – 23:00)                                                                  | Night-time<br>(23:00 – 07:00) |
| Living Room | 35 dB L <sub>Aeq</sub>                                                                      | -                             |
| Dining Room | 40 dB L <sub>Aeq</sub>                                                                      | -                             |
| Bedroom     | 35 dB L <sub>Aeq</sub>                                                                      | 30 dB L <sub>Aeq</sub>        |
| Garden      | Desired Limit Not Exceeding 50 dB L <sub>Aeq</sub><br>Upper limit of 55 dB L <sub>Aeq</sub> |                               |

**Assessment of Noise Impact**

- 4.17 Allowing -15 dB attenuation for an open window, based on the highest measured daytime noise level of 61 dB L<sub>Aeq</sub>, the resultant internal noise level within habitable rooms during the daytime will be 46 dB L<sub>Aeq</sub> (61 dB – 15 dB).
- 4.18 For the night-time period, allowing -15 dB attenuation for an open window, based on the highest measured night-time noise level of 54 dB L<sub>Aeq</sub>, the resultant internal noise level within bedrooms will be 39 dB L<sub>Aeq</sub> (54 dB – 15 dB).
- 4.19 Therefore, with windows open, the internal noise limit outlined within BS 8233 : 2014 of 35 dB L<sub>Aeq</sub> within living rooms and bedrooms during the daytime will be exceeded by 11 dB(A).

- 4.20 The internal noise limit of 40 dB  $L_{Aeq}$  within dining rooms during the daytime will also be exceeded by 6 dB(A).
- 4.21 At night-time with the windows open the 30 dB  $L_{Aeq}$  criteria in bedrooms will be exceeded by 9 dB(A).

### **Night-time Maximum Noise Levels**

- 4.22 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.”

- 4.23 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.
- 4.24 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.
- 4.25 If we therefore remove the 10 no. highest measured  $L_{Amax}$  noise levels obtained between 23:00 – 07:00 hours for the night-time periods from the results table shown in Appendix II, the 11<sup>th</sup> highest recorded night-time level is 68 dB  $L_{Amax}$ .
- 4.26 External maximum noise levels of 68 dB(A) would result in internal maximum levels of approximately 53 dB(A) with the bedroom windows open. External levels should not exceed 60 dB  $L_{Amax}$  in order to ensure internal maximum levels of 45 dB  $L_{Amax}$  are achieved with windows open.

- 4.27 The detailed noise survey results in Appendix II indicate that for the rest of the night-time periods, the maximum levels did exceed 60 dB(A) throughout the majority of the 8-hour night-time period.
- 4.28 Therefore, for this particular development scheme, the WHO criteria and ProPG guidance limits for internal  $L_{Amax}$  levels at night will be exceeded with bedroom windows open.
- 4.29 Therefore, in order to achieve the required internal noise criteria for habitable rooms, it is considered that an appropriate scheme of noise mitigation measures is required to achieve both the daytime and night-time internal noise levels for the proposed dwellings.
- 4.30 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<br>R <sub>w</sub> |
|----------------------------------------------------|--------------------------------------------------|
| 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 Based on the measured external noise levels, we would recommend that the **glazing throughout the development** should generally consist of the following configuration:-

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

5.3 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 61 dB L<sub>Aeq</sub> should be attenuated to 31 dB L<sub>Aeq</sub> in all rooms with the windows closed.

5.4 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 54 dB L<sub>Aeq</sub> should be attenuated to 24 dB L<sub>Aeq</sub> in all rooms with the windows closed.

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

- 5.6 The 11<sup>th</sup> highest measured external maximum noise level of 68 dB(A) would result in an internal maximum level of approximately 38  $L_{Amax}$  with the bedroom windows closed, based on the proposed glazing configuration of 6/20/4.

### Ventilation

- 5.7 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.
- 5.8 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.
- 5.9 For this particular development, we would recommend that **for all habitable rooms on the front elevation overlooking Perry Street and on the eastern elevation facing Alfred Place**, acoustically treated ventilation will need to be provided to meet the required internal noise limits without the need to open the windows for ventilation and cooling.
- 5.10 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 35 dB  $D_{n,e,w} + C_{tr}$  with the vent open**.
- 5.11 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.

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

5.13 It is considered that provision of any one of the above ventilation schemes should provide sufficient sound insulation from road traffic noise, street noise, commercial noise and noise from the nearby pub garden to ensure that the required internal noise limits are achieved.

5.14 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.

5.15 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.

5.16 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.

### **Predicted Noise From Pub Garden**

- 5.17 Normal human speech produces a sound pressure level of approximately 60 dB(A) at 1m distance. If the pub garden contained an assumed maximum amount of 25 no. customers at any one point, in order to represent a 'worst case' scenario, the resultant noise level at 1m distance would be 74 dB(A).
- 5.18 Based on the attenuation of sound over distance, a source noise level of 74 dB(A) at 1m distance would produce a resultant noise level of 60 dB(A) at the proposed 1<sup>st</sup> floor residential façade located approximately 5m distance away.
- 5.19 The pub garden has 1.8m high fencing around it and therefore, it would be reasonable to assume that this screening would provide at least 5 dB(A) attenuation in any noise from the pub garden when assessed at the proposed 1<sup>st</sup> floor façade of No. 35 Perry Street.
- 5.20 Therefore, the predicted noise impact at the proposed 1<sup>st</sup> floor residential windows is 55 dB  $L_{Aeq}$ .
- 5.21 This level of noise impact is 6 dB(A) below the measured daytime ambient noise climate of 61 dB  $L_{Aeq}$  (07:00 – 23:00 Hours) and therefore the proposed noise mitigation measures for the road traffic noise will be adequate to mitigate any noise from the pub garden to ensure that the internal noise criteria outlined in BS 8233 are achieved.

### **External Areas**

- 5.22 The measured outdoor daytime noise level at the site was 61 dB  $L_{Aeq}$ . This level is 6 dB higher than the recommended general daytime outdoor noise level upper limit of 55 dB  $L_{Aeq}$  outlined within BS 8233 and the WHO Guidelines.
- 5.23 We understand that as part of the proposal, each of the new flats at the 1<sup>st</sup> floor level will be provided with a small balcony area on the front elevation overlooking Perry Street, which are the only areas of private external amenity space provided.

- 5.24 However, it is important to note that BS 8233 is for guidance and recommendations only and the noise limits are not mandatory. Paragraph 7.7.3.2 of BS 8233 is replicated below:-

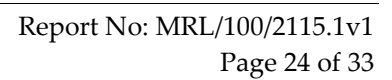
**7.7.3.2 Design criteria for external noise**

For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB  $L_{Aeq,T}$  with an upper guideline value of 55 dB  $L_{Aeq,T}$  which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

- 5.25 Therefore, it is considered that for this particular development, the Local Authority planning department should consider the above statement and make allowances for the existing level of external ambient noise affecting any proposed amenity areas.
- 5.26 The above paragraph is stating that even if the external recommended guideline values are not achievable for particular developments in built-up areas, it would be better to provide the new residents with some external amenity rather than none at all and the development should not be refused permission for this reason alone.

## 6.0 SUMMARY AND CONCLUSIONS

- 6.1 The impact of noise has been assessed for the proposed residential development scheme at No. 35 Perry Street, Northfleet, Gravesend, Kent.
- 6.2 The results of the 24-hour noise level survey and assessment indicate that the development site is exposed to moderate levels of external environmental noise during both the daytime and the night-time periods due to road traffic noise from Perry Street and potentially noise from use of the nearby pub garden of The Crown PH.
- 6.3 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.
- 6.4 The general outdoor daytime noise climate within the private balcony amenity spaces at the front of the development is unlikely to be within the criteria outlined in the WHO Guidance, BS 8233 : 2014 and the ProPG guidance document due to the noise from road traffic on Perry Street.
- 6.5 In such cases, BS 8233 states that the Local Authority should consider the benefits to the new residents of providing external amenity against providing none at all and not prohibit the development for this reason only; providing that the development has been designed to achieve the lowest practicable levels in these external amenity spaces, as stated in BS 8233 : 2014.



## 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:-

$L_{Aeq}$  This is the A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. In other words,  $L_{Aeq}$  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 and is the preferred parameter for all forms of environmental noise.

$L_{Amax}$  This is the maximum A-weighted noise level that was recorded during the monitoring period.

$L_{A10}$  This is 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.

$L_{A90}$  This is 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.
- $B_g$  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  $D = \text{source level} - (\text{receiver level corrected for background level})$ .
- $D_{nT}$  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: Saturday 28<sup>th</sup> September – Sunday 29<sup>th</sup> September 2024

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

Weather: Warm, dry and calm throughout

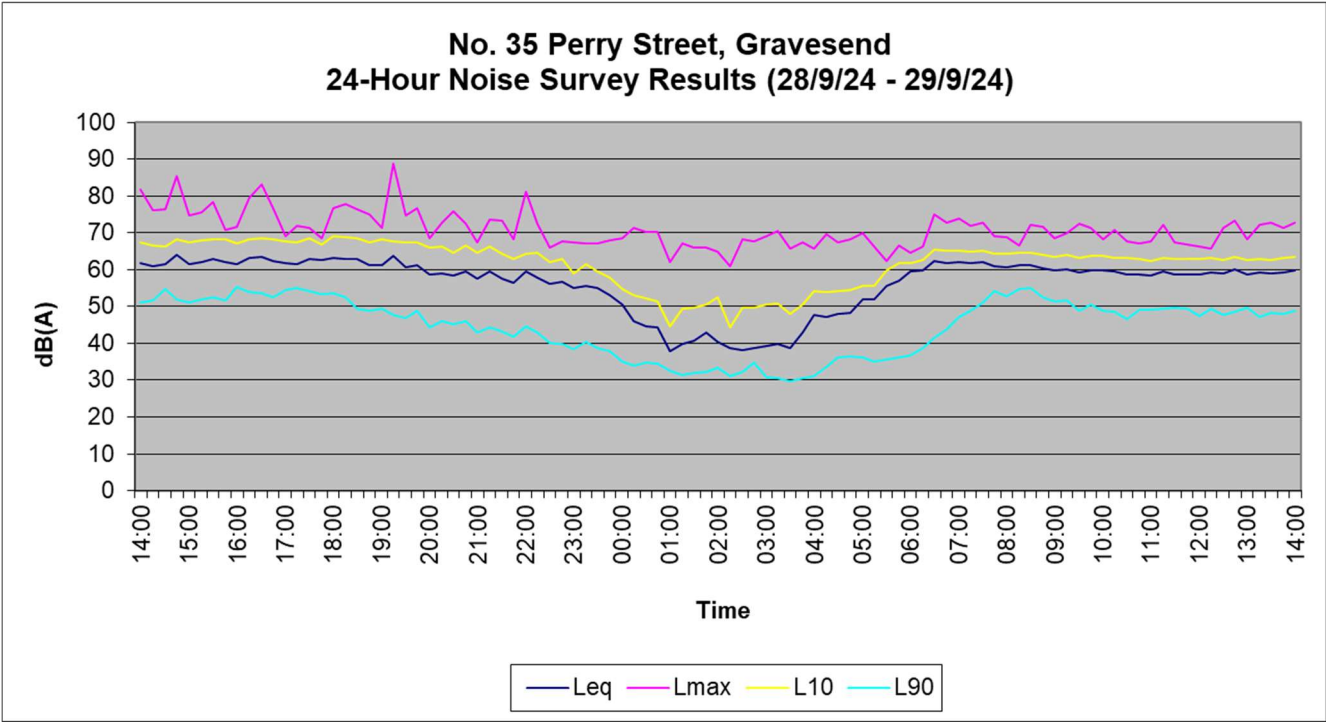
Results: All values in dB(A)

**Table A1: Results of Ambient Noise Level Survey**

| Date       | Time  | Run Time | Leq   | Lmax  | L10   | L90   | SPL Time Weighting | Frequency Weighting |
|------------|-------|----------|-------|-------|-------|-------|--------------------|---------------------|
| 28/09/2024 | 14:00 | 00:15:00 | 61.80 | 81.60 | 67.30 | 51.10 | Fast               | A                   |
| 28/09/2024 | 14:15 | 00:15:00 | 60.90 | 76.00 | 66.50 | 51.60 | Fast               | A                   |
| 28/09/2024 | 14:30 | 00:15:00 | 61.40 | 76.50 | 66.40 | 54.60 | Fast               | A                   |
| 28/09/2024 | 14:45 | 00:15:00 | 63.90 | 85.50 | 68.30 | 52.00 | Fast               | A                   |
| 28/09/2024 | 15:00 | 00:15:00 | 61.60 | 74.70 | 67.50 | 51.20 | Fast               | A                   |
| 28/09/2024 | 15:15 | 00:15:00 | 62.00 | 75.50 | 67.90 | 51.90 | Fast               | A                   |
| 28/09/2024 | 15:30 | 00:15:00 | 62.80 | 78.50 | 68.20 | 52.50 | Fast               | A                   |
| 28/09/2024 | 15:45 | 00:15:00 | 62.10 | 70.70 | 68.10 | 51.50 | Fast               | A                   |
| 28/09/2024 | 16:00 | 00:15:00 | 61.60 | 71.60 | 67.20 | 55.30 | Fast               | A                   |
| 28/09/2024 | 16:15 | 00:15:00 | 63.20 | 79.50 | 68.10 | 54.00 | Fast               | A                   |
| 28/09/2024 | 16:30 | 00:15:00 | 63.50 | 83.10 | 68.50 | 53.70 | Fast               | A                   |
| 28/09/2024 | 16:45 | 00:15:00 | 62.30 | 76.70 | 68.20 | 52.50 | Fast               | A                   |
| 28/09/2024 | 17:00 | 00:15:00 | 61.70 | 69.10 | 67.70 | 54.40 | Fast               | A                   |
| 28/09/2024 | 17:15 | 00:15:00 | 61.40 | 71.90 | 67.30 | 55.00 | Fast               | A                   |
| 28/09/2024 | 17:30 | 00:15:00 | 62.80 | 71.30 | 68.60 | 54.10 | Fast               | A                   |
| 28/09/2024 | 17:45 | 00:15:00 | 62.50 | 68.60 | 66.70 | 53.30 | Fast               | A                   |
| 28/09/2024 | 18:00 | 00:15:00 | 63.30 | 76.80 | 69.10 | 53.70 | Fast               | A                   |
| 28/09/2024 | 18:15 | 00:15:00 | 62.90 | 77.70 | 68.80 | 52.40 | Fast               | A                   |
| 28/09/2024 | 18:30 | 00:15:00 | 62.90 | 76.40 | 68.50 | 49.50 | Fast               | A                   |
| 28/09/2024 | 18:45 | 00:15:00 | 61.10 | 75.00 | 67.40 | 48.70 | Fast               | A                   |
| 28/09/2024 | 19:00 | 00:15:00 | 61.30 | 71.40 | 68.20 | 49.30 | Fast               | A                   |
| 28/09/2024 | 19:15 | 00:15:00 | 63.60 | 88.80 | 67.60 | 47.70 | Fast               | A                   |
| 28/09/2024 | 19:30 | 00:15:00 | 60.70 | 74.70 | 67.40 | 46.90 | Fast               | A                   |
| 28/09/2024 | 19:45 | 00:15:00 | 61.20 | 76.70 | 67.40 | 48.70 | Fast               | A                   |
| 28/09/2024 | 20:00 | 00:15:00 | 58.70 | 68.60 | 65.90 | 44.30 | Fast               | A                   |
| 28/09/2024 | 20:15 | 00:15:00 | 59.00 | 72.80 | 66.30 | 46.00 | Fast               | A                   |
| 28/09/2024 | 20:30 | 00:15:00 | 58.50 | 75.90 | 64.70 | 45.30 | Fast               | A                   |
| 28/09/2024 | 20:45 | 00:15:00 | 59.50 | 72.40 | 66.50 | 46.00 | Fast               | A                   |
| 28/09/2024 | 21:00 | 00:15:00 | 57.50 | 67.30 | 64.50 | 42.80 | Fast               | A                   |
| 28/09/2024 | 21:15 | 00:15:00 | 59.40 | 73.60 | 66.20 | 44.30 | Fast               | A                   |
| 28/09/2024 | 21:30 | 00:15:00 | 57.60 | 73.30 | 64.20 | 43.10 | Fast               | A                   |
| 28/09/2024 | 21:45 | 00:15:00 | 56.50 | 68.10 | 62.90 | 41.80 | Fast               | A                   |
| 28/09/2024 | 22:00 | 00:15:00 | 59.50 | 81.20 | 64.20 | 44.60 | Fast               | A                   |

| Date       | Time  | Run Time | Leq   | Lmax  | L10   | L90   | SPL Time Weighting | Frequency Weighting |
|------------|-------|----------|-------|-------|-------|-------|--------------------|---------------------|
| 28/09/2024 | 22:15 | 00:15:00 | 57.80 | 72.40 | 64.50 | 42.80 | Fast               | A                   |
| 28/09/2024 | 22:30 | 00:15:00 | 56.00 | 66.10 | 62.10 | 40.10 | Fast               | A                   |
| 28/09/2024 | 22:45 | 00:15:00 | 56.70 | 67.70 | 63.00 | 39.90 | Fast               | A                   |
| 28/09/2024 | 23:00 | 00:15:00 | 55.00 | 67.30 | 59.00 | 38.40 | Fast               | A                   |
| 28/09/2024 | 23:15 | 00:15:00 | 55.60 | 67.00 | 61.50 | 40.40 | Fast               | A                   |
| 28/09/2024 | 23:30 | 00:15:00 | 55.10 | 67.20 | 59.40 | 38.60 | Fast               | A                   |
| 28/09/2024 | 23:45 | 00:15:00 | 53.00 | 67.90 | 57.80 | 37.90 | Fast               | A                   |
| 29/09/2024 | 00:00 | 00:15:00 | 50.50 | 68.60 | 54.60 | 35.00 | Fast               | A                   |
| 29/09/2024 | 00:15 | 00:15:00 | 46.10 | 71.30 | 53.00 | 33.90 | Fast               | A                   |
| 29/09/2024 | 00:30 | 00:15:00 | 44.50 | 70.30 | 52.10 | 34.70 | Fast               | A                   |
| 29/09/2024 | 00:45 | 00:15:00 | 44.30 | 70.10 | 51.40 | 34.50 | Fast               | A                   |
| 29/09/2024 | 01:00 | 00:15:00 | 37.90 | 62.10 | 44.70 | 32.60 | Fast               | A                   |
| 29/09/2024 | 01:15 | 00:15:00 | 39.90 | 67.20 | 49.30 | 31.40 | Fast               | A                   |
| 29/09/2024 | 01:30 | 00:15:00 | 40.60 | 66.00 | 49.80 | 32.00 | Fast               | A                   |
| 29/09/2024 | 01:45 | 00:15:00 | 43.00 | 66.00 | 50.40 | 32.10 | Fast               | A                   |
| 29/09/2024 | 02:00 | 00:15:00 | 40.50 | 64.90 | 52.60 | 33.30 | Fast               | A                   |
| 29/09/2024 | 02:15 | 00:15:00 | 38.80 | 61.00 | 44.20 | 31.00 | Fast               | A                   |
| 29/09/2024 | 02:30 | 00:15:00 | 38.20 | 68.10 | 49.60 | 32.20 | Fast               | A                   |
| 29/09/2024 | 02:45 | 00:15:00 | 38.60 | 67.80 | 49.80 | 34.80 | Fast               | A                   |
| 29/09/2024 | 03:00 | 00:15:00 | 39.30 | 69.00 | 50.50 | 30.70 | Fast               | A                   |
| 29/09/2024 | 03:15 | 00:15:00 | 39.90 | 70.50 | 50.70 | 30.50 | Fast               | A                   |
| 29/09/2024 | 03:30 | 00:15:00 | 38.60 | 65.80 | 48.10 | 29.80 | Fast               | A                   |
| 29/09/2024 | 03:45 | 00:15:00 | 42.80 | 67.50 | 50.50 | 30.40 | Fast               | A                   |
| 29/09/2024 | 04:00 | 00:15:00 | 47.70 | 65.60 | 54.30 | 31.00 | Fast               | A                   |
| 29/09/2024 | 04:15 | 00:15:00 | 47.20 | 69.70 | 53.80 | 33.60 | Fast               | A                   |
| 29/09/2024 | 04:30 | 00:15:00 | 48.10 | 67.50 | 54.30 | 36.10 | Fast               | A                   |
| 29/09/2024 | 04:45 | 00:15:00 | 48.40 | 68.20 | 54.50 | 36.50 | Fast               | A                   |
| 29/09/2024 | 05:00 | 00:15:00 | 51.90 | 69.80 | 55.70 | 36.20 | Fast               | A                   |
| 29/09/2024 | 05:15 | 00:15:00 | 52.00 | 66.30 | 55.70 | 35.00 | Fast               | A                   |
| 29/09/2024 | 05:30 | 00:15:00 | 55.60 | 62.40 | 59.80 | 35.70 | Fast               | A                   |
| 29/09/2024 | 05:45 | 00:15:00 | 57.10 | 66.60 | 61.90 | 36.10 | Fast               | A                   |
| 29/09/2024 | 06:00 | 00:15:00 | 59.40 | 64.70 | 61.80 | 36.70 | Fast               | A                   |
| 29/09/2024 | 06:15 | 00:15:00 | 59.70 | 66.30 | 62.50 | 38.80 | Fast               | A                   |
| 29/09/2024 | 06:30 | 00:15:00 | 62.20 | 74.90 | 65.40 | 41.40 | Fast               | A                   |
| 29/09/2024 | 06:45 | 00:15:00 | 61.90 | 72.60 | 65.10 | 43.70 | Fast               | A                   |
| 29/09/2024 | 07:00 | 00:15:00 | 62.10 | 74.00 | 65.20 | 47.10 | Fast               | A                   |
| 29/09/2024 | 07:15 | 00:15:00 | 61.90 | 72.00 | 65.00 | 48.80 | Fast               | A                   |
| 29/09/2024 | 07:30 | 00:15:00 | 62.00 | 72.70 | 65.10 | 51.20 | Fast               | A                   |
| 29/09/2024 | 07:45 | 00:15:00 | 60.90 | 69.20 | 64.30 | 54.20 | Fast               | A                   |
| 29/09/2024 | 08:00 | 00:15:00 | 60.70 | 68.80 | 64.30 | 52.70 | Fast               | A                   |
| 29/09/2024 | 08:15 | 00:15:00 | 61.10 | 66.50 | 64.60 | 54.70 | Fast               | A                   |
| 29/09/2024 | 08:30 | 00:15:00 | 61.10 | 72.10 | 64.50 | 55.00 | Fast               | A                   |
| 29/09/2024 | 08:45 | 00:15:00 | 60.40 | 71.60 | 64.00 | 52.60 | Fast               | A                   |
| 29/09/2024 | 09:00 | 00:15:00 | 59.80 | 68.40 | 63.50 | 51.40 | Fast               | A                   |
| 29/09/2024 | 09:15 | 00:15:00 | 60.20 | 69.80 | 64.10 | 51.70 | Fast               | A                   |
| 29/09/2024 | 09:30 | 00:15:00 | 59.20 | 72.50 | 63.10 | 48.90 | Fast               | A                   |
| 29/09/2024 | 09:45 | 00:15:00 | 59.90 | 71.40 | 63.70 | 50.50 | Fast               | A                   |
| 29/09/2024 | 10:00 | 00:15:00 | 59.80 | 68.10 | 63.60 | 48.80 | Fast               | A                   |
| 29/09/2024 | 10:15 | 00:15:00 | 59.40 | 70.90 | 63.10 | 48.60 | Fast               | A                   |
| 29/09/2024 | 10:30 | 00:15:00 | 58.80 | 67.60 | 63.10 | 46.50 | Fast               | A                   |

| Date       | Time  | Run Time | Leq   | Lmax  | L10   | L90   | SPL Time Weighting | Frequency Weighting |
|------------|-------|----------|-------|-------|-------|-------|--------------------|---------------------|
| 29/09/2024 | 10:45 | 00:15:00 | 58.80 | 67.20 | 62.80 | 49.20 | Fast               | A                   |
| 29/09/2024 | 11:00 | 00:15:00 | 58.40 | 67.70 | 62.40 | 49.20 | Fast               | A                   |
| 29/09/2024 | 11:15 | 00:15:00 | 59.40 | 72.20 | 63.20 | 49.40 | Fast               | A                   |
| 29/09/2024 | 11:30 | 00:15:00 | 58.80 | 67.40 | 62.80 | 49.60 | Fast               | A                   |
| 29/09/2024 | 11:45 | 00:15:00 | 58.60 | 66.80 | 62.80 | 49.30 | Fast               | A                   |
| 29/09/2024 | 12:00 | 00:15:00 | 58.70 | 66.20 | 62.90 | 47.50 | Fast               | A                   |
| 29/09/2024 | 12:15 | 00:15:00 | 59.20 | 65.60 | 63.10 | 49.40 | Fast               | A                   |
| 29/09/2024 | 12:30 | 00:15:00 | 58.90 | 71.20 | 62.70 | 47.60 | Fast               | A                   |
| 29/09/2024 | 12:45 | 00:15:00 | 60.20 | 73.20 | 63.40 | 48.60 | Fast               | A                   |
| 29/09/2024 | 13:00 | 00:15:00 | 58.60 | 68.30 | 62.70 | 49.60 | Fast               | A                   |
| 29/09/2024 | 13:15 | 00:15:00 | 59.10 | 72.10 | 62.90 | 47.00 | Fast               | A                   |
| 29/09/2024 | 13:30 | 00:15:00 | 58.90 | 72.70 | 62.60 | 48.20 | Fast               | A                   |
| 29/09/2024 | 13:45 | 00:15:00 | 59.10 | 71.30 | 63.10 | 48.00 | Fast               | A                   |
| 29/09/2024 | 14:00 | 00:15:00 | 59.80 | 72.70 | 63.40 | 48.90 | Fast               | A                   |



## APPENDIX III – NOISE BREAK-IN CALCULATIONS

## BS8233 Calculation of Noise Break-in : Daytime

Project Number: MRL/100/2115.1v1

Description: No. 35 Perry Street, Gravesend, Kent

Consultant: Matt Lawrence



| Term     | Term Description                             | Value |
|----------|----------------------------------------------|-------|
| $S_f$    | Façade area (incl. window) (m <sup>2</sup> ) | 18.0  |
| $S_w$    | Area of the windows (m <sup>2</sup> )        | 4.0   |
| $S_{rr}$ | Area of the ceiling (m <sup>2</sup> )        | 30.0  |
| $S_{ew}$ | Area of the external wall (m <sup>2</sup> )  | 14.0  |
| $S$      | Area of facade and roof                      | 48.0  |
| $x$      | Room Dimension x                             | 6.0   |
| $y$      | Room Dimension y                             | 5.0   |
| $z$      | 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 31 dB(A)**

**$L_{Aeq}$  Result 31 dB(A)**

| Term | Term Description                           | Description                      | Octave Band Centre Frequency                                             |         |         |         |         |         |         |         | Broadband |
|------|--------------------------------------------|----------------------------------|--------------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|-----------|
|      |                                            |                                  | 63                                                                       | 125     | 250     | 500     | 1000    | 2000    | 4000    | 8000    |           |
| A    | $L_{eq,ff}$                                | Free-field $L_{eq}$ outside room | Enter the Octave Band $L_{eq}$ Data                                      |         |         |         |         |         |         |         | 61        |
|      | $D_{n,e}$                                  | Insulation of the trickle vent   | Titon Type TA 5221/V25 + Standard Canopy (35 dB $D_{n,e,w}$ + Ctr)       |         |         |         |         |         |         |         |           |
| B    | $\frac{A_0}{S} 10^{\frac{-D_{n,e}}{10}}$   |                                  | 0.00013                                                                  | 0.00005 | 0.00003 | 0.00005 | 0.00013 | 0.00004 | 0.00002 | 0.00000 |           |
|      | $R_{wi}$                                   | SRI of the window                | 6:20:4 mm                                                                |         |         |         |         |         |         |         |           |
|      | $\frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}}$ |                                  | 0.00083                                                                  | 0.00042 | 0.00053 | 0.00017 | 0.00001 | 0.00001 | 0.00001 | 0.00000 |           |
| C    | $R_{ew}$                                   | SRI of the external wall         | BS8233 Example - Brick and block external wall                           |         |         |         |         |         |         |         |           |
|      | $\frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}}$ |                                  | 0.00006                                                                  | 0.00003 | 0.00001 | 0.00001 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |           |
| D    | $R_{rr}$                                   | SRI of roof/ceiling              | Tiled/slatted roof, 25mm plasterboard ceiling, 100mm quilt above ceiling |         |         |         |         |         |         |         |           |
|      | $\frac{S_{rr}}{S} 10^{\frac{-R_{rr}}{10}}$ |                                  | 0.00313                                                                  | 0.00125 | 0.00012 | 0.00003 | 0.00001 | 0.00000 | 0.00000 | 0.00000 |           |
| E    |                                            |                                  | -24                                                                      | -28     | -32     | -36     | -38     | -43     | -45     | -51     |           |
| F    |                                            |                                  |                                                                          |         |         |         |         |         |         |         |           |
|      | A                                          | Equivalent Absorption Area       | $\frac{0.161 V}{RT}$ (Includes RT rise at low frequency)                 |         |         |         |         |         |         |         |           |
| G    |                                            |                                  | 2                                                                        | 2       | 2       | 2       | 2       | 2       | 2       | 2       |           |

 **$L_{eq}$  Results**

| Term        | Term Description                                          | Octave Band Centre Frequency |     |     |     |      |      |      |      | Broadband |
|-------------|-----------------------------------------------------------|------------------------------|-----|-----|-----|------|------|------|------|-----------|
|             |                                                           | 63                           | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |           |
| $L_{eq,2}$  | Level in the receiver room (includes façade correction K) | 44                           | 40  | 37  | 26  | 21   | 14   | 9    | 1    | 46        |
|             | A-weighting                                               | -26                          | -16 | -9  | -3  | 0    | 1    | 1    | -1   |           |
| $L_{Aeq,2}$ | A-weighted Level in the receiver room                     | 18                           | 24  | 28  | 23  | 21   | 15   | 10   | 0    | 31        |

## BS8233 Calculation of Noise Break-in : Night-time

Project Number: MRL/100/2115.1v1

Description: No. 35 Perry Street, Gravesend, Kent

Consultant: Matt Lawrence



| Term     | Term Description                             | Value |
|----------|----------------------------------------------|-------|
| $S_f$    | Façade area (incl. window) (m <sup>2</sup> ) | 18.0  |
| $S_w$    | Area of the windows (m <sup>2</sup> )        | 4.0   |
| $S_{rf}$ | Area of the ceiling (m <sup>2</sup> )        | 30.0  |
| $S_{ew}$ | Area of the external wall (m <sup>2</sup> )  | 14.0  |
| $S$      | Area of facade and roof                      | 48.0  |
| $x$      | Room Dimension x                             | 6.0   |
| $y$      | Room Dimension y                             | 5.0   |
| $z$      | 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 24 dB(A)**

**$L_{Aeq}$  Result 24 dB(A)**

| Term | Term Description                           | Description                      | Octave Band Centre Frequency                                             |         |         |         |         |         |         |         | Broadband |
|------|--------------------------------------------|----------------------------------|--------------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|-----------|
|      |                                            |                                  | 63                                                                       | 125     | 250     | 500     | 1000    | 2000    | 4000    | 8000    |           |
| A    | $L_{eq,ff}$                                | Free-field $L_{eq}$ outside room | Enter the Octave Band $L_{eq}$ Data                                      |         |         |         |         |         |         |         | 54        |
|      | $D_{n,e}$                                  | Insulation of the trickle vent   | Titon Type TA 5221/V25 + Standard Canopy (35 dB $D_{n,e,w}$ + Ctr)       |         |         |         |         |         |         |         |           |
| B    | $\frac{A_0}{S} 10^{\frac{-D_{n,e}}{10}}$   |                                  | 0.00013                                                                  | 0.00005 | 0.00003 | 0.00005 | 0.00013 | 0.00004 | 0.00002 | 0.00000 |           |
|      | $R_w$                                      | SRI of the window                | 6:20:4 mm                                                                |         |         |         |         |         |         |         |           |
|      | $\frac{S_w}{S} 10^{\frac{-R_w}{10}}$       |                                  | 0.00083                                                                  | 0.00042 | 0.00053 | 0.00017 | 0.00001 | 0.00001 | 0.00001 | 0.00000 |           |
| C    | $R_{ew}$                                   | SRI of the external wall         | BS8233 Example - Brick and block external wall                           |         |         |         |         |         |         |         |           |
|      | $\frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}}$ |                                  | 0.00006                                                                  | 0.00003 | 0.00001 | 0.00001 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |           |
| D    | $R_{rf}$                                   | SRI of roof/ceiling              | Tiled/slatted roof, 25mm plasterboard ceiling, 100mm quilt above ceiling |         |         |         |         |         |         |         |           |
|      | $\frac{S_{rf}}{S} 10^{\frac{-R_{rf}}{10}}$ |                                  | 0.00313                                                                  | 0.00125 | 0.00012 | 0.00003 | 0.00001 | 0.00000 | 0.00000 | 0.00000 |           |
| E    |                                            |                                  |                                                                          |         |         |         |         |         |         |         |           |
| F    |                                            | $10\log(B + C + D + E)$          | -24                                                                      | -28     | -32     | -36     | -38     | -43     | -45     | -51     |           |
|      | A                                          | Equivalent Absorption Area       | $\frac{0.161 V}{RT}$ (Includes RT rise at low frequency)                 |         |         |         |         |         |         |         |           |
| G    |                                            | $10\log(S/A)$                    | 2                                                                        | 2       | 2       | 2       | 2       | 2       | 2       | 2       |           |

### $L_{eq}$ Results

| Term        | Term Description                                          | Octave Band Centre Frequency |     |     |     |      |      |      |      | Broadband |
|-------------|-----------------------------------------------------------|------------------------------|-----|-----|-----|------|------|------|------|-----------|
|             |                                                           | 63                           | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |           |
| $L_{eq,2}$  | Level in the receiver room (includes façade correction K) | 38                           | 33  | 30  | 19  | 14   | 7    | 2    | -6   | 40        |
|             | A-weighting                                               | -26                          | -16 | -9  | -3  | 0    | 1    | 1    | -1   |           |
| $L_{Aeq,2}$ | A-weighted Level in the receiver room                     | 12                           | 17  | 21  | 16  | 14   | 8    | 3    | -7   | 24        |