
NOVA CROWD LIMITED

NOISE IMPACT ASSESSMENT REPORT

ARTHUR STREET, BARWELL, LEICESTER LE9 8AH

Client: Nova Crowd Limited

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P4971-R1-V1	16/12/2021	Phil Lodge, BSc (Hons), PGDip	M. J. Malone, BSc (Hons), MIOA	M. J. Malone, BSc (Hons), MIOA

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1 INTRODUCTION

1.1.1 By instruction from Nova Crowd Limited ('the client'), NoiseAir was commissioned to undertake a noise impact assessment (NIA) for a proposed residential development at the location Arthur Street, Barwell, Leicester LE9 8AH, herein referred to as the 'development site'.

1.1.2 This noise report has been prepared with respect to an existing planning application reference 20/00504/FUL and specifically condition 13 of the particulars of decision. The report assesses the results of a noise survey carried out in accordance with current guidance and includes recommendations and mitigation, as appropriate.

1.2 Site Description

1.2.1 At the time of writing, the development site is open land occupied by a combination of building debris and vegetation.

1.2.2 The development site is located in an urban area approximately 10 miles southwest of the city of Leicester. It is flanked to the north and west boundary by King Street, beyond which lies a mix of commercial units and residential dwellings. To the south and east of the site lies George Street and Arthur Street respectively beyond which lies a mix of commercial units and residential dwellings. King Street, Arthur Street and George Street accommodate occasional cars, vans, and medium sized lorries travelling at speeds no greater than 30 miles per hour.

1.2.3 **Figure 1** shows an aerial photograph of the development site with respect to the local area and its context.



Figure 1: Site aerial photograph.

1.3 Development Proposals

1.3.1 The client is proposing to develop 14 residential apartments over 2 / 3 floors with additional car parking area. At the time of writing, design drawings available regarding the proposals are as follows and are shown in appendix C.

- Phase 2, 13 Dwellings, ND.19.190.02 Rev D, Date Nov 2109;
- Phase 2, 13 Dwellings, ND.19.190.03 Rev D, Date Nov 2109; and,
- Phase 2, 13 Dwellings, ND.19.190.04 Rev D, Date Nov 2109.

2 ASSESSMENT METHODOLOGY AND SCOPE OF WORKS

2.1 Planning Guidance and Noise

2.1.1 This acoustic report has been prepared as supporting documentation for an existing planning application and condition 13 of the particulars of decision, therefore, it is considered that reference should be made to the appropriate planning guidance documentation, specifically:

- National Planning Policy Framework (NPPF), 2021;
- Noise Policy Statement for England (NPSE), 2010;
- Planning Practice Guidance – Noise, 2019;

2.1.2 A summary of the relevant planning documentation and its relevance with respect to noise is provided below.

National Planning Policy Framework [NPPF 2021]

2.1.3 The NPPF was published in March 2012 with the most recent version updated in January 2021. The NPPF sets out the Governments planning policies for England and how these are expected to be applied across a number of areas.

2.1.4 With respect to noise specifically, Section 15, Paragraph 174 of the NPPF 2021 states:

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

- *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;’*

2.1.5 The NPPF 2021 continues to state in Paragraph 185:

‘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:

- *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;*
- *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;*

Noise Policy Statement for England [NPSE 2010]

- 2.1.6 The Noise Policy Statement for England (NPSE), published in March 2010, states the long-term vision of Government noise policy 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*”.
- 2.1.7 This long-term vision 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;
 - Where possible, contribute to the improvement of health and quality of life.
- 2.1.8 The NPSE also introduces the below categories with respect to ‘adverse impacts’.

‘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’.

- 2.1.9 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided. The second aim refers to the situation where the impact lies somewhere between LOAEL and SOAEL, and it requires that all reasonable steps be taken to mitigate

and minimise the adverse effects of noise. However, the requirement to mitigate and minimise the adverse effects of noise does not mean that such adverse effects cannot occur.

Planning Practice Guidance - Noise [PPG 2019]

- 2.1.10 The National Planning Practice Guidance (PPG) is a web-based resource, launched by the Department for Communities and Local Government (DCLG) in March 2014 to support the NPPF¹.
- 2.1.11 The PPG advises on how planning can manage potential noise impacts in new development. The guidance is regularly reviewed and updated, and noise is listed as a specific category, the noise category was most recently updated on 22nd July 2019.
- 2.1.12 The PPG provides further detail about how the effect levels can be recognised. Above the NOEL noise becomes noticeable, however it has no adverse effect as it does not cause any change in behaviour or attitude. Once noise crosses the LOAEL threshold it begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise.
- 2.1.13 Increasing noise exposure further might cause the SOAEL threshold to be crossed. If the exposure is above this level the planning process should be used to avoid the effect occurring by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.
- 2.1.14 At the highest extreme the situation should be prevented from occurring regardless of the benefits which might arise.
- 2.1.15 **Table 1** summarises the noise exposure hierarchy outlined within the PPG.

¹ <https://www.gov.uk/guidance/noise--2>

Table 1: National Planning Practice Guidance noise exposure hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable 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
Lowest Observed Effect Level			
Noticeable 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 non-awakening 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 Effect Level			
Noticeable 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
Noticeable 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

2.2 Consultation and Scope of Works

- 2.2.1 Based on the information provided and the subsequent site visits, it is considered that an NIA should be undertaken to assess the potential for adverse impact from primarily road traffic noise from Arthur Street, King Street and George Street.
- 2.2.2 The sound insulation requirements to the north and west facade of the proposed building structure are likely to be dominated by noise from traffic on King Street.
- 2.2.3 The sound insulation requirements to the south and East facade of the proposed building structure are likely to be dominated by noise from traffic on George Street and Arthur Street respectively.
- 2.2.4 The scope of the assessment includes consideration of noise at sensitive areas of the proposed development, i.e., proposed residential areas / bedrooms and amenity areas, specifically in terms of the potential impact of local noise sources.

2.3 Assessment Criteria

- 2.3.1 To achieve noise levels which are considered to be in alignment with the planning approaches and policies discussed in Section 2.1, it is considered that all efforts are made to ensure that future occupants are unlikely to be exposed to noise levels which might breach the LOEL criteria.
- 2.3.2 It should be noted however that planning guidance does not preclude development where the LOEL is likely to be breached in certain circumstances as long as reasonable efforts are made to mitigate and reduce such an effect.
- 2.3.3 It is therefore considered that the noise assessment and subsequent criteria should be undertaken in accordance with Pro-PG:2017 Planning and Noise a summary of which is provided below.

Pro-PG:2017 – Planning & Noise [Pro-PG 2017]

- 2.3.4 Pro-PG Planning and Noise provides professional practice guidance in relation to new residential development exposed to noise from transport sources. It provides practitioners with a recommended approach to the management of noise within the planning system in England.
- 2.3.5 The guidance reflects the Government's overarching National Planning Policy Framework, the Noise Policy Statement for England, and Planning Practice Guidance (including PPG-Noise) and draws on other authoritative sources of guidance. It provides advice for Local

Planning Authorities and developers, and their professional advisers, on achieving good acoustic design in and around new residential developments.

2.3.6 Pro-PG:2017 adopts a two-stage approach to assessment:

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

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

- **Element 1** – demonstrating a “Good Acoustic Design Process”;
- **Element 2** – observing internal “Noise Level Guidelines”;
- **Element 3** – undertaking an “External Amenity Area Noise Assessment”; and,
- **Element 4** – consideration of other relevant issues.

2.3.8 Internal noise level guidelines are set out in Figure 2 of Pro-PG:2017 which have been reproduced in **Table 2**.

Table 2: Summary of internal noise guidelines.			
Activity	Location	07:00 – 23:00 hours	23:00 – 07:00 hours
Resting	Living Room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room / area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB L_{Amax}

2.3.9 There are multiple notes outlined within Pro-PG:2017 with respect to **Table 2** which should be considered in full however the main points for consideration are outlined below:

- The table provides recommended internal $L_{Aeq,T}$ target levels for overall noise in the design of a building. These are the sum total of structure-borne noise and airborne noise sources.
- The internal $L_{Aeq,T}$ target levels shown in the table are based on the existing guidelines issued by the World Health Organisation (WHO) and assume normal diurnal fluctuation in external noise.
- The internal $L_{Aeq,T}$ 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.
- Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. 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.

- 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.
- 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.

2.3.10 The guidelines presented in **Table 2** reflect and extend current practice contained in BS 8233:2014.

2.3.11 In terms of external amenity noise assessment, Pro-PG:2017 again draws upon guidelines set and presented by the WHO and also presented in BS 8233:2014.

2.3.12 BS 8233:2014 states that “the acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$ ”. The standard continues... “These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces but should not be prohibited.”

2.4 Noise Survey

2.4.1 As part of this assessment, NoiseAir has carried out a primarily unattended noise survey to measure the existing sound levels at the development site.

2.4.2 The primary noise sources assessed are:

- Road traffic noise from the adjacent Arthur Street;
- Road traffic noise from the adjacent King Street; and,
- Road traffic noise from the adjacent George Street.

2.4.3 The above noise sources have been assessed in relation to the below identified receptors:

- Future occupants of the proposed residential dwellings.

3 ACOUSTIC SURVEY

3.1 Acoustic Survey Details

- 3.1.1 NoiseAir carried out fixed position noise monitoring between 5th of October 2021 to 7th of October 2021 at the development site.
- 3.1.2 Noise monitoring was undertaken at one monitoring location (ML1). The noise monitoring location is shown in **Figure 2** and described in **Table 3** below.



Figure 2: Site layout plan and noise monitoring location.

Table 3: Summary of Noise Monitoring Locations				
Monitor Location Number	Location Description	Time Period Monitored		Attended or Unattended Monitoring
		Start	End	
ML1	Mounted on a tripod protruding out of the second floor window at the southwest of corner the development site.	10:15 05/10/21	10:30 07/10/21	Unattended

- 3.1.3 Monitoring location ML1 was considered to be representative of the noise levels at the approximate location of the development site and so data from this location will be adopted for the calibration of the 3D sound model.

3.1.4 The noise measurements were made using a Class 1, integrating sound level meter (SLM).

3.1.5 The acoustic equipment was calibrated to comply with Section 4.2 of BS 7445-1:2003², before and after the noise monitoring periods.

3.1.6 Details of the SLM and associated field calibration can be found in **Table 4** below:

Table 4: Summary of SLM used for survey and associated field calibration					
SLM (Serial Number)	Preamp (Serial Number)	Microphone (Serial Number)	Start Calibration	End Calibration	Drift
NOR140 (1403328)	NOR1209 (14517)	NOR1225 (42327)	-26.2	-26.3	-0.1

3.1.7 The weather conditions were noted to be as outlined in **Table 5** during the site visits at the start and end of the monitoring period.

Table 5: Summary of weather conditions noted at the start of the monitoring duration.		
	5 th October 2021	7 th October 2021
Roads (Wet / Dry)	Dry	Dry
Temperature (°C)	11	16
Wind speed (ms ⁻¹)	< 0.5	< 0.5
Cloud Cover (Approx. %)	100	60
Humidity (%)	87	85

3.1.8 A-weighted³ L_{eq}⁴ and L_{AMax}⁵ noise levels were measured to comply with the requirements of Pro-PG:2017, WHO and BS 8233:2014. A-weighted L₉₀⁶ were also measured to provide additional information. The measured noise levels are set out in full in Appendix B.

3.1.9 Attending the development site at the start and end of the survey monitoring period provided opportunity for observations and detailed notes to be made of the significant noise sources, which contribute to the measured level.

² BS 7445-2003 "Description and measurement of environmental noise – Part 1: Guide to quantities and procedures.

³ An electronic filter in a sound level meter which mimics the human ear's response to sounds at different frequencies under defined conditions.

⁴ Equivalent continuous noise level; the steady sound pressure which contains an equivalent quantity of sound energy as the time-varying sound pressure levels.

⁵ The instantaneous maximum noise level recorded for a measurement period.

⁶ The noise level which is exceeded for 90% of the measurement period.

ML1

Road Traffic Noise: Distant traffic noise originating from local road network accommodating occasional cars, vans and medium sized lorries. It was noted that there was no audible commercial noise at ML1.

3.2 Measured Sound Levels

3.2.1 The results for the monitoring location during the daytime and night-time periods are presented in **Table 6**.

Table 6: Average Measured Daytime and Night-time Noise Levels				
Monitoring Location	Time	Measured Noise Level		
		dB L _{Aeq,16hour} / dB L _{Aeq,8hour}	dB L _{Aeq,1hour} / dB L _{Aeq,15mins}	dB L _{A90,1hour} / dB L _{A90,15mins}
ML1	07:00 - 23:00	50.4 – 58.4	47.0 – 59.6	39.8 – 50.7
	23:00 - 07:00	42.7 – 51.4	35.5 – 54.9	30.6 – 44.7

3.2.2 Given the time when the SLM's were installed and collected, the daytime measurements taken on the 5th of October and the 7th of October do not constitute the full 16 hour average. However, it is reasoned that the length of time over which the measurements were taken are representative of the required 16 hour average.

3.2.3 The maximum noise level exceeded more than 10 times recorded during a single night-time period, is presented in **Table 7**.

Table 7: Summary of the Maximum Night-time Noise Levels Exceeded More than 10 times in one Night-Time Period (Figures in dB L _{Amax}).	
Monitoring Location	Measured Maximum Noise Level Exceeded More than 10 times in one night-time period (dB(A))
ML1	71

3.2.4 Data is shown in Figure 3 detailing a level vs time graph of the recorded L_{Amax}, L_{Aeq} and L_{A90} sound level over 15-minute time periods for ML1.

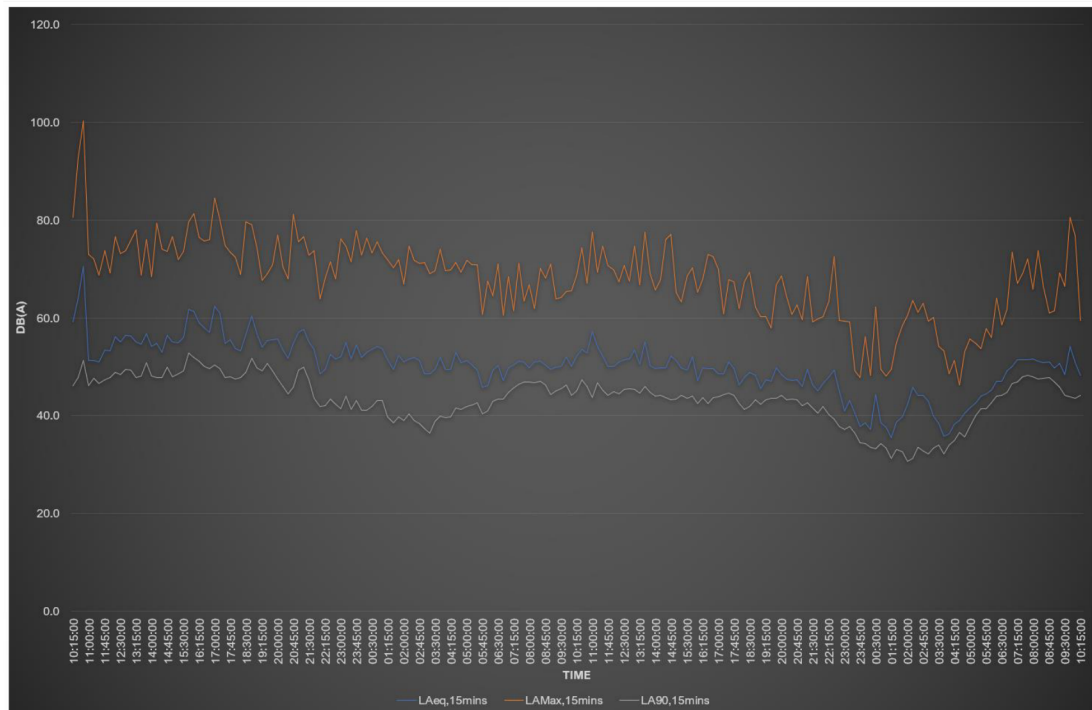


Figure 3: Level vs. time graph showing L_{Max}, L_{Aeq} and L_{A90} sound levels – ML1.

4 SITE NOISE RISK ASSESSMENT

- 4.1.1 In accordance with Pro-PG:2017, a Site Noise Risk Assessment (SNRA) has been carried out. The SNRA assesses the initial risk of noise to have an adverse impact on a proposed development based on the overall measured levels with no mitigation in place.
- 4.1.2 The results of noise measurements undertaken during the daytime and night-time periods are presented in **Table 8**, and have been compared to the information provided on **Figure 1** of Pro-PG:2017.

Table 8: Stage 1 Risk Assessment of Noise Levels					
Monitoring Location	Residential Property Location	Daytime Noise Level (Figures in dB L _{Aeq})	Risk of Adverse Effect	Night-time Noise Level (Figures in dB L _{Aeq})	Risk of Adverse Effect
ML1	Mounted on tripod protruding out of the second floor window at the southwest of corner the development site.	58	Low	51	Low / Medium

- 4.1.3 **Table 8** indicates that during the daytime and night-time periods, proposed receptors of the development are at a '**Low**' to '**Medium**' risk of adverse effect at the development site.
- 4.1.4 ProPG states that:

'At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.'

'As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.'

- 4.1.5 The Site Noise Risk Assessment shows that local noise mitigation and good acoustic design will be required to ensure that the potential risk of the noise impact is minimised, and guideline internal and external noise levels are achieved.

-
- 4.1.6 In accordance with Pro-PG:2017, a Stage 2 full noise assessment, which includes an acoustic design statement, is required to ensure future residents are protected and a good acoustic design has been implemented.

5 NOISE IMPACT ASSESSMENT

5.1.1 The results of the Pro-PG:2017 Stage 1: Initial Site Noise Risk Assessment shows that receptors at the proposed development are likely to be at '**Low**' to '**Medium**' risk of experiencing an adverse noise impact, with no mitigation in place. Therefore, an assessment against the criteria in WHO, BS 8233:2014 has been undertaken with reference to the general sound levels at the site.

5.1.2 This section forms the Stage 2 Acoustic Design Statement of Pro-PG:2017.

5.2 3D Sound Model

5.2.1 A 3D sound model has been constructed in SoundPLAN™ to calculate the predicted sound pressure levels at selected potential receiver facades. The model uses the calculation method from ISO 9613-2:1996⁷ to account for the distance between the source and receiver and any screening or reflections provided by the surrounding buildings. The model is based on and calibrated against data collected during the survey presented in Section 3.2 of this report.

5.2.2 The 3D noise model specifically includes the following noise sources:

- **Road traffic noise breakout from Arthur Street, George Street and King Street**
– these roads were modelled as line sources at a height of 0.5 m from ground level and calibrated to daytime site measurement at ML1 of 58.4 dB $L_{Aeq,16hours}$, night-time measurement of 51.4 dB $L_{Aeq,8hours}$, and night-time measurement of 71.0 dB L_{Amax} . The frequency spectrum adopted for the model was that acquired at ML1.

5.2.3 A noise contour plot illustrating the propagation of the sound from source to receptor during the daytime ($L_{Aeq,16hour}$), night time ($L_{Aeq,8hour}$) and night time L_{Amax} condition is given in Figure 4, Figure 5 and Figure 6 respectively.

⁷ ISO9613-2:1996 "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation"

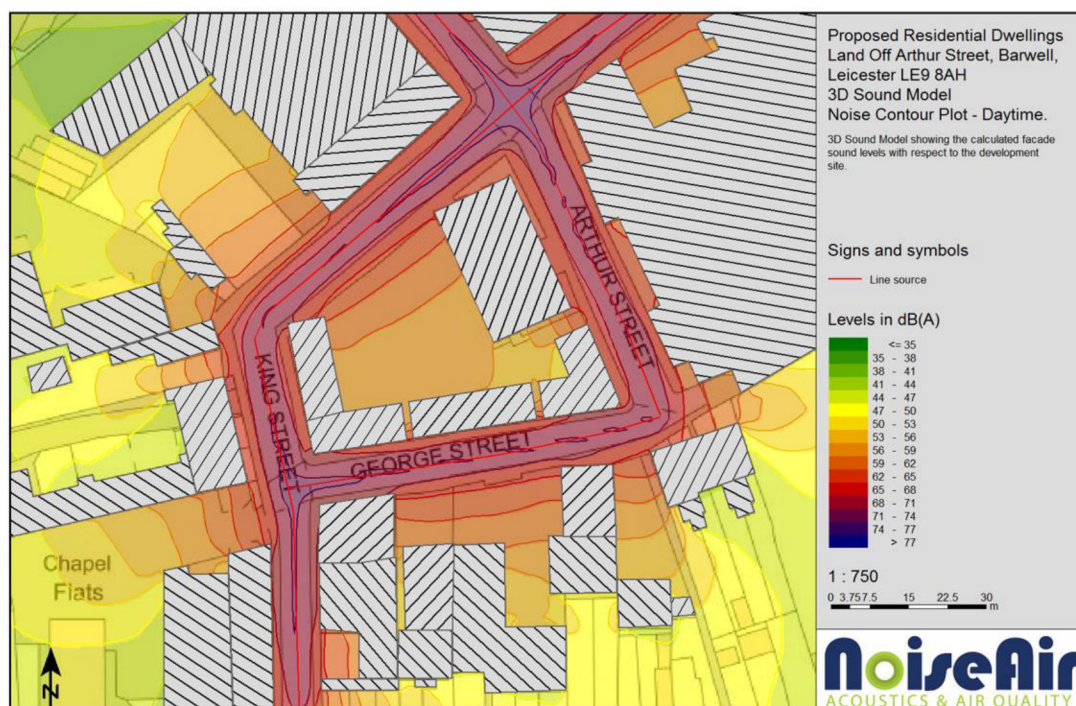


Figure 4: Noise contour plot illustration of the predicted propagation of sound to the proposed development during the daytime – $L_{Aeq,16hour}$.

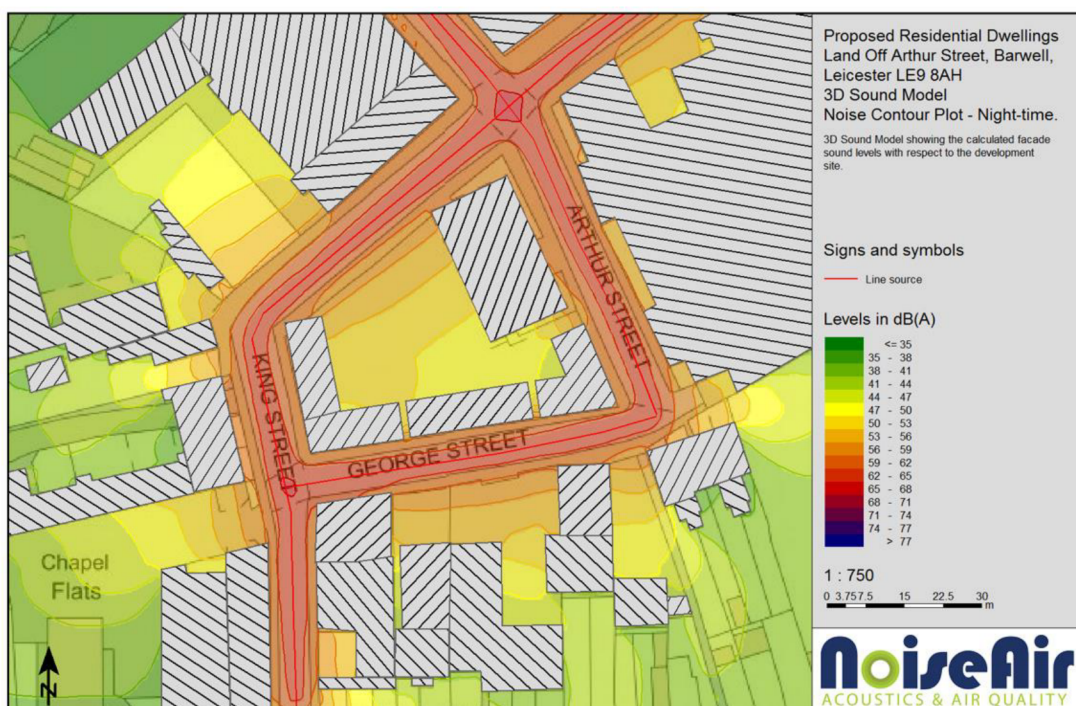


Figure 5: Noise contour plot illustration of the predicted propagation of sound to the proposed development during the night-time – $L_{Aeq,8hour}$.

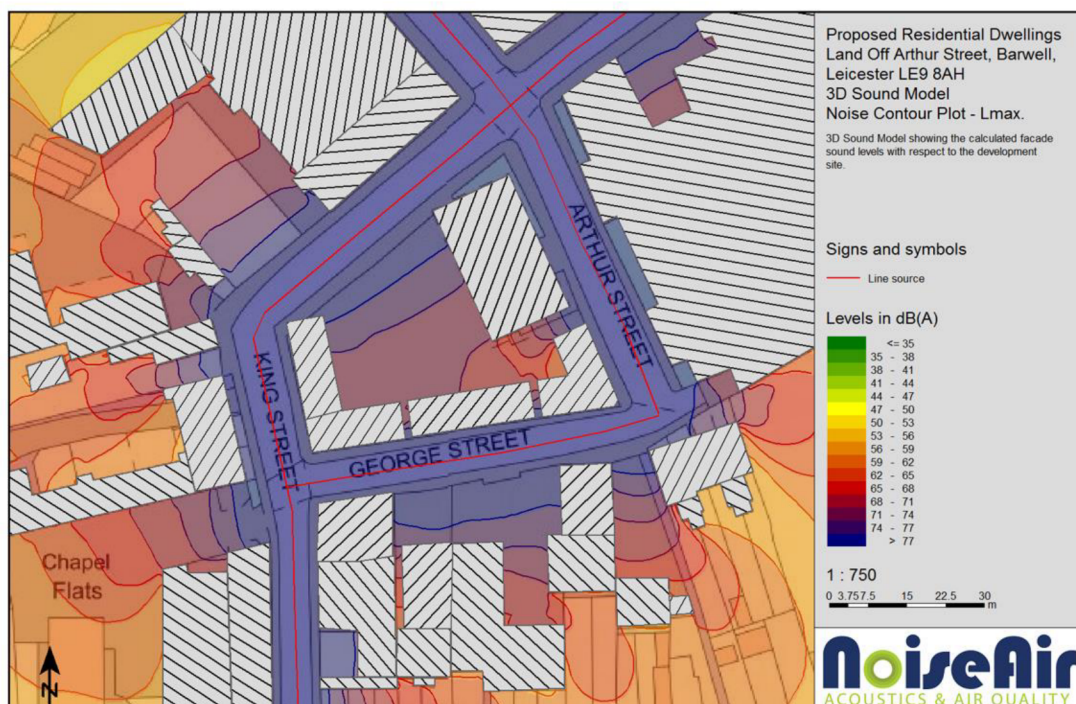


Figure 6 Noise contour plot illustration of the predicted propagation of sound to the proposed development during the night-time – L_{max}.

5.2.4 Receptor locations and calculated façade levels are presented in Figure 7 below.

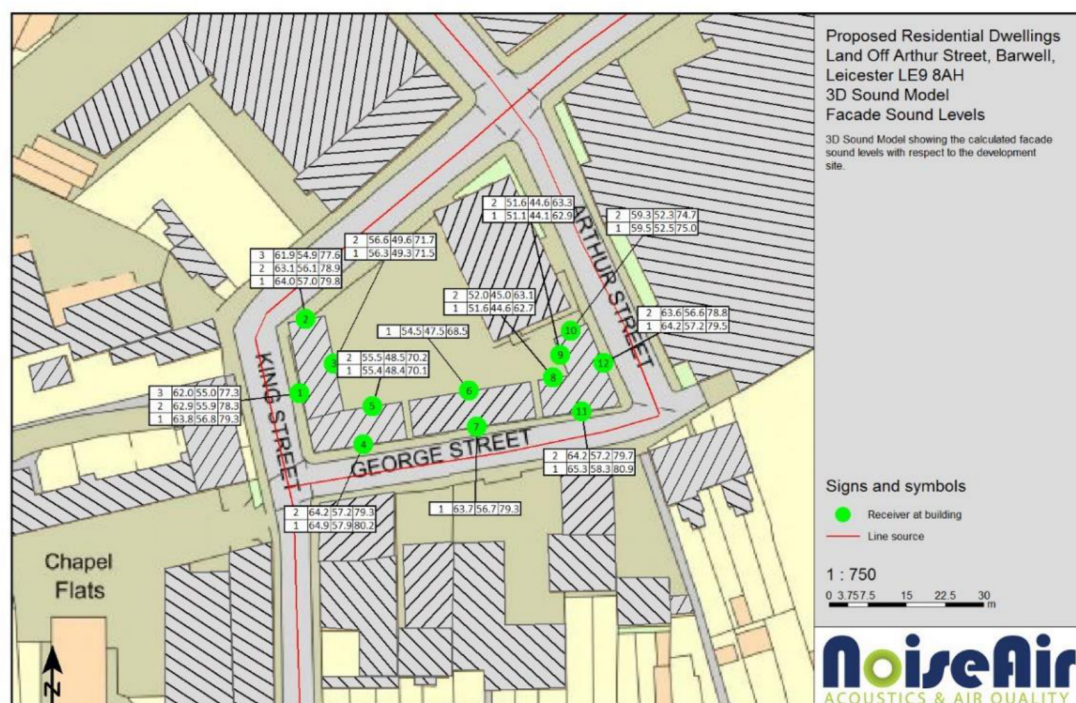


Figure 7: Illustration of the 3D sound model receptor locations and calculated façade levels.

5.2.5 **Table 9** below details the predicted noise levels at each façade receptor location.

Table 9: Predicted Façade Receptor Noise Levels					
Receptor Number	Facade	Floor	dB L _{Aeq,16hours} Daytime	dB L _{Aeq,8hours} Night-Time	dB L _{Amax} , Night
1	West	G.FI	63.8	56.8	79.3
		1.FI	62.9	55.9	78.3
		2.FI	62.0	55.0	77.3
2	North	G.FI	64.0	57.0	79.8
		1.FI	63.1	56.1	78.9
		2.FI	61.9	54.9	77.6
3	East	1.FI	56.3	49.3	71.5
		2.FI	56.6	49.6	71.7
4	South	G.FI	64.9	57.9	80.2
		1.FI	64.2	57.2	79.3
5	North	G.FI	55.4	48.4	70.1
		1.FI	55.5	48.5	70.2
6	North	1.FI	54.5	47.5	68.5
7	South	1.FI	63.7	56.7	79.3
8	South	G.FI	51.6	44.6	62.7
		1.FI	52.0	45.0	63.1
9	South-west	G.FI	51.1	44.1	62.9
		1.FI	51.6	44.6	63.3
10	North-west	G.FI	59.5	52.5	75.0
		1.FI	59.3	52.3	74.7
11	South	G.FI	65.3	58.3	80.9
		1.FI	64.2	57.2	79.7
12	North-east	G.FI	64.2	57.2	79.5
		1.FI	63.6	56.6	78.8

5.3 WHO Assessment of Daytime Noise Levels in Outdoor Living Areas

5.3.1 The proposals at the time of writing do not indicate the requirement for amenity space for future residents at the development site.

5.4 WHO:1999 and BS 8233:2014 Assessment of Daytime Noise Levels in Living Rooms and Bedrooms

- 5.4.1 The predicted noise levels at the façades of the proposed building structures, as detailed in Figure 7 and **Table 9** for the daytime period, together with the level of attenuation required to achieve 35 dB L_{Aeq} in the living room and bedroom areas in accordance with BS 8233:2014 and WHO:1999, are presented in **Table 10** below.

Table 10: Level of Attenuation Required to Achieve the Internal Daytime Noise Guideline Levels (Figures in dB(A))		
Façade	Worst Case Noise Level at the Façade of the Property	Worst Case Level of Attenuation Needed to Achieve 35 dB L_{Aeq} in Living Room and Bedroom Areas
South	65	30
East	57	22
West	64	29
North	64	29
North-east	64	29
North-west	60	25
South-west	52	17

5.5 Assessment of Night-time Noise Levels in Bedrooms

- 5.5.1 The noise levels calculated from the 3D sound model at the façades of the proposed building structures, as detailed in Figure 7 and **Table 9** for the night-time period, together with the level of attenuation required to achieve 30 dB L_{Aeq} and 45 dB $L_{Amax,f}$ in the bedrooms, are summarised in **Table 11**.

Table 11: Level of Attenuation Required to Achieve the Internal Night-time Noise Guideline Levels (Figures in dB(A))			
Façade	Worst Case Noise Level at the Façade of the Property (dB L_{Aeq})	Maximum Noise Level at the Façade of the Property (dB $L_{Amax,f}$)	Worst Case Level of Attenuation Needed to Achieve the Noise Guideline Levels in Bedrooms (dB)
South	58	81	36
East	50	72	27
West	57	79	34
North	57	80	35
North-east	57	80	35
North-west	53	75	30
South-west	45	63	18

6 SOUND INSULATION SCHEME

6.1 Building Envelope Requirements – Windows Closed

- 6.1.1 Proposals for the development site at the time of writing outline residential use, specifically in the form of 14 no. dwellings across 2 / 3 floors. The proposed layout is presented on drawings in Appendix C.
- 6.1.2 Noise sensitive rooms at the proposed dwellings are identified on the drawings so the sound insulation scheme will be adopted to meet the following requirements:
- Internal noise levels to not exceed 35 dB L_{Aeq} during the daytime hours in all rooms and 30 dB L_{Aeq} and 45 dB L_{Amax} during the night-time hours in bedrooms.
- 6.1.3 When assessing sound levels in habitable areas of the proposed development, the sound attenuation provided by the overall building facade should be considered. To mitigate sound levels, the composition of the building facade can be designed to provide the level of attenuation required. Glazing is generally the building element which attenuates noise the least, so the proportion of glazing in a building facade is an important consideration when assessing overall sound attenuation. Additionally, any façade penetrations should also be considered such as for ventilation, i.e., trickle ventilation.
- 6.1.4 Due to the nature of the sound ambient in the area, predominantly traffic noise, it is important that the C_{tr} correction is considered when selecting the glazing for this development. **Table 12** and **Table 13** below present a summary of the building envelope performance requirements to all rooms of the developments.

Table 12: Summary of Building Envelope Performance Requirements – Living Room, Dining Room and Bedroom Worse Case (Except Arthur Street east facing bedroom).

Walls	50 R_w+C_{tr}	Typical Example: 100 mm brick exterior wall, 100 mm cavity with 60 mm 10 kg / m ³ fiberglass insulation, 100 mm lightweight concrete block / breeze block and two layers of plasterboard.
Glazing	39 R_w+C_{tr}	Typical Example: Double glazed unit consisting of 10.0 mm Optiphon pane, 20.0 mm argon cavity and 8.8 mm Optiphon pane ⁸ .
Roof	47 R_w+C_{tr}	Typical Example: Tiles on felt pitched roof, lath, and plaster ceiling.
Acoustic Vent	39 $D_{ne,w}+C_{tr}$ (Up to 2 no. trickle vents per room)	Typical Example – Titon TA5225 (V75) + TA5204 (C50) 2500EA internal controllable trickle ventilator. Other supplier may be used, must achieve minimum 39 $D_{ne,w}+C_{tr}$ when open.
NOTE: Where an active ventilation system is opted for (i.e., MVHR), the glazing specification can be relaxed to a worse case at the façade of 30 dB R_w+C_{tr} .		

⁸ Glazing acoustic values are based on those presented in BS 12758:2011. Specialist glazing advice should be sought.

Table 13: Summary of Building Envelope Performance Requirements –Bedroom Worse Case (Arthur Street east facing bedroom).

Walls	50 R_w+C_{tr}	Typical Example: 100 mm brick exterior wall, 100 mm cavity with 60 mm 10 kg / m ³ fiberglass insulation, 100 mm lightweight concrete block / breeze block and two layers of plasterboard.
Glazing	35 R_w+C_{tr}	Typical Example: Double glazed unit consisting of 6.0 mm Optiphon pane, 16.0 mm argon cavity and 8.8 mm Optiphon pane ⁹ .
Roof	47 R_w+C_{tr}	Typical Example: Tiles on felt pitched roof, lath, and plaster ceiling.
Acoustic Vent	52 $D_{ne,w}+C_{tr}$ (Up to 2 no. trickle vents per room)	Typical Example – Greenwood MA3051 internal controllable trickle ventilator. Other supplier may be used, must achieve minimum 52 $D_{ne,w}+C_{tr}$ when open.
NOTE: Where an active ventilation system is opted for (i.e., MVHR), the glazing specification can be relaxed to a worse case at the façade of 34 dB R_w+C_{tr} .		

6.2 Building Envelope Performance – Windows Open

- 6.2.1 The sound performance requirements for bedrooms, living and dining rooms at the development during the daytime and night-time in rooms with windows closed are summarised in Section 6.1.
- 6.2.2 However, with windows open, the attenuation provided by the façade will be approximately 10-15 dB(A). This would potentially allow the recommended internal noise limit to be exceeded in some rooms at the development during certain parts of a typical day / night.
- 6.2.3 **Table 14** shows the level of exceedance for partially open windows at all facades of the development site.

Table 14: Summary of Internal Noise Levels with Windows Partially Open (based on a Partially Open Window Providing up to 15 dB(A) Attenuation).

Façade	Day / Night	Yes / No	Excess (dB)
South	Day	Yes	15
	Night	No	21
East	Day	Yes	7
	Night	Yes	12
West	Day	Yes	14

⁹ Glazing acoustic values are based on those presented in BS 12758:2011. Specialist glazing advice should be sought.

Table 14: Summary of Internal Noise Levels with Windows Partially Open (based on a Partially Open Window Providing up to 15 dB(A) Attenuation).

Façade	Day / Night	Yes / No	Excess (dB)
	Night	No	19
North	Day	Yes	14
	Night	No	20
North-east	Day	Yes	14
	Night	No	20
North-west	Day	Yes	10
	Night	Yes	15
South-west	Day	Yes	2
	Night	Yes	3
*Worst case exceedance is due to LAFMax events.			

6.2.4 It is considered that in many circumstances, such as urban / sub-urban developments, an exceedance of up to 5 dB(A) in accordance with BS 8233:2014 is likely to be acceptable to future residents and therefore is unlikely to breach the LOEL criteria discussed in Section 2 of this report.

6.2.5 Where exceedances are likely to be greater than +5 dB, on occasions, this may be acceptable to a resident, but when quiet conditions are required, the resident should be able to close the windows whilst maintaining adequate ventilation. Some form of acoustic ventilation would therefore need to be installed in the dwelling located at the site, ventilation is to be designed by others.

6.3 Ventilation Requirements

6.3.1 It is recommended that the acoustic ventilation proposed at the site should, as a minimum, comply with Building Regulations 2000 Approved Document F1 Means of Ventilation and British Standard BS 5925 1991: "Code of Practice for Ventilation Principles and Designing for Natural Ventilation". Acoustic ventilation is only recommended for noise sensitive rooms, which are bedrooms and living / dining rooms.

6.3.2 As detailed in Section 6.2 it is likely that noise levels in noise sensitive rooms within some of the proposed dwellings will likely rely on the windows being in the closed position and therefore appropriate ventilation design should be completed. It is likely that either a passive

or active ventilation system can be adopted at the development site, however it should be noted that ventilation requirements for future occupants of the proposed development are outside the scope of this report.

- 6.3.3 Where a passive ventilation system is incorporated into the design, ventilators should be acoustically treated for habitable rooms to all facades, this would ensure that the required internal daytime and night-time noise limits are achieved.
- 6.3.4 Where an active ventilation system is to be adopted at the development site by the client, such as an MVHR system, and there are to be no trickle ventilators installed, the acoustic requirement of the glazing may be reduced. Any mechanical ventilation adopted for the noise sensitive rooms should have a noise output which complies with NR25 L_{eq} noise rating curve.

7 CONCLUSIONS

- 7.1.1 NoiseAir has carried out a noise impact assessment with respect to the proposed residential development to be located at Arthur Street, Barwell, Leicester LE9 8AH.
- 7.1.2 At the time of writing, the client is proposing to develop 14 residential apartments over 2 / 3 floors with additional car parking area.
- 7.1.3 The noise sources assessed as part of the NIA are:
- Road traffic noise from Arthur Street;
 - Road traffic noise from King Street; and,
 - Road traffic noise from George Street.
- 7.1.4 The results of the noise survey and initial site noise risk assessment show that areas of the development have a 'Low' to 'Medium' Risk of adverse effect in accordance with Pro-PG:2017 without mitigation.
- 7.1.5 Building performance requirements with windows closed are based around two design categories as presented in **Table 12** and **Table 13** of this report.
- 7.1.6 With windows open, the recommended internal noise limit is likely to be exceeded in some habitable rooms at the development site. On occasions, this may be acceptable to a resident, but when quiet conditions are required, the resident should be able to close the windows whilst maintaining adequate ventilation.
- 7.1.7 Some form of ventilation has been recommended for the development site. The recommendations provided show that with the option of installing passive ventilation, the internal levels meet the requirements given in BS 8233:2014. **Table 12** and **Table 13** does however provide options for both passive and active ventilation as follows:
- All rooms with the exception of Arthur Street east facing bedroom, installation of glazing offering attenuation of no less than $39 R_w + C_{tr}$
 - All rooms with the exception of Arthur Street east facing bedroom, installation of acoustic trickle vents offering attenuation of no less than $39 D_{ne,w} + C_{tr}$
 - Where active ventilation is opted for in the above rooms, the glazing specification can be relaxed to offer attenuation of no less than $30 \text{ dB } R_w + C_{tr}$.
 - Arthur Street east facing bedroom, installation of glazing offering attenuation of no less than $35 R_w + C_{tr}$
 - Arthur Street east facing bedroom, installation of acoustic trickle vents offering attenuation of no less than $52 D_{ne,w} + C_{tr}$

-
- Where active ventilation is opted for in the Arthur Street bedroom, the glazing specification can be relaxed to offer attenuation of no less than 34 dB R_w+C_{tr} .

APPENDIX A - REPORT LIMITATIONS

This Report is presented to Nova Crowd Limited and may not be used or relied on by any other person or by the client in relation to any other matters not covered specifically by the scope of this report.

Notwithstanding anything to the contrary contained in the report, NoiseAir Limited is obliged to exercise reasonable skill, care and diligence in the performance of the services required by Nova Crowd Limited and NoiseAir shall not be liable except to the extent that it has failed to exercise reasonable skill, care and diligence, and this report shall be read and construed accordingly.

This report has been prepared by NoiseAir Limited. No individual is personally liable in connection with the preparation of this report. By receiving this report and acting on it, the client or any other person accepts that no individual is personally liable whether in contract, tort, for breach of statutory duty or otherwise.

The conclusions and recommendations contained in this report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from who it has been requested and that such information is accurate. Information obtained by NoiseAir Limited has not been independently verified by NoiseAir Limited unless otherwise stated in the report and should be treated accordingly.

Where assessments of works or costs identified in this report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

Where / if estimates and projects are made within this report, are made based on reasonable assumptions as of the date of this report, such statements however by their very nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. NoiseAir Limited specifically does not guarantee or warrant any estimates or projects contained in this report.

DISCLAIMER- This report was prepared by NoiseAir Limited. The material in it contains NoiseAir Limited best judgment in light of the information available at the time of preparation of this report. Any use which a third party makes of this report, or any reliance on, or decisions based on it are the responsibility of such third parties. NoiseAir Limited accept no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

APPENDIX B – METER READINGS

ML1

Start Date	Start Time	Duration	LAeq	LAFMax	LA90
dd/mm/yyyy	hh:mm:ss	hh:mm:ss	dB	dB	dB
05/10/2021	10:15:00	00:15:00	59.1	80.6	46.1
05/10/2021	10:30:00	00:15:00	64.1	92.8	47.8
05/10/2021	10:45:00	00:15:00	70.6	100.3	51.3
05/10/2021	11:00:00	00:15:00	51.2	73.0	46.1
05/10/2021	11:15:00	00:15:00	51.3	72.1	47.6
05/10/2021	11:30:00	00:15:00	51.0	68.8	46.5
05/10/2021	11:45:00	00:15:00	53.4	73.7	47.3
05/10/2021	12:00:00	00:15:00	53.2	69.2	47.8
05/10/2021	12:15:00	00:15:00	56.2	76.7	48.9
05/10/2021	12:30:00	00:15:00	55.0	73.1	48.4
05/10/2021	12:45:00	00:15:00	56.4	73.7	49.5
05/10/2021	13:00:00	00:15:00	56.3	75.9	49.3
05/10/2021	13:15:00	00:15:00	55.1	78.0	47.8
05/10/2021	13:30:00	00:15:00	54.6	68.8	48.1
05/10/2021	13:45:00	00:15:00	56.7	76.1	50.8
05/10/2021	14:00:00	00:15:00	54.1	68.5	48.1
05/10/2021	14:15:00	00:15:00	54.7	79.3	47.8
05/10/2021	14:30:00	00:15:00	52.9	74.0	47.8
05/10/2021	14:45:00	00:15:00	56.5	73.6	49.9
05/10/2021	15:00:00	00:15:00	55.0	76.7	48.0
05/10/2021	15:15:00	00:15:00	54.9	71.9	48.6
05/10/2021	15:30:00	00:15:00	56.0	73.6	49.2
05/10/2021	15:45:00	00:15:00	61.7	79.7	52.8
05/10/2021	16:00:00	00:15:00	61.3	81.4	51.9
05/10/2021	16:15:00	00:15:00	59.0	76.5	51.1
05/10/2021	16:30:00	00:15:00	57.9	75.7	50.1
05/10/2021	16:45:00	00:15:00	57.0	76.1	49.6
05/10/2021	17:00:00	00:15:00	62.3	84.6	50.4
05/10/2021	17:15:00	00:15:00	61.0	80.1	49.6
05/10/2021	17:30:00	00:15:00	54.7	74.8	47.8
05/10/2021	17:45:00	00:15:00	55.5	73.4	48.0
05/10/2021	18:00:00	00:15:00	53.7	72.4	47.5
05/10/2021	18:15:00	00:15:00	53.2	68.9	47.8
05/10/2021	18:30:00	00:15:00	56.6	79.7	48.9
05/10/2021	18:45:00	00:15:00	60.4	79.0	51.8
05/10/2021	19:00:00	00:15:00	56.8	74.4	49.8
05/10/2021	19:15:00	00:15:00	54.0	67.7	49.1
05/10/2021	19:30:00	00:15:00	55.3	69.0	50.7
05/10/2021	19:45:00	00:15:00	55.5	70.9	49.2
05/10/2021	20:00:00	00:15:00	55.7	77.0	47.5
05/10/2021	20:15:00	00:15:00	53.4	70.4	46.0
05/10/2021	20:30:00	00:15:00	51.8	68.0	44.4
05/10/2021	20:45:00	00:15:00	54.8	81.2	45.8
05/10/2021	21:00:00	00:15:00	57.0	75.6	49.3
05/10/2021	21:15:00	00:15:00	57.6	76.7	49.9
05/10/2021	21:30:00	00:15:00	55.1	72.8	47.4

Start Date	Start Time	Duration	LAeq	LAFMax	LA90
dd/mm/yyyy	hh:mm:ss	hh:mm:ss	dB	dB	dB
05/10/2021	21:45:00	00:15:00	53.5	73.8	43.6
05/10/2021	22:00:00	00:15:00	48.6	63.9	41.9
05/10/2021	22:15:00	00:15:00	49.5	68.1	42.0
05/10/2021	22:30:00	00:15:00	52.5	71.5	43.4
05/10/2021	22:45:00	00:15:00	51.6	68.0	42.3
05/10/2021	23:00:00	00:15:00	52.1	76.2	41.4
05/10/2021	23:15:00	00:15:00	54.9	74.7	44.0
05/10/2021	23:30:00	00:15:00	51.6	71.5	41.3
05/10/2021	23:45:00	00:15:00	54.4	77.9	43.0
06/10/2021	00:00:00	00:15:00	51.9	72.9	41.1
06/10/2021	00:15:00	00:15:00	52.9	76.4	41.1
06/10/2021	00:30:00	00:15:00	53.5	73.3	41.9
06/10/2021	00:45:00	00:15:00	54.2	75.6	43.0
06/10/2021	01:00:00	00:15:00	53.7	73.3	43.0
06/10/2021	01:15:00	00:15:00	51.4	71.9	39.8
06/10/2021	01:30:00	00:15:00	49.4	70.3	38.5
06/10/2021	01:45:00	00:15:00	52.3	71.9	39.7
06/10/2021	02:00:00	00:15:00	50.9	66.9	39.0
06/10/2021	02:15:00	00:15:00	51.6	74.7	40.3
06/10/2021	02:30:00	00:15:00	51.9	71.8	38.9
06/10/2021	02:45:00	00:15:00	51.2	71.1	38.3
06/10/2021	03:00:00	00:15:00	48.6	71.3	37.3
06/10/2021	03:15:00	00:15:00	48.6	69.0	36.4
06/10/2021	03:30:00	00:15:00	49.4	69.6	38.8
06/10/2021	03:45:00	00:15:00	51.9	74.1	39.9
06/10/2021	04:00:00	00:15:00	49.5	69.6	39.6
06/10/2021	04:15:00	00:15:00	49.4	69.8	39.7
06/10/2021	04:30:00	00:15:00	53.0	71.3	41.6
06/10/2021	04:45:00	00:15:00	50.8	69.3	41.2
06/10/2021	05:00:00	00:15:00	51.2	71.8	41.9
06/10/2021	05:15:00	00:15:00	50.3	70.8	42.1
06/10/2021	05:30:00	00:15:00	49.3	70.8	42.6
06/10/2021	05:45:00	00:15:00	45.8	60.7	40.3
06/10/2021	06:00:00	00:15:00	46.1	67.6	41.0
06/10/2021	06:15:00	00:15:00	49.3	64.5	42.9
06/10/2021	06:30:00	00:15:00	50.2	71.0	43.4
06/10/2021	06:45:00	00:15:00	47.1	60.5	43.4
06/10/2021	07:00:00	00:15:00	49.7	68.5	44.8
06/10/2021	07:15:00	00:15:00	50.3	61.4	45.7
06/10/2021	07:30:00	00:15:00	51.1	71.1	46.4
06/10/2021	07:45:00	00:15:00	50.9	63.5	46.9
06/10/2021	08:00:00	00:15:00	49.8	66.7	46.9
06/10/2021	08:15:00	00:15:00	50.9	61.9	46.7
06/10/2021	08:30:00	00:15:00	51.1	70.1	47.0
06/10/2021	08:45:00	00:15:00	50.3	68.1	46.3
06/10/2021	09:00:00	00:15:00	49.5	71.0	44.3
06/10/2021	09:15:00	00:15:00	49.9	63.9	45.1
06/10/2021	09:30:00	00:15:00	50.1	64.2	45.5
06/10/2021	09:45:00	00:15:00	52.0	65.4	46.2

Start Date	Start Time	Duration	LAeq	LAFMax	LA90
dd/mm/yyyy	hh:mm:ss	hh:mm:ss	dB	dB	dB
06/10/2021	10:00:00	00:15:00	50.1	65.6	44.1
06/10/2021	10:15:00	00:15:00	52.2	68.8	45.1
06/10/2021	10:30:00	00:15:00	53.5	74.3	47.3
06/10/2021	10:45:00	00:15:00	52.8	67.0	46.0
06/10/2021	11:00:00	00:15:00	57.2	77.5	43.7
06/10/2021	11:15:00	00:15:00	54.1	69.4	46.7
06/10/2021	11:30:00	00:15:00	52.2	74.6	45.2
06/10/2021	11:45:00	00:15:00	50.0	70.7	44.2
06/10/2021	12:00:00	00:15:00	50.1	69.8	44.9
06/10/2021	12:15:00	00:15:00	50.9	67.3	44.5
06/10/2021	12:30:00	00:15:00	51.4	70.7	45.3
06/10/2021	12:45:00	00:15:00	51.6	67.6	45.5
06/10/2021	13:00:00	00:15:00	53.4	74.6	45.3
06/10/2021	13:15:00	00:15:00	50.5	66.7	44.6
06/10/2021	13:30:00	00:15:00	55.0	77.5	45.9
06/10/2021	13:45:00	00:15:00	50.2	69.1	44.8
06/10/2021	14:00:00	00:15:00	49.6	65.7	44.0
06/10/2021	14:15:00	00:15:00	49.8	67.9	44.2
06/10/2021	14:30:00	00:15:00	49.8	76.1	43.7
06/10/2021	14:45:00	00:15:00	52.2	77.1	43.3
06/10/2021	15:00:00	00:15:00	51.2	65.2	43.4
06/10/2021	15:15:00	00:15:00	49.8	63.2	44.1
06/10/2021	15:30:00	00:15:00	49.3	68.6	43.5
06/10/2021	15:45:00	00:15:00	52.1	70.2	44.0
06/10/2021	16:00:00	00:15:00	47.2	65.2	42.5
06/10/2021	16:15:00	00:15:00	49.7	68.0	43.7
06/10/2021	16:30:00	00:15:00	49.6	73.0	42.5
06/10/2021	16:45:00	00:15:00	49.6	72.6	43.7
06/10/2021	17:00:00	00:15:00	48.5	69.9	43.8
06/10/2021	17:15:00	00:15:00	48.6	60.8	44.3
06/10/2021	17:30:00	00:15:00	50.9	67.9	44.6
06/10/2021	17:45:00	00:15:00	49.6	67.4	44.2
06/10/2021	18:00:00	00:15:00	46.3	61.9	42.5
06/10/2021	18:15:00	00:15:00	47.8	67.3	41.3
06/10/2021	18:30:00	00:15:00	48.9	69.4	41.9
06/10/2021	18:45:00	00:15:00	48.3	62.2	43.2
06/10/2021	19:00:00	00:15:00	45.5	60.3	42.3
06/10/2021	19:15:00	00:15:00	47.4	60.2	43.3
06/10/2021	19:30:00	00:15:00	47.0	57.9	43.5
06/10/2021	19:45:00	00:15:00	49.7	66.7	43.5
06/10/2021	20:00:00	00:15:00	48.4	68.6	44.2
06/10/2021	20:15:00	00:15:00	47.5	64.3	43.3
06/10/2021	20:30:00	00:15:00	47.1	60.7	43.4
06/10/2021	20:45:00	00:15:00	47.4	62.6	43.2
06/10/2021	21:00:00	00:15:00	46.0	59.6	42.0
06/10/2021	21:15:00	00:15:00	49.4	68.5	42.6
06/10/2021	21:30:00	00:15:00	46.2	59.1	41.6
06/10/2021	21:45:00	00:15:00	45.0	59.8	40.5
06/10/2021	22:00:00	00:15:00	46.6	60.3	41.8

Start Date	Start Time	Duration	LAeq	LAFMax	LA90
dd/mm/yyyy	hh:mm:ss	hh:mm:ss	dB	dB	dB
06/10/2021	22:15:00	00:15:00	48.0	63.5	40.2
06/10/2021	22:30:00	00:15:00	49.3	72.5	39.3
06/10/2021	22:45:00	00:15:00	45.1	59.5	37.8
06/10/2021	23:00:00	00:15:00	40.9	59.3	37.1
06/10/2021	23:15:00	00:15:00	43.0	59.2	37.7
06/10/2021	23:30:00	00:15:00	40.5	49.1	36.4
06/10/2021	23:45:00	00:15:00	37.8	47.8	34.4
07/10/2021	00:00:00	00:15:00	38.5	56.2	34.3
07/10/2021	00:15:00	00:15:00	37.1	48.3	33.5
07/10/2021	00:30:00	00:15:00	44.3	62.2	33.2
07/10/2021	00:45:00	00:15:00	38.5	49.4	34.3
07/10/2021	01:00:00	00:15:00	37.6	48.1	33.3
07/10/2021	01:15:00	00:15:00	35.5	49.5	31.3
07/10/2021	01:30:00	00:15:00	38.6	54.9	33.0
07/10/2021	01:45:00	00:15:00	39.7	58.4	32.6
07/10/2021	02:00:00	00:15:00	42.3	60.5	30.6
07/10/2021	02:15:00	00:15:00	45.8	63.6	31.2
07/10/2021	02:30:00	00:15:00	44.2	61.1	33.5
07/10/2021	02:45:00	00:15:00	44.2	62.9	32.8
07/10/2021	03:00:00	00:15:00	42.9	59.4	32.2
07/10/2021	03:15:00	00:15:00	39.9	60.1	33.3
07/10/2021	03:30:00	00:15:00	38.4	54.1	33.9
07/10/2021	03:45:00	00:15:00	35.8	53.3	32.2
07/10/2021	04:00:00	00:15:00	36.2	48.6	34.0
07/10/2021	04:15:00	00:15:00	38.2	51.3	34.9
07/10/2021	04:30:00	00:15:00	38.9	46.3	36.5
07/10/2021	04:45:00	00:15:00	40.5	53.1	35.7
07/10/2021	05:00:00	00:15:00	41.5	55.7	37.7
07/10/2021	05:15:00	00:15:00	42.6	54.8	40.1
07/10/2021	05:30:00	00:15:00	44.0	53.7	41.4
07/10/2021	05:45:00	00:15:00	44.4	57.8	41.4
07/10/2021	06:00:00	00:15:00	45.2	56.0	42.6
07/10/2021	06:15:00	00:15:00	47.0	64.0	44.0
07/10/2021	06:30:00	00:15:00	47.0	58.6	44.2
07/10/2021	06:45:00	00:15:00	49.2	61.8	44.7
07/10/2021	07:00:00	00:15:00	50.0	73.4	46.5
07/10/2021	07:15:00	00:15:00	51.5	67.1	46.9
07/10/2021	07:30:00	00:15:00	51.4	69.0	48.0
07/10/2021	07:45:00	00:15:00	51.5	72.1	48.3
07/10/2021	08:00:00	00:15:00	51.6	65.8	48.0
07/10/2021	08:15:00	00:15:00	51.1	73.8	47.5
07/10/2021	08:30:00	00:15:00	50.8	66.5	47.7
07/10/2021	08:45:00	00:15:00	51.0	61.0	47.8
07/10/2021	09:00:00	00:15:00	49.8	61.5	46.9
07/10/2021	09:15:00	00:15:00	50.7	69.2	45.8
07/10/2021	09:30:00	00:15:00	48.4	66.5	44.1
07/10/2021	09:45:00	00:15:00	54.2	80.6	43.9
07/10/2021	10:00:00	00:15:00	50.8	76.8	43.6
07/10/2021	10:15:00	00:15:00	48.2	59.5	44.2

APPENDIX C – CLIENT PROPOSAL DRAWINGS

APPENDIX D – BS 12354-3:2000 CALCULATIONS

King Street West living room / Arthur Street Phase 2 Development											
Room type:		Living room PR, GR, HOS				Ground area:		23.20 m²			
L2,nT valid:		35.0 dB				L2,nT existent / improved:		29.9 / 29.9 dB			
West facade											
						Area:		9.60 m²			
						L2,nTi existent / improved:		28.9 / 28.9 dB			
Assessment level Day:						64.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						64.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	8.32	50	-	Wall	1	8.32	50	-	-
2	Window	1	1.18	32	-	Window	1	1.18	32	-	-
3	passive vent	1	0.10	-	32	passive vent	1	0.10	-	32	-
East Facade											
						Area:		17.10 m²			
						L2,nTi existent / improved:		22.0 / 22.0 dB			
Assessment level Day:						57.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						57.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	15.57	50	-	Wall	1	15.57	50	-	-
2	Window	1	1.43	32	-	Window	1	1.43	32	-	-
3	passive vent	1	0.10	-	32	passive vent	1	0.10	-	32	-
roof											
						Area:		23.20 m²			
						L2,nTi existent / improved:		17.0 / 17.0 dB			
Assessment level Day:						64.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						64.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	roof	1	23.20	47	-	roof	1	23.20	47	-	-

King Street West bedroom / Arthur Street Phase 2 Development											
Room type:		Sleeping room PR, GR, HOS				Ground area:		16.60 m²			
L2,nT valid:		30.0 dB				L2,nTi existent / improved:		18.1 / 17.8 dB			
West Facade											
Facade geometry:						3.60 m x 3.00 m = 10.80 m²					
L2,nTi existent / improved:						16.7 / 16.7 dB					
Assessment level Day:						57.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						57.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	9.27	50	-	= Wall	1	9.27	50	-	-
2	Window	1	1.43	39	-	= Window	1	1.43	39	-	-
3	wall vent	1	0.10	-	39	= wall vent	1	0.10	-	39	-
roof											
Area:						16.60 m²					
L2,nTi existent / improved:						10.0 / 7.0 dB					
Assessment level Day:						57.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						57.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	roof	1	16.60	47	-	= roof	1	16.60	50	-	-
East Facade											
Area:						7.20 m²					
L2,nTi existent / improved:						9.5 / 9.5 dB					
Assessment level Day:						50.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						50.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	5.90	50	-	= Wall	1	5.90	50	-	-
2	Window	1	1.20	39	-	= Window	1	1.20	39	-	-
3	Passive vent	1	0.10	-	39	= Passive vent	1	0.10	-	39	-

King Street West bed max / Arthur Street Phase 2 Development											
Room type:		Sleeping room others				Ground area:		16.60 m²			
L2,nT valid:		45.0 dB				L2,nT existent / improved:		40.1 / 40.1 dB			
West Facade											
						Area:		10.80 m²			
						L2,nTi existent / improved:		38.7 / 38.7 dB			
Assessment level Day:						79.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						79.0 dB					
ser. No.	Component existent	Count	Area (m²)	R'w (dB)	Dn,e (dB)	Component improved	Count	Area (m²)	R'w (dB)	Dn,e (dB)	Fan
1	Wall	1	9.27	50	-	= Wall	1	9.27	50	-	-
2	Window	1	1.43	39	-	= Window	1	1.43	39	-	-
3	passive wall vent	1	0.10	-	39	= passive wall vent	1	0.10	-	39	-
roof											
						Area:		16.60 m²			
						L2,nTi existent / improved:		32.0 / 32.0 dB			
Assessment level Day:						79.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						79.0 dB					
ser. No.	Component existent	Count	Area (m²)	R'w (dB)	Dn,e (dB)	Component improved	Count	Area (m²)	R'w (dB)	Dn,e (dB)	Fan
1	roof	1	16.60	47	-	= roof	1	16.60	47	-	-
East Facade											
						Area:		7.20 m²			
						L2,nTi existent / improved:		31.5 / 31.5 dB			
Assessment level Day:						72.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						72.0 dB					
ser. No.	Component existent	Count	Area (m²)	R'w (dB)	Dn,e (dB)	Component improved	Count	Area (m²)	R'w (dB)	Dn,e (dB)	Fan
1	Wall	1	5.90	50	-	= Wall	1	5.90	50	-	-
2	Window	1	1.20	39	-	= Window	1	1.20	39	-	-
3	Passive vent	1	0.10	-	39	= Passive vent	1	0.10	-	39	-

Corner King Street/George Street Living Room / Arthur Street Phase 2 Development											
Room type:		Living room PR, GR, HOS				Ground area:		23.70 m²			
L2,nT valid:		35.0 dB				L2,nTi existent / improved:		29.8 / 29.8 dB			
West facade											
						Area:		17.64 m²			
						L2,nTi existent / improved:		25.9 / 25.9 dB			
Assessment level Day:						64.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						64.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	16.34	50	-	= Wall	1	16.34	50	-	-
2	Window	1	1.20	35	-	= Window	1	1.20	35	-	-
3	Passive vent	1	0.10	-	35	= Passive vent	1	0.10	-	35	-
South Facade											
						Area:		14.87 m²			
						L2,nTi existent / improved:		27.0 / 27.0 dB			
Assessment level Day:						65.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						65.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	13.40	50	-	= Wall	1	13.40	50	-	-
2	Window	1	1.37	35	-	= Window	1	1.37	35	-	-
3	Passive vent	1	0.10	-	35	= Passive vent	1	0.10	-	35	-
Roof											
						Area:		23.70 m²			
						L2,nTi existent / improved:		18.0 / 18.0 dB			
Assessment level Day:						65.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						65.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	roof	1	23.70	47	-	= Wall	1	23.70	47	-	-

george street living room / Arthur Street Phase 2 Development

Room type:	Living room PR, GR, HOS	Ground area:	23.28 m²								
L2,nT valid:	35.0 dB	L2,nT existent / improved:	30.1 / 30.1 dB								
north facade											
		Area:	13.20 m²								
		L2,nTi existent / improved:	20.1 / 20.1 dB								
Assessment level Day:		55.0 dB(A)									
Correction for facade structure by EN 12354-3		0.0 dB									
Correction by user:		0.0 dB									
Exterior level:		55.0 dB									
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	11.26	50	-	= Wall	1	11.26	50	-	-
2	Window	1	1.84	32	-	= Window	1	1.84	32	-	-
3	passive vent	1	0.10	-	32	= passive vent	1	0.10	-	32	-
south facade											
		Area:		13.80 m²							
		L2,nTi existent / improved:		29.3 / 29.3 dB							
Assessment level Day:		64.0 dB(A)									
Correction for facade structure by EN 12354-3		0.0 dB									
Correction by user:		0.0 dB									
Exterior level:		64.0 dB									
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	11.26	50	-	= Wall	1	11.26	50	-	-
2	Window	1	2.44	32	-	= Window	1	2.44	32	-	-
3	passive vent	1	0.10	-	32	= passive vent	1	0.10	-	32	-
roof											
		Area:		23.28 m²							
		L2,nTi existent / improved:		17.0 / 17.0 dB							
Assessment level Day:		64.0 dB(A)									
Correction for facade structure by EN 12354-3		0.0 dB									
Correction by user:		0.0 dB									
Exterior level:		64.0 dB									
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	roof	1	23.28	47	-	= Wall	1	23.28	47	-	-

bedroom george street / Arthur Street Phase 2 Development											
Room type:		Sleeping room PR, GR, HOS				Ground area:		19.25 m²			
L2,nT valid:		30.0 dB				L2,nT existent / improved:		18.1 / 18.1 dB			
north facade											
						Area:		10.50 m²			
						L2,nTi existent / improved:		7.9 / 7.9 dB			
Assessment level Day:						48.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						48.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	9.20	50	-	= Wall	1	9.20	50	-	-
2	Window	1	1.20	38	-	= Window	1	1.20	38	-	-
3	passive vent	1	0.10	-	38	= passive vent	1	0.10	-	38	-
south facade											
						Area:		10.50 m²			
						L2,nTi existent / improved:		16.9 / 16.9 dB			
Assessment level Day:						57.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						57.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	9.18	50	-	= Wall	1	9.18	50	-	-
2	Window	1	1.22	38	-	= Window	1	1.22	38	-	-
3	passive vent	1	0.10	-	38	= passive vent	1	0.10	-	38	-
roof											
						Area:		19.25 m²			
						L2,nTi existent / improved:		10.0 / 10.0 dB			
Assessment level Day:						57.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						57.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	roof	1	19.25	47	-	= roof	1	19.25	47	-	-

bedroom george street max / Arthur Street Phase 2 Development											
Room type:		Sleeping room others				Ground area:		19.25 m²			
L2,nT valid:		45.0 dB				L2,nT existent / improved:		39.7 / 39.7 dB			
north facade											
						Area:		10.50 m²			
						L2,nTi existent / improved:		28.9 / 28.9 dB			
Assessment level Day:						69.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						69.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	9.20	50	-	= Wall	1	9.20	50	-	-
2	Window	1	1.20	38	-	= Window	1	1.20	38	-	-
3	passive vent	1	0.10	-	38	= passive vent	1	0.10	-	38	-
south facade											
						Area:		10.50 m²			
						L2,nTi existent / improved:		38.9 / 38.9 dB			
Assessment level Day:						79.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						79.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	9.18	50	-	= Wall	1	9.18	50	-	-
2	Window	1	1.22	38	-	= Window	1	1.22	38	-	-
3	passive vent	1	0.10	-	38	= passive vent	1	0.10	-	38	-
roof											
						Area:		19.25 m²			
						L2,nTi existent / improved:		29.0 / 29.0 dB			
Assessment level Day:						79.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						79.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	19.25	50	-	= Wall	1	19.25	50	-	-

arthur street living room / Arthur Street Phase 2 Development										
Room type:		Living room PR, GR, HOS				Ground area:		21.24 m²		
L2,nT valid:		35.0 dB				L2,nT existent / improved:		29.9 / 29.9 dB		
west facade										
Facade geometry:						4.03 m x 3.00 m = 12.11 m²				
L2,nTi existent / improved:						17.3 / 17.3 dB				
Assessment level Day:						52.0 dB(A)				
Correction for facade structure by EN 12354-3						0.0 dB				
Correction by user:						0.0 dB				
Exterior level:						52.0 dB				
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Fan
1	Wall	1	10.81	50	-	= Wall	1	10.81	50	-
2	Window	1	1.20	32	-	= Window	1	1.20	32	-
3	passive vent	1	0.10	-	32	= passive vent	1	0.10	-	32
east facade										
Facade geometry:						4.03 m x 3.00 m = 12.11 m²				
L2,nTi existent / improved:						29.4 / 29.4 dB				
Assessment level Day:						64.0 dB(A)				
Correction for facade structure by EN 12354-3						0.0 dB				
Correction by user:						0.0 dB				
Exterior level:						64.0 dB				
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Fan
1	Wall	1	10.62	50	-	= Wall	1	10.62	50	-
2	Window	1	1.39	32	-	= Window	1	1.39	32	-
3	passive vent	1	0.10	-	32	= passive vent	1	0.10	-	32
roof										
Area:						21.24 m²				
L2,nTi existent / improved:						17.0 / 17.0 dB				
Assessment level Day:						64.0 dB(A)				
Correction for facade structure by EN 12354-3						0.0 dB				
Correction by user:						0.0 dB				
Exterior level:						64.0 dB				
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Fan
1	roof	1	21.24	47	-	= roof	1	21.24	47	-

arthur street bedroom / Arthur Street Phase 2 Development										
Room type:		Sleeping room PR, GR, HOS				Ground area:		8.38 m²		
L2,nT valid:		30.0 dB				L2,nT existent / improved:		17.1 / 17.1 dB		
north facade										
Facade geometry:						3.45 m x 3.00 m = 10.36 m²				
L2,nTi existent / improved:						3.9 / 3.9 dB				
Assessment level Day:						53.0 dB(A)				
Correction for facade structure by EN 12354-3						0.0 dB				
Correction by user:						0.0 dB				
Exterior level:						53.0 dB				
ser. No.	Component existent	Count	Area (m²)	R'w (dB)	Dn,e (dB)	Component improved	Count	Area (m²)	R'w (dB)	Fan
1	Wall	1	10.36	50	-	= Wall	1	10.36	50	-
east facade										
Facade geometry:						2.59 m x 3.00 m = 7.76 m²				
L2,nTi existent / improved:						15.8 / 15.8 dB				
Assessment level Day:						57.0 dB(A)				
Correction for facade structure by EN 12354-3						0.0 dB				
Correction by user:						0.0 dB				
Exterior level:						57.0 dB				
ser. No.	Component existent	Count	Area (m²)	R'w (dB)	Dn,e (dB)	Component improved	Count	Area (m²)	R'w (dB)	Fan
1	Wall	1	6.13	50	-	= Wall	1	6.13	50	-
2	Window	1	1.43	35	-	= Window	1	1.43	35	-
3	passive vent	2	0.10	-	52	= passive vent	2	0.10	-	52
roof										
Area:						8.38 m²				
L2,nTi existent / improved:						10.0 / 10.0 dB				
Assessment level Day:						57.0 dB(A)				
Correction for facade structure by EN 12354-3						0.0 dB				
Correction by user:						0.0 dB				
Exterior level:						57.0 dB				
ser. No.	Component existent	Count	Area (m²)	R'w (dB)	Dn,e (dB)	Component improved	Count	Area (m²)	R'w (dB)	Fan
1	roof	1	8.38	47	-	= roof	1	8.38	47	-

arthur street bed max / Arthur Street Phase 2 Development											
Room type:		Sleeping room others				Ground area:				8.38 m²	
L2,nT valid:		45.0 dB				L2,nTi existent / improved:				40.0 / 40.0 dB	
north facade											
						Area:		10.36 m²			
						L2,nTi existent / improved:		25.9 / 25.9 dB			
Assessment level Day:						75.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						75.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	10.36	50	-	= Wall	1	10.36	50	-	-
east facade											
						Area:		7.76 m²			
						L2,nTi existent / improved:		38.8 / 38.8 dB			
Assessment level Day:						80.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						80.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	6.13	50	-	= Wall	1	6.13	50	-	-
2	Window	1	1.43	35	-	= Window	1	1.43	35	-	-
3	passive vent	2	0.10	-	52	= passive vent	2	0.10	-	52	-
roof											
						Area:		8.38 m²			
						L2,nTi existent / improved:		33.0 / 33.0 dB			
Assessment level Day:						80.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						80.0 dB					
ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	roof	1	8.38	47	-	= roof	1	8.38	47	-	-

George Street facing bedroom / Active ventilation

Room type:Sleeping room others

L2,nT valid:45.0 dB

Ground area:19.25 m²

L2,nT existent / improved:39.7 / 39.7 dB

north facade

Area:10.50 m²

L2,nTi existent / improved:28.2 / 28.2 dB

Assessment level Day:69.0 dB(A)

Correction for facade structure by EN 12354-30.0 dB

Correction by user:0.0 dB

Exterior level:69.0 dB

ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	9.30	50	-	= Wall	1	9.30	50	-	-
2	Window	1	1.20	29	-	= Window	1	1.20	29	-	-

south facade

Area:10.50 m²

L2,nTi existent / improved:38.5 / 38.5 dB

Assessment level Day:79.0 dB(A)

Correction for facade structure by EN 12354-30.0 dB

Correction by user:0.0 dB

Exterior level:79.0 dB

ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	9.28	47	-	= Wall	1	9.28	47	-	-
2	window	1	1.22	29	-	= window	1	1.22	29	-	-

roof

Area:19.25 m²

L2,nTi existent / improved:32.0 / 32.0 dB

Assessment level Day:79.0 dB(A)

Correction for facade structure by EN 12354-30.0 dB

Correction by user:0.0 dB

Exterior level:79.0 dB

ser. No.	Component existent	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m²]	R'w [dB]	Dn,e [dB]	Fan
1	roof	1	19.25	47	-	= roof	1	19.25	47	-	-

King street west facing bed max / Active ventilation											
Room type:		Sleeping room others		Ground area:		16.60 m ²					
L2,nT valid:		45.0 dB		L2,nT existent / improved:		40.0 / 40.0 dB					
west facade											
				Area:		10.80 m ²					
				L2,nTi existent / improved:		38.6 / 38.6 dB					
Assessment level Day:						79.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						79.0 dB					
ser. No.	Component existent	Count	Area [m ²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m ²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	9.37	50	-	= Wall	1	9.37	50	-	-
2	Window	1	1.43	30	-	= Window	1	1.43	30	-	-
roof											
				Area:		16.60 m ²					
				L2,nTi existent / improved:		32.0 / 32.0 dB					
Assessment level Day:						79.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						79.0 dB					
ser. No.	Component existent	Count	Area [m ²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m ²]	R'w [dB]	Dn,e [dB]	Fan
1	roof	1	16.60	47	-	= roof	1	16.60	47	-	-
east facade											
				Area:		7.20 m ²					
				L2,nTi existent / improved:		30.8 / 30.8 dB					
Assessment level Day:						72.0 dB(A)					
Correction for facade structure by EN 12354-3						0.0 dB					
Correction by user:						0.0 dB					
Exterior level:						72.0 dB					
ser. No.	Component existent	Count	Area [m ²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m ²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	6.00	50	-	= Wall	1	6.00	50	-	-
2	Window	1	1.20	30	-	= Window	1	1.20	30	-	-

arthur street facing bed max / Active ventilation											
Room type:		Sleeping room others		Ground area:		8.38 m ²					
L2,nT valid:		45.0 dB		L2,nT existent / improved:		40.0 / 40.0 dB					
north facade											
				Area:		10.36 m ²					
				L2,nTi existent / improved:		25.9 / 25.9 dB					
Assessment level Day:				75.0 dB(A)							
Correction for facade structure by EN 12354-3				0.0 dB							
Correction by user:				0.0 dB							
Exterior level:				75.0 dB							
ser. No.	Component existent	Count	Area [m ²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m ²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	10.36	50	-	= Wall	1	10.36	50	-	-
east facade											
				Area:		7.76 m ²					
				L2,nTi existent / improved:		38.8 / 38.8 dB					
Assessment level Day:				80.0 dB(A)							
Correction for facade structure by EN 12354-3				0.0 dB							
Correction by user:				0.0 dB							
Exterior level:				80.0 dB							
ser. No.	Component existent	Count	Area [m ²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m ²]	R'w [dB]	Dn,e [dB]	Fan
1	Wall	1	6.33	50	-	= Wall	1	6.33	50	-	-
2	Window	1	1.43	34	-	= Window	1	1.43	34	-	-
roof											
				Area:		8.38 m ²					
				L2,nTi existent / improved:		33.0 / 33.0 dB					
Assessment level Day:				80.0 dB(A)							
Correction for facade structure by EN 12354-3				0.0 dB							
Correction by user:				0.0 dB							
Exterior level:				80.0 dB							
ser. No.	Component existent	Count	Area [m ²]	R'w [dB]	Dn,e [dB]	Component improved	Count	Area [m ²]	R'w [dB]	Dn,e [dB]	Fan
1	roof	1	8.38	47	-	= roof	1	8.38	47	-	-

APPENDIX E - GLOSSARY

A-weighted sound pressure, p_A	Value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-weighting network. <i>NOTE: The A-weighting network modifies the electrical response of a sound level meter with frequency in approximately the same way as the sensitivity of the human hearing system.</i>
A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure in decibels (dBA).
Acoustic environment	Sound from all sound sources as modified by the environment [BS ISO 12913-1:2013].
Ambient sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. <i>NOTE: The ambient sound comprises the residual sound and the specific sound when present.</i>
Ambient sound level, $L_a = L_{Aeq,T}$ (BS 4142:2014)	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T <i>NOTE: The ambient sound level is a measure of the residual sound and the specific sound when present.</i>
Background sound	Underlying level of sound over a period, T, which might in part be an indication of relative quietness at a given location.
Background sound level, $L_{A90,T}$ (BS 4142:2014)	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
Break-in	Noise transmission into a structure from outside.
Break-out	Noise transmission from inside a structure to the outside.
Cross-talk	Noise transmission between one room and another room or space via a duct or other path.
C_{tr}	Correction term applied against the sound insulation single-number values (R_w , D_w , and $D_{nT,w}$) to provide a weighting against low frequency performance. <i>NOTE: The reference values used within the C_{tr} calculation are based on urban traffic noise.</i>
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within a specified time interval, T, has the same mean-squared sound pressure as the sound under consideration that varies with time.
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$ (BS 4142:2014)	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time.
Equivalent sound absorption area of a room, A	Hypothetical area of a totally absorbing surface without diffraction effects, expressed in square metres (m ²), which, if it were the only absorbing element in the room, would give the same reverberation time as the room under consideration
Facade level	Sound pressure level 1 m in front of the façade. <i>NOTE: Facade level measurements of L_{pA} are typically 1 dB to 2 dB higher than corresponding free-field measurements because of the reflection from the facade.</i>
Free-field level	Sound pressure level away from reflecting surfaces. <i>NOTE: Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e., not 3.5 m from the reflecting surface in the direction of the source). Estimates of noise from aircraft overhead usually include a correction of 2 dB to allow for reflections from the ground.</i>

Impact sound pressure level, L_i	Average sound pressure level in a specific frequency band in a room below a floor when it is excited by a standard tapping machine or equivalent.
Indoor ambient noise	Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants. <i>NOTE: The location(s) within the room at which the ambient indoor noise is to be measured or calculated ought to be considered.</i>
Measurement time interval, T_m (BS 4142:2014)	Total time over which measurements are taken. <i>NOTE: This may consist of the sum of a number of non-contiguous, short-term measurement time intervals.</i>
Noise criteria	Numerical indices used to define design goals in a given space.
Noise rating, NR	Graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves.
Normalised impact sound pressure level, L_n	Impact sound pressure level normalized for a standard absorption area in the receiving room. <i>NOTE: Normalised impact sound pressure level is usually used to characterize the insulation of a floor in a laboratory against impact sound in a stated frequency band.</i>
Octave band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit.
Percentile level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting "F", which is exceeded for $N\%$ of a specified time interval.
Reference time interval, T_r (BS 4142:2014)	Specified interval over which the specific sound level is determined. <i>NOTE: This is 1 h during the day from 07:00 h to 23:00 h and a shorter period of 15 min at night from 23:00 h to 07:00 h.</i>
Residual sound (BS 4142:2014)	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual sound level, $L_r = L_{Aeq,T}$ (BS 4142:2014)	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T .
Rating level, L_{Ar,T_r}	Equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise. <i>NOTE: This is used in BS 7445 and BS 4142 for rating industrial noise, where the noise is the specific noise from the source under investigation.</i>
Reverberation time, T	Time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped.
Sound exposure level, L_{AE}	Level of a sound, of 1 s duration, that has the same sound energy as the actual noise event considered.
Sound level difference, D	Difference between the sound pressure level in the source room and the sound pressure level in the receiving room.
Sound pressure, p	Root-mean-square value of the variation in air pressure, measured in pascals (Pa) above and below atmospheric pressure, caused by the sound.
Sound pressure level, L_p	Quantity of sound pressure, in decibels (dB).
Sound reduction index, R	Laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.

Specific sound level, $L_s = L_{Aeq,T_r}$ (BS 4142:2014)	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r .
Specific sound source (BS 4142:2014)	Sound source being assessed.
Standardised impact sound pressure level, L'_{nT}	Impact sound pressure level normalized to a reverberation time in the receiving room of 0.5 s.
Standardised level difference, D_{nT}	Difference in sound level between a pair of rooms, in a stated frequency band, normalized to a reference reverberation time of 0.5 s for dwellings.
Groundborne noise	Audible noise caused by the vibration of elements of a structure, for which the vibration propagation path from the source is partially or wholly through the ground. <i>NOTE Common sources of ground-borne noise include railways and heavy construction work on adjacent construction sites.</i>
Structure-borne noise	Audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements. <i>NOTE Common sources of structure-borne noise include building services plant, manufacturing machinery and construction or demolition of the structure.</i>
Third octave band	Band of frequencies in which the upper limit of the band is 2% times the frequency of the lower limit.
Weighted level difference, D_w	Single-number quantity that characterizes airborne sound insulation between rooms, but which is not adjusted to reference conditions. <i>NOTE Weighted level difference is used to characterize the insulation between rooms in a building as they are. Values cannot normally be compared with measurements made under other conditions (see BS EN ISO 717-1).</i>
Weighted normalised impact sound pressure level, $L'_{n,w}$	Single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies.
Weighted sound reduction index, R_w	Single-number quantity which characterizes the airborne sound insulating properties of a material or
Weighted standardised impact sound pressure level $L'_{nT,w}$	Single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies.
Weighted standardised level difference, $D_{nT,w}$	Single-number quantity that characterizes the airborne sound insulation between rooms.

Symbols

D_w	Weighted level difference (dB)
D_{nT}	Standardized level difference (dB)
$D_{nT,w}$	Weighted standardized level difference (dB)
L_{Amax}	Maximum noise level (dB)
$L_{Ar,Tr}$	Rating level (dB)
L_n	Normalised impact sound pressure level (dB)
L'_{nT}	Standardised impact sound pressure level (dB)
$L'_{nT,w}$	Weighted standardised impact sound pressure level (dB)
$L'_{n,w}$	Weighted normalised impact sound pressure level (dB)
L_p	Sound pressure level (dB)
L_{pA}	A-weighted sound pressure level (dB)
$L_{AN,T}$	Percentile level (dB)
L_{AE}	Sound exposure level (dB)
$L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level (dB)
p	Sound pressure (Pa)
p_A	A-weighted sound pressure (dB)
$p_{A(t)}$	Instantaneous A-weighted sound pressure (Pa)

R	Sound reduction index (dB)
R_w	Weighted sound reduction index (dB)
T	Time interval (also used for reverberation time) (s)
t_0	Reference time interval (s)

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WWW.NOISEAIR.CO.UK

