RS Acoustic Engineering

55 High Lane, Chorlton
Noise Assessment Report

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1. Introduction

1.1 RS Acoustic Engineering Ltd has been appointed by Cube Homes to undertake a noise assessment with regard to a proposed residential redevelopment at No.55 High Lane, Chorlton, Manchester, M21.

1.2 The site is currently occupied by Manchester Islamic Grammar School for Girls. The proposals are to demolish the existing school buildings and redevelop the site to provide 14 townhouses, 6 apartments and a pair of semi-detached dwellings (22 dwellings in total).

1.3 The dominant source of noise at the site is road traffic on High Lane (A5145). The properties in the immediate surrounding area are predominantly residential dwellings. There is an amateur boxing club and parish centre to the east of the site and commercial/retail properties are located approximately 100 metres south of the site along Beech Road.

1.4 A noise assessment has been undertaken taking into consideration the guidance contained within British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings* and ProPG's *Planning & Noise*. Manchester City Council's planning and noise guidance has also been taken into consideration.

1.5 This assessment is based on the results of an environmental noise survey undertaken by RS Acoustic Engineering Ltd. Continuous sound level monitoring was conducted over several days in order to establish the ambient sound pressure levels during the daytime and night-time period.

1.6 The measured sound level data has been used to determine the acoustic performance requirements for the building envelope constructions and to determine whether it will be suitable to naturally ventilate habitable rooms via opening windows alone.

1.7 An assessment of noise ingress through the building envelope with windows open and closed has been undertaken to determine the resulting sound levels.

1.8 The guidance given within Approved Document F (Ventilation) and Approved Document O (Overheating) has also been taken into consideration with regard to noise ingress and opening windows.

1.9 An assessment of road traffic noise within garden areas has also been undertaken to determine whether noise barriers are necessary at the development site.

1.10 The survey and assessment was conducted by Mr Ryan Swales ($BSc_{(Hons)}$, MIOA), Principal Acoustic Consultant and Member of the Institute of Acoustics.

1.11 The results of the noise survey have been presented, along with the assessment criteria and a discussion of the results with respect to the appropriate guidance and targets.

1.12 Recommendations regarding sound insulation, ventilation and noise mitigation are also provided within this report.

2. Assessment Guidance & Acoustic Criteria

National Planning Policy Framework

2.1 The latest Planning Policies are included in the National Planning Policy Framework (NPPF) published by the Department for Communities and Local Government (first published March 2012) and updated in September 2023.

2.2 With regard to the impact of noise, paragraphs 174, 185 and 187 of the document state the following:

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

(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.

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:

(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.

187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

Noise Policy Statement for England

2.3 The terms 'significant adverse' and 'adverse' in the NPPF above, are references to the Noise Policy Statement for England (NPSE), published by DEFRA in March 2010.

2.4 The first aim of the NPSE is to *Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development*.

2.5 The second aim is to *Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development*.

2.6 The third aim is to *Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development*.

2.7 Further to the above, the Governments Planning Practice Guidance document updated in July 2019 states:

Noise needs to be considered when development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced). When preparing plans, or taking decisions about new development, there may also be opportunities to make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.

2.8 In addition, the guidance indicates that, whilst noise can override other planning concerns, it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users and its surroundings, as these can have an important effect as to whether or not noise is likely to pose a concern.

Manchester City Council: Planning & Noise Technical Guidance

2.9 With regard to residential developments, Manchester City Council has adopted the following noise criteria:

- Bedrooms (night time - 23.00 - 07.00) 30 dB L_{Aeq} (individual noise events should not normally exceed 45 dB $L_{Amax,F}$ by more than 10 times).
- Living Rooms (daytime - 07.00 - 23.00) 35 dB L_{Aeq}.
- Gardens and terraces (daytime) 55 dB L_{Aeq}.

2.10 These criteria have been adopted for the following reasons:

- BS 8233: 2014 recognises these levels as a good standard for resting/sleeping conditions.
- The WHO document 'Guidelines for Community Noise' recommends an internal L_{Aeq} of 30 dB for optimal sleep conditions (and no more than 35 dB for internal rooms during daytime).
- The performance of acoustic insulation schemes can often be below that specified, according to the quality of installation, materials, noise spectrum and deterioration / wear and tear of building elements. A high design specification introduces a 'safety margin' should building elements not perform as well as expected (‘on-site’ performance).
- Performance specification for glazing does not usually take into account the detrimental effect of vents on the sound insulation. Even 'acoustic' vents will reduce the performance of the facade insulation, as they will inherently contain a free open area for air exchange.
- There is a general increase in urban noise levels, which can in the future be reasonably accommodated by these standards.
- The standards support the Local Authority corporate objective to prevent ill-health and improve local people’s health and well-being.

British Standard 8233:2014: Guidance on sound insulation and noise reduction for buildings

2.11 BS 8233 provides guidance regarding acoustic criteria and noise levels appropriate for various types of space that have different functions.

2.12 With regard to dwellings, appropriate internal ambient sound levels are given for bedrooms, living rooms and dining rooms (habitable rooms). The guidelines take into consideration the effect of internal noise on sleep and also the effect of noise on resting, listening and communicating.

2.13 The internal sound level targets presented in Table 2.1 have been reproduced directly from Table 4 of BS 8233.

Table 2.1 - Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
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 $L_{Aeq,8hour}$

2.14 Note 7 of the standard also suggests that in some circumstances it may be appropriate to relax the indoor ambient noise level targets by up to 5 dB:

Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

2.15 Note 5 also states:

If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the facade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.

World Health Organisation: Guidelines for community noise (1999)

2.16 To help avoid sleep disturbance within bedrooms, this historical guidance document recommends that the night-time internal ambient sound level should not exceed 30 dB $L_{Aeq,T}$ and the maximum sound level should not typically exceed 45 dB $L_{AFmax,T}$.

2.17 The corresponding values directly outside of bedroom windows are therefore 45 dB $L_{Aeq,8hour}$ and 60 dB $L_{AFmax,T}$. This is based on the assumption that a partially open window provides approximately 15 dB of sound attenuation (from external noise).

2.18 With regard to sleep disturbance and maximum L_{AFmax} sound levels, the study undertaken by Vallet & Vernet (1991) suggests that for good sleep, indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10-15 times per night.

Professional Practice Guidance on Planning & Noise (2017)

2.19 Professional Practice Guidance on Planning and Noise (ProPG) has been produced in order to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England.

2.20 The NPPF encourages improved standards of design. This guidance document encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise.

2.21 The scope of ProPG is restricted to the consideration of new residential development that will be exposed predominantly to airborne noise from transportation sources.

2.22 The document states that an initial noise risk assessment of the proposed development site should be conducted by a competent noise practitioner at the earliest opportunity, before any planning application is submitted. The noise risk assessment should provide an indication of the likely risk of adverse effects from noise were no subsequent mitigation to be included as part of the development proposal. It should indicate whether the proposed site is considered to pose a negligible, low, medium or high risk from a noise perspective.

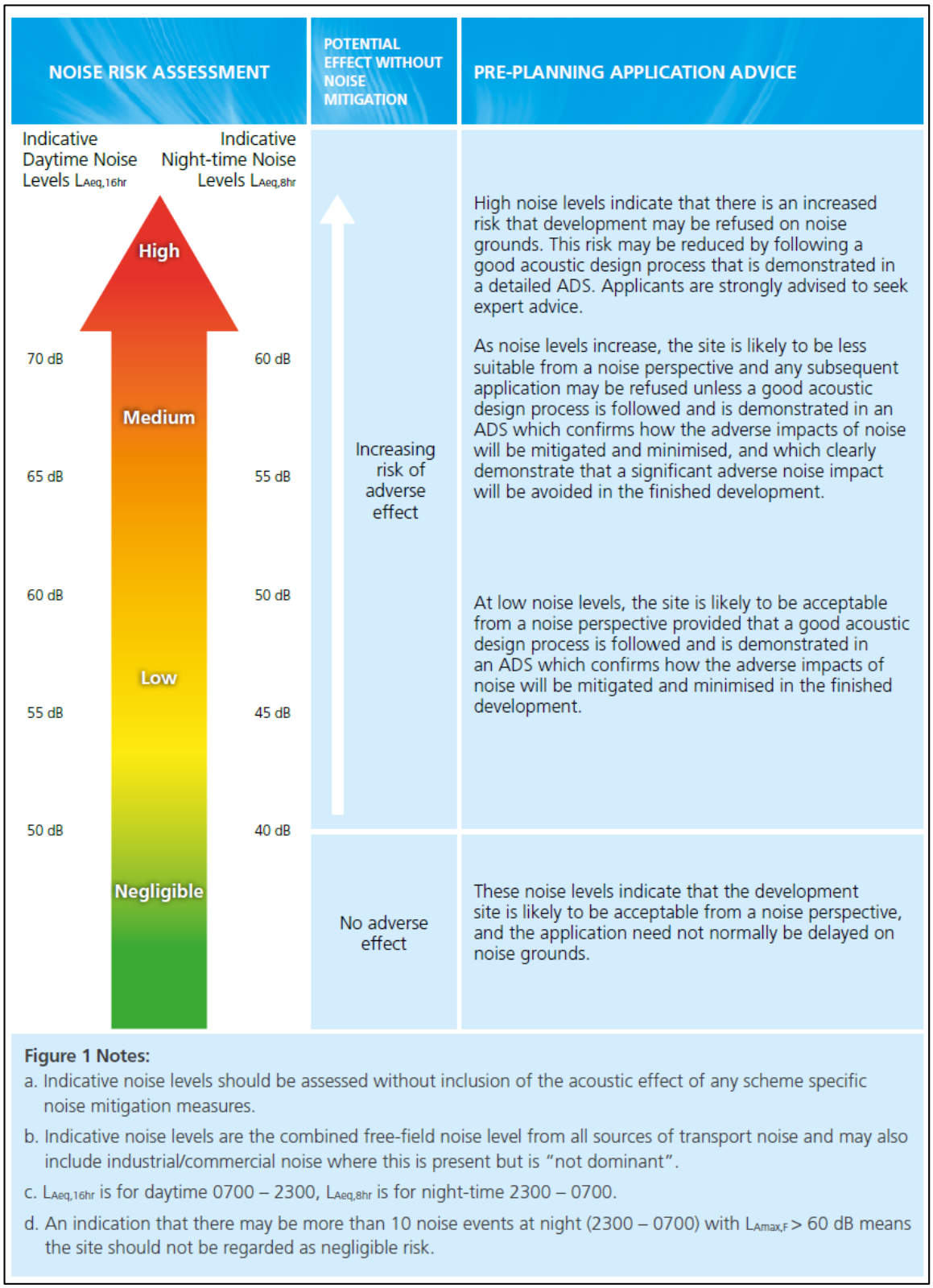
2.23 The risk assessment should not include the impact of any new or additional mitigation measures that may subsequently be included in development proposals for the site and proposed as part of a subsequent planning application.

2.24 The risk assessment may be based on measurement or prediction (or a combination) as appropriate and should aim to describe noise levels over a typical 24-hour day, either now or in the foreseeable future.

2.25 It is important that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker. The recommended approach is intended to give the developer, the noise practitioner and the decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced.

2.26 Figure 2.1 overleaf summarises the initial site noise risk assessment.

Figure 2.1 - Initial site noise risk assessment



Internal noise level guidelines

2.27 The recommended ProPG internal noise level guidelines are presented in Table 2.2. The guidelines reflect and extend current practice contained within BS 8233:2014.

Table 2.2 - ProPG internal noise level guidelines

Activity	Location	07:00 to 23:00	23:00 to 07:00
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 $L_{Amax,F}$

2.28 Where the local planning authority accepts that there is a justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources, special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment.

2.29 In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide "*whole dwelling ventilation*" in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position.

2.30 It should also be noted that the internal noise level guidelines are generally not applicable under "*purge ventilation*" conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).

External noise and amenity areas

2.31 The ProPG external amenity area noise assessment reflects and extends the advice contained within BS 8233:2014 and is summarised as follows:

(i) If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

(ii) 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 $L_{Aeq,16hr}$.

(iii) 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.

(iv) Whether or not external amenity spaces are an intrinsic part of the overall design, consideration of the need to provide access to a quiet or relatively quiet external amenity space forms part of a good acoustic design process.

(v) Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:

- *a relatively quiet facade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
- *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different, protected, location); and/or*
- *a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
- *a relatively quiet, protected, publically accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations.*

3. Environmental Noise Survey

Survey methodology

3.1 Continuous sound level monitoring was conducted over a 94-hour period at the north facing elevation adjacent to High Lane. The equipment was installed at first floor level on a small flat roof area to the front of the property.

3.2 Measurements were performed from 13:15 hours on Thursday 23rd through to 11:15 hours on Monday 27th March 2023.

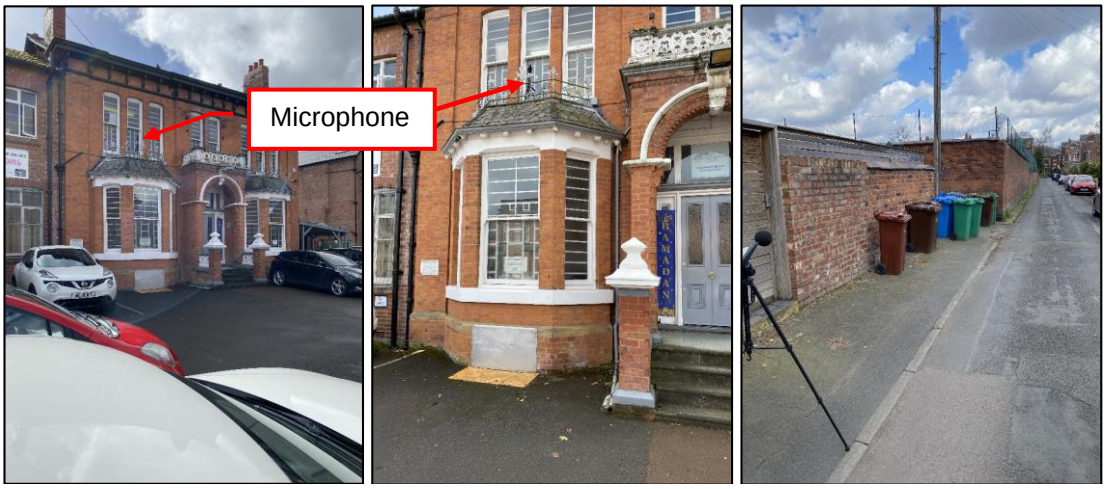
3.3 A measurement interval of 5-minutes was used during the survey and measurements were considered to be subject to sound reflections from the façade (as opposed to free-field). One-third octave band and A-weighted broadband sound pressure levels were recorded during the survey.

3.4 Sample measurements were also conducted during the daytime and evening period at a second location near to the southern boundary, directly adjacent to Acres road.

3.5 The site location, surrounding area and survey measurement positions are shown in Figure 3.1 and Figure 3.2. The proposed site layout is presented in Appendix A.

Figure 3.1 - Site location and survey measurement positions (source: Google Earth)

Figure 3.2 - Photographs showing survey measurement positions



Survey equipment

3.6 The survey was conducted using the following Class-1 specification equipment:

- Brüel & Kjaer 2250-Light data logging sound level meter, microphone type 4189, pre-amplifier type ZC0032.
- Brüel & Kjaer 2260 sound level meter, microphone type 4189, pre-amplifier type ZC0026.
- CEL-120/1 Acoustic calibrator.

3.7 Calibration of the sound level meter and microphone used for the measurements are traceable to UKAS accredited laboratories (calibration certificates are available upon request).

3.8 The calibration of both sound level meter and microphone was checked using a 1 kHz tone at 94 dB prior to and following the measurements performed. Calibration drift was less than 0.1 dB.

Weather conditions

3.9 The weather conditions during the survey were generally dry and fine with a light cloud cover. There was intermittent rainfall on Friday and Saturday and wind speed measurements taken outside of the building were between 1.2 and 2.7 m/s^{-1}.

3.10 The air temperature during the survey ranged between 2°C and 13°C. The overall weather conditions were considered suitable to obtain representative measurements.

Subjective observations of the acoustic environment

3.11 The dominant source of noise is road traffic on High Lane. The road is subject to moderate traffic flows during the daytime and night-time period.

3.12 Intermittent vehicle movements on Acres Road, Stockton Road and Beech Road also contributes to the prevailing ambient noise climate but to a lesser degree when compared to High Lane.

3.13 Operational noise and activity related to the amateur boxing club located off Chequers Road was inaudible during the daytime and evening site visits.

3.14 Commercial activity related to the high street to the south (circa 100 metres away) was generally inaudible at the site.

3.15 Other noted sources of noise include high altitude aircraft and passing pedestrians.

3.16 There was no audible fixed plant noise from neighbouring properties impacting on the site.

Measured indices

3.17 Although a wide range of statistical sound level data was recorded during the survey, the L_{Aeq} and L_{AFmax} indices are of most interest in this instance:

- $L_{Aeq,T}$ - The A-weighted equivalent continuous sound pressure level over a period of time, T. Representative of the 'average' sound pressure level over a given period (commonly used to describe the 'ambient' sound level).
- $L_{AFmax,T}$ - The A-weighted 'maximum' sound pressure level that occurred during a given period, T (commonly used for the assessment of occasional loud noises).

3.18 Sound pressure level measurements are taken with an A-weighting (denoted by a subscript 'A', e.g. L_{Aeq}) to approximate the frequency response of the human ear.

Results summary

3.19 Table 3.1 presents a summary of the measured sound pressure levels from the continuous monitoring position. Measured values have been rounded to the nearest whole number.

Table 3.1 - Summary of continuously measured sound pressure levels

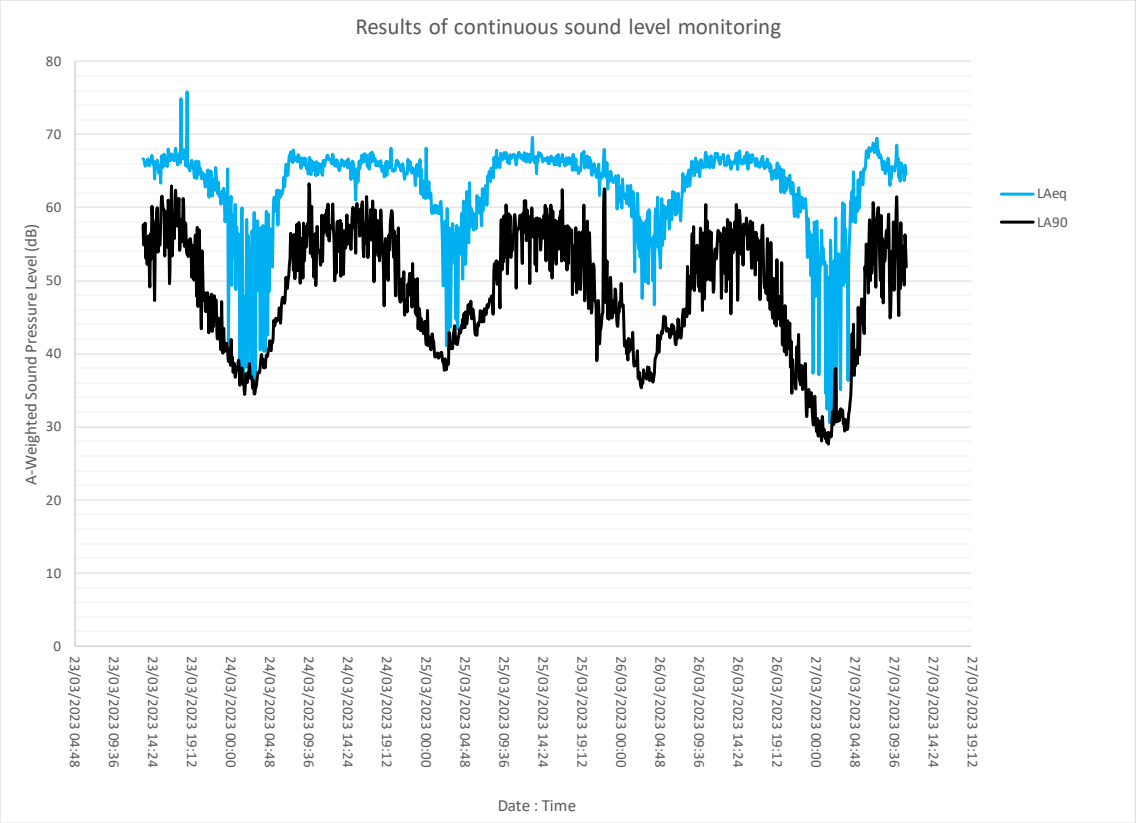
Date	Period	Duration, T (hours)	$L_{Aeq,T}$ dB	10th Highest[1] $L_{AFmax,T}$ dB	15th Highest[2] $L_{AFmax,T}$ dB
Thursday 23/03/2023	Daytime (13:15-23:00)	9.75	66	---	---
	Night-time (23:00-07:00)	8	59	76	75
Friday 24/03/2023	Daytime (07:00-23:00)	16	66	---	---
	Night-time (23:00-07:00)	8	60	76	76
Saturday 25/03/2023	Daytime (07:00-23:00)	16	66	---	---
	Night-time (23:00-07:00)	8	60	76	75
Sunday 26/03/2023	Daytime (07:00-23:00)	16	65	---	---
	Night-time (23:00-07:00)	8	61	76	75
Monday 27/03/2023	Daytime (07:00-11:15)	4.25	66	---	---

[1]The 10th highest value from 96 measurement periods [2]The 15th highest value from 96 measurement periods (indoor sound pressure levels should ideally not exceed 45 dB L_{Amax} more than 10-15 times per night).

3.20 The daytime ambient sound pressure level was 65 to 66 dB $L_{Aeq,16hour}$ and the night-time ambient sound pressure level was 59 to 61 dB $L_{Aeq,8hour}$.

3.21 The ambient and background sound levels are presented graphically in Figure 3.3 overleaf. Additional tabulated survey data can be made available upon request.

Figure 3.3 - Graph showing results of continuous sound level monitoring



Sample measurement results

3.22 Sample measurements conducted near to the southern boundary indicate daytime ambient sound pressure levels ranging between 45 to 49 dB $L_{Aeq,5min}$.

3.23 The measurement results indicate that the ambient sound pressures levels are approximately 17 to 19 dB $L_{Aeq,5min}$ lower than those measured simultaneously at the front elevation.

4. Assessment & Discussion

Initial site noise risk assessment

4.1 The initial noise risk assessment provides an indication of the likely risk of adverse effects from noise were no subsequent mitigation included as part of the development proposal.

4.2 At the position of the dwellings directly adjacent to High Lane, the survey results indicate that the site is a Low to Medium Risk for the daytime and night-time period. The new dwellings set-back from High Lane are a Low Risk for the daytime and night-time period.

Building envelope construction and acoustic performance

4.3 External walls are expected to be of a brickwork/cavity/blockwork construction. The sound insulation performance of such a construction is typically in the region of 45 to 55 dB R_w+C_{tr}.

4.4 A tiled roof construction with mineral wool (loft) insulation and an internal plasterboard finish typically provides a sound insulation performance in the region of 39 to 43 dB R_w+C_{tr}.

4.5 Standard double glazing typically provides a sound insulation performance in the region of 25 to 30 dB R_w+C_{tr}. The glazing is therefore expected to be the weakest element with regard to the building envelope sound insulation (excluding ventilator units).

- 6 mm glass / 16 mm - 20 mm cavity / 4 mm glass (28 - 30 dB R_w+C_{tr})
- 6 mm glass / 16 mm - 20 mm cavity / 6 mm glass (27 - 29 dB R_w+C_{tr})
- 4 mm glass / 16 mm - 20 mm cavity / 4 mm glass (25 - 27 dB R_w+C_{tr})

4.6 Laminated (acoustic) double glazing as is commonly used within dwellings provides a sound insulation performance in the region of 31 to 37 dB R_w+C_{tr}.

- 6 mm glass / 16 mm - 20 mm cavity / 10.8 mm acoustic laminate (35 - 37 dB R_w+C_{tr})
- 6 mm glass / 16 mm - 20 mm cavity / 8.8 mm acoustic laminate (33 - 35 dB R_w+C_{tr})
- 6 mm glass / 16 mm - 20 mm cavity / 6.8 mm acoustic laminate (31 - 33 dB R_w+C_{tr})

4.7 As an example, Pilkington Optiphon or Stadip Silence is a high performing acoustic laminate that can be used within double glazed systems.

- www.pilkington.com/en-gb/uk/products/product-categories/noise-control/pilkington-optiphon/
- SGG STADIP SILENCE® | Saint-Gobain Building Glass (saint-gobain-building-glass.com)

4.8 The acoustic performance of a particular construction may differ slightly between manufacturers and therefore the sound insulation performance should be verified where possible.

4.9 With standard double glazing, the composite sound insulation of the building envelope is expected to be approximately 33 to 34 dB R_w+C_{tr}.

4.10 The quantity R_w is the weighted sound reduction index expressed in dB. It is a single number quantity for rating airborne sound insulation. The 'C_{tr}' term is added to the single number rating R_w to take account of the characteristics of particular sound spectra (e.g. road traffic).

4.11 The acoustic performance of a particular construction may differ slightly between manufacturers and therefore the sound insulation performance should be verified where possible.

4.12 To achieve the optimum performance, external windows should be well sealed around the frame when installed. Large gaps between the frame and the brickwork and poorly sealed frames can notably reduce performance.

Noise ingress with windows closed

Dwellings adjacent to High Lane

4.13 Table 4.1 and 4.2 presents the noise ingress calculation results for the ground floor lounge, first floor bedroom and second floor bedroom on the front elevation facing High Lane (plot no.13 & 14).

4.14 The highest measured 16-hour daytime sound pressure level has been used in the calculation (66 dB $L_{Aeq,16hour}$). There is no significant increase expected with regard to road traffic flow along High Lane and therefore this value is considered to be robust.

4.15 Standard thermal double glazing consisting of 4 mm glass /16 – 20 mm cavity /4 mm glass has been assumed for the calculation. The calculations take into account the sound insulation performance of each building element, surface area and internal room dimensions.

4.16 The measured octave-band sound levels and typical reverberation time for a habitable room have also been taken into consideration.

Table 4.1 - Noise ingress calculation results (lounge and 1st floor bedroom to front elevation)

Title: 55 High Lane (Lounge & Bedroom 1) **Noise Break In (ISO 12354-3)**												
Formula/Comment	***Single Value***		***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***	***Rw***	***(C,C$_{tr}$)***
				25.7	21.9	29.8	39.5	41.7	35.9			
L_{in}				36.3	37.1	31.2	24.5	15.3	10.1			
Materials												
4mm glass/16 - 20 mm cavity/4mm glass		3.6		21.0	17.0	25.0	35.0	37.0	31.0		**29**	**(-1,-4)**
Brickwork / blockwork cavity wall		14.4		40.0	44.0	45.0	51.0	56.0	60.0		**51**	**(-1,-4)**
$L_{out,s}$												
$L_{out,2m}$	Add Element			62.0	59.0	61.0	64.0	57.0	46.0		**66**	
$L_{out,free\ field}$				59.0	56.0	58.0	61.0	54.0	43.0		**63**	
Element 1				25.7	21.9	29.8	39.5	41.7	35.9			
Plane façade	ΔL_{fs}	18.0		0.0	0.0	0.0	0.0	0.0	0.0			
Visible	X_{fs}	0.0		25.7	21.9	29.8	39.5	41.7	35.9			**34**
$L_{p,out,2m}$				62.0	59.0	61.0	64.0	57.0	46.0		**66**	
$L_{p,in}$				36.3	37.1	31.2	24.5	15.3	10.1		**33**	**dBA**

Table 4.2 - Noise ingress calculation results (2nd floor bedroom to front elevation)

Title: 55 High Lane (Bedroom 3) **Noise Break In (ISO 12354-3)**												
Formula/Comment	***Single Value***		***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***	***Rw***	***(C,C$_{tr}$)***
				23.3	21.6	29.3	38.2	40.8	35.7			
L_{in}				38.7	37.4	31.7	25.8	16.2	10.3			
Materials												
4mm glass/16 - 20 mm cavity/4mm glass		3.6		21.0	17.0	25.0	35.0	37.0	31.0		**29**	**(-1,-4)**
Brickwork / blockwork cavity wall		14.4		40.0	44.0	45.0	51.0	56.0	60.0		**51**	**(-1,-4)**
Tiled roof, insulation, plasterboard ceiling		14.0		28.0	34.0	40.0	45.0	49.0	50.0		**44**	**(-2,-5)**
$L_{out,s}$												
$L_{out,2m}$	Add Element			62.0	59.0	61.0	64.0	57.0	46.0		**66**	
$L_{out,free\ field}$				59.0	56.0	58.0	61.0	54.0	43.0		**63**	
Element 1				23.3	21.6	29.3	38.2	40.8	35.7			
Plane façade	ΔL_{fs}	32.0		0.0	0.0	0.0	0.0	0.0	0.0			
Visible	X_{fs}	0.0		23.3	21.6	29.3	38.2	40.8	35.7			**33**
$L_{p,out,2m}$				62.0	59.0	61.0	64.0	57.0	46.0		**66**	
$L_{p,in}$				38.7	37.4	31.7	25.8	16.2	10.3		**33**	**dBA**

4.17 The calculation results indicate a daytime internal sound level of approximately 33 dB $L_{Aeq,16hour}$ with standard thermal double glazing.

4.18 The daytime sound level target of 35 dB $L_{Aeq,16hour}$ will therefore be achieved with windows closed.

4.19 Since the night-time L_{Aeq} sound level is approximately 4 to 7 dB lower than the daytime sound level, the night-time target of 30 dB $L_{Aeq,8hour}$ will also be easily achieved.

4.20 With regard to the maximum L_{AFmax} internal sound levels, the recommended target of 45 dB L_{AFmax} will also be achieved within bedrooms for the majority of the night-time period.

- 76 dB $L_{AFmax,5min}$ – 33 dB R_w+C_{tr} = 43 dB $L_{AFmax,5min}$

Dwellings adjacent to Acres Road & Stockton Road (plot no's 1 to 12 & 17 to 22)

4.21 The internal sound level within habitable rooms will be slightly lower than those presented in the tables above, since there is a greater separation distance to High Lane and the dwellings will also benefit from a degree of acoustic screening from neighbouring properties.

4.22 This assessment demonstrates that standard thermal double glazing will be sufficient for all habitable rooms and additional noise mitigation such as installing acoustically-laminated double glazing and/or thick heavy panes of glass is unnecessary.

Noise ingress with windows open

4.23 The level of sound attenuation through an open window is dependent on the type and size of window, the extent of opening, the angle of sound incidence and the characteristics of the noise source in question.

4.24 It is reasonable to assume a sound attenuation performance of approximately 15 dB for a partially open window. Partially open windows will provide background ventilation only, as opposed to rapid/purge ventilation.

4.25 ProPG also assumes that the acoustic performance of the building envelope will be reduced to no more than 15 dBA when windows are opened for ventilation or cooling purposes.

North facing habitable rooms (plot no's 13 to 16)

4.26 Daytime façade sound pressure levels are approximately 65 to 66 dB $L_{Aeq,16hour}$ and night-time sound pressure levels are approximately 59 to 61 dB $L_{Aeq,8hour}$.

4.27 When assessing noise ingress through an open window, it is appropriate to correct the measured sound levels at the façade by approximately -3 dB to give an equivalent free-field sound level.

4.28 The corresponding 'free-field' sound pressure levels are therefore 62 to 63 dB $L_{Aeq,16hour}$ during the daytime and 56 to 58 dB $L_{Aeq,8hour}$ during the night-time.

4.29 Assuming a partially open window provides 15 dB of sound attenuation, the resulting internal sound level is approximately 47 to 48 dB $L_{Aeq,16hour}$ during the daytime and approximately 41 to 43 dB $L_{Aeq,8hour}$ during the night-time.

- 63 dB $L_{Aeq,16hour}$ – 15 dB = 48 dB $L_{Aeq,16hour}$
- 58 dB $L_{Aeq,8hour}$ – 15 dB = 43 dB $L_{Aeq,8hour}$

4.30 The daytime and night-time sound level targets will therefore not be achieved with windows open.

4.31 BS 8233 states where occupants rely on closed windows to meet the internal noise limits, there needs to be appropriate alternative ventilation that does not compromise the facade sound insulation or resulting internal sound level.

4.32 BS 8233 also provides the following comment with regard to ventilation:

The Building Regulations' supporting documents on ventilation recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice.

4.33 It is therefore recommended that an alternative means of ventilation is provided to habitable rooms facing High Lane.

4.34 A suitable mitigation measure would be to install good quality (acoustically treated) sound attenuating ventilator units to habitable rooms. Bathrooms, toilets and circulation areas do not require acoustic ventilator units.

4.35 As an alternative to acoustic ventilator units, a mechanically assisted ventilation system could be used to serve the worst-case rooms (e.g. MVHR system).

4.36 Fully opening windows will be appropriate to provide rapid or purge ventilation (e.g. to remove odour from painting and decorating or from burnt food).

Overheating and opening windows

4.37 With regard to noise at night and opening windows, Approved Document O (Overheating) states the following:

In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

a. 40 dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).

b. 55 dB L_{AFmax}, more than 10 times a night (between 11pm and 7am).

4.38 The predicted internal sound levels are slightly above the noise limits which indicates that occupants are likely to close windows during the night. Further consideration should therefore be given to the overheating mitigation strategy for the new habitable rooms on the front elevation.

South facing habitable rooms (plot no's 13 to 16)

4.39 South facing habitable rooms will be acoustically screened from vehicle movements on High Lane and therefore the resulting sound level outside of windows will be notably lower. The degree of sound attenuation due to screening is expected to be approximately 15 dB.

4.40 On this basis, the internal sound pressure level is approximately 32 to 33 dB $L_{Aeq,16hour}$ during the daytime and approximately 26 to 28 dB $L_{Aeq,8hour}$ during the night-time.

- 63 dB $L_{Aeq,16hour}$ – 15 dB (screening) – 15 dB (open window) = 33 dB $L_{Aeq,16hour}$
- 58 dB $L_{Aeq,8hour}$ – 15 dB (screening) – 15 dB (open window) = 28 dB $L_{Aeq,8hour}$

4.41 The daytime and night-time sound level targets will therefore be achieved with windows open.

4.42 The maximum sound level target of 45 dB L_{AFmax} will also be typically achieved during the night-time period.

4.43 Since it is anticipated that the targets will be achieved within south facing habitable rooms with windows open, an alternative method of ventilation is considered unnecessary (i.e. such as acoustic ventilator units or mechanically assisted ventilation).

4.44 If required, standard non-acoustic hit-and-miss trickle vents will be suitable for providing background ventilation.

4.45 In addition, the predicted internal sound levels are below the noise limits given within Approved Document O. This indicates that occupants are likely to open bedroom windows during the night time to help cool and remove excess heat from the room.

East facing habitable rooms (plot no's 1 to 12)

4.46 The ambient sound pressure level is expected to be approximately 12 to 15 dB lower, compared to the front elevations adjacent to High Lane. The daytime and night-time sound level targets will therefore be typically achieved with windows open.

4.47 With regard to noise ingress, an alternative means of ventilation is unnecessary for habitable rooms. If required, standard non-acoustic trickle vents could be installed within the window frames in order to provide background ventilation with windows closed.

4.48 Residents are likely to open bedroom windows to help with room cooling since the resulting ambient sound levels are below the noise limits given within Approved Document O.

West facing habitable rooms (plot no's 7 to 12)

4.49 The ambient sound pressure level is expected to be approximately 5 to 10 dB lower, compared to the front elevations adjacent to High Lane. With windows open, the internal ambient sound level will be slightly above the daytime and night-time sound level targets.

4.50 On this basis, it is recommended that an alternative means of ventilation is provided to habitable rooms. A suitable mitigation measure would be to install good quality sound attenuating ventilator units to habitable rooms.

4.51 Residents are likely to open bedroom windows to help with room cooling since the resulting ambient sound levels are below the noise limits given within Approved Document O.

West facing habitable rooms (plot no's 1 to 6)

4.52 The ambient sound level is expected to be approximately 12 to 15 dB lower, compared to the front elevations adjacent to High Lane. The daytime and night-time sound level targets will therefore be typically achieved with windows open.

4.53 With regard to noise ingress, an alternative means of ventilation is unnecessary for habitable rooms. If required, standard non-acoustic trickle vents could be installed within the window frames in order to provide background ventilation with windows closed.

4.54 Residents are likely to open bedroom windows to help with room cooling since the resulting ambient sound levels are below the noise limits given within Approved Document O.

East and west facing habitable rooms (plot no's 17 to 22)

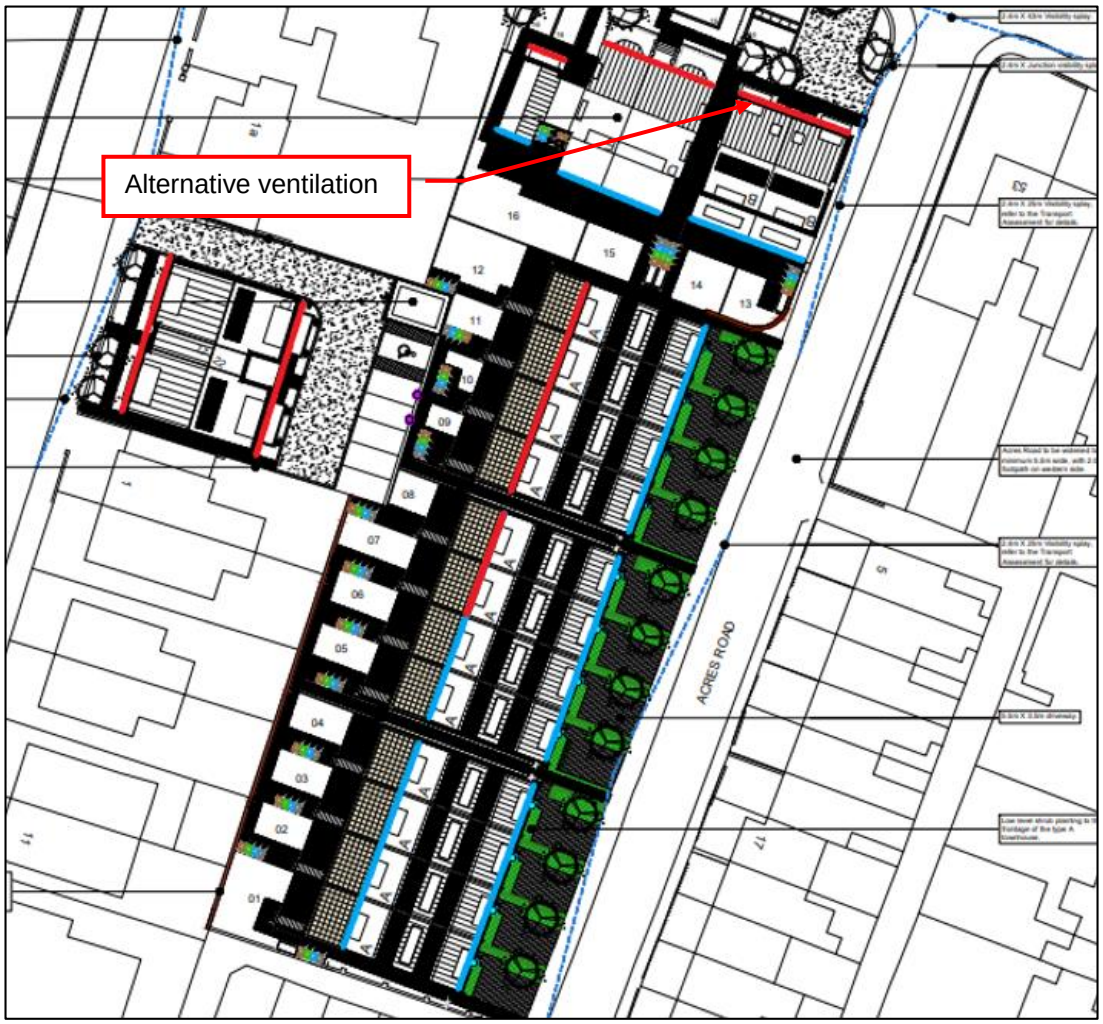
4.55 The ambient sound level is expected to be approximately 5 to 10 dB lower, compared to the front elevations adjacent to High Lane. With windows open, the internal ambient sound level will be slightly above the daytime and night-time sound level targets.

4.56 On this basis, it is recommended that an alternative means of ventilation is provided to habitable rooms. A suitable mitigation measure would be to install good quality sound attenuating ventilator units to habitable rooms.

4.57 Residents are likely to open bedroom windows to help with room cooling since the resulting ambient sound levels are below the noise limits given within Approved Document O.

4.58 Figure 4.1 overleaf indicates where an alternative method of ventilation would be the most beneficial from a noise perspective. Elevations highlighted in red indicate where acoustic vents to the frames/walls or mechanically assisted ventilation would be appropriate and the elevations highlighted in blue indicate where natural ventilation would be appropriate (i.e. opening windows and standard non-acoustic trickle vents).

Figure 4.1 - Site layout showing elevations with an alternative method of ventilation



Ambient sound level in outdoor living areas

4.59 With regard to outdoor living areas (gardens), BS 8233 provides the following guidelines:

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 recognised 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.

4.60 ProPG states the following with regard to noise levels:

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 $L_{Aeq,16hr}$.

4.61 It is appropriate to design a site so that at least one garden space to a dwelling will achieve the guideline values. It is assumed that the main garden area for resting and relaxation will be to the rear of the property.

4.62 The daytime façade sound pressure level was 65 to 66 dB $L_{Aeq,16hour}$ at the front elevation of the existing building which reduces down to approximately 47 to 49 dB $L_{Aeq,16hour}$ near to the southern boundary.

4.63 The ambient sound pressure levels reduce considerably with increased separation distance from High Lane and also where there is acoustic screening from neighbouring dwellings and boundary walls.

Plot no's 13 to 16

4.64 With regard to the rear gardens of plot no's 13 to 16, approximately 15 dB of sound reduction is anticipated once the new dwellings are constructed. The buildings will provide acoustic screening from vehicle movements on High Lane.

4.65 The resulting daytime ambient sound pressure level is therefore expected to be approximately 50 to 51 dB $L_{Aeq,16hour}$.

Plot no's 1 to 12 & 17 to 22

4.66 Taking into consideration the increased separation distance from High Lane and the acoustic screening provided by neighbouring dwellings and boundary walls, the resulting ambient sound pressure level is expected to be approximately 45 to 50 dB $L_{Aeq,16hour}$.

4.67 It is anticipated that the ambient sound pressure level will achieve and even improve on the guideline values which are considered appropriate for residential amenity space.

4.68 Consequently, a good acoustic standard will be achieved and it is highly unlikely that residents will be annoyed by road traffic related noise.

4.69 Additional noise mitigation measures are unnecessary for the proposed garden areas.

5. Ventilation & Noise Mitigation

Approved Document F, Volume 1: Dwellings

5.1 Approved Document F (Volume 1: Dwellings) provides guidance on how to comply with Part F of Schedule 1 to the Building Regulations 2010 and came into effect on 15th June 2022.

5.2 The aim of the document is to protect the health of occupants within a dwelling by providing adequate ventilation. Without adequate ventilation, mould and internal air pollution may become hazardous to health.

5.3 Guidance on the non-dwelling parts of the building, such as shared communal rooms and commercial or retail space, can be found within Approved Document F, Volume 2: Buildings other than dwellings.

Ventilation strategy

5.4 Ventilation of a dwelling may be delivered through natural ventilation (without the use of mechanically driven equipment), mechanical ventilation or a combination of both methods.

5.5 The ventilation systems in Approved Document F are examples of systems that comply with the Building Regulations. Other ventilation systems may be acceptable if they can be shown to meet an equal level of performance.

5.6 The ventilation strategy in the approved document relies on a combination of all of the following:

a). Extract ventilation from rooms where water vapour or pollutants are likely to be released (e.g. bathrooms, WC's, kitchens and utility rooms), to minimise their spread to the rest of the building. Ventilation fans may be either intermittent operation or continuous operation.

b). Whole dwelling ventilation to provide fresh air to the building and to dilute, disperse and remove water vapour and pollutants not removed by extract ventilation.

c). Purge ventilation to remove high concentrations of pollutants and water vapour. Purge ventilation is used intermittently and required only for pollutants produced by occasional activities (e.g. fumes from painting).

5.7 With regard to whole dwelling ventilation, supply air for the dwelling should be delivered by either continuous supply fans or background ventilator units.

5.8 The minimum whole dwelling ventilation rate for the supply of air to the habitable rooms in a dwelling should meet a minimum rate of 0.3 litres per second per m^2 of internal floor area and also a minimum rate (l/s) determined by the number of bedrooms, as specified in Table 1.3 of the document.

5.9 The document also provides minimum standards for purge ventilation for rapidly diluting indoor air pollutants and extracting water vapour where necessary in habitable rooms. For domestic-type buildings, Part O (overheating) may require a higher standard in order to remove excess heat.

Acoustically rated ventilator units

5.10 Manually controlled trickle ventilators (the most common type of background ventilators) can be located over the window frames, in window frames or just above the glass. Background ventilators are intended to normally be left open.

5.11 Ventilation should be controllable. Controls may be either manual (i.e. operated by the occupant) or automatic. Background ventilators should be at least 1700 mm above floor level, to reduce cold draughts, but still be easy for the occupant to reach.

5.12 Installing a background ventilator directly through a wall that provides the equivalent areas described in Approved Document F can also be an acceptable route to compliance.

5.13 Sound attenuating ventilator units are often installed to habitable rooms in order to allow background ventilation whilst maintaining a high sound insulation performance from the façade.

5.14 The ventilator should provide a sound insulation performance of at least **38 dB $D_{n,e,w}$** in the open position. Further guidance regarding ventilator type and performance can be provided once the glazing specification and ventilator type/size has been finalised.

5.15 Example manufacturers of acoustically-rated ventilator units include:

- www.aereco.co.uk/products-and-systems/
- www.greenwood.co.uk/acoustic
- http://brookvent.co.uk/product/airvent-sm-acoustic/

5.16 The minimum 'equivalent area' of background ventilators for natural ventilation should follow the guidance in Table 1.7 of Approved Document F for each room type.

5.17 Bathrooms, toilets, utility rooms and circulation areas do not require sound attenuating ventilator units. Standard (non-acoustic) trickle vents may be fitted to bathrooms to achieve the required equivalent area.

5.18 It should be noted that a window with a 'night-latch' position is not adequate for background ventilation, due to the risk of draughts, security issues and the difficulty of measuring the equivalent area.

Mechanically assisted ventilation

5.19 A further option with regard to ventilating and cooling habitable rooms whilst achieving a high facade sound insulation would be to use a mechanical ventilation system, such as a heat recovery system (MVHR) or positive input ventilation system (PIV).

5.20 Example suppliers of MVHR and PIV systems include:

- www.nuaire.co.uk/residential/positive-input-ventilation
- www.envirovent.com/specifier/products/heat-recovery-systems/
- www.envirovent.com/specifier/products/positive-input-ventilation/
- www.greenwood.co.uk/range/5/heat-recovery-mvhr.html

5.21 Appropriate ventilation rates will depend on the number of bedrooms and the anticipated occupancy rate (refer to Approved Document F for guidance). Such systems can also be supplied with a 'boost' function in order to reduce the need to open windows for purge ventilation.

5.22 With a loft mounted motor and control unit, particular attention should be paid to the construction of bedroom ceilings and the mounting of the motor unit in order to minimise the noise transmission into adjacent rooms. It is commonplace for a double-boarded ceiling construction and acoustically enhanced loft-hatch to be used where there is a loft mounted motor/control unit.

5.23 To avoid unintended air pathways, background ventilators should not be installed with mechanical ventilation with heat recovery.

Noise from mechanical systems (comments within Approved Document F)

5.24 With regard to noise from mechanical systems, page 6 of the document states the following:

1.5 Mechanical ventilation systems, including both continuous and intermittent mechanical ventilation, should be designed and installed to minimise noise. This includes doing all of the following.

a. Correctly sizing and jointing ducts.

b. Ensuring that equipment is appropriately and securely fixed, such as using resilient mountings where noise carried by the structure of the building could be a problem.

c. Selecting appropriate equipment, including following paragraph 1.6.

1.6 For mechanical ventilation systems, fan units should be appropriately sized so that fans operating in normal background ventilation mode are not overly noisy. This might require fans to be sized so that they do not operate near maximum capacity when in normal background ventilation mode.

1.7 Account should be taken of outside noise when considering whether openable windows are appropriate for purge ventilation.

Note: Although there is no requirement to undertake noise testing, achieving the levels in the following guidance would ensure good acoustic conditions. The average A-weighted sound pressure level for a ventilator operating under normal conditions and not at boost rates should not exceed both of the following.

a. 30 dB $L_{Aeq,T}$ for noise-sensitive rooms (e.g. bedrooms and living rooms) when a continuous mechanical ventilation system is running on its minimum low rate.*

b. 45 dB $L_{Aeq,T}$ in less noise-sensitive rooms (e.g. kitchens and bathrooms) when a continuous operation system is running at the minimum high rate or an intermittent operation system is running.*

** The noise index $L_{Aeq,T}$ is used in BS 8233, where T is the duration of the measurement. If the noise from the sound source is steady (i.e. fluctuating by up to 3dB), a measuring time of 1 minute will be adequate and the L_{Aeq}, 1 min level will be similar to the dB(A) level used elsewhere. If the noise from the sound source fluctuates more than this, a longer measuring time (T) may be required, but the higher portion of the fluctuating level should be considered, and the sound may attract more attention due to the changes in level.*

Note: Methods for measuring the sound power level produced by the fan unit of decentralised extract ventilation, centralised extract ventilation and balanced mechanical ventilation with heat recovery systems are described in BS EN 13141.

6. Conclusion

6.1 At the position of the dwellings directly adjacent to High Lane, the survey results indicate that the site is a Low to Medium Risk for the daytime and night-time period. The new dwellings set-back from High Lane are a Low Risk for the daytime and night-time period.

6.2 Standard thermal double glazing and a traditional building envelope construction will provide sufficient sound insulation for all habitable rooms. Acoustically laminated double glazing is unnecessary.

6.3 An alternative means of ventilation should be provided to the habitable rooms most exposed to road traffic noise from High Lane. A suitable option would be to install good quality acoustically rated ventilator units to frames/walls or alternatively a mechanically assisted ventilation system.

6.4 It is anticipated that the recommended targets will be achieved along the south facing elevations of plot no's 13 to 16, the east facing elevations of plot no's 1 to 12 and the west facing elevations of plot no's 1 to 6. In this instance, an alternative method of ventilation is considered unnecessary.

6.5 In most instances, the predicted internal sound levels are below the night-time noise limits stated within Approved Document O, which indicates that occupants are likely to open bedroom windows during the night to help cool and remove excess heat from the room.

6.6 Appropriate daytime sound levels and a good acoustic standard is anticipated for the proposed garden areas. Additional noise mitigation measures are unnecessary.

Appendix A
Site layout, floor layouts and elevations

Figure A.1 - Proposed site layout (rev: P3)

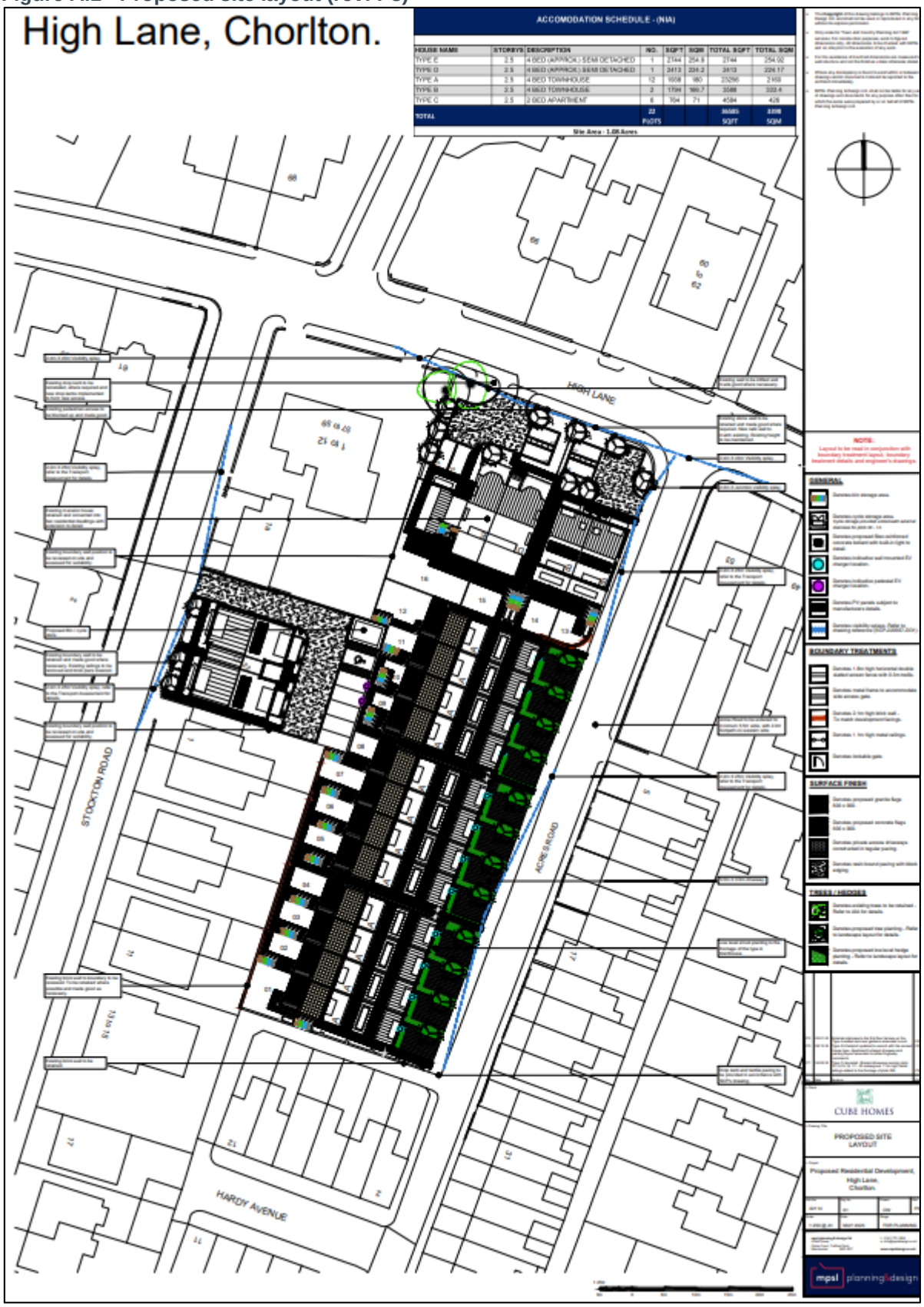


Figure A.2 - Illustrative street scenes

Figure A.3 - Landscape GA

Figure A.4 - Proposed floor plans and elevations (type A)

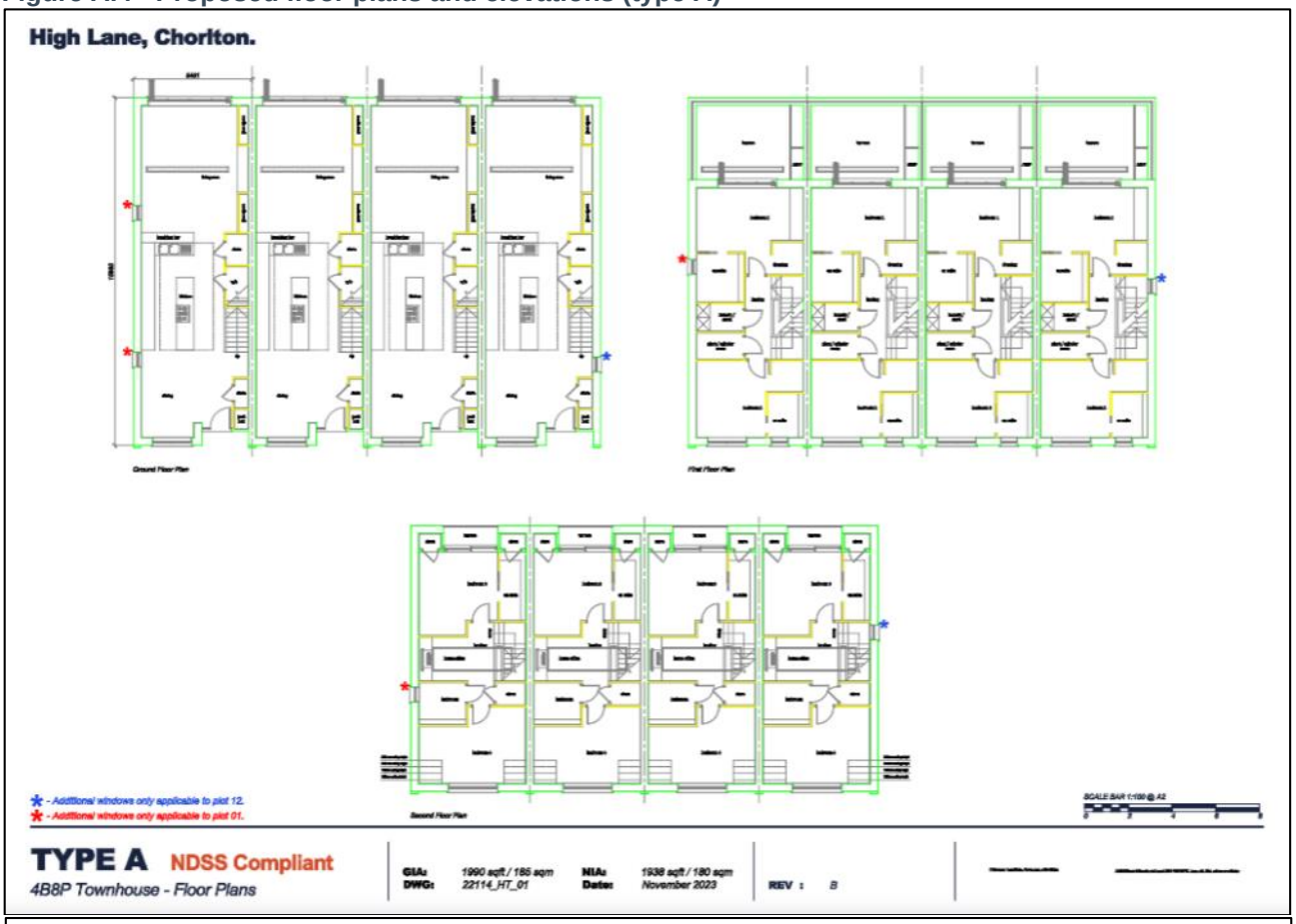
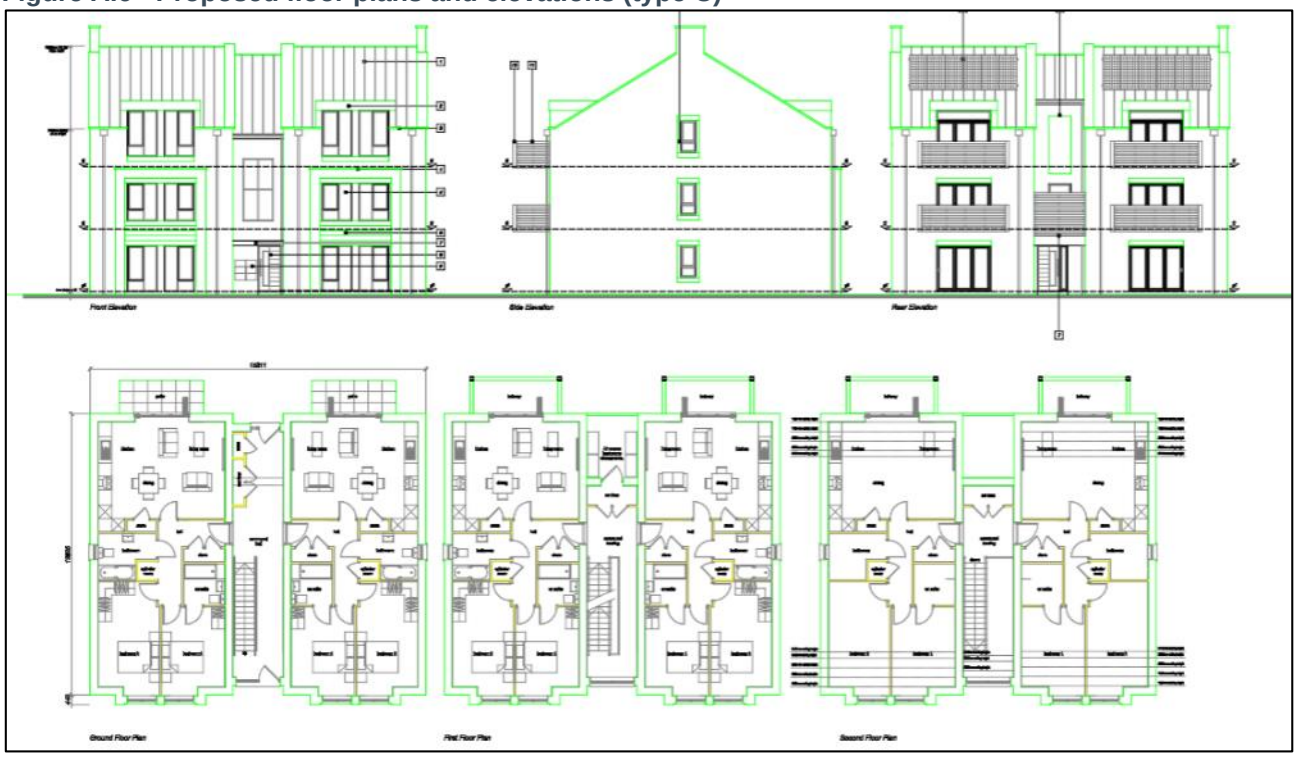


Figure A.5 - Proposed floor plans and elevations (type B)

Figure A.6 - Proposed floor plans and elevations (type C)



Appendix B
Assessment terminology

Assessment terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$Pa).
dB(A)	The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc, according to the parameter being measured.
Acoustic environment	Sound from all sources as modified by the environment.
Ambient sound level	The totally encompassing sound in a given situation at a given time; it is usually composed of sound from many sources, near and far.
Equivalent continuous sound level - $L_{Aeq,T}$	The A-weighted equivalent continuous sound pressure level over a period of time, T. Representative of the 'average' sound pressure level over a given period (commonly used to describe the 'ambient' sound level).
Maximum sound level - $L_{AFmax,T}$	The A-weighted 'maximum' sound pressure level that occurred during a given period, T (commonly used for the assessment of intermittent loud noises).
Background sound level - $L_{A90,T}$	The sound pressure level that is exceeded for 90% of the measurement time interval, T. $L_{A90,T}$ is often used to describe the 'background' sound level.
Habitable room	Any room used or intended to be used for sleeping, cooking, living or eating purposes (enclosed spaces such as bath or toilet facilities, service rooms, corridors, laundries, hallways, utility rooms or similar spaces are excluded from this definition).
R_w	The weighted sound reduction index expressed in dB. A single number quantity for airborne sound insulation rating.
Free-field level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other significant reflective surfaces. Generally as measured outside and away from buildings (>3.5metres).