DM VEST

CARRWOOD HOUSE, 109 SHAW HEATH, STOCKPORT

NOISE ASSESSMENT FOR PLANNING PURPOSES

04 April 2022

AEC REPORT: P4083/R1b/RDC

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DOCUMENT STATUS

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Revision	Date	Document Details	Author	Checked By
-	10/03/2020	Original Document	NRS	PJK
a	28/01/2021	Minor Revisions	RDC	PJK
b	04/04/2022	Revisions to site layout	RDC	PJK

1.0 INTRODUCTION

1.1 Acoustic & Engineering Consultants Limited (AEC) has been instructed by DM Vest to undertake a noise assessment in relation to the proposed conversion of an existing three storey former office block into a residential block at 109 Shaw Heath, Stockport.

1.2 This report details the noise levels measured on site, presents the assessment criteria and discusses the implications on building design to achieve acceptable noise levels in internal areas to meet the Local Authority requirements.

1.3 Acoustic terminology is discussed in brief in Appendix A.

2.0 BACKGROUND AND SITE DESCRIPTION

2.1 Carrwood House is a former three storey office block, located at 109 Shaw Heath, Stockport. The site is bound to the north and south by existing residential properties, to the east by the Triton House commercial unit and to the west by Shaw Heath which is a busy road connecting the M60 to the north and Davenport to the south. A site location plan is presented on the attached Figure 1.

2.2 It is understood that the commercial units in Triton House operate during daytime only.

2.3 Following a review of information issued by Manchester Airport, the site is located within the noise contours for the airport.

2.4 The proposed development will consist of nine apartments and a proposed site layout is presented on the attached Figure 2.

2.5 Based on the provided drawings, all flats to the upper two floors are dual aspect, with the two ground floor flats being the only single aspect apartments.

3.0 NOISE CLIMATE

General

3.1 An attended daytime noise level survey was undertaken by AEC on Monday 2 March 2020 between approximately 1340 and 1600h and night-time noise levels were measured on Friday 28 February 2020 between approximately 0500 and 0640h.

3.2 Measurements were undertaken at three locations around the development site identified as A to C on the attached Figure 1. A and B were both undertaken under free-field conditions, however, Location C was a façade measurement.

3.3 All measurements were undertaken in general accordance with BS7445-1: 2003 '*Description and measurement of environmental noise. Guide to quantities and procedures*'.

3.4 A full measurement procedure is presented in Appendix B and the measured data is presented in Tables B1 and B2.

Road Traffic Noise from Shaw Heath

3.5 Location A was selected to measure the noise levels due to road traffic on Shaw Heath. During the daytime, noise levels were relatively consistent 68dB$L_{Aeq,15mins}$ and 72dB$L_{A10,15mins}$.

3.6 At night-time the noise levels ranged from 55 to 68dB$L_{Aeq,10mins}$ as the traffic increased on Shaw Heath. Maximum night-time noise levels due to vehicle movements on Shaw Heath were no greater than 80dB$L_{Amax,F}$.

Aircraft Noise

3.7 Based on Manchester Airport's Noise Action Plan 2019-2023, the site falls under the 54-51dB$L_{Aeq,16h}$ and 48-51dB$L_{Aeq,8h}$ noise level contours during the daytime and night-time, respectively.

3.8 At Location A, noise from aircraft flying over the site was audible, however, they did not contribute to the ambient noise level which was dominated by road traffic. In addition, maximum noise levels at night were lower than typical maximum noise levels due to vehicle movements.

3.9 At Location B, ambient noise levels and maximum night-time noise levels due to aircraft flying over were around 53dB$L_{Aeq,10mins}$ and up to 70dB$L_{Amax,F}$, respectively.

Industrial Noise

3.10 Measurement Location C was chosen to measure noise levels affecting the eastern façade of the site.

3.11 Daytime façade noise levels were consistently around 51dB$L_{Aeq,T}$ and were due to continuous plant noise from Triton House. Road traffic on Lowfield Road did impact the measurements but to a lesser extent.

4.0 BASIS OF ASSESSMENT

National Planning Policy Framework

4.1 Current national planning policies are set out in the National Planning Policy Framework (NPPF) published by the Department for Communities and Local Government, dated March 2012, and revised in February 2019.

4.2 The planning policies which relate specifically to noise, were updated in July 2021, and are presented in paragraphs 174, 185 and 187 which are reproduced below:

"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."

4.3 Further to the above, the Governments '*Planning Practice Guidance'* (PPG) published on 6 March 2014 and updated on 22 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.'

4.4 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.

Determining and Assessment of External Noise Levels

4.5 BS 8233:2014 '*Guidance on sound insulation and noise reduction for buildings'* (BS8233) describes how noise levels can be determined and assessed from different sources in chapters 6.2 to 6.7.

4.6 In relation to road traffic noise, BS8233 states that the noise from road traffic can be determined using the Department of Transport, Welsh Office, document '*Calculation of Road Traffic Noise'* (CRTN) issued in 1988. CRTN presents the shortened measurement procedure which can be used to convert the arithmetic mean of the measured $L_{A10,T}$ levels (measured over 3 consecutive hours during the period 1000h to 1700h) into an 18-hour L_{A10} level by subtracting 1dB.

4.7 BS8233 suggests that the conversion of the $L_{A10,18h}$ to $L_{Aeq,16h}$ can be achieved by the (approximate) relationship of $L_{Aeq,16h} = L_{A10,18h} – 2dB$. Therefore, the daytime ambient noise level can be determined by subtracting 3dB from the arithmetic mean of the $L_{A10,T}$ levels measured on-site over 3 consecutive hours (between 1000 and 1700h).

4.8 Chapter 6.5 of BS8233 provides guidance on how to assess noise from industrial and commercial sites. Paragraph 6.5.2 states that where industrial noise affects residential or mixed residential areas, the methods for rating noise in BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound', (BS4142) should be applied.

Internal Noise Level Limits

4.9 Based on AEC's experience of assessments previously undertaken for submission to Stockport Metropolitan Borough Council (SMBC), it is understood that they require that internal noise levels in new residential properties should comply with guidance presented in BS8233 and the Association of Noise Consultants (ANC) document *'ProPG: Planning and Noise - New Residential Development*', 2017 (ProPG).

4.10 Based on the guidance presented in BS8233 and ProPG, the proposed noise levels to be achieved in habitable rooms due to transportation noise sources are presented in Table 4.1, below.

Table 4.1 – Internal Noise Level Limits within Habitable Rooms

Activity	Location	Noise Level Limit, dB		
		Daytime 0700 – 2300h $L_{Aeq,16h}$	Night-Time 2300 – 0700h	
			$L_{Aeq,8h}$	$L_{Amax,F}$
Resting	Living Room	35	-	-
Dining	Dining Room/Area	40	-	-
Sleeping (daytime resting)	Bedroom	35	30	45

4.11 Where noise sources have specific character, such as being intermittent in nature, containing a distinguishable, discrete, and continuous tone, is irregular enough to attract attention, or has a strong low-frequency content, BS8233 suggests that lower internal noise level limits may be appropriate.

4.12 Therefore, as the scheme includes a residential apartment block with no suitable mitigation measure options available (such as acoustic barriers) to control external noise levels to the upper floors, it is proposed that a suitable internal noise level limit is set to control noise from operations associated with Triton House.

4.13 To minimise the potential impact on future residents from noise events associated with the stores it is proposed that a -5dB correction is applied to the internal noise levels presented in Table 4.1 in the habitable rooms overlooking Triton House.

4.14 In relation to maximum noise levels in bedrooms during the night-time period, Note 4 of ProPG states that "*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*."

4.15 Based on this, AEC would propose to design the façade in order that maximum noise levels in bedrooms do not typically exceed 45dB$L_{Amax,F}$ during the night-time period 2300h to 0700h and any non-typical events such as a one-off emergency siren or noisy motorbike pass-by will be excluded from the assessment.

Ventilation and Control of Overheating

4.16 The ventilation specifications presented in BS8233 and ProPG are based on achieving the requirements of Approved Document F (ADF) '*Ventilation*' (2010) of the Building Regulations only.

4.17 ADF requires that continuous whole dwelling (background) ventilation be provided to limit the accumulation of moisture and other pollutants originating within a building. This is typically achieved either via a partially opened window, or by a whole building ventilation system through the provision of trickle ventilators or mechanical ventilators. ADF states that '*The ventilation provisions will not necessarily meet cooling needs*'.

4.18 ProPG notes that the attenuation of external to internal noise levels provided by a window partially open for whole dwelling ventilation is no more than 15dB.

4.19 Therefore, for habitable rooms to have whole dwelling ventilation via a partially open window, external noise levels outside habitable rooms should not exceed 50dB$L_{Aeq,16h}$ during the daytime, and 45dB$L_{Aeq,8h}$ and 60dB$L_{Amax,F}$ at night.

4.20 In relation to purge ventilation, ProPG suggests that as this should only occur occasionally (e.g., to remove odour from painting and decorating or from burnt food), the internal desired noise levels are not generally applicable. Therefore, internal noise levels due to windows being opened for purge ventilation has not been discussed further.

4.21 To provide guidance on the relationship between internal noise levels and the control of overheating in residential properties, the ANC issued *'Acoustic ventilation and Overheating – Residential Design Guide'* (AVO) in January 2020. It is important to note that this is a design guide only and not a statutory document and the Local Authority may have their own requirements.

4.22 At this stage AEC are unaware of any specific Local Authority requirements in relation to acceptable internal noise level limits in habitable rooms with windows open to aid with the control of overheating. Therefore, this indicative assessment is based on the guidance presented in AVO.

4.23 Table 3.3 of AVO presents guidance for allowable noise from transportation sources whilst windows are open for the control of overheating. With reference to this document AEC would propose that windows can be utilised in the control of overheating provided that the resultant internal ambient noise levels are below approximately 50dB$L_{Aeq,\ 16h}$ during the daytime, and 42dB$L_{Aeq,8h}$ and 65dB$L_{Amax,F}$ during the night-time.

4.24 These internal noise levels are the upper end of the medium risk category for adverse effects. Where these internal noise levels would be exceeded, AVO states that "*noise causes a material change in behaviour (e.g., having to keep windows closed most of the time)*". In this situation, AEC would suggest alternative means for the control of overheating are considered, which do not rely on open windows.

4.25 AVO states that where transportation is the main source of noise, *"it is assumed that a partially open window will provide an outside-to-inside level difference of 13dB and is considered representative of typical domestic rooms with simple façade openings of around 2% of the floor area"*.

4.26 Considering the above, it is considered acceptable to control summertime heating via opening windows where external free-field noise levels are no greater than those presented in the following Table 4.2. This is based on simple façade openings to around 2% of the floor area.

Table 4.2 – External Free-Field Noise Level Limits for the Control of Overheating via Openable Windows

Activity	Location	Noise Level Limit, dB		
		Daytime 0700 – 2300h	Night-Time 2300 – 0700h	
		$L_{Aeq,16h}$	$L_{Aeq,8h}$	$L_{Amax,F}$
Resting	Living Room	63	-	-
Dining	Dining Room/Area	63	-	-
Sleeping (daytime resting)	Bedroom	63	55	78

4.27 The limits presented in Table 4.2 are subject to agreement with the Local Authority and may be subject to change.

5.0 ASSESSMENT OF PROPOSED DEVELOPMENT

5.1 As mentioned above, the main sources of noise affecting the proposed site are road traffic on Shaw Heath, industrial noise from Triton House and aircraft flying into Manchester Airport. These sources are discussed separately below.

Road Traffic Noise from Shaw Heath

5.2 Based on the methodology described in Section 4.7 and 4.8, the free-field daytime ambient noise level affecting the habitable rooms overlooking Shaw Heath due to road traffic would be around 68dB$L_{Aeq,16hour}$ and this level is used in the assessment.

5.3 In relation to night-time noise levels, based on AEC's experience, the ambient noise level would be lower in the period between 0100 and 0500h, therefore, this assessment is based on the highest ambient and maximum noise levels measured between 0500 and 0700h. It is expected that the noise levels would be similar between 2300 and 0100h and 0500 and 0700h.

5.4 The highest ambient noise level measured during the period (0500-0700h) was 68dB$L_{Aeq,10min}$ due to road traffic on Shaw Heath and this level have been used in the assessment. However, it should be noted that the overall 8-hour L_{Aeq} night-time noise level will be lower.

5.5 In addition, the highest maximum noise level of 80dB$L_{Amax,F}$ measured during this period has been used in this assessment.

Aircraft & Industrial Noise

5.6 In relation to aircraft noise, on the elevations facing Shaw Heath (or have significant line of sight), the noise levels from aircraft flying over are 10dB below the noise level from traffic and are not contributing to the overall daytime and night-time noise levels.

5.7 On the eastern elevation, however, noise from aircraft could be as high as 54dB$L_{Aeq,16h}$ during the day and is therefore, slightly higher than that from either the industrial noise or from road traffic. At night, they are as high as 51dB$L_{Aeq,8h}$ which is understood to be higher as well than that from industrial or road traffic noise. Therefore, ambient noise levels from aircraft has been used to assess the eastern elevation.

5.8 In relation to maximum noise levels, the main noise source affecting the roof would be maximum noise levels due to aircraft fly overs. Therefore, a noise level of 70dB$L_{Amax,F}$ has been used to assess this element but also for the eastern elevation.

Determined Free-field External Noise Levels

5.9 Based on the noise levels mentioned above, and applying appropriate distance and screening attenuation where applicable, the determined free-field daytime and night-time noise levels external to each elevation are shown in Figure 5.1 and Table 5.1, below, and on the attached Figure 2.

Figure 5.1 – Façade Colour Layout (Only Ground Floor Presented)

Table 5.1 – Free-field Noise Levels External to Each Facade

Façade (Colour)	Noise Limit, dB		
	Daytime 0700 – 2300h	Night-Time 2300 – 0700h	
	$L_{Aeq, 16h}$	$L_{Aeq,8h}$	L_{AFmax}
	68	68	79
	64	64	76
	54	51	70

Glazing and Whole Dwelling Ventilation

5.10 A comparison of the determined noise levels presented in Table 5.1 and the external noise level limits presented in paragraph 4.19, all habitable rooms in the development would need their windows to be kept closed and alternate means of whole dwelling (background) ventilation would need to be provided.

5.11 The sound insulation performance of the glazing and ventilator to meet the requirements stated in Table 4.1 have been calculated based on the spectrum data measured on-site, the room sizes and glazing areas (assumed to be approximately 33% of the total room area for living rooms and approximately 25% of the total room area for bedrooms) presented on the architectural drawings and presented in Table 5.2, below.

Table 5.2 – Outline Requirements to Achieve Internal Noise Levels in Habitable Rooms

Colour on Figure 5.1	Sound Insulation Performance	
	Glazing	Ventilator
Green	$35dBR_w$ / $32dBR_w + C_{tr}$	$38dBD_{n,e,w}$
Blue		$38dBD_{n,e,w}$
Orange	$31dBR_w$ / $27dBR_w + C_{tr}$	$38dBD_{n,e,w}$

5.12 Example of the glazing build-up to achieve the above required sound insulation performance is presented in Table 5.3 below.

Table 5.3 – Example Glazing Constructions

Sound Insulation Performance	Example Construction
$35dBR_w$ / $32dBR_w + C_{tr}$	10mm Glass /TC/ 6mm Glass
$31dBR_w$ / $27dBR_w + C_{tr}$	6mm Glass /TC/ 6mm Glass

TC = Thermal Cavity

5.13 Prior to any glazing being installed, octave band sound insulation performance data of the glazing build-ups and ventilators selected must be verified by AEC or others.

5.14 All ventilation requirements have been based on the use of a single ventilator per room. If more than one unit is required, such as may be required to satisfy Building Control requirements, the performance of each unit might need to be increased.

5.15 The above glazing specification would achieve the suggested criteria to control noise from activities associated with Triton House to below $30dBL_{Aeq,16h}$ in living rooms during the daytime, and $25dBL_{Aeq,8h}$ and $40dBL_{Amax,F}$ in bedrooms at night.

Purge Ventilation

5.16 Windows can be openable for purge ventilation provided that they are effectively acoustically sealed when closed, and it is important that any frames and seals do not downgrade the sound insulation performance of the glazing.

Control of Overheating

5.17 If it is determined by others that there is a need to control overheating within this development, this could not be supplied by opening windows based on the noise levels presented in Table 5.1 and comparing them with the noise levels presented in Table 4.2.

5.18 Therefore, if needed, an alternate means of cooling would be required such as a decentralised or separate system of cooling. This will need further development.

Other Façade Elements

5.19 The roof and walls of the building would need to achieve a minimum sound insulation performance of at least 45dBR'$_w$ and 50dBR'$_w$ respectively.

5.20 Assuming the roof is made of concrete, its sound insulation performance should be sufficient to accommodate any noise break-in from aircraft flying over.

5.21 In addition, areas where existing glazed panels on the elevation overlooking Shaw Heath are to be replaced with opaque/solid panels, these need to achieve a minimum sound insulation performance of 45dBR'$_w$ and this may need further development.

6.0 SUMMARY AND CONCLUSIONS

6.1 Acoustic & Engineering Consultants Limited (AEC) has been instructed by DM Vest to undertake a noise assessment in relation to the proposed conversion of a former three storey office block into a nine-apartment residential building. This noise assessment is required to accompany the associated planning application for the development.

6.2 The main sources of noise affecting the site are road traffic on Shaw Heath, noise from aircraft flying into Manchester Airport and plant noise from Triton House affecting the eastern elevation.

6.3 The measured noise levels are presented in Appendix B and summarised in Section 3.

6.4 Section 4 presents the design aim to achieve the desirable internal noise level limits as required by the local authority and which are similar to ones presented in BS8233:2014 *'Guidance on sound insulation and noise reduction for buildings'* and ProPG.These limits are based on achieving the background ventilation requirements as set out in Approved Document F *'Ventilation'* (2010) of the Building Regulations only.

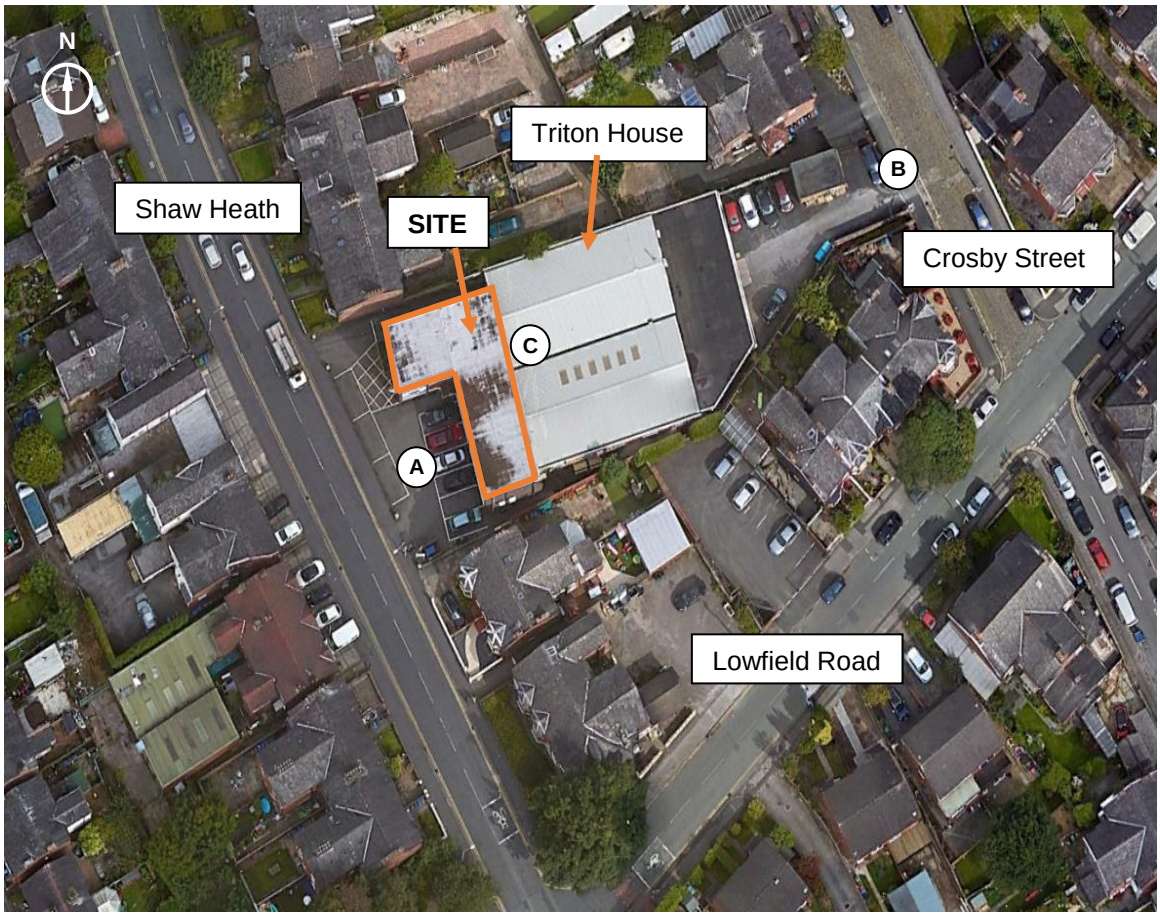
6.5 The noise levels presented in Section 3 have been assessed in Section 5 and the determined daytime and night-time noise levels external to each elevation is presented in Table 5.1 and on the attached Figure 2.

6.6 Based on the measured noise levels affecting the proposed development site, the sound insulation requirements of the building envelope and ventilation have been determined and are presented in Table 5.2 and indicates that all habitable rooms of the development would need their windows to be closed and alternate means of whole dwelling ventilation would be required.

6.7 If it was deemed necessary by others that there would be a requirement to control overheating, based on the noise levels presented in Section 5, windows would need to be closed and an alternate means of cooling would need to be considered.

6.8 Provided the mitigation measures detailed in Section 5 are implemented, noise should not be considered a determining factor in relation to any planning permission being sought.

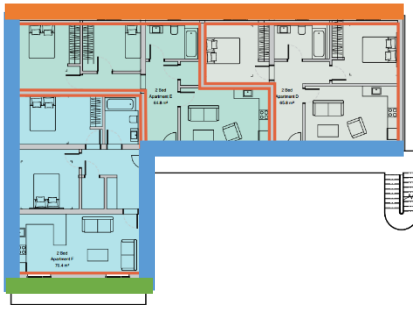
FIGURE 1 – Existing Site Showing Monitoring Locations



Map data ©2022 Google

FIGURE 2 – Proposed Site Layout

Ground Floor Plan



First Floor Plan

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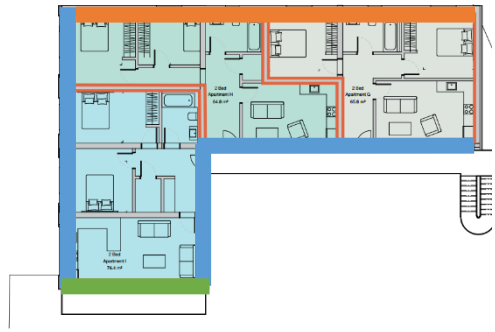
Table 5.1 – Free-field Noise Levels External to Each Facade

Façade (Colour)	Noise Limit, dB		
	Daytime 0700 – 2300h	Night-Time 2300 – 0700h	
	$L_{Aeq,\ 16h}$	$L_{Aeq,8h}$	L_{AFmax}
	67	67	79
	64	64	76
	57	57	70



Second Floor Plan

APPENDIX A – Acoustic Terminology in Brief

Sound Description

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz *(Hz)*, that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discreet frequency - a 'pure tone' - most sound is made up of many different frequencies.

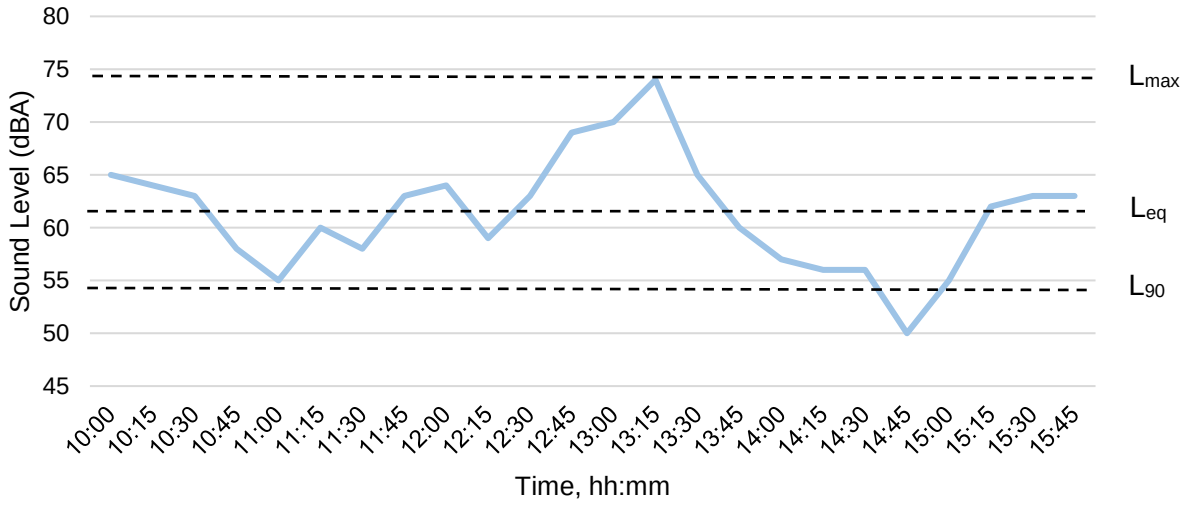
The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA,* normally used to assess the effect of noise on people. The dBA weighting emphasises or reduces the importance of certain frequencies within the audible range.

Sound Units

In order to assess environmental noise, measurements are carried out by sampling over specific periods of time, such as fifteen minutes or one hour, the statistically determined results being used to quantify various aspects of the sound.

The figure below shows an example of sound level varying with time. Because of this time variation, the same period of sound can be described by several different levels. The most common of these are described below. It should be noted that in many instances in the main body of text, the unit will be proceeded by a dB descriptor in the report e.g. $L_{Aeq,T}$ could be written $dBL_{Aeq,T}$.

Example of Sound Varying with Time



Unit Type	Acoustic Unit	Description
Ambient Sound Level	**$L_{Aeq, T}$**	The equivalent continuous (A-weighted) sound level. It may be thought of as the "average" sound level over a given time, T. It is used for assessing noise from various sources: industrial and commercial premises, construction sites, railways and other intermittent noises and can be considered as the "ambient" noise level.
Percentile Level	**L_{A10}**	The (A-weighted) sound level exceeded for 10% of a measurement period. It is the value often used to describe traffic noise.
	L_{A90}	The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value often used to describe background noise.
Maximum Sound level	**L_{Amax}**	The maximum (A-weighted) sound level measured during a given time. 'Fast' or 'Slow' meter response should be cited.
Free-field Level	**-**	This refers to the sound level measured outside, away from reflecting surfaces.
Façade Level	**-**	This refers to the sound level measured outside, at 1m from a hard-reflecting surface, typically 3dB greater than the free-field level.
Sound reduction index	**R_w**	Single number rating used to describe the laboratory airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
A road traffic spectrum adaptation term	**C_{tr}**	Referenced to demonstrate the to the low frequency sound insulation performance of building elements. Makes reference to the A-weighted urban traffic noise spectrum.
Element normalized level difference	**$D_{n,e,w}$**	Single number rating used to describe the sound insulation performance of small elements.

APPENDIX B – Noise Survey Details

Date & Time of Survey:	Friday 28 February 2020, 0500 to 0700h. Monday 2 March 2020, 1300 to 1600h.					
Personnel:	Naveen Ramesh Simha (AEC).					
Equipment Used:	Cirrus CR:171B Real Time Analyser (AEC Kit 5). B&K 2250 Real Time Analyser (AEC Kit 1).					
Calibration:	The sound level analysers, which conforms to BS EN 61672-1: 2003 *'Electro acoustics – sound level meters - Part 1 Specifications'* for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration. Calibration certificates are available on request.					
Weather Conditions:	**Date**	**Period**	**Wet/Dry**	**Temp**°C	**Wind Speed & Direction**	**Cloud Cover**
	28-02-2020	Night	Dry	3°C	Southerly and 3 m/s	95%
	02-03-2020	Day	Dry	4°C	Southerly and 3 m/s	90%
Measurement Locations:	Measurements were undertaken at three locations around the development site. Identified as A to C on Figure 1 and described below. A – 7m from nearest carriageway of Shaw Heath. B – 2m from nearest carriageway of Crosby Street. C – 1m from eastern faced of the Site.					
Measurement Details:	Measurements were undertaken over various periods in terms of L_{eq}, L_{10}, $L_{90,}$ and L_{max}.					
Façade / Free-Field:	A & B - free-field, C – façade.					
	Full results for the attended measurements are given in Tables B1 and B2.					
Measured Data:	Full 1/3rd octave band centre frequency data was obtained for all measurements.					

TABLE B1 – Measured Daytime Noise Levels

Location	Period, h	Noise Level, dB				Comments
		L_{Aeq}	L_{A10}	L_{A90}	$L_{Amax, F}$	
A	1341 – 1356	67.5	71.7	55.4	80.5	Ambient noise level was due to road traffic on Shaw Heath and maximum noise level was due to car pass by on Shaw Heath. Noise from aircraft was audible but did not contribute to the ambient noise level.
	1441 – 1456	68.0	72.2	52.5	81.4	
	1536 – 1551	66.4	70.5	51.3	76.9	
C	1327 – 1332	50.4	52.0	48.6	62.4	Constant plant noise from Triton House slightly affected by road traffic on Lowfield Road.
	1501 – 1506	51.4	53.3	48.9	56.5	

TABLE B2 – Measured Night-Time Noise Levels

Location	Period, h	Noise Level, dB			Comments
		L_{Aeq}	L_{A90}	$L_{Amax, F}$	
A	0500 – 0510	54.6	37.2	76.0	Ambient noise level was due to road traffic on Shaw Heath and maximum noise level was due to car pass. Noise from aircraft was audible but did not contribute to the ambient noise level.
	0559 – 0609	64.7	43.8	79.9	
	0630 – 0640	67.9	47.4	79.8	
B	0515 – 0525	52.9	38.8	69.7	Background noise level was due to plant noise from International Gas Detectors Ltd and maximum noise level was due to aircraft flying over.
	0544 – 0554	45.3	41.3	62.1	
	0615 – 0625	52.2	44.4	68.3	