

Upper Brook Street Masterplan

(Williams Motor Co (Holdings) / Alliance UBS Limited)

Environmental Noise Survey and Noise Impact Assessment Report

29547/NIA1

30 October 2023

For:
Property Alliance Group /
Moda Living /
Williams Motor Co (Holdings)



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Document Control

Rev	Date	Comment	Prepared by	Authorised by
2	30/10/2023	Updated to reflect final building massing.		
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1	23/06/2023	Revised to include operational noise transfer assessment and coordinated project description text.		
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0	19/05/2023	-		
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1.0 Introduction

This report has been prepared by Hann Tucker Associates on behalf of Williams Motor Co (Holdings) and Alliance UBS Limited, to support a full planning application for a life sciences and purpose-built student accommodation (PBSA) development (hereafter referred to as the 'Proposed Development') on Phase Two of the Upper Brook Street Masterplan (hereafter referred to as the 'Site'). The proposal would bring forward development on a previously developed site which is earmarked for commercial and PBSA uses in the Oxford Road Corridor Strategic Regeneration Framework Guidance (SRFG) endorsed by MCC in 2019. This application is accompanied by a comprehensive suite of technical documents, reports and plans.

The site is subject to road traffic noise from Upper Brook St and Kincardine Rd, as well as road traffic noise from Mancunian Way (A57(M)).

Baseline noise conditions have been established by means of a detailed noise survey, presented herein. The findings have subsequently been used to assess the suitability of the site for residential, educational and commercial use. Measures required to mitigate noise impacts for the proposed development (when operational) have been discussed in context with relevant national & local planning policies, design standards and good practice guides.

2.0 Objectives

- To review the latest national and local planning policies, industry standards and good practice design guides relating to noise surveys and assessments of proposed residential developments.
- To undertake an environmental noise survey to establish baseline road noise levels at selected accessible positions around the site.
- Based on the results of the survey, to undertake a noise assessment to assess the suitability of the site for residential, educational and commercial use in accordance with the Noise Policy Statement for England (NPSE), National Planning Policy Framework (NPPF), Planning Practice Guidance (ProPG), British Standard (BS) 8233, World Health Organisation (WHO) guidance, Local Authority requirements and other relevant good practice guides.
- To discuss noise mitigation and acoustic design solutions to achieve acceptable noise levels in residential areas.



- With reference to BS 4142 and other relevant guides, to propose suitable noise limits for plant and commercial operations to protect neighbouring noise sensitive receptors.

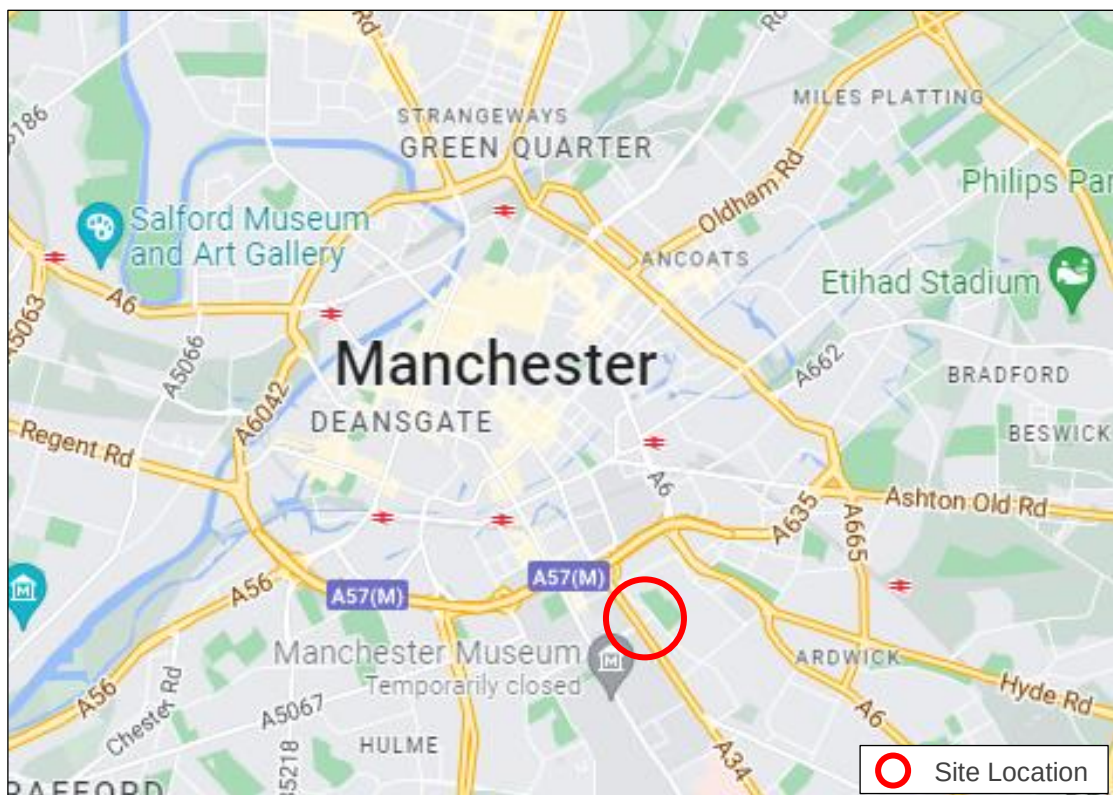
3.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

4.0 Site Description

4.1 Location

The site is located in Chorlton-on-Medlock, south of Manchester City, and falls within the jurisdiction of Manchester City Council. See Location Map below.



Location Map (Map Data ©2022 Google)

4.2 Description

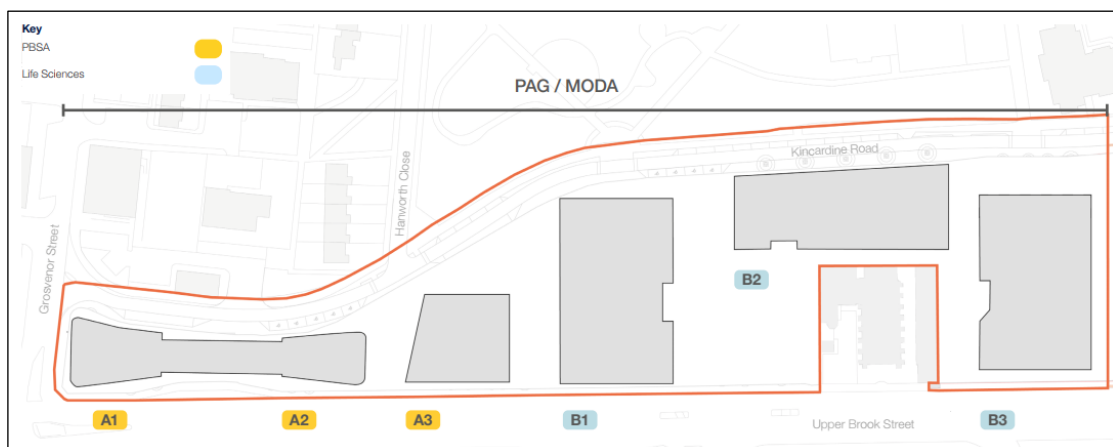
The site lies to the east of Upper Brook St, and west of Gartside Gardens. To the immediate north lies residential properties, as well as to the west-southwest. Approximately 120m north of the site lies the A57(M). To the east, across Upper Brook St, lie a number of university buildings and multi-storey car parks. See Site Plan overleaf.



Site Plan (Map Data ©2022 Google Earth)

5.0 Proposed Development

The proposed development comprises full planning application for the demolition of existing buildings and erection of three ground floor + 12/14/29 storey buildings to be used for Purpose Built Student Accommodation (Use Sui Generis), comprising 983 bedrooms in total and 506sqm of ground floor ancillary uses (café/ commercial and convenience store - Use Classes E (a)/(b)/(c)), three buildings comprising ground floor + 5/7/9 storeys for Science and Innovation uses (Use Class E (g)(i) & (ii)) and 834sqm ground floor community uses (retail/ cafés and medical facility (Use Classes E (a)/(b) and (e))), and the provision of new public realm, two new public squares, new access and parking, and associated works



Plan Showing Proposed Development



6.0 Planning Policies, Standards & Guidance

In order to provide a suitable assessment a number of national planning policies have been considered, including:

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

The above documents highlight the importance of considering the potential noise effects on any new residential development and provide a qualitative approach to assessment. However, each of the above does not provide any quantitative guidance. As such, all quantitative guidance used to form a noise impact assessment is taken from various other standards, guidance, and Local Authority requirements as summarised below:

- Local Planning Policy (MCC Planning and Noise Technical Guidance: October 2022)
- World Health Organisation: 2018
- British Standard BS8233: 2014
- ProPG : Planning & Noise: 2017
- Building Regulations Approved Document O: 2021

Detailed information for relevant planning policies and guidance can be found within Appendix B.

7.0 Environmental Noise Survey

7.1 Procedure

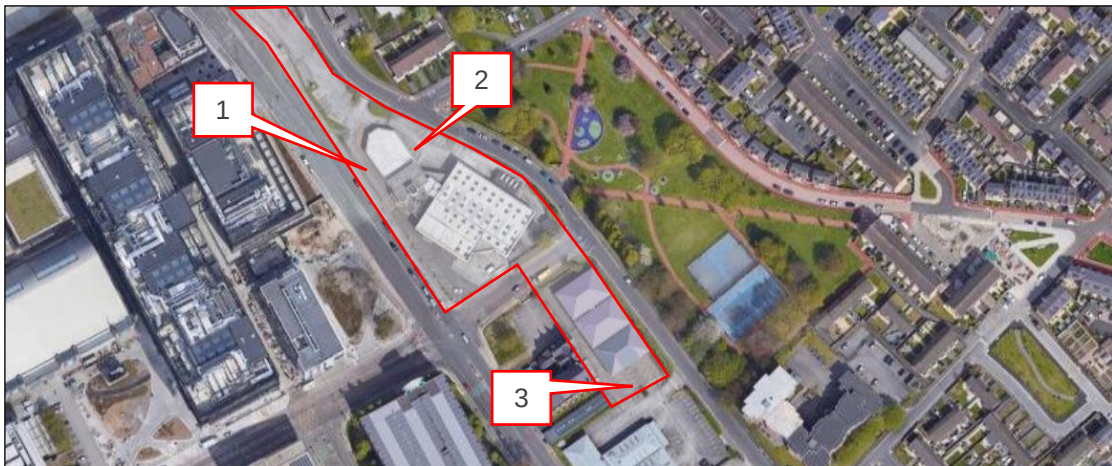
Unattended noise monitoring was undertaken on site over a 4-day period to establish full daytime and night-time noise levels over a typical weekday and weekend period. The monitoring was carried out between 12:00 hours on Friday 1st July 2022 and 10:00 hours on Tuesday 5th July 2022 with equipment set up to record broadband and spectral (octave band) sound pressure levels over discrete 5 and 15-minute periods.

The survey was performed by Cameron Maskew BEng(Hons) AMIOA. All measurements were collated in general accordance with BS 7445-1:2003 *Description and Measurement of Environmental Noise*.



7.2 Measurement Position

The measurement positions were as described and illustrated below.



Position	Type	Description
1	Unattended	To the north western boundary of the site, over looking Upper Brook Street, the microphone was secured to a tripod and hung out of a first floor window approximately 4 meters above ground. The sound level meter was secured in a security case.
2	Unattended	To the north eastern boundary of the site, over looking Upper Brook Street, the microphone was secured to a tripod and hung out of a first floor window approximately 4 meters above ground. The sound level meter was secured in a security case.
3	Unattended	To the southern boundary of the site, located centrally within the car park overlooking Kincardine Road. The meter was screened from noise emitted by Upper Brook Street. The microphone was mounted to a fence approximately 2 meters above ground. The sound level meter was secured in a security case.

7.3 Weather Conditions

For the unattended survey between Friday 1st July 2022 and Tuesday 5th July 2022, local weather reports indicated no notable periods of prolonged rainfall, with temperatures ranging from 10°C (night) to 19°C (day) and wind speeds less than 5 m/s. During our time on site, skies were overcast, wind conditions were light and from a westerly direction and road surfaces were dry.

Weather conditions were deemed suitable for obtaining representative noise readings.

7.4 Instrumentation

The instrumentation used during the survey is presented in the table below.



Position	Description	Manufacturer	Type	Serial Number	Last Calibration
1	Type 1 Data Logging Sound Level Meter	Larson Davis	824	5111	10/06/2022
2	Type 1 Data Logging Sound Level Meter	Larson Davis	824	4086	10/06/2022
3	Type 1 Data Logging Sound Level Meter	Larson Davis	824	5104	10/06/2022
All	Type 1 Calibrator	Larson Davis	CAL200	3083	06/05/2021

Each unattended sound level meter was housed in a weatherproof case with the microphone connected via an extension cable. Manned measurements were taken with a handheld sound level meter mounted onto a tripod. All microphones were fitted with a windshield.

Each sound level meter was calibrated prior to and on completion of the surveys. No significant deviations occurred (not more than 0.3 dB).

7.5 Results

The results have been plotted on Time History Graphs 29547/TH1 to 29547/TH3 enclosed presenting the 15 minute A-weighted (dBA) L_{90} , L_{eq} and L_{max} levels at each measurement position throughout the duration of the survey.

In order to compare the results of our survey with the relevant guidelines it is necessary to convert the measured $L_{Aeq(15\text{-minute})}$ noise levels into single figure daytime $L_{Aeq(16\text{-hour})}$ (07:00-23:00 hours) and night-time $L_{Aeq(8\text{-hour})}$ (23:00-07:00 hours) levels.

A summary of the results, as used to inform subsequent assessments against current guidelines, is presented in the table below. The L_{A90} values presented are the 'representative' levels determined through statistical analysis of the 15-minute readings, in line with BS 4142. L_{Amax} values are the '10th highest' typical 5-minute value in line with Approved Document O (Part O) requirements.

Position	Daytime (07:00 – 23:00 hrs)		Night-time (23:00 – 07:00 hrs)		
	$L_{Aeq,16hr}$	L_{A90}	$L_{Aeq,8hr}$	L_{A90}	L_{Amax}
1	65	55	63	44	77
2	52	46	47	41	63
3	55	48	50	42	66



7.6 Discussion of Noise Climate

Due to the nature of the survey, i.e. unattended, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period. However, at the beginning and end of the survey period the noise climate was noted to be dominated by road noise primarily emitted by heavy traffic flow on Upper Brook Street.

The results of the baseline survey show indication of a number of events that appear to be associated with sirens (proximity to hospital) and busses (Bus stops along Upper Brook Street) which make up the significant majority of highest typical L_{max} noise levels. The L_{Amax} presented above is the 10th highest typical value which excludes higher frequency dominated siren events as they are more easily attenuated by a typical glazing sound reduction profile and as such the low frequency dominated vehicle pass-by events will drive the internal L_{Amax} levels.

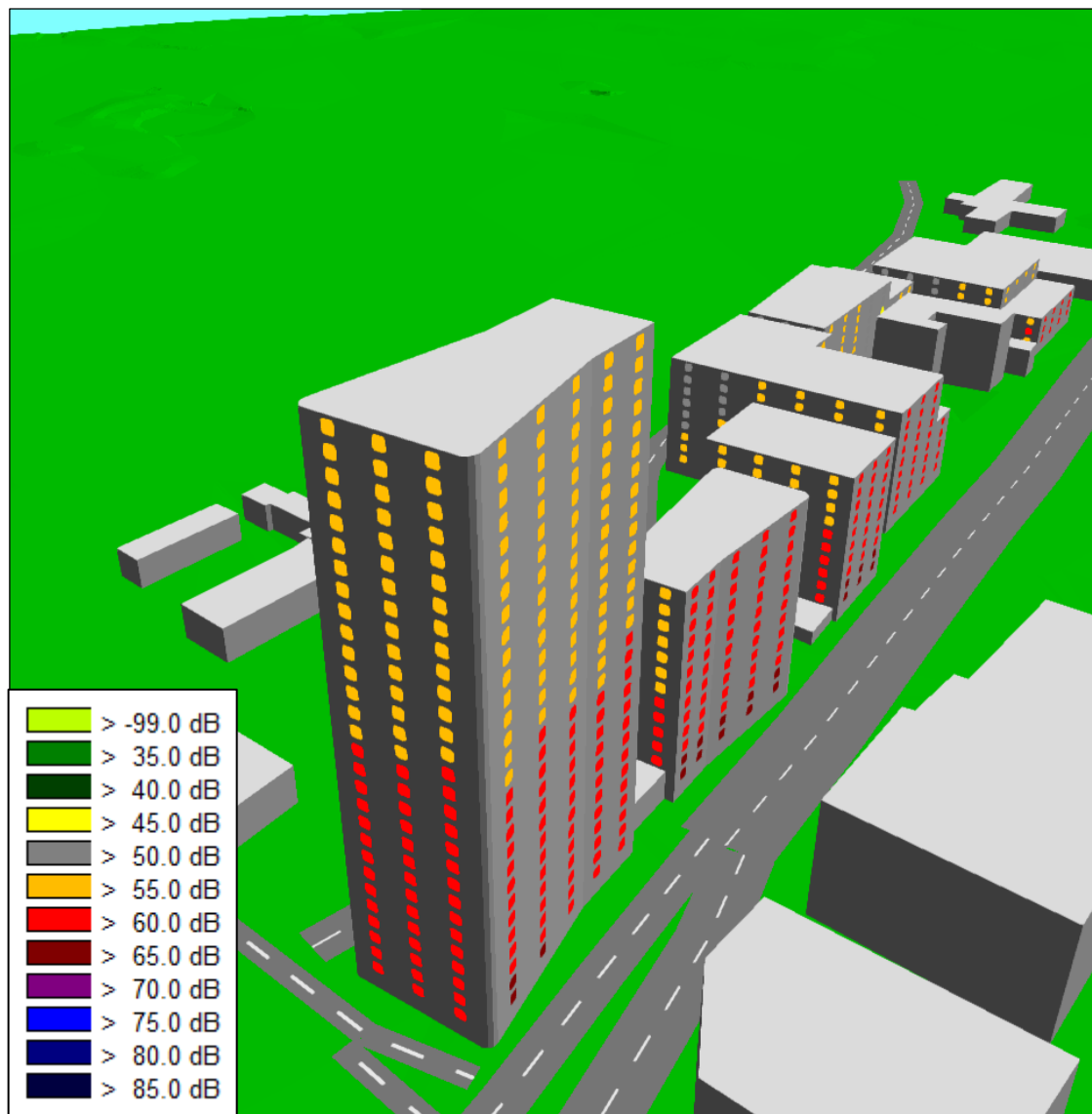
Noise was assessed from Kincardine Road but not noted to be dominant compared to noise from Upper Brook Street.

Intermittent noise was present from the use of the two Multi-Use Games Areas (MUGA) on the southern western boundary, specifically a basketball court and a tennis court. Noise came in the form of impacts where basketballs and tennis balls would rebound off the metal fencing around the perimeter of the area.

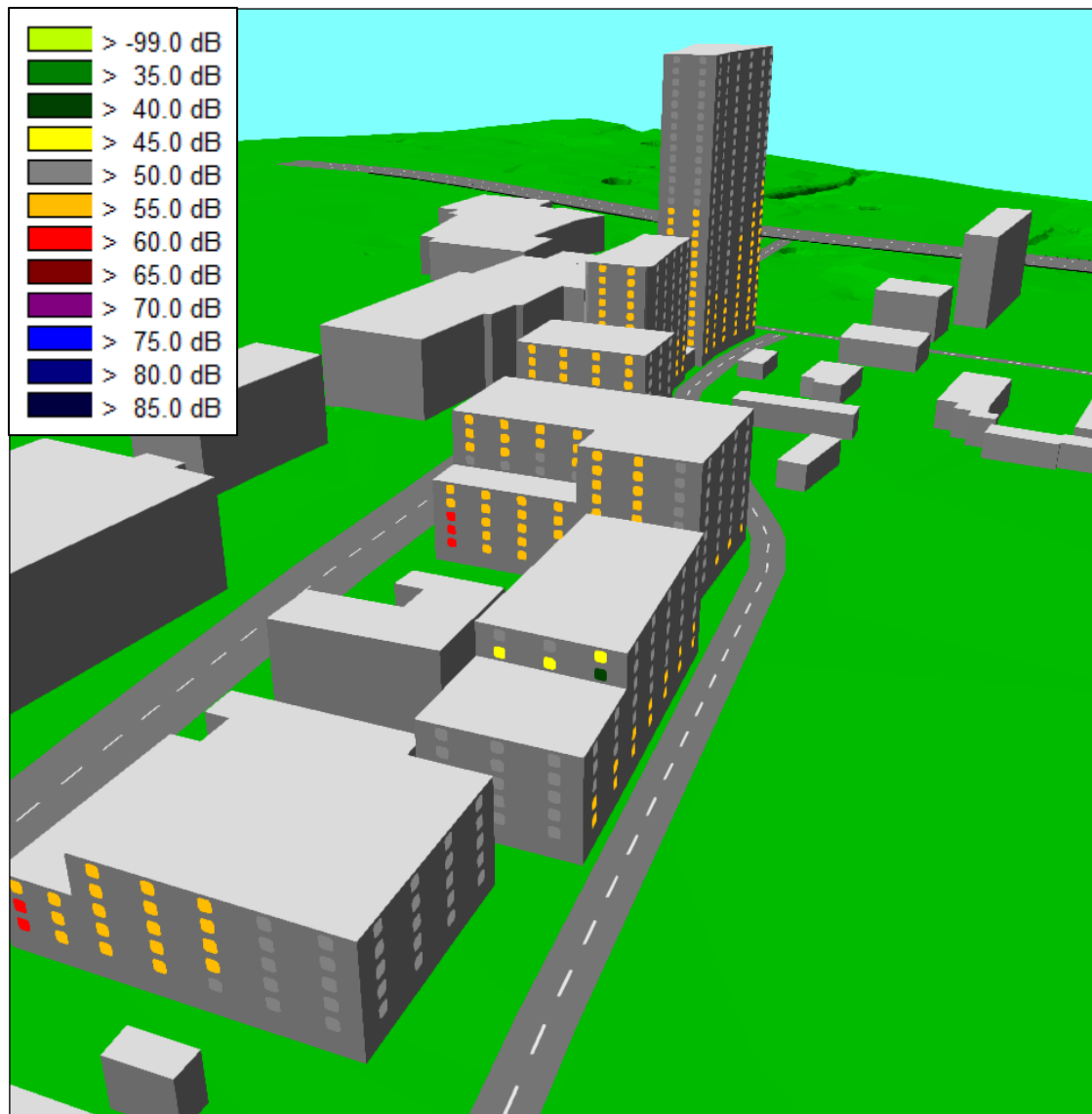
8.0 Incident Noise Levels

Using the survey data, we have created a 3D noise model in CadnaA® to predict the incident ambient noise levels upon each elevation of the proposed development.

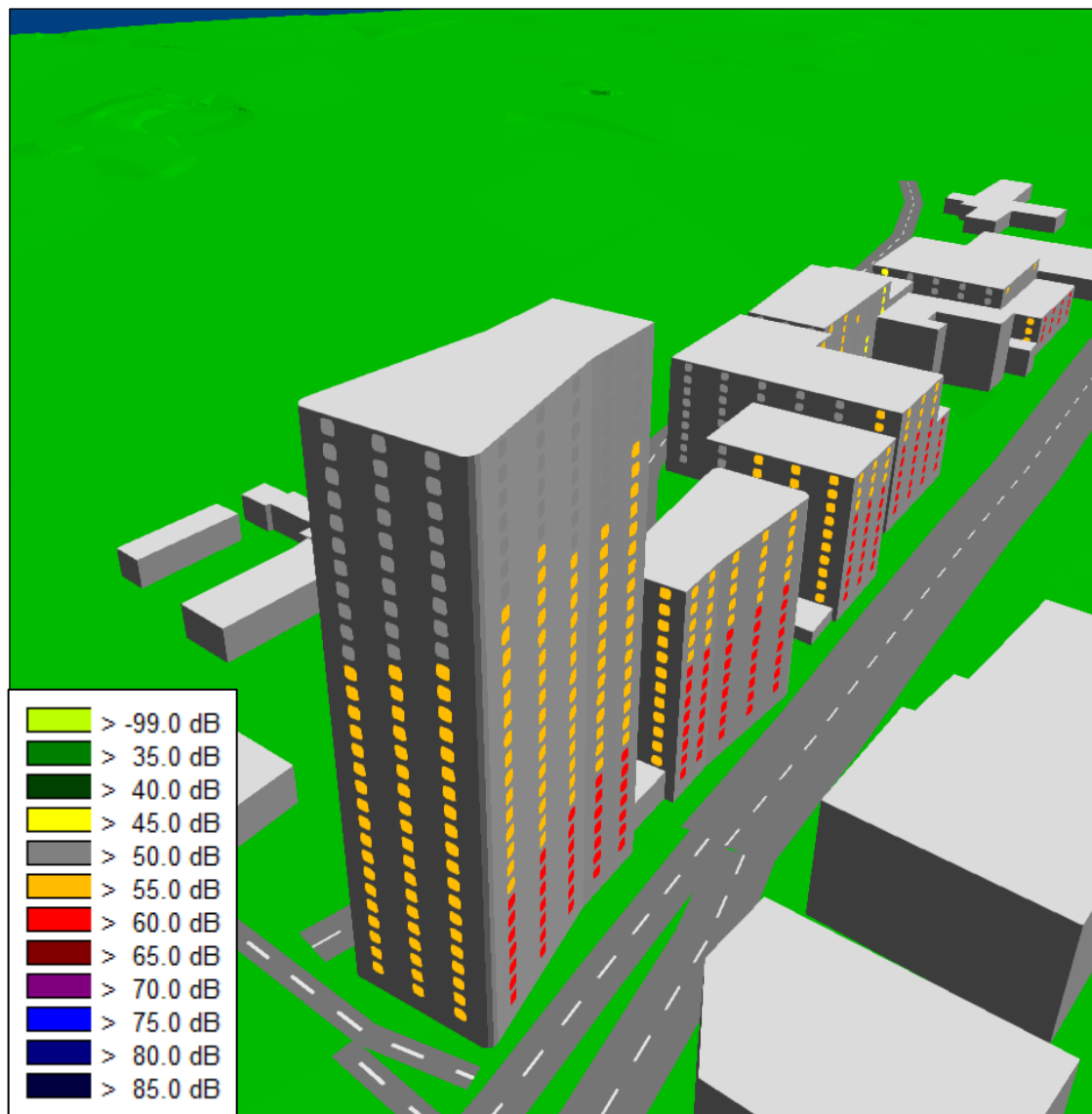
L_{max} spectral events from both siren and bus pass-bys have been reviewed and considered in our calculation of incident noise levels. It should be noted that due to the differing frequency content of these event types, although only a single broadband L_{Amax} level is presented in Section 8.0 above, the typical and 10th highest L_{Amax} levels for sirens and bus pass-bys have been considered individually for the purposes of preliminary specification of critical façade elements. 3D noise maps displaying the predicted daytime and night-time free-field incident noise levels are shown below.



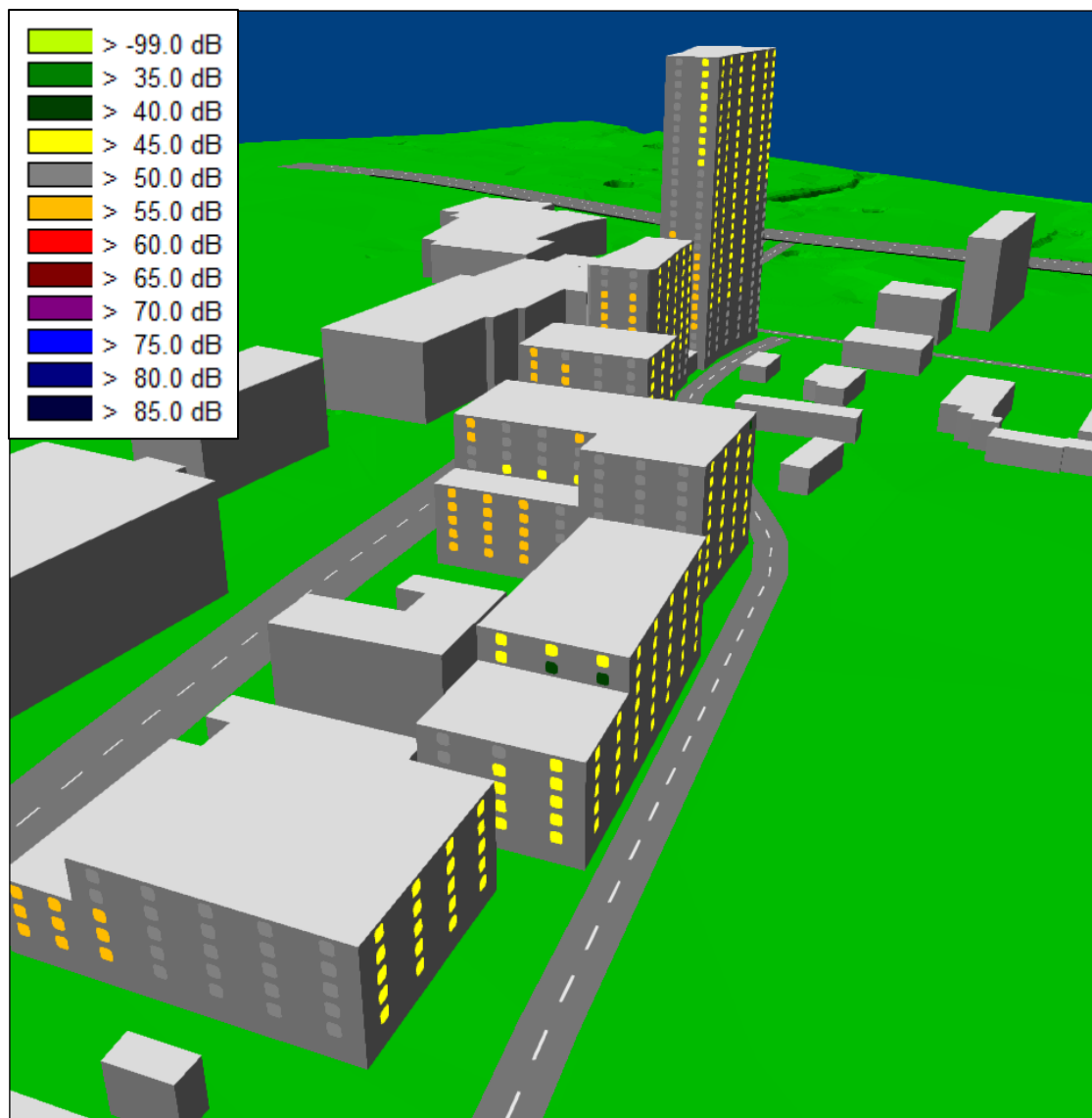
Predicted Incident $L_{Aeq,16hr}$ Daytime Noise Levels (Looking South)



Predicted Incident $L_{Aeq,16hr}$ Daytime Noise Levels (Looking North)



Predicted Incident $L_{Aeq,8hr}$ Night-time Noise Levels (Looking South)



Predicted Incident $L_{Aeq,8hr}$ Night-time Noise Levels (Looking North)

9.0 Achieving Residential Internal Noise Levels

There are 3 ventilation strategies applicable to proposed residential dwellings. These include Background Ventilation as described in Approved Document F (Part F), Overheating as described in Approved Document O (Part O), and Purge Ventilation.

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



9.1 Background Ventilation Condition

9.1.1 Proposed Design Target Internal Noise Levels

With reference to the acoustic standards and guidelines as reviewed in Appendix B, we propose external noise intrusion levels from environmental sources be controlled so as to not exceed the following criteria.

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 – 23:00	23:00 – 07:00
Resting	Living Rooms	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 ^[1] L_{Amax}

[1] regular noise events such as trains, aircraft (10th highest)

9.1.2 Outline Facade Specifications

At this stage of the design scheme the precise details of window to be used are not known, each bedroom will be ventilated mechanically with a dedicated MVHR unit.

Provision exists to provide appropriate sound insulation solutions as required including, where necessary, suitably specified glazing. We have carried out preliminary calculations to determine the likely façade sound insulation performance requirements for the worst affected facade. Our calculation methods follow those outlined in BS 8233:2014. Our calculations are based on the following assumptions:

- Conventional brick/block cavity external wall or equivalent
- 55m³ approximate room volume
- 1.6m² approximate window area
- Typical furnishings including beds, sofas, chairs etc.

Preliminary sound insulation calculations have been carried out in order to specify the minimum sound insulation performance of windows and ventilators. From the results of our assessment, the following minimum preliminary acoustic performance specifications are recommended. These are intended for planning use only, and detailed design stage octave band acoustic specifications will need to be developed for tender.



Façade Zone		Façade Element	Preliminary Minimum Sound Reduction Specification
A	Purple	Window	40 dB $R_w + C_{tr}$
B	Red	Window	38 dB $R_w + C_{tr}$
C	Orange	Window	35 dB $R_w + C_{tr}$
D	Blue	Window	32 dB $R_w + C_{tr}$
E	Green	Window	29 dB $R_w + C_{tr}$

The following plans show the location of each façade zone noted in the table above.



Plan Showing Preliminary Façade Performance Zones (L01-05)



Plan Showing Preliminary Façade Performance Zones (L06-09)



Plan Showing Preliminary Façade Performance Zones (L09-11)



Plan Showing Preliminary Façade Performance Zones (L12-13)



Plan Showing Preliminary Façade Performance Zones (L14-15)



Plan Showing Preliminary Façade Performance Zones (L16-30)

9.1.3 Example Glazing Configurations

Example glazing configurations commensurate with achieving the sound insulation performances are given below.

Glazing Specification, $R_w + C_{tr}$ (dB)	Example Configuration
40	Acoustic double glazed system e.g. 10/20/8.8 mm
38	Acoustic double glazed system e.g. 10/16/8.8 mm
35	Uprated double glazed system e.g. 6/16/8.8 mm.
32	Uprated double glazed system e.g. 7/12/6 mm.
29	double glazed system e.g 10/16/4 mm.



9.2 Overheating & Noise Assessment

9.2.1 Approved Document O (AD-O)

It is understood that Manchester would be a “medium” risk location when considering the requirements of AD-O. Based on the required free area for the medium risk zones the resulting outside-to-inside level difference for window openings are expected to be approximately 9 dB for “medium” risk locations.

Based on the above and the external noise levels calculated across the site the following table sets out the external noise levels that would be commensurate with having open windows as a means of overheating control.

Façade Zone	Incident Noise Level (dB)		Notes
	L _{Aeq,8h}	L _{AFmax,2min}	
Green	<= 49	<= 64	Open windows based on simplified model should be suitable
Red	50+	65+	Open windows based on simplified model not suitable. Detailed modelling required. However, opening windows unlikely suitable to achieve AD-O compliance.

Based on the table above, the following mark-ups show the locations in which the external noise are either in the Green or Red AD-O façade zones

In the red façade zones, it is likely that opening windows as a means of overheating control would not be possible and alternative measures would be required.



Plan Showing ADO Façade Zones (All Levels)

9.2.2 ANC/IOA Acoustics, Ventilation, & Overheating (AVO)

Based on the guidance set out in AVO and the calculated noise levels across each façade of the development a level 1 assessment has been carried out to establish the “risk categories” for each of the proposed building façades.



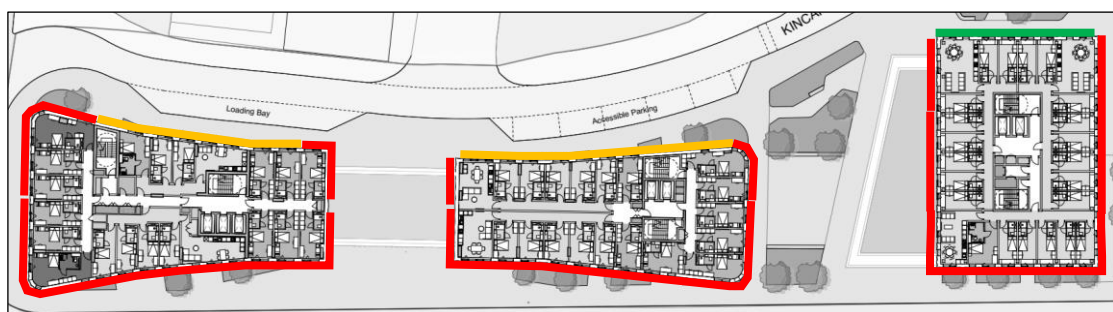
The table below sets out the risk categories and provides guidance as to whether opening windows as a means of overheating control would be suitable.

Incident Day-time Noise Level $L_{Aeq,16h}$	Incident Night-time Noise Level $L_{Aeq,8h}$	Incident Night-time L_{AFmax}	Risk Category	Comments
Below 50 dB	Below 45 dB	Does not normally exceed 58 dB ¹	Negligible	Opening windows likely suitable
50 dB to 55 dB	45 to 49 dB	-	Low	
55 dB to 65 dB	49 dB to 55 dB	-	Medium	Level 2 Assessment Recommended
Above 65 dB	Above 55 dB	Normally Exceeds 78 dB ²	High	Level 2 Assessment Recommended Opening Windows Unlikely Suitable

¹External L_{AFmax} noise level not normally exceeded more than 10 times a night. This is considered to be the SOAEL ventilation design case when considering opening windows as a means of background ventilation.

²Not normally exceeded absolute night-time maximum events should be calculated in-line with the paper *Assessing L_{max} for residential developments: the AVO Guide Approach*. This is considered to be the SOAEL overheating design case when assessing opening windows as a means of overheating control.

Based on the above the following mark-ups have been produced which show the AVO risk categories across each façade of the proposed development. Please note that the mark-ups below should be read in conjunction with the table above to establish the risk category of each façade.



Plan Showing AVO Façade Zones (L01-11)



Plan Showing AVO Façade Zones (L12-13)



Plan Showing AVO Façade Zones (L14-29)

Based on the above it would be prudent to ensure habitable rooms in the **Red** and **Yellow** zones are designed so as to remove (or severely restrict) the reliance on openable windows to satisfy overheating targets. This can be achieved by use of solar rated glazing, black out blinds, or through fenestration design. It can be assisted with mechanical ventilation too, such as MVHR with a manual summer boost function. Air conditioning can also be considered for quality developments. However, the introduction of mechanical solutions should be considered carefully; not only with regard to cost and maintenance, but sustainability and the environment, which are likely to be more prominent drivers for any new development with the LPA's jurisdiction.

10.0 Achieving Non-Residential Internal Noise Levels

There are no statutory requirements for internal noise levels from noise ingress within the Life Sciences buildings. Although internal partitioning and layouts for the Life Sciences buildings are yet to be developed it is understood that all internal spaces in these buildings will be mechanically ventilated, therefore suitable internal noise levels will be achievable through conventional façade design measures. The specifications of the façade will be developed through design.



11.0 External Amenity Area

Communal garden amenity space is proposed on the roof of the shared 2No. storey podium and rooftop level of the G+13 Storey block.

Noise levels in external amenity areas should ideally not be above the range of 50-55dB $L_{Aeq,16hr}$, as stated in BS8233:2014. It is acknowledged that noise levels on the rooftop gardens will likely be above this noise level.

It should be noted that BS8233:2014 states: *"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."*

In addition to the above, ProPG states that where despite following a good acoustic design, adverse noise impacts remain on any private external amenity space (ie garden or balcony), the impact may be partially off-set if residents are provided through the design of the development or the planning process, with access to:

"a relatively quiet, protected, publicly accessible, external amenity space (eg a public park or local green space designated because of its tranquillity) that is nearby (eg 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."

As such we would note the presence of a number of nearby public amenity spaces including Gartside Gardens and All Saints Park which are both located within short walking distance of the proposed development site.

12.0 Operational Noise Impacts

12.1 Fixed Plant & Equipment

Based on the results of the noise site and the requirements of the Local Authority, we propose that the following plant noise emission criteria be achieved incident at the nearest noise sensitive residential windows, in free-field conditions, with all plant operating simultaneously.



Plant Noise Emission Criteria ($L_{Aeq,T}$, dB)	
Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
41	36

Noise shall be assessed in accordance with BS 4142:2014 with corrections applied for any plant emitting noise of a tonal or irregular quality. The above limits shall be subject to the final approval of the Local Authority.

12.2 Life Sciences/Amenity/Commercial Unit Operations

No significant operational noise egress from the Life Sciences lab spaces is anticipated. The PBSA buildings will feature 506sqm of ground floor ancillary uses (café / commercial and convenience store – Use Classes E (a)/(b)/(c)). The Life Sciences buildings will feature 834sqm of ground floor community uses (retail/café and medical facility – Use Classes E(g)(i) & (ii)).

With respect to planning it is pertinent to consider operational noise egress and transfer from the proposed commercial units. Noise transfer from the ground floor uses of the Life Sciences buildings have not been specifically assessed at this stage as the Life Sciences labs at upper floors are not considered sensitive in this context; however it is noted that the proposed first floor slabs of the Life Sciences buildings will be ca. 450mm concrete and likely easily control noise transfer from the proposed ground floor use classes to the labs above.

Considering the prevailing environmental noise climate at the site, we would expect that noise egress via the unit frontages from the proposed commercial uses (e.g. restaurant, café, shop) should be readily controllable. However, for completeness we advise that operational noise break-out from any proposed use is controlled to no more than 5 dB below the existing background noise level at 1m from the nearest noise sensitive window as follows:

Period	Commercial noise break-out Limit, L_{Aeq} (dB)
Daytime (07:00-23:00)	41
Night-time (23:00-07:00)	36

¹Should the operation include music noise, we advise that the above limits are reduced by a further 5 dB

² Established based on achieving suitable internal noise levels within noise sensitive premises.

The first-floor slabs of the PBSA buildings will comprise 225mm PT concrete which could reasonably be expected to achieve the following minimum sound reduction indices.



Minimum Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1000	2000	4000	8000
35	38	42	49	53	55	60	60

MCC do not provide a standard criterion for the assessment of commercial noise transfer for non-entertainment venues where significant music noise levels may be present. Therefore we propose the aim should be to achieve an internal noise level 10 dB below the standard BS 8233:2014 internal ambient noise level criteria.

Based on the this, and with consideration to the need for spectral noise control in octave bands between 63 Hz and 4 kHz, we would propose that reverberant noise levels from the restaurant within the residential spaces above should be controlled so as to not exceed NR 20 $L_{eq,T}$ (in octave bands).

The following table summarises the calculation of operational noise limits based on the bare slab, any exceedance of these limits would require additional mitigation measures (e.g. mass-barrier ceiling) and would be the responsibility of the tenant to design/install such that operational noise transfer is suitably controlled to apartments above.

Description	Octave Band Centre Frequency (Hz) dB						
	63	125	250	500	1k	2k	4k
Limit in Apartment Bedroom $L_{eq,5min}$ (dB)	51	39	30	24	20	17	14
Sound Reduction Index of Slab, R (dB)	35	38	42	49	53	55	60
Calculated Noise Limit within Commercial Unit, $L_{eq,5min}$ (dB)	85	76	71	72	72	71	73

The calculated limits should allow for operation of a restaurant or café, which are likely to be the noisiest of the proposed commercial unit uses in the PBSA buildings. The following table compares the calculated noise limits with levels recently measured by Hann Tucker Associates in a busy restaurant unit with background music.

Description	Octave Band Centre Frequency (Hz) dB						
	63	125	250	500	1k	2k	4k
Calculated Noise Limit within Commercial Unit, $L_{eq,5min}$ (dB)	85	76	71	72	72	71	73
Noise Measured in Restaurant	67	67	69	72	70	66	63



13.0 Conclusions

A detailed environmental noise survey has been undertaken in order to establish the currently prevailing environmental noise climate around the site.

The environmental noise impact upon the proposed dwellings has been assessed in the context of building regulations, and national and local planning policies.

Appropriate target internal noise levels have been proposed. These are achievable using conventional mitigation measures.

Preliminary acoustic performance specifications for the residential external building fabric elements have been recommended such that appropriate internal noise levels should be achieved. These are intended for planning use only, and detailed design stage octave band acoustic specifications will need to be developed for tender.

Based on the prevailing noise climate at the site limits for any operational and plant noise egress have been specified in line with the requirements of the Local Planning Authority.

The assessment shows the site, subject to appropriate mitigation measures, is suitable for the proposed development in terms of noise.

Appendix A

The acoustic terms used in this report are defined as follows:

dB	Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).
dBA	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The _A subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.
L _{90,T}	L ₉₀ is the noise level exceeded for 90% of the period <i>T</i> (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.
L _{eq,T}	L _{eq,T} is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, <i>T</i> .
L _{max}	L _{max} is the maximum sound pressure level recorded over the period stated. L _{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L _{eq} noise level.
L _p	Sound Pressure Level (SPL) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).
L _w	Sound Power Level (SWL) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).

Appendix B

B. Planning Policies, Standards & Guidance

B.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published in March 2010 (i.e. before the NPPF). The NPSE is the overarching statement of noise policy for England and applies to all forms of noise other than occupational noise, setting out the long term vision of Government noise policy which is to:

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

That vision is supported by the following NPSE noise policy aims which are reflected in three of the four aims of planning policies and decisions in paragraph 123 of the NPPF (see paragraph 8.2 (b) below):

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life.”*

The Explanatory Note to the NPSE has three concepts for the assessment of noise in this country:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observable 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.

None of these three levels are defined numerically and for the SOAEL the NPSE makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time

of day/day of the week, etc. The need for more research to investigate what may represent an SOAEL for noise is acknowledged in the NPSE and the NPSE asserts that not stating specific SOAEL levels provides policy flexibility in the period until there is further evidence and guidance.

The NPSE concludes by explaining in a little more detail how the LOAEL and SOAEL relate to the three NPSE noise policy aims listed above. It starts with the aim of avoiding significant adverse effects on health and quality of life, then addresses the situation where the noise impact falls between the LOAEL and the SOAEL when *“all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development.”* The final aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development which include the need to minimise travel distance between housing and employment uses in an area.

B.2 National Planning Policy Framework (NPPF)

The following paragraphs are from the NPPF (published July 2021):

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.”

Paragraph 185 also references the Noise Policy Statement for England (NPSE). This document does not refer to specific noise levels but instead sets out three aims:

- “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.
- 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.
- 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.”

B.3 Planning Practice Guidance on Noise

Planning Practice Guidance (PPG) under the NPPF has been published by the Government as a web based resource at <http://planningguidance.planningportal.gov.uk/blog/guidance/>. This includes specific guidance on Noise although, like the NPPF and NPSE the PPG does not provide any quantitative advice. It seeks to illustrate a range of effect levels in terms of examples of outcomes as set out in the following table:

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 Adverse 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 some reported sleep disturbance.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse 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

Perception	Examples of Outcomes	Increasing effect level	Action
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 hard, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

B.4 Local Planning Policy

Manchester City Council give criteria for noise from various types of development in their document Planning & Noise Technical Guidance 2022. In relation to the project, the following sections are highlighted.

13.1.1 Residential Developments

Manchester City Council has adopted the following internal noise limits for residential properties:

- 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 15 times)
- Living Rooms (daytime - 07.00 - 23.00) 35 dB L_{Aeq}
- Gardens and terraces (daytime) 55 dB L_{Aeq}

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 30dB for optimal sleep conditions (and no more than 35dB 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 wellbeing.

13.1.2 Mixed Use Developments

Where a planning application includes a proposal to contain a potentially noisy development within the same building as a noise sensitive use or visa versa the noise survey should consider the transfer of noise between the noisy and noise sensitive uses. An example of where this should be considered would be a proposal for a bar or club within the same building as residential properties (see section 3.6.1.2). Consultants should demonstrate that the structure of the development will be sufficient to adequately contain the noise generated within the development. In doing so consultants should consider:

- flanking noise;
- structure borne noise;
- the overall level of noise (L_{Aeq}) generated by the use in question and any tonal or impulsive characteristics that the noise may contain; and
- the acoustic properties of the development (Including the construction of party floors and/or walls, windows and doors, ventilation systems, and structural columns.)

13.1.3 Industrial/Commercial Developments

BS 4142 should be used to assess the likely impact of noise from industrial and commercial sources at noise sensitive premises (section 3.5). One of the indications of the impact of a BS 4142 assessment is the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

The Council consider that new developments should contribute and enhance the area in which they are located and where possible, contribute to the improvement of people's health and quality of life as per the NPSE. With this in mind, the design objective should be:

'The development should be designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location'.

Where this criterion cannot be achieved, the various noise control measures considered as part of the assessment should be fully explained (i.e. relocation of noise sources, use of quieter equipment, enclosures, screening, restriction of the hours of operation) and the achievable noise level should be identified. This information will allow us to make a judgement concerning the application and its likely impact on the surrounding area.

In addition to the above, maximum noise levels should also be adequately controlled. Where Uses generate high noise levels of a short duration (e.g. loud bangs) on a regular basis, these should aim to be controlled so as not to exceed 60 dB (L_{Amax}) at the façade of noise sensitive premises nearby in accordance with the recommendations of the World Health Organisation (section 3.5).

Deliveries and collections are usually controlled by restricting operational hours but depending on the extent of these activities, a Noise Management Plan (NMP) may be requested, which would include an assessment of noise. This would usually involve assessing the noise upon arrival, loading/unloading period and then departure.

The NMP may also need to include controls such as acoustically sealed delivery bays, and restrictions on vehicle mounted refrigeration units and audible alarm systems. Where applicable, the noise assessment will take account of multiple noise sources operating simultaneously and the state cumulative level of these.

13.1.4 Noise and Vibration from Fixed Plant/Equipment

Noise from fixed plant, equipment or machinery can be very annoying and disruptive to people living nearby particularly where that item involved emits a noise with impulsive or tonal characteristics.

Many of the noise complaints Environmental Health receive about noise from plant, equipment and machinery specifically concern the character of the noise emitted. Any noise assessment needs to consider not only the overall level of noise emitted but also its particular characteristics. The noise assessment should be based on BS 4142: 2014 and any application for fixed plant, equipment or machinery must demonstrate that:

‘Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location’.

By designing the sound pressure level of any plant items to generate a noise impact of at least 5dB below the existing background level, any plant noise impact should be of a negligible level which should not give rise to complaints from users or occupiers of existing noise-sensitive usages.

Past experience has shown that this criterion can be readily achieved. Where available, product specification data for new items should be submitted with the acoustic report. Consultants should be using these to compare with data from the noise survey, and propose mitigation where the levels are above those specified in the criterion. Where this information is not available a consultant may choose to measure the noise levels generated by the equipment in question where the equipment has already been installed elsewhere (and in accordance with the guidance in BS 4142).

Where fixed plant, equipment or machinery is attached to a building the vibration caused by it can pass through the building structure and cause structure borne noise elsewhere in the building. Where it is to be installed in or on a building containing a noise sensitive use structure borne noise should be considered in the noise assessment and adequate control measures should be proposed. An example of where this would be required is where there is a proposal to install fixed plant or equipment on the roof of a residential apartment block.

B.5 World Health Organisation

The current Environmental Noise Guidelines 2018 for the European Region (ENG) supersede the Guidelines for Community Noise from 1999 (CNG). Nevertheless, the ENG recommends that all CNG indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) remain valid.

A summary of the guidance from the ENG and CNG is shown in the table below.

Source	CNG guideline indoors all sources	ENG guideline outdoors noise from specific source only
Road traffic noise	35 $L_{Aeq, 16h}$	53 dB L_{den}
	30 $L_{Aeq, 8h}$	45 dB L_{night}
Railway noise	35 $L_{Aeq, 16h}$	54 dB L_{den}
	30 $L_{Aeq, 8h}$	44 dB L_{night}
Aircraft noise	35 $L_{Aeq, 16h}$	45 dB L_{den}
	30 $L_{Aeq, 8h}$	40 dB L_{night}

With regard to single-event noise indicators, Section 2.2.2 of the WHO Environmental Noise Guidelines 2018 state:

“In many situations, average noise levels like the L_{den} or L_{night} indicators may not be the best to explain a particular noise effect. Single-event noise indicators – such as the maximum sound pressure level ($L_{A,max}$) and its frequency distribution – are warranted in specific situations, such as in the context of night-time railway or aircraft noise events that can clearly elicit awakenings and other physiological reactions that are mostly determined by $L_{A,max}$.

Nevertheless, the assessment of the relationship between different types of single-event noise indicators and long-term health outcomes at the population level remains tentative. The guidelines therefore make no recommendations for single-event noise indicators.”

B.6 British Standard BS8233: 2014

British Standard 8233: 2014 “Guidance on sound insulation and noise reduction for buildings” provides guidance for the control of noise in and around buildings.

Internal Areas

BS8233:2014 Section 7.7.2 titled “Internal ambient noise levels for dwellings” states:

“In general for steady external noise sources, it is desirable that internal ambient noise levels do not exceed the following guideline values:

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 – 23:00	23:00 to 07:00
Resting	Living Rooms	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 $L_{Aeq,8hour}$

Note 1 The above table provides recommended levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Groundborne noise is assessed separately and is not included as part of these targets, as human response to groundborne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

Note 2 The levels shown in the above table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the levels recommended in the above table.

Note 3 These 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 nigh or News Year’s Eve.

Note 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values.

Note 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.

If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.

Note 6 Attention is drawn to the Building Regulations.

Note 7 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.”

External Amenity Areas

BS8233:2014 Section 7.7.3.2 titled “Design criteria for external noise” states:

“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 $L_{Aeq,T}^1$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens, and terraces, which might be intended to be used for relaxation. In high-noise areas consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space.”

B.7 ProPG : Planning & Noise : 2017

The primary goal of the ProPG is to assist the delivery of sustainable development by promoting good health and well-being through the effective management of noise. It seeks to do that through encouraging a good acoustic design process in and around proposed new residential development having regard to national policy on planning and noise.

It is applicable to noise from existing transport sources (noting that good professional practice should have regard to any reasonably foreseeable changes in existing and/or new sources of noise). The recommended approach is also considered suitable where some industrial or commercial noise contributes to the acoustic environment provided that is “not dominant”.

This ProPG advocates a systematic, proportionate, risk based, 2-stage, approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites, and assists proper consideration of noise issues where the acoustic environment is challenging.

The two sequential stages of the overall approach are:

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

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”.

The ProPG considers suitable guidance on internal noise levels found in “BS8233:2014: Guidance on sound insulation and noise reduction for buildings”. Table 4 in Section 7.7.2 of the standard suggests that “in general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values”. The standard states (Section 7.7.1) that “occupants are usually more tolerant of noise without a specific character” and only noise without such character is considered in Table 4 of the standard.

Activity	Location	07:00 – 23:00 Hours	23:00 – 07:00 Hours
Resting	Living Room	35dB $L_{Aeq,16hr}$	-
Dining	Dining Room / Area	40dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,16hr}$	30dB $L_{Aeq,16hr}$ 45dB $L_{Amax,F}$

NOTE 1 the Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as

human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

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

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal

L_{Aeq} levels exceed the target levels by more than 10dB, they are likely to be regarded as “unacceptable” by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing “unacceptable” noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (See Section 3.D).

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

B.8 Building Regulations Approved Document O

Building Regulations Approved Document O relates to setting standards for overheating in new residential buildings. It aims to protect the health and welfare of occupants of the building by reducing the occurrence of high indoor temperatures.

Requirement O1 of Approved Document O is met by designing and constructing the building to achieve both of the following:

- a. Limiting unwanted solar gains in summer.
- b. Providing an adequate means of removing excess heat from the indoor environment.

Sections 3.2 to 3.4 of this document relate to noise and state 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. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).
- b. 55dB L_{AFmax} , more than 10 times a night (between 11pm and 7am).

Where in-situ noise measurements are used as evidence that these limits are not exceeded, measurements should be taken in accordance with the Association of Noise Consultants’ Measurement of Sound Levels in Buildings with the overheating mitigation strategy in use.

NOTE: *Guidance on reducing the passage of external noise into buildings can be found in the National Model Design Code: Part 2 – Guidance Notes (MHCLG, 2021) and the Association of Noise Consultants’ Acoustics, Ventilation and Overheating: Residential Design Guide (2020).*

B.9 Building Regulations Approved Document O

The Acoustics, Ventilation and Overheating Residential Design Guide (Version 1.1) was issued in January 2020 by the Association of Noise Consultants (ANC) and the Institute of Acoustics (IOA). This document provides guidance on the interdependence between acoustics, ventilation and overheating.

The AVO guide recommends a two-level approach to assess the potential impact of noise ingress through windows that have been opened to mitigate overheating and also noise from any mechanical services used to provide comfort cooling. The level 1 assessment relates to incident environmental noise levels across a proposed site, it is used to define “risk categories” for each building façade based on these levels. These categories are set out below:

Risk category for Level 1 assessment [Note 5]	Potential Effect without Mitigation	Recommendation for Level 2 assessment
L_{Aeq,T} [Note 3] during 07:00 - 23:00 L_{Aeq,8hr} during 23:00 - 07:00 Increasing risk of adverse effect		Recommended
		Optional
	Use of opening windows as primary means of mitigating overheating is not likely to result in adverse effect	Not required

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Where a Level 2 assessment is recommended the AVO guide states that the Significant Observed Adverse Effect Level (SOAEL), which is the noise level above which significant adverse effects on health and quality of life occur, is dependent on how frequently and for what duration the overheating condition occurs (i.e. how often the windows need to be open to mitigate overheating). However, the document refers to the overheating condition being “rare” or “most of the time” rather than providing specific durations. Therefore this is open to interpretation.

At planning stage the level of information required to undertake a level 2 assessment in-line with the AVO guide is often not available and a level 1 assessment, which establishes the risk categories of each proposed façade would be most suitable.

Upper Brook Street

Position 1

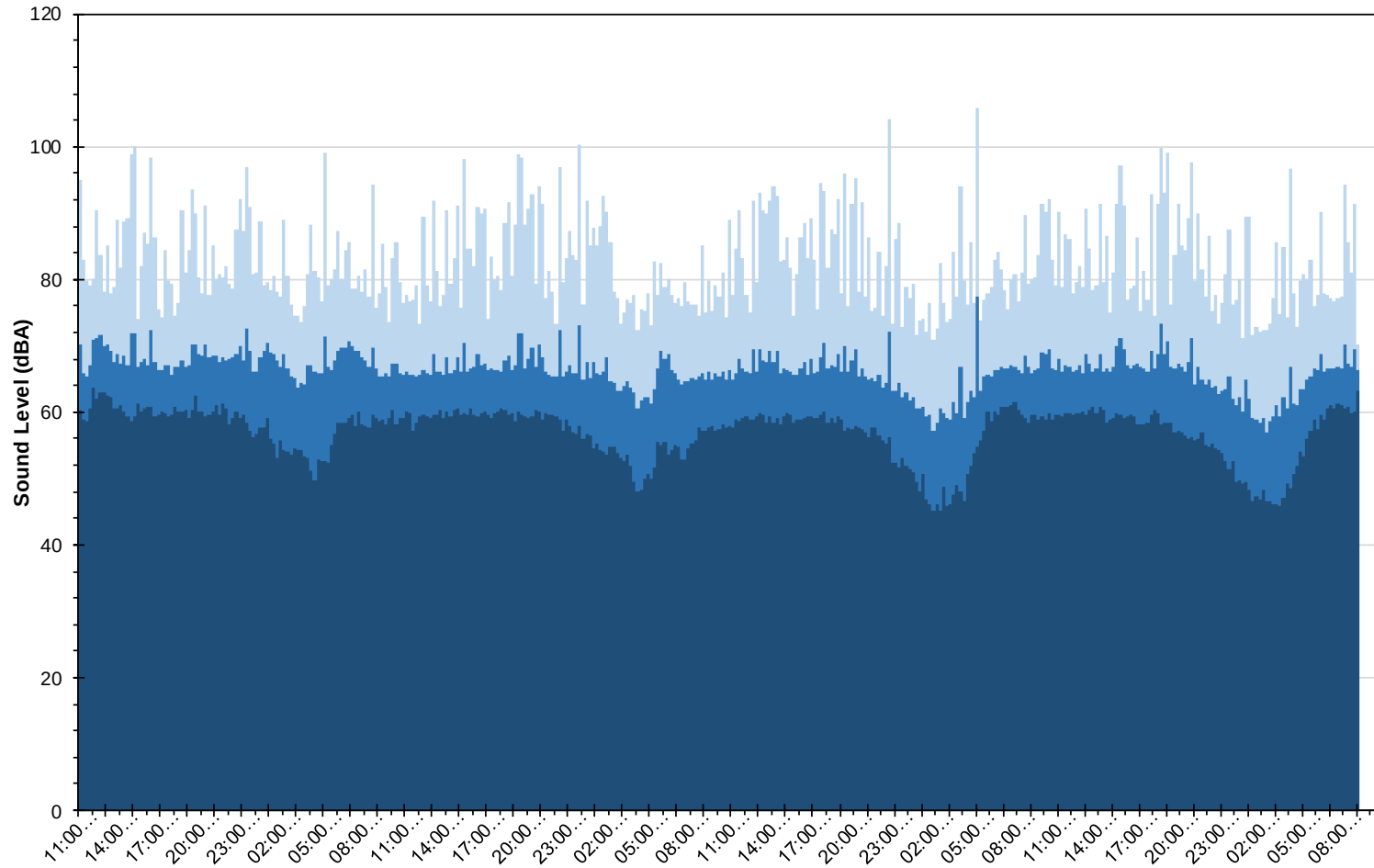
L_{eq} , L_{max} and L_{90} Noise Levels

Friday 1 July 2022 to Tuesday 5 July 2022

■ L_{Amax}

■ L_{Aeq}

■ L_{A90}



Date and Time

29547/TH1

Upper Brook Street

Position 2

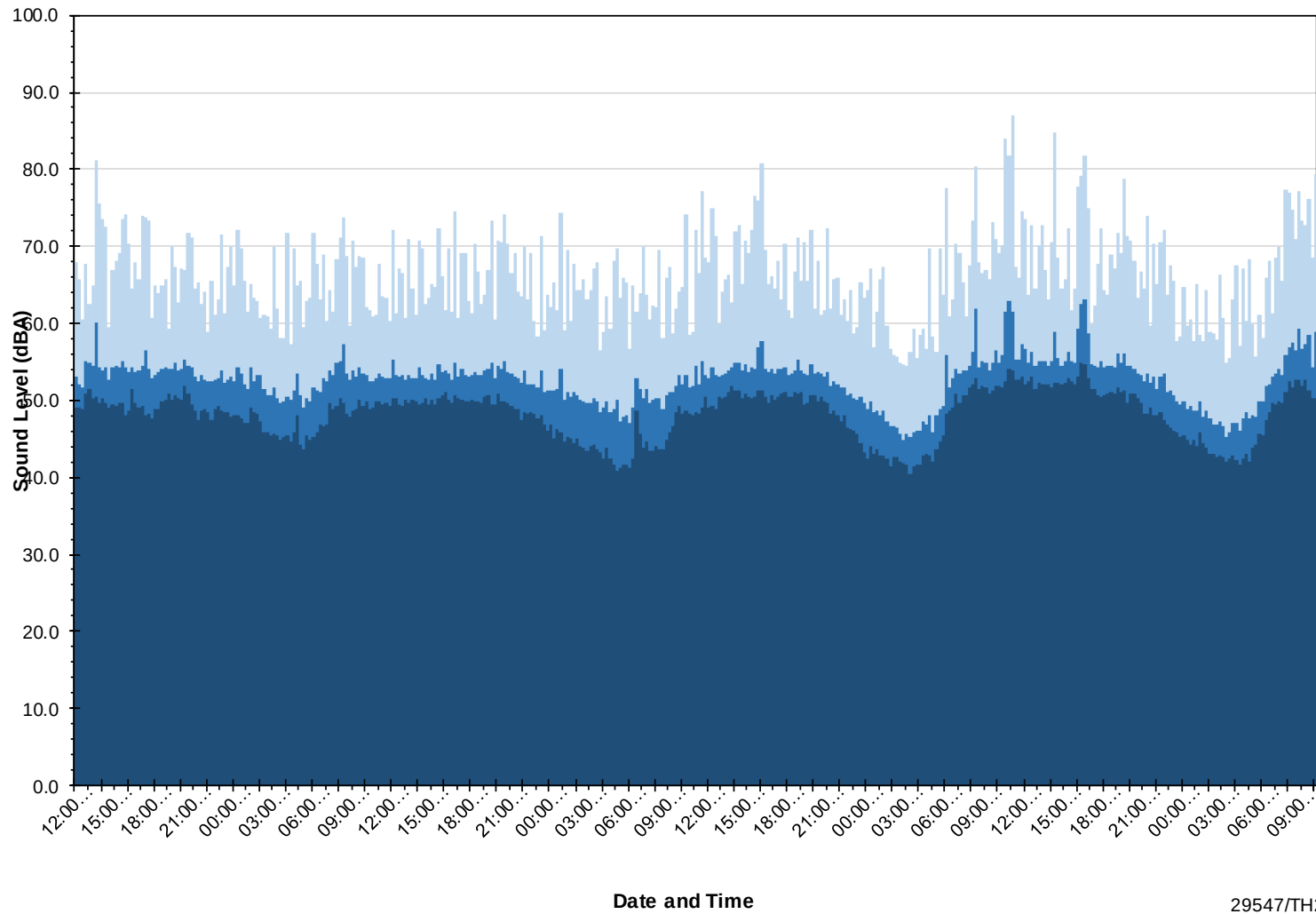
L_{eq} , L_{max} and L_{90} Noise Levels

Friday 1 July 2022 to Tuesday 5 July 2022

■ L_{Amax}

■ L_{Aeq}

■ L_{A90}



Upper Brook Street

Position 3

L_{eq} , L_{max} and L_{90} Noise Levels

Friday 1 July 2022 to Tuesday 5 July 2022

■ L_{Amax}

■ L_{Aeq}

■ L_{A90}

