

An architectural rendering of a modern urban development. On the left is a multi-story building with a grid-like facade of windows and balconies. To its right is a taller, more slender building with a similar grid pattern. In the foreground, there are trees and a paved area with some figures of people. The entire image has a blue color overlay.

June 2023
Noise Impact Assessment

Upper Brook Street Masterplan (McLaren / Kadans)

Upper Brook Street Masterplan – McLaren / Kadans

Noise Impact Assessment

McLaren Property Limited and Kadans Life Science

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1.0

Introduction

1.0 Introduction

This report has been prepared by Cundall in support of a planning application for the development of a 5 to 23 storey student accommodation block consisting of 737 units in total in the northern part of the site, and a 6 to 9 storey Sci-Tech Building in the southern part of the site, both located at land off Upper Brook Street, Manchester.

The purpose of this assessment is to evaluate the findings of the acoustic survey in relation to the proposed scheme being brought forward and, if required, to provide recommendations for mitigation measures in order to achieve a comfortable internal acoustic environment and protect the amenity of existing developments, in line with the relevant standards and local and national planning policies and standards.

To establish the prevailing noise climate across the existing site, noise surveys were undertaken between 5 and 6 December 2022 and 18 and 19 January 2023.

The scope of the assessment is based on the relevant technical guidance, good practice techniques and extensive previous experience of similar projects.

2.0

Assessment criteria

2.0 Assessment criteria

This section of the report outlines the key legislation and guidance relevant to the assessment of noise for a development of this type.

2.1 National Planning Policy Framework

The revised National Planning Policy Framework was updated on 20 July 2021 and sets out the government's planning policies for England and how these are expected to be applied.

The NPPF states:

134. *Development that is not well designed should be refused, especially where it fails to reflect local design policies and government guidance on design, taking into account any local design guidance and supplementary planning documents such as design guides and codes. Conversely, significant weight should be given to:*
- a) *development which reflects local design policies and government guidance on design, taking into account any local design guidance and supplementary planning documents such as design guides and codes; and/or*
 - b) *outstanding or innovative designs which promote high levels of sustainability, or help raise the standard of design more generally in an area, so long as they fit in with overall form and layout of their surroundings.*
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;*
186. *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.*

2.2 Noise Policy Statement for England

The noise policy statement for England (NPSE) was published by Defra in March 2010. The NPSE sets out the long-term vision of Government noise policy.

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

The NPSE long term vision is supported by the following aims:

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

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement on health and quality of life.*

2.3 Planning Practice Guidance

The Department for Communities and Local Government (DCLG) launched a planning practice guidance in March 2014 (last updated July 2019) which is a web-based resource and includes a section on Noise. This resource provides guidance on how to determine the noise impact in terms of whether a significant adverse effect is likely to occur and/or whether a good standard of amenity can be achieved.

In line with the NPSE, PPG Noise introduces the concept of:

- Significant observed adverse effect level (SOAEL): This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
- Lowest observed adverse effect level (LOAEL): this is the level of noise exposure above which adverse effects on health and quality of life can be detected.
- No observed effect level (NOEL): this is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Table 2—1 summarises the noise exposure hierarchy, based on the likely average response.

Perception	Examples of outcomes	Increasing effect level	Action
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable but 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
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. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
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 where possible
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 2—1 - PPG noise exposure hierarchy

2.4 BS 8223:2014 ‘Guidance on sound insulation and noise reduction for buildings’

British Standard 8233:2014 provides guidance on internal ambient noise levels in residential spaces. The following table summarises this guidance:

Location	Day (07:00 – 23:00 hours)	Night (23:00 – 07:00 hours)
Living room	≤ 35 dBA $L_{Aeq,16hour}$	N/A
Dining room	≤ 40 dBA $L_{Aeq,16hour}$	N/A
Bedroom	≤ 35 dBA $L_{Aeq,16hour}$	≤ 30 dBA $L_{Aeq,8hour}$

Table 2—2 - BS 8223:2014 Indoor ambient noise levels in unoccupied spaces

BS 8233:2014 does not provide internal noise criteria for individual events in terms of L_{AFmax} . However, it does state:

“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.”

2.5 Approved Document O (ADO)

It is understood that Manchester City Council have generally requested that as part of determining appropriate internal ambient noise levels, that in addition to the above requirements an assessment of noise levels during periods of overheating is undertaken.

Recently published draft guidance for consultation from the ANC / IOA relates to achieving newly introduced limits for noise during periods of overheating as specified in Approved Document O - ‘Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O (July 2022)’

This guidance will form the basis of assessing the overheating ventilation strategy in the student accommodation block, with regards to compliance with the set noise limits, and though Approved Document O is Building Regulations legislation, this indicates to the Local Authority that should overheating strategies wish to be considered at the planning stage that compulsory legislation is in place to consider this throughout the design.

Approved Document O mandates that night-time internal noise levels should be limited to see that should open windows be required to control overheating, this does not come at the cost of adverse overnight noise levels to occupants. The limiting levels are as follows:

- a. 40 dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am)
- b. 55 dB L_{AFmax} , more than 10 times a night (between 11pm and 7am)

2.6 ANC AVO Design Guide

Approved Document O considers noise levels during the night-time period only. For analysis of noise levels under overheating conditions during the daytime period, reference is made to the Association of Noise Consultants (ANC) Acoustics Ventilation and Overheating Residential Design Guide (AVO) (published in January 2020) which provides guidance on internal noise levels and overheating. The AVO Guide seeks to:

- encourage an assessment of noise that recognises the interdependence between the acoustics, ventilation and overheating designs;
- provide a means of assessment to satisfy the need to consider acoustics, ventilation and overheating at the planning stage;
- assist in educating clients, environmental health/planning officers and other stakeholders of the interdependence of design for acoustics, ventilation and overheating.

As the ProPG emphasises the importance and principles of good acoustic design, the AVO Guide is intended to “contribute to the practice of good acoustic design”. In particular, it is noted that the over-arching aspiration of good

acoustic design is that residents may open windows without any adverse acoustic impact (ProPG paragraph 2.33) and the AVO Guide provides a practical method to address these requirements

2.7 BREEAM Version 6.0 performance standards (Sci-Tech Building)

BREEAM Version 6.0 allocates four acoustic credits for office buildings, three under Hea 05 Acoustic Performance for sound insulation, indoor ambient noise control, and reverberation control, and one under Pol 05 for reduction of noise pollution.

This section outlines acoustic performance standards given in the BREEAM manual that are considered relevant to the planning application.

2.7.1 BREEAM Hea 05 Acoustic Performance

The three available acoustic credits under BREEAM Hea 05 for office buildings are as below.

The second available acoustic credits under BREEAM Hea 05 is for indoor ambient noise levels. To obtain this credit, the BREEAM manual requires *“Achieve indoor ambient noise levels that comply with the design ranges given in Section 7 of BS 8233:2014.”*

To demonstrate compliance with these performance requirements, testing must be carried out in a sample of representative spaces prior to completion.

2.7.1.1 Second credit - indoor ambient noise levels

Table 6 in Section 7.7.4 of BS 8233:2014 outlines the overall indoor ambient noise limits for office spaces when unoccupied. Indoor ambient noise is a combination of external noise intrusion and internal noise from building services. The BCO provides three sets of criteria - one for averaged intrusive external noise, one for regular individual noise events (e.g., passing trains) and one for noise from building services.

BREEAM states “Where the specific room functions and areas within the building are yet to be defined, the acoustician’s assessment should demonstrate that the criteria for the most sensitive room type likely to be present in the building is capable of being achieved”.

For the flexibility of the spatial layouts in the subsequent Cat B phase, it is recommended to use the criteria for staff / meeting room, training room and general cellular office for the office / lab spaces without detailed functions.

The BREEAM indoor ambient noise limits relevant to this project are summarised in Table 2—3.

Activity	Space	BS 8233: 2014 indoor ambient noise range ¹ L _{Aeq,T} dB	BCO external noise intrusion limit L _{eq,T} dB	BCO external noise intrusion limit L _{01,1hr} dB	BCO building services noise limit L _{eq,T} dB ²
Speech or telephone communications	Cafeteria	50 - 55	-	-	-
	Corridor, circulation space, lobby, reception	45 - 55	-	-	NR 40
Study and work requiring concentration	Staff / meeting room, training room	35 - 45	NR 35	50	NR 35
	Cellular office	n/a	NR 35	50	NR 35
	Executive office	35 - 40	NR 35	50	NR 35
	Open plan office	45 - 50 ³	NR 40	55	NR 40
	Speculative office	n/a	NR 38	55	NR 38
Toilet	-	-	-	-	NR 45

Activity	Space	BS 8233: 2014 indoor ambient noise range ¹ $L_{Aeq,T}$ dB	BCO external noise intrusion limit $L_{eq,T}$ dB	BCO external noise intrusion limit $L_{01,1hr}$ dB	BCO building services noise limit $L_{eq,T}$ dB ²
1. The ambient noise level is a combination of external noise intrusion L_{eq} and noise from building services L_{eq} . 2. These criteria are based on building services noise without a specific character. Where individual noise sources are impulsive or tonal, they shall be at least 5 dB below (10 dB lower where the noise is both impulsive and tonal) 3. For open-plan offices, a moderate ambient noise levels can provide masking for acoustic privacy in shared spaces without causing disturbance, so upper and lower noise levels should be considered.					

Table 2—3: Criteria for obtaining the BREEAM internal indoor ambient noise credit

Rain noise should be controlled so it does not exceed 60 dB $L_{Aeq,T}$ in the office spaces during heavy rain fall as defined within BS EN ISO 140-18: 2006.

2.7.2 BREEAM Pol 05 Reduction of Noise Pollution

The BREEAM requirement for the credit under Pol 05 – Noise attenuation requires a BS 4142:2014 assessment, and *The noise level from the assessed building, as measured in the locality of the nearest or most exposed noise-sensitive areas, must be at least 5 dB lower than the background noise throughout the day and night.*

Complying with the requirements of MCC will see the above credit achieved by default.

2.8 WELL performance standards (Sci-Tech Building)

The WELL pre-assessment has identified what acoustic related features whose requirements as defined in the WELL v2 Q4 2022 version should be included in the CAT A fit-out design, which include limiting internal noise levels.

2.8.1 S02.1 Limit background noise levels (max 3 points)

To achieve the allocated points, measured average background noise levels, including noise emitted from HVAC systems and external noise intrusion from external noise sources, should not achieve the thresholds below.

Parameter	Weighting	Category 4	Category 3	Category 2	Category 1	Points
L_{eq}	dBA	55	50	45	40	1
	dBC	75	70	65	60	
$L_{s,max}$	dBA	65	60	55	50	
	dBC	85	80	75	70	
L_{eq}	dBA	50	45	40	35	3
	dBC	70	65	60	55	
$L_{s,max}$	dBA	60	55	50	45	
	dBC	80	75	70	65	

Category 1: Areas for conferencing, learning, and speaking, such as meeting rooms

Category 2: Enclosed areas for concentration, such as cellular offices

Category 3: Open areas for concentration, such as open-plan offices; areas with regularly used PA systems; areas for dining (excluding office kitchenettes)

Category 4: Areas with machinery and appliances used by occupants (e.g., baggage handling areas, security, commercial kitchens, labs where spoken lectures do not take place)

Table 2—4: Criteria given in S02 Maximum noise levels

2.9 Manchester City Council - Planning & Noise: Technical Guidance (October 2022)

2.9.1 Fixed mechanical services plant

With respect to noise from fixed mechanical services plant items, this document states that:

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 5 dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location'.

2.9.2 Residential developments

Section 3.7.1.1 of the document relates to internal / external ambient noise limits for residential properties and adopts the following criteria based on BS 8233 guidance:

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}***

2.9.3 Structure-borne entertainment noise

Should there be the potential for amplified music within the ground-floor of the development, Section 3.7.1.2 of the MCC Planning & Noise Technical Guidance document states the following criteria with respect to “new residential developments that are structurally connected to entertainment venues” in order to achieve a condition of ‘inaudible’ / ‘virtually inaudible’:

'Music noise levels in the 63Hz and 125Hz octave centre frequency bands (L_{eq}) should be controlled so as not to exceed (in habitable rooms) 47dB and 41dB (L_{eq}) respectively'.

In addition to the above limits in 63 Hz and 125 Hz octave bands, we would suggest that entertainment noise frequency content in other octave bands up to 8 kHz do not exceed NR 20 values where measured in adjacent habitable rooms. The maximum acceptable noise levels in each octave band from 63 Hz to 8 kHz are as shown in Table 2—5 below:

Maximum permissible structure-borne entertainment noise levels, dB (L_{eq})							
63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
47	41	31	24	20	17	14	13

Table 2—5 - Structure-borne entertainment noise limits

It is also noted that:

This criterion may also be applicable for new residential developments that are structurally separate from an existing entertainment venue.

2.9.4 Airborne entertainment noise

Section 3.7.1.2 of the MCC document also makes reference to airborne entertainment noise from new entertainment venues that are structurally detached from other buildings. Music noise from the proposal will not be ‘audible’ in nearby properties, assuming that the residential properties in question have their windows open. The criterion here is:

Entertainment noise (L_{Aeq}) should be controlled to 5 dB below the background noise level (L_{A90}) without the entertainment noise present, in each octave band at the nearest noise sensitive location.

2.10 Manchester's Local Development Framework - Core Strategy

The Core Strategy was adopted by Manchester City Council in July 2012. It is the key document in Manchester's Local Development Framework and outlines the Council's vision for Manchester in 2027 along with the planning policies which will be used to deliver that vision. Section of Policy DM1 of the Core Strategy which are relevant to noise and good acoustic design are reproduced below:

Policy DM 1

Development Management

All development should have regard to the following specific issues for which more detailed guidance may be given within a supplementary planning document:

- *Appropriate siting, layout, scale, form, massing, materials and detail.*

[...]

- *Effects on amenity, including privacy, light, noise, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation. This could also include proposals which would be sensitive to existing environmental conditions, such as noise.*
- *Design for health.*

[...]

2.11 Citywide Development Control Policies

Item DC26 of the Manchester City Council 'Citywide Development Control Policies' document is relevant to noise and is taken into regard when considering whether permission should be granted.

26. DEVELOPMENT AND NOISE

DC26.1 The Council intends to use the development control process to reduce the impact of noise on people living and working in, or visiting, the City. In giving effect to this intention, the Council will consider both:

- a. the effect of new development proposals which are likely to be generators of noise; and*
- b. the implications of new development being exposed to existing noise sources which are effectively outside planning control*

DC26.2 New noise-sensitive developments (including large-scale changes of use of existing land or buildings), such as housing, schools, hospitals or similar activities, will be permitted subject to their not being in locations which would expose them to high noise levels from existing uses or operations, unless the effects of the noise can realistically be reduced. In giving effect to this policy, the Council will take account both of noise exposure at the time of receiving a planning application and of any increase that may reasonably be expected in the foreseeable future.

DC26.3 Developments likely to result in unacceptably high levels of noises will not be permitted:

- a. in residential areas;*
- b. near schools, hospitals, nursing homes and similar institutions;*
- c. near open land used frequently for recreational purposes.*

DC26.4 Where the Council believes that an existing noise source might result in an adverse impact upon a proposed new development, or where a new proposal might generate potentially unacceptable levels of noise, it will in either case require the applicant to provide an assessment of the likely impact and of the measures he proposes to deal satisfactorily with it. Such measures might include the following:

- a. engineering solutions, including reduction of noise at source, improving sound insulation of sensitive buildings or screening by purpose-built barriers;*

- b. layout solutions, including consideration of the distance between the source of the noise and the buildings or land affected by it; and screening by natural barriers or other buildings or non-critical rooms within a building; and*
- c. administrative steps, including limiting the operating times of the noise source, restricting activities allowed on the site or specifying an acceptable noise limit. Any or all of these factors will be considered appropriate for inclusion in conditions on any planning permission.*

DC26.5 The Council will control noise levels by requiring, where necessary, high levels of noise insulation in new development as well as noise barriers where this is appropriate.

DC26.6 Exceptions to the general policy will be considered on their merits. The Council accept, as an example, that the occasional use of outdoor facilities such as sports stadia for concerts can be acceptable in certain circumstances. Any such proposal will be considered in the light of consultation with local residents and others, and the practicability of appropriate conditions on any approval.

Reasons :-

It has become increasingly accepted that noise is a major source of environmental pollution, affecting peoples' physical and mental health. The Council considers that the planning process has a role to play in reducing noise levels generally and, through the development control system, to consider carefully the relationship between different land-uses from the point of view of noise generation and impact. Reaching judgments on what is or is not an acceptable amount or type of noise is a complex matter, consideration of which will depend on the particular circumstances on the ground.

(NOTE: The Council will issue more detailed advice on the subject as supplementary guidance, and this will have regard to current Government policy. The UDP policies therefore are limited to broad principles. Two key areas are:

- i) a presumption against allowing highly "noise sensitive" uses (such as housing and schools) so close to existing noise sources that problems would be likely to result. An existing noisy factory, for example, is entitled to some protection from objection about its activities from future residential neighbours, who would themselves feel entitled to a reasonable degree of residential amenity; and*

the reverse situation, where there would be an equal presumption against allowing noisy, or potentially noisy, activities into an area with low ambient noise levels, and where people would have a reasonable expectation that no significant increase in those background levels would be allowed. Where the relationship is difficult to predict, the Council will place the onus for assessing the noise impact of, or upon, a proposed new development on the developer, and will consult (in particular) with the Director of Environmental Health. The policy sets out the range of measures which are available to help to reduce the noise effect to acceptable levels. As well as conditions on any planning permission, a "planning obligation" (for example, an Agreement under Section 106 of the Town and Country Planning Act 1990) may be appropriate to ensure key measures are taken effectively).

3.0

Site context

3.0 Site context

The site is located off Upper Brook Street (UBS) in Manchester and comprises 1.084 hectares (ha) of land controlled by McLaren Property and Manchester City Council (MCC). The adjacent land uses surrounding the site include:

- To the north of the Site is a vacant single-storey commercial building and the Grade II listed 'Former Unitarian Chapel' which now functions as student accommodation.
- To the east of the Site is Kincardine Road; beyond which is a 4 to 6-storey student accommodation building known as Kincardine Court, and 2-storey terraced dwellings off Whitekirk Close, Arkley Street and associated side streets.
- To the south of the Site is Cottenham Street beyond which is W.H. Lung Chinese & Asian Supermarket and Wholesaler.
- To the west of the Site is Upper Brook Street and University of Manchester teaching buildings

The nearest off-site noise sensitive receptors are understood to be the 4 to 6-storey student accommodation building and 2-storey residential dwellings located to the east of the site, and the Manchester of University teaching building to the west of the site.

The existing site plan with red site line boundary is shown in the figure below as taken from Sheppard Robson's site plan drawing (Ref: 6601-SRA-ZZ-ZZ-DR-A-SK201 Rev P01), with the identified noise sensitive receptors highlighted in green.



Figure 3—1 - Proposed site plan and noise sensitive receptors

4.0

Environmental noise survey

4.0 Environmental noise survey

4.1 Objective

The objective was to capture representative background sound levels at the nearest NSRs, and prevailing ambient noise levels at the facades of the proposed development.

4.2 Date and time

Competently trained staff from Cundall conducted noise surveys on weekdays over the following periods:

- 17:00 on Monday, 5 December to 07:00 on Tuesday, 6 December 2022, and
- 12:00 on Wednesday, 18 January to 15:15 on Tuesday, 19 January 2023

4.3 Measurement locations

Two measurement locations were chosen at representative positions as described in Table 4—1 and marked in



Figure 4—1. The observations at the measurement positions are also summarised in Table 4—1.

No.	Description	Observations
NMP1	10 m from edge of Upper Brook Street, and 2 m above local ground level in free field condition.	Road traffic along Upper Brook Street (A34) was the dominant noise source
NMP2	2 m from edge of Kincardine Road, and 2 m above local ground level in free field condition.	Road traffic along Upper Brook Street (A34) was the dominant noise source

Table 4—1: Measurement locations and observations



Figure 4—1: Measurement locations

4.4 Utilised equipment

The equipment listed below were used for the noise survey. Calibration certificates for all equipment are available upon request.

Equipment	Type	Serial No.	Last calibration date
Casella Sound Level Meter	633	1211405	22/07/2021
Casella Pre-amp	495	001211	
Casella Microphone	251	2626	
Casella Calibrator	120/1	4921893	05/07/2022
NTi Sound Level Meter	NTi XL2	A2A-16315-E0	15/07/2021
NTi Pre-amp	MA220	8550	
NTi Microphone Capsule	MC230A	A17555	
Larson Davis Calibrator	CAL200	16781	30/06/2022

Table 4—2: Utilised equipment

4.5 Measurement procedure

The weather during the surveys was cold, dry, and overcast with minimal wind throughout – suitable for the measurements undertaken.

Noise measurements were made in accordance with BS EN 60651:1994 and BS 7445:1993. The sound level meters were calibrated prior and post to site measurements using the appropriate calibrators to a reference tone of 114 dB at 1 kHz. Pre- and post-calibrations indicated a shift of no more than 0.2 dB.

The measurements were carried out unattended. Audio triggers were set as 65 dB(A) to identify unusual noise events with a level higher than this during the unattended periods.

4.6 Measurement results

A summary of the average ambient noise levels recorded at positions NMP1 and NMP2 is detailed within Table 4—3. The values are the logarithmically averaged $L_{Aeq,T}$, the 10th highest night-time maximum $L_{AFmax,X}$, the highest hourly $L_{A01,T}$ occurring during rush hour times (taken as 07:00 – 09:00 and 17:00 – 19:00, onerously considered worst case levels for occupied office hours), and the range of $L_{A90,15min}$ and $L_{A10,15min}$ values measured. All values have been rounded to the nearest integer value (as fractions of a decibel are imperceptible) and were measured as free-field in dBA.

Position	Date	Period	Average $L_{Aeq,T}$ dB	10th highest night- time L_{AFmax} dB	Highest rush hour $L_{A01,1hour}$ dB	Range $L_{A90,15min}$ dB
NMP1	5/12/2022	Daytime (17:00 – 23:00 hours)	71	-	79	56 – 64
	5/12/2022 – 6/12/2022	Night-time (23:00 – 07:00 hours)	67	82	-	46 – 62
NMP2	18/01/2023	Daytime (12:00 – 23:00 hours)	55	-	63	57 – 65
	18/01/2023– 19/01/2023	Night-time (23:00 – 07:00 hours)	49	70	-	45 – 64
	19/01/2023	Daytime 07:00 – 15:15 hours)	55	-	66	54 – 60

Table 4—3 – Summary of Position NMP2 noise measurement data

Graphs of the full continuous time history measurements at positions NMP1 and NMP2 are presented in Appendix A.

5.0

Noise impact assessment

5.0 Noise impact assessment

5.1 Environmental noise model

In order to determine road traffic noise propagation across the proposed development site, a 3D model has been produced using SoundPLAN v8.2 acoustic modelling software. This model is capable of accurately determining sound propagation by taking into account variations in topography, barrier attenuation provided by existing landscaping and buildings, and distance attenuation.

5.2 Student residential noise impact assessment

5.2.1 Noise modelling results

Road traffic noise sources within the 3D model have been calibrated based upon the night-time L_{Aeq} results obtained during the survey at position NMP1 for Upper Brook Street, and position NMP2 for Kincardine Road. This is because the night-time L_{Aeq} is the most onerous criterion and will see all other internal noise level targets achieved by default.

Façade noise maps are presented in Figure 5—5. Levels referred to in the following sub-sections are 'free-field' values at 1 m from the building façade. The façade have been divided into two zones as shown in Figure 5-1 based on relative noise levels:

- Orange zone: L_{Aeq} level between 64 dB and 67 dB, the highest predicted level
- Green zone: L_{Aeq} level less than 64 dB

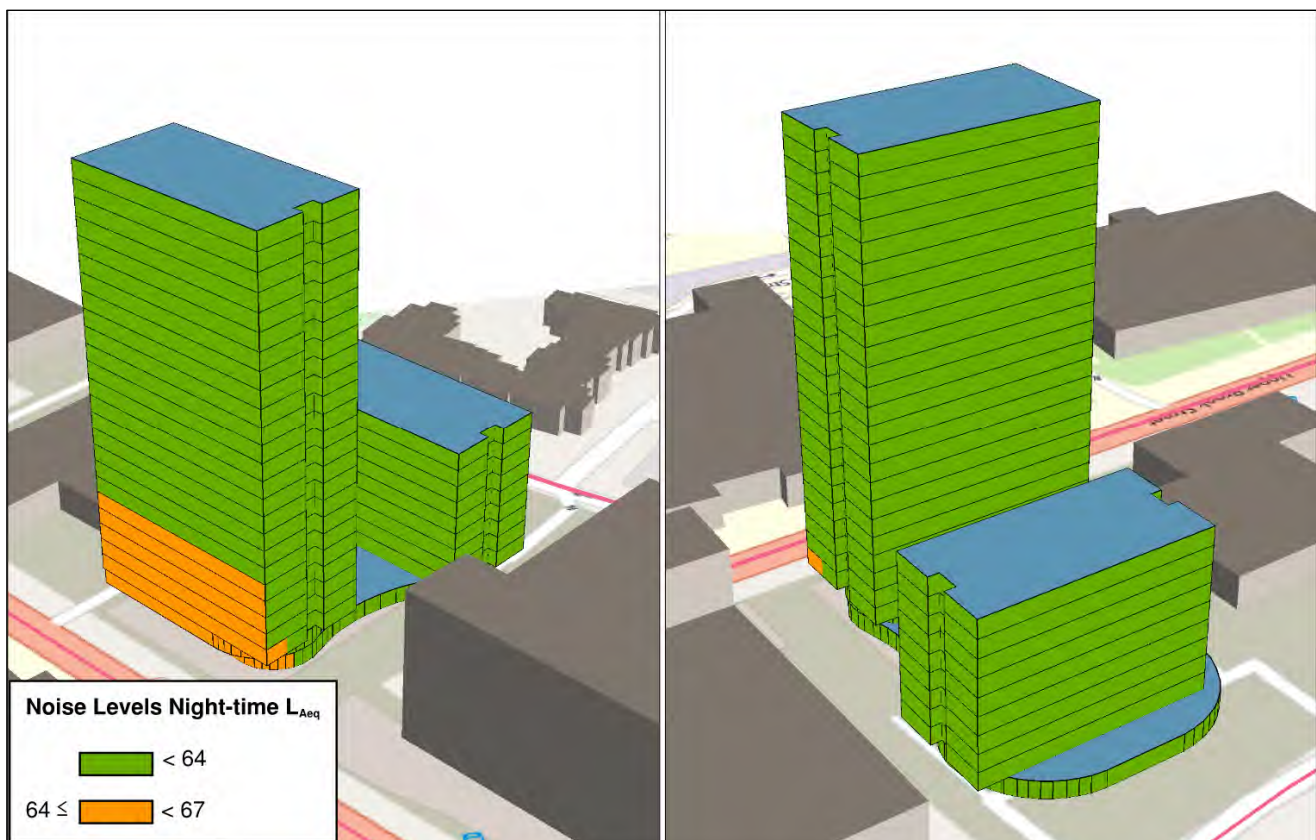


Figure 5—1: Predicted free-field noise levels from road traffic on façades of the Student Accommodation building

5.2.2 Ventilation systems (whole dwelling ventilation)

It is a requirement of the building regulations that 'whole dwelling ventilation' (previously known as 'background' ventilation) is provided in dwellings. It is proposed that Mechanical Ventilation and Heat Recovery (MVHR) units will be used to provide necessary whole dwelling ventilation rates to all dwellings.

This will mean that where MVHR units are used, no façade openings (e.g. trickle vents) are required directly into habitable rooms. MVHR ventilation systems tend to have inherently high sound attenuation and rarely results in intrusive noise issues via supply / extract duct paths. However, where air inlets and outlets associated with the system are located on noisy façades, this will be examined in detail during the design of the scheme. Additionally, if necessary, appropriate mitigation measures will be applied (silencers) so IANL design criteria are met.

In addition, any mechanical ventilation system used will need to be appropriately designed so that noise generated by the system itself does not result in significant adverse effects. This should be examined in more detail during the design stage of the project, but the following initial internal mechanical services noise level limits as adopted from CIBSE Guide A 2016 are proposed within dwellings:

Location	Daytime (07:00 to 23:00 hrs)	Night time (23:00 – 07:00 hrs)
Living room	NR30	NR30
Bedroom	NR30	NR25

Table 5—1: Summary of proposed MVHR noise limits in dwellings when providing 'whole dwelling' ventilation

As 'whole dwelling ventilation' will be provided by a mechanical system, the only time windows will be required to be open for the purposes of ventilation will be for occasional 'purge' ventilation. With respect to noise levels during purge ventilation the ProPG states the following:

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

It is therefore not considered necessary to further consider noise levels during purge ventilation conditions and using windows for this purpose is unlikely to result in any significant adverse effects.

5.2.3 Required glazing systems

For mechanically ventilated buildings, the weakest elements of the external elevation are typically the glazing. The specification of glazing is therefore considered to be the primary factor in determining the internal ambient noise level within noise sensitive areas due to noise ingress from outside.

Whilst the predicted propagation of L_{Aeq} has been modelled, it is not possible to model a propagation of L_{AFmax} in the same manner. As such for the sake of this assessment, it has been assumed that the difference in L_{Aeq} and L_{AFmax} levels is largely the same as those surveyed at position NMP1 (responding to calibration of the dominant noise source on the development from Upper Brook Street).

Calculation procedures for determining the glazing attenuation ($R_w + C_{tr}$) are as described in the "more rigorous calculation method" outlined in BS 8233:2014. Based on the worst-case incident noise levels and considering rooms with the internal ambient noise level targets (IANL), the following table presents the required sound insulation required to see the IANL are achievable. Full details of the external noise intrusion calculations are available at request.

Zone	Predicted external free-field noise level on façade – maximum in the zone (dB)	Internal noise criteria (dB)	Required minimum glazing sound insulation
Orange zone	66 $L_{Aeq,T}$	$\leq 30 L_{Aeq,T}$	$R_w + C_{tr}$ 32 dB
	79 $L_{AF,max}$	$\leq 45 L_{AF,max}$	

Zone	Predicted external free-field noise level on façade – maximum in the zone (dB)	Internal noise criteria (dB)	Required minimum glazing sound insulation
Green zone	60 $L_{Aeq,T}$	$\leq 30 L_{Aeq,T}$	$R_w + C_{tr}$ 28 dB
	72 $L_{AF,max}$	$\leq 45 L_{AF,max}$	

Table 5—2: Required minimum sound insulation performances for student residential

Examples of glazing constructions are provided in Table 5-3 to achieve the sound insulation requirements given in Table 5-2.

Minimum required glazing sound reduction index, dB $R_w + C_{tr}$	Example glazing construction
32	6 mm Glass / 12 mm Gap / 6.4 mm Laminated
28	6 mm Glass / 12 mm gap / 4 mm Glass

Table 5—3: Examples of glazing constructions for achieving minimum glazing sound insulation performance requirements

All glazing should be well sealed when closed. It is imperative that frames / non-glazed curtain walling components do not compromise the performance of the glazing. No gaps should be visible around the frame from the exterior.

To control noise break-in from outside, it is considered good practice for the external wall panel construction to provide a sound reduction at least 10 dB above that of the glazing values given above. The proposed lightweight wall panels should be submitted for review at a later design stage.

5.3 Overheating assessment

5.3.1 Approved Document O

A preliminary TM59 thermal comfort evaluation undertaken by Cundall has determined that for summertime overheating, the requirements of Approved Document O will be satisfied with windows fully closed between the hours of 10pm and 7am.

As such, since noise requirements for Approved Doc O relate to open windows, during night-time hours (23:00 – 07:00), this element of the Building Regulations will be complied with by default.

5.3.2 AVO Guide assessment

Where an AVO Guide Level 2 assessment is required for transport noises sources, Table 3-3 of the document presents a summary of the assessment of adverse effect based on internal ambient noise level and duration. The AVO Guide risk criteria are summarised below, with corresponding external free-field façade levels also defined. This is based on the openable area 0.653 m² given in the preliminary TM59 thermal comfort evaluation undertaken by Cundall which provides an external to internal noise reduction of 7 dB.

AVO risk category	Internal ambient noise levels	Corresponding external free-field façade level if windows are partially open
	$L_{Aeq,day}$ (07:00 – 23:00)	$L_{Aeq,daytime}$ (07:00 – 23:00)
RED High Risk	>50 dB	>57 dB
AMBER Medium to Low	36 to 50 dB	43 to 57 dB

AVO risk category	Internal ambient noise levels	Corresponding external free-field façade level if windows are partially open
	$L_{Aeq,day}$ (07:00 – 23:00)	$L_{Aeq,daytime}$ (07:00 – 23:00)
GREEN Negligible	≤35 dB	≤42 dB

Table 5—4 - AVO Guidance for noise assessment of noise from transport noise sources relating to overheating condition.

Based on the above external free field façade criteria, external façade noise maps are presented below which detail the AVO guide risk categories across the site if relying on opening window ventilative cooling.

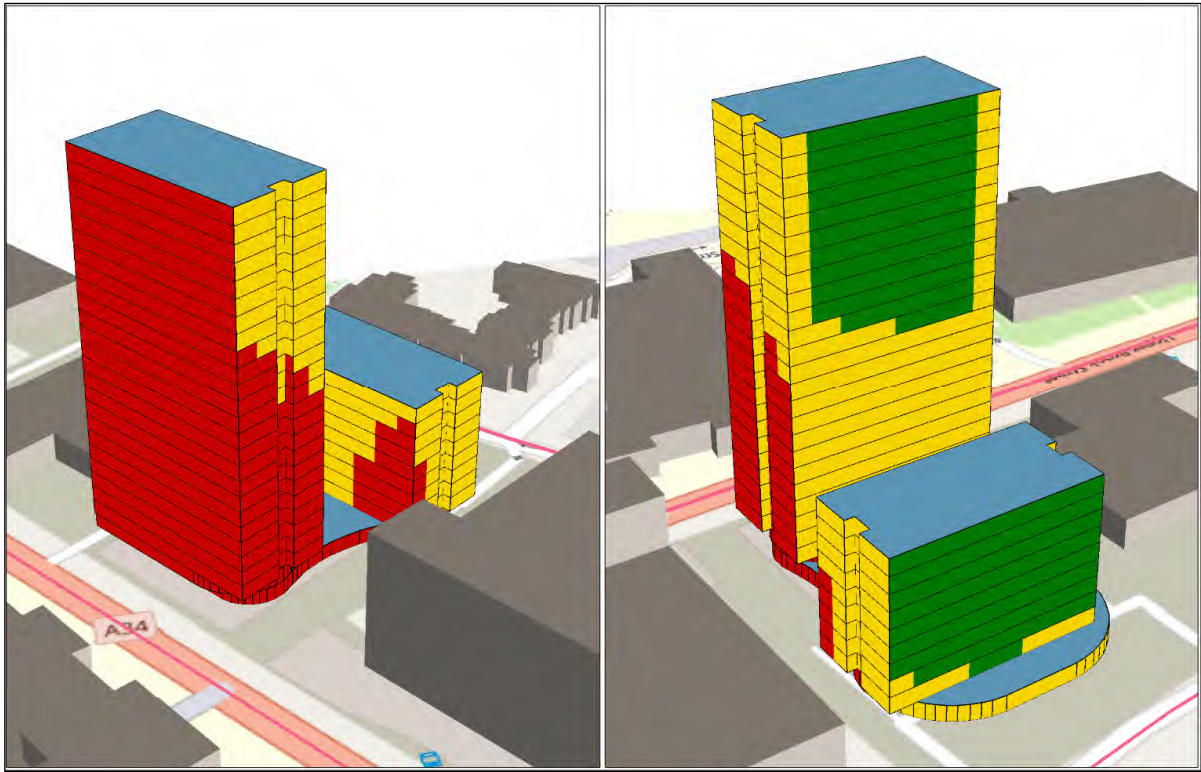


Figure 5—2 - AVO Guide risk categories across the scheme based on openable windows

Whilst Table 3-3 of the AVO guide provides no quantitative guidance regarding the combined effect of level and duration for the overheating condition, the situation is summarised qualitatively in Figure 3-2 of the AVO Guide, as reproduced below.

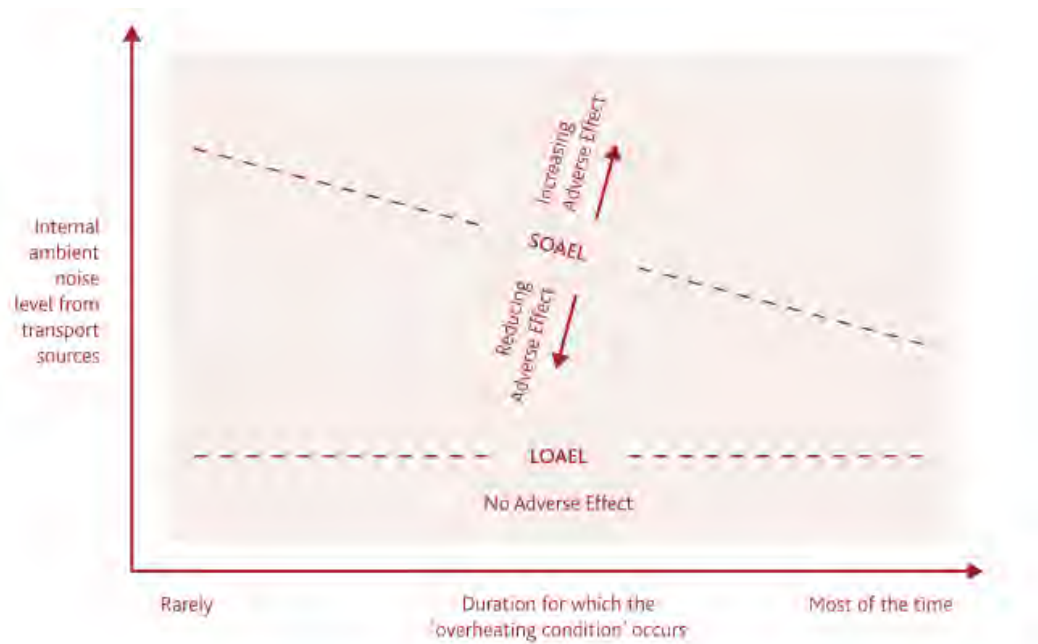


Figure 5—3 - Figure 3-2 of AVO Guide

From the preliminary TM59 thermal comfort evaluation undertaken by Cundall, compliance with the requirements of Approved Documents O and TM59 criteria for daytime hours have been demonstrated, with the overheating condition with windows fully open expected to occur for a maximum of 1.0% Total Annual Hours for worst case affected Bedroom.

It is therefore expected that during very occasional daytime periods when ventilative cooling is required to control summertime overheating, levels of ≥ 50 dB $L_{Aeq,T}$ may be experienced in some habitable rooms.

However, the following context is considered applicable to the Development and should be considered when determine the outcomes of the AVO Guide Part 2 assessment and context within the Noise Exposure Hierarchy.

- The majority of bedrooms across the development (>50%) are not in the highest AVO risk category
- All of the exceedances described would at a maximum occur over very short periods over the whole year of 1.0% of annual hours.
- The road transport network is expected to be mostly electric vehicles in future years (as a result of both UK wide policy of the ban of new diesel and petrol cars by 2030 and MCCs own target of Manchester being a zero carbon city by 2038), and it is expected that this will further reduce noise from the road transport network and therefore reduce the amount of bedrooms exposed to the highest risk category
- As a result of complying with the acoustic requirements of Approved Document O, all above exceedances would be confined to daytime hours, with night-time noise levels being compliant with BS 8233 internal noise limits all year round.
- The current interdependency between acoustics, ventilation and overheating has been designed in line with the Noise Policy Statement for England (NPSE) vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on 'sustainable development'. In clarifying how the term 'the context of Government policy on sustainable development' should be interpreted, some assistance can be obtained from the Government decision letter associated with the Thames Tideway Tunnel project. In that letter, it is stated that:
"The National Planning Policy Framework, the National Planning Practice Guidance on noise and the Noise Policy Statement for England are all clear that noise management should be determined in the context of sustainable development including the environmental, economic and social benefits of the proposal."
- The Planning Policy Guidance Noise (PPG(N)) states that local authority planning policies can include noise standards which apply to various forms of proposed development and locations in their area. The PPG(N), however,

states that care should be taken to avoid these standards from being applied as rigid thresholds as specific circumstances may justify some variation being allowed.

Considering the above, and the illustration of the Cundall's interpretation of the daytime condition in the AVO diagram below, the predicted levels are below the "SOAEL" level, and below a level at which noise causes a material change in behaviour in Table 3-3 of the AVO Guide. They are therefore considered to be suitable for occupants given the very low overheating risk, and hence limited periods of time that windows are required to be open to mitigate overheating during the day (and with no requirement to open windows to mitigate cooling at night).

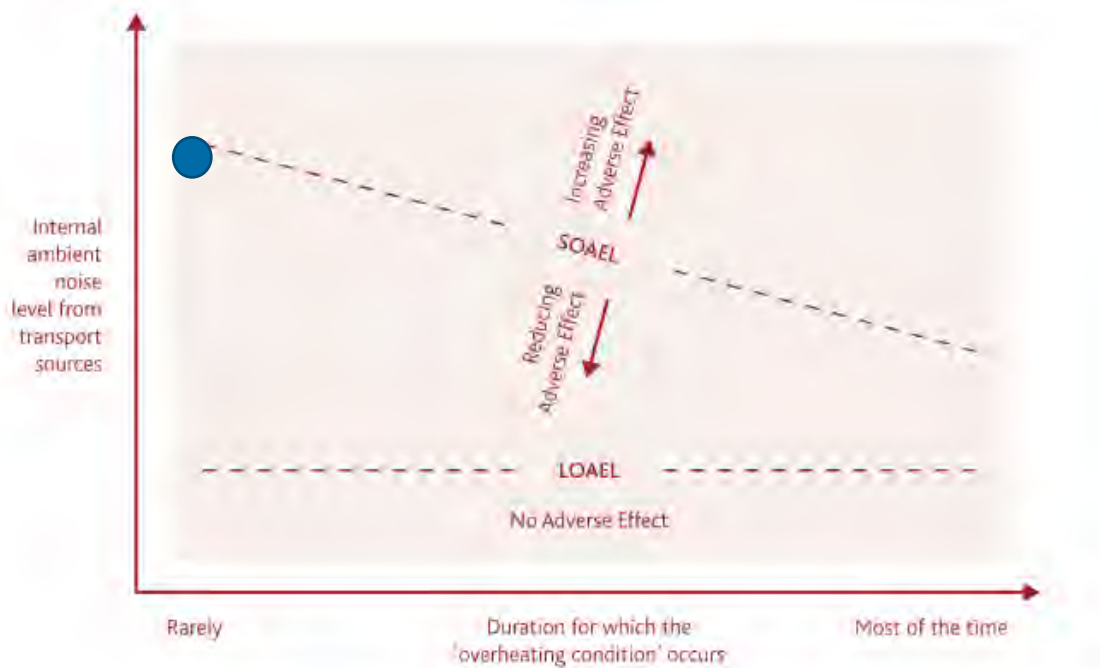


Figure 5—4 – AVO Assessment

5.4 Sci-Tech Building noise impact assessment

5.4.1 Noise modelling results

Road traffic noise sources within the 3D model have been calibrated based upon the worst-case average daytime L_{Aeq} results obtained during the survey at position NMP1 for Upper Brook Street, and position NMP2 for Kincardine Road.

Façade noise maps are presented in Figure 5—5. Levels referred to in the following sub-sections are 'free-field' values at 1 m from the building façade. The façade have been divided into three zones as shown in Figure 5—5:

- Red zone: $L_{Aeq,daytime}$ between 68 dB and 71 dB (the highest predicted level)
- Yellow zone: $L_{Aeq,daytime}$ between 63 dB and 68 dB
- Green zone: $L_{Aeq,daytime}$ less than 63 dB



Figure 5—5: Predicted free-field noise levels from road traffic on façades of Sci-Tech Building

5.4.2 Required glazing systems

The current proposal for the ventilation strategy of the building is to utilise mechanical ventilation via centralised air handling plant and comfort cooling. The minimum sound reduction requirements for façades can be derived using the following equation:

$$R_w + C_{tr} = \text{External free-field Level dBA} + 3 \text{ dB façade correction} - \text{Internal design target dBA}$$

The required sound insulation performances of façade elements derived from the above equation are presented below for achieving the defined BREEAM and WELL internal ambient noise level criteria. Whilst the predicted propagation of L_{Aeq} has been modelled, it is not possible to model a propagation of statistical percentile values such as L_{A01} in the same manner. As such for the sake of this assessment, it has been assumed that the relative difference in L_{Aeq} and L_{A01} levels is largely the same as those surveyed at position NMP1 (responding to calibration of the dominant noise source on the development from Upper Brook Street).

Zone	Predicted external free-field noise level on façade – maximum in the zone		Use of the spaces	Required façade sound insulation $R_w + C_{tr}$ dB
	L_{Aeq} dB	L_{A01} dB		
Red zone	71	77	Cellular office / lab, meeting room, undefined office area	37
			Open-plan office / lab, Café	29
			Reception / atrium	29
Yellow zone	68	74	Cellular office / lab, meeting room, undefined office area	34
			Open-plan office / lab, Café	26
			Reception / atrium	26

Zone	Predicted external free-field noise level on façade – maximum in the zone		Use of the spaces	Required façade sound insulation $R_w + C_{tr}$ dB
	L_{Aeq} dB	$L_{A,01}$ dB		
Green zone	63	69	Cellular office / lab, meeting room, undefined office area	29
			Open-plan office / lab, Café	21
			Reception / atrium	21

Table 5—5: Required façade sound insulation performances for achieving the relevant BREEAM credit

Zone	Predicted external free-field noise level on façade – maximum in the zone				Use of the spaces	Required façade sound insulation $R_w + C_{tr}$ dB	
	L_{Aeq} dB	L_{Ceq} dB	$L_{As,max}$ dB	$L_{Cs,max}$ dB		3 points	1 point
Red zone	71	80	86	92	Conference room, meeting room	44	39
					Enclosed office / lab, undefined office area	39	34
					Open-plan office / lab, Café, reception / atrium	34	29
Yellow zone	68	77	83	89	Conference room, meeting room	41	36
					Enclosed office / lab, undefined office area	36	31
					Open-plan office / lab, Café, reception / atrium	31	26
Green zone	63	72	78	84	Conference room, meeting room	36	31
					Enclosed office / lab, undefined office area	31	26
					Open-plan office / lab, Café, reception / atrium	26	21

Table 5—6: Required façade sound insulation performances for achieving the relevant WELL points

It is understood the façade will consist of glazing and light-weight panel. Examples of glazing constructions are provided in Table 5—7 to achieve the sound insulation requirements given in Table 5—5 and Table 5—6. The constructions achieving the BREEAM credit are highlighted in bold.

Minimum required glazing sound reduction index, dB $R_w + C_{tr}$	Example glazing construction
44	12.76 mm Laminated / 75 mm Gap / 12.76 mm Laminated
41	12.76 mm Laminated / 50 mm Gap / 12.76 mm Laminated
39	12.76 mm Laminated / 40 mm Gap / 12.76 mm Laminated
37	12.76 mm Laminated / 12 mm gap / 12.76 mm Laminated
34	10.76 mm Laminated / 12 mm Gap / 6 mm Glass
31	12 mm Glass / 16 mm gap / 8 mm Glass
29	10 mm Glass / 12 mm gap / 6 mm Glass
26	6 mm Glass / 12 mm gap / 6 mm Glass

Table 5—7: Examples of glazing constructions for achieving minimum glazing sound insulation performance requirements

It should be noted that, in line with guidance in BS 8233 noise levels in open plan office spaces should aim to not be lower than 45 dB L_{Aeq} . This will be addressed in the design program through the acoustic design of building services.

All glazing should be well sealed when closed. It is imperative that frames / non-glazed curtain walling components do not compromise the performance of the glazing. No gaps should be visible around the frame from the exterior. For $R_w + C_{tr}$ ratings of ≥ 34 dB, it will be necessary to take account of the window frame performance as well as the glazing.

To control noise break-in from outside, it is considered good practice for the external wall panel construction to provide a sound reduction at least 10 dB above that of the glazing values given above. The proposed lightweight wall panels should be submitted for review at a later design stage.

6.0

External plant noise limits

6.0 External plant noise limits

As detailed in Section 2.9.1, Manchester City Council stipulate the following criteria with respect to noise emissions from new building services plant installations:

“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 5 dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.”

The above limits will also see compliance with the available BREEAM Pol 05 credit as discussed in Section 2.7.2.

6.1 Nearest noise sensitive receptor

The nearest off-site noise sensitive receptors are understood to be the 4 to 6-storey student accommodation building and 2-storey residential dwellings located to the east of the site, and the Manchester of University teaching building to the west of the site.

6.2 Representative background levels

When assessing the level of adverse impact upon existing dwellings to the introduction on new industrial and commercial sound sources, the relevant British Standard (BS 4142:2014) requires that the predicted level of new impact (Rating Level) be compared against the existing ‘representative’ background sound level’.

Histograms of the $L_{A90,15min}$ values measured at position NMP2 (considered representative of worst case background levels measured across both surveys) are provided in Figure 6—1 and Figure 6—2 for daytime and night-time periods, respectively. The L_{A90} values deemed representative of the background sound level for the purposes of the BS 4142 assessment are highlighted red.

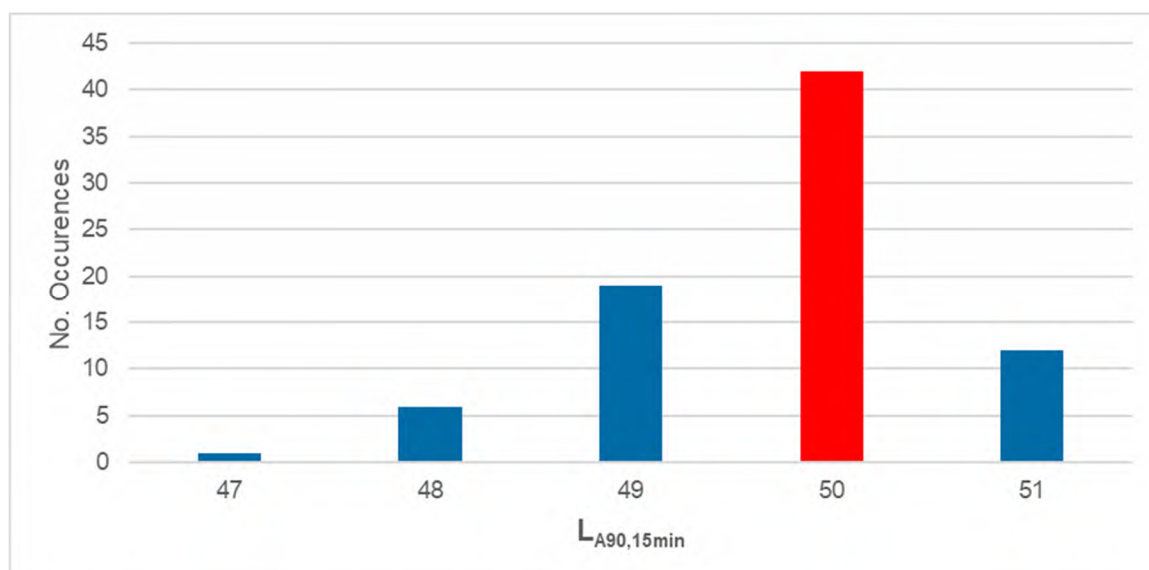


Figure 6—1 – Daytime representative background noise levels

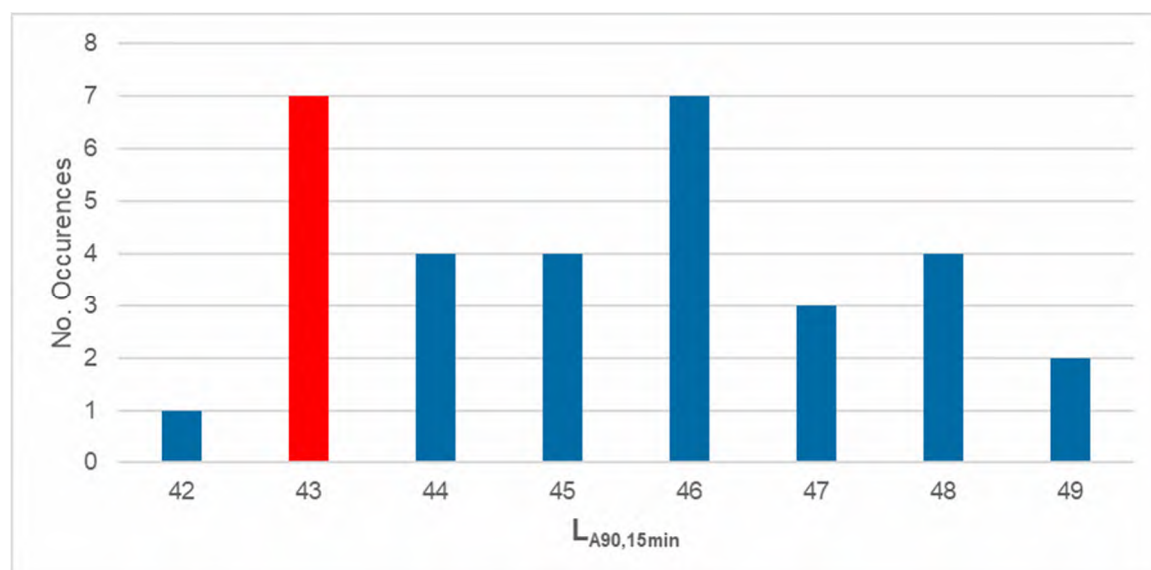


Figure 6—2 – Night-time representative background noise levels

6.3 Limiting noise levels

Table 6—1 below summarises the existing representative background sound levels measured at the site along with limiting noise levels for all new items of services plant, when measured at 1 m from the nearest noise sensitive receptor.

Time period	Existing representative background sound level dB LA90	Plant noise rating level not to be exceeded at 1 m from nearest noise-sensitive receptor dB LA _{r,Tr}
Daytime (07:00 – 23:00 hrs)	50	45
Night-time (07:00 – 23:00 hrs)	43	38

Table 6—1 – Limiting rating noise levels for building services plant

The above limit is applicable to the cumulative noise level from all new items of plant when running under normal operation. Where applicable, acoustic feature corrections should be applied to the specific plant noise level to account for any distinguishable acoustic characteristics (e.g. tonality, impulsivity, intermittency).

7.0

Entertainment noise

7.0 Entertainment noise

7.1 Limiting noise levels

7.1.1 Airborne entertainment noise at sensitive receptors

It is understood that amplified music may be included within the amenity and retail spaces located on the lower levels of both developments. The noise system should be calibrated so as not to exceed a level of -5 dB relative to the prevailing octave-band background sound levels at the nearest and / or most exposed noise sensitive receptors. For the nearest noise sensitive receptors, the arithmetic average values of octave band $L_{A90,15min}$ for each measurement period at position NMP2 has been calculated, with this spectrum then shifted to match the representative background levels as discussed in Section 6.2.

Period	MCC limiting amplified noise criterion – dB $L_{eq,T}$						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Daytime (07:00 – 23:00)	51	48	43	41	42	36	25
Night-time (23:00 – 07:00)	45	42	37	34	34	28	19

Table 7—1 Limiting entertainment noise levels

7.1.2 Structure-borne entertainment to adjoining student accommodation

For amplified noise directly to student accommodation rooms above, music noise levels in the 63Hz and 125Hz octave centre frequency bands (L_{eq}) should be controlled so as not to exceed 47 dB and 41 dB (L_{eq}), respectively, as per the MCC requirements. In addition to the above limits in 63 Hz and 125 Hz octave bands, it is proposed that entertainment noise frequency content in other octave bands up to 8 kHz do not exceed NR 20 values where measured in adjacent habitable rooms. The limiting levels are therefore as per the below.

Maximum permissible structure-borne entertainment noise levels, dB (L_{eq})							
63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
47	41	31	24	20	17	14	13

Table 7—2 - Maximum allowable music noise level in residential rooms due to entertainment venues

8.0

Conclusions

8.0 Conclusions

Prevailing noise levels at the proposed development site have been measured, and an assessment of the site has been made in accordance with Local and National Planning Policy.

Based on predicted façade noise impacts at the proposed development, sound insulation performance requirements for glazed elements of the façade have been provided to see that suitable internal ambient noise levels, compliant with both MCC and BREEAM / WELL standards.

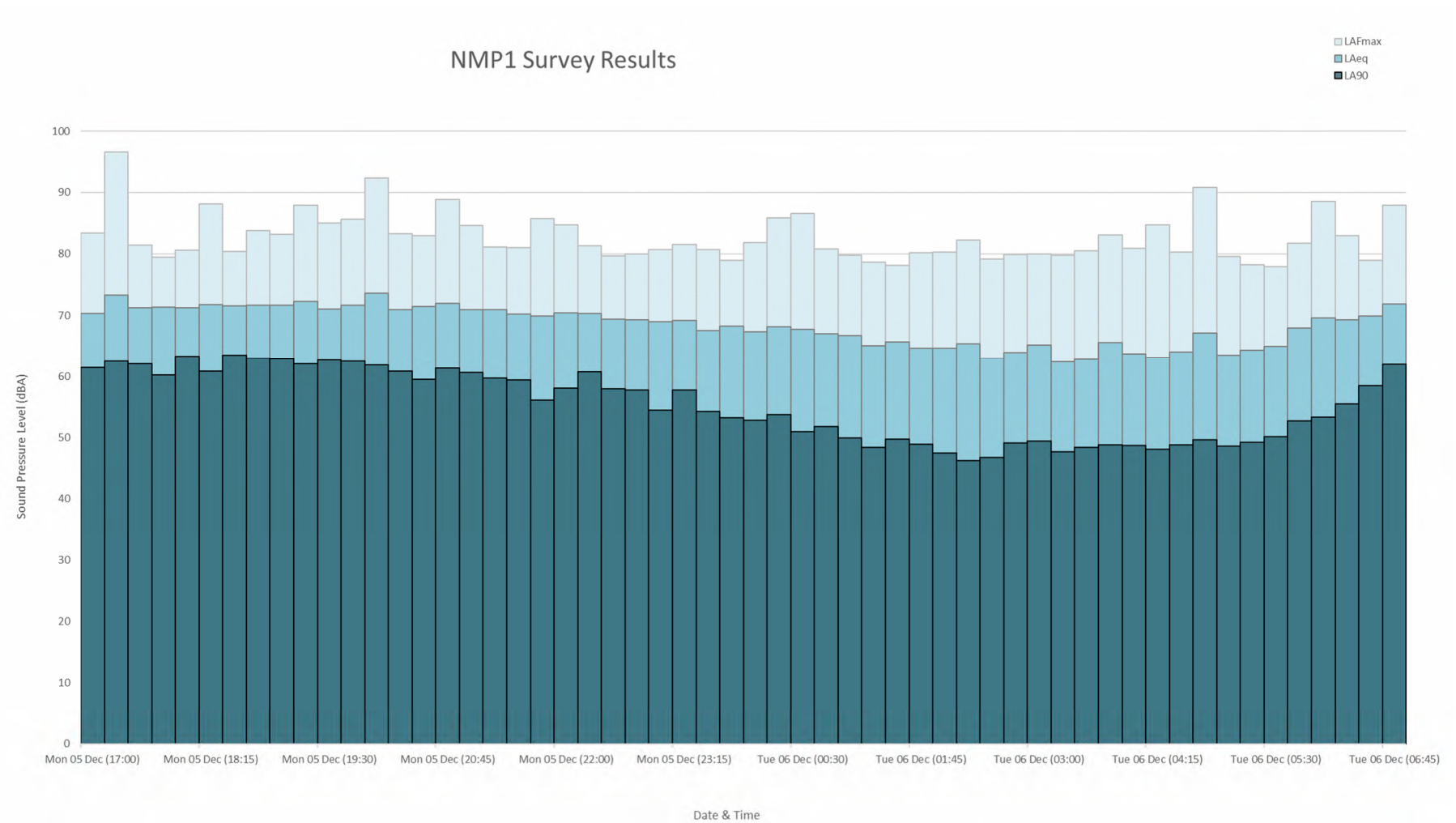
Limiting noise levels have been provided for external noise impacts at existing nearby noise-sensitive receptors. These limits will see compliance with the relevant Local Planning Authority policy.

It is understood that there is potential for an entertainment noise installation within areas of both buildings, which could have an impact on noise sensitive receptors. Limits for areas of the buildings with entertainment noise to structurally detached receptors and structurally attached areas of the buildings have been provided based on the requirements of the Local Authority.

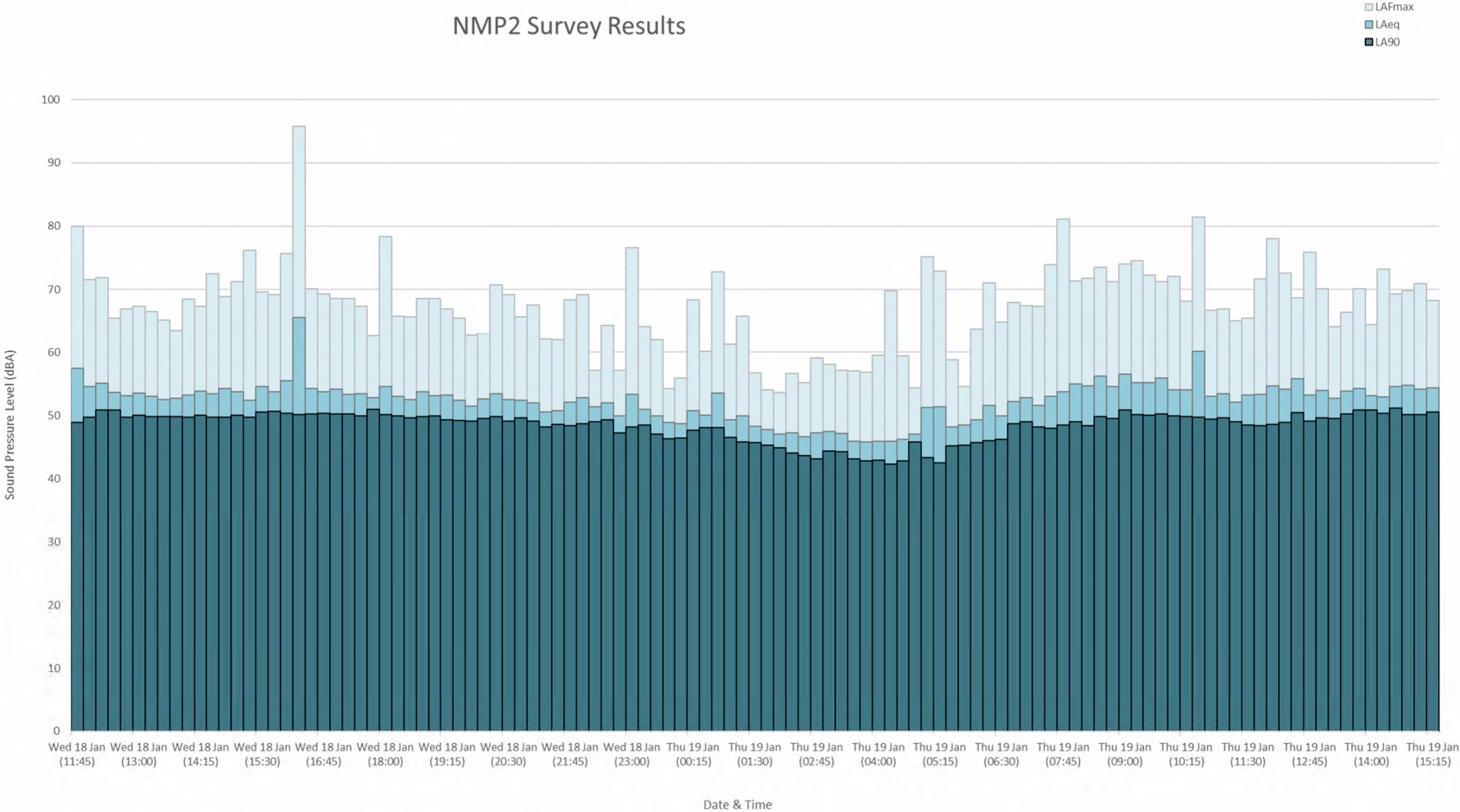
Appendices

Appendices

Appendix A - Time history graphs



NMP2 Survey Results



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