

Student Residential Moss Lane East Manchester

Noise Impact Assessment Report

29829/NIA1

4 November 2022

For:
CS Moss Lane East Limited
Level 10, Tower 12
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Appendix A – Acoustic Terminology



1.0 Introduction

Hann Tucker Associates Limited (Hann Tucker) has been commissioned by CS Moss Lane East Ltd to undertake a noise assessment for a site in Manchester, Greater Manchester.

The site, which is located on Moss Lane East, is being considered for residential development. The proposals are for the Erection of a nine-storey purpose-built student accommodation building (plus basement and rooftop level) including the conversion of and formation of internal link to nos. 466-468 and associated landscaping, following demolition of nos. 470-472

The site is subject to road noise from Moss Lane East as well as commercial noise from the car wash adjacent to site.

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 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

Establish, by means of both fully automated noise monitoring and attended noise measurements, the prevailing noise levels at selected positions around the site.

Undertake acoustic analysis of noise intrusion to the development through the building façade, and subsequently prepare preliminary sound reduction performance specifications for the external building fabric elements.

To set plant noise emission limits in accordance with the Local Authority Requirements.

3.0 Acoustic Terminology

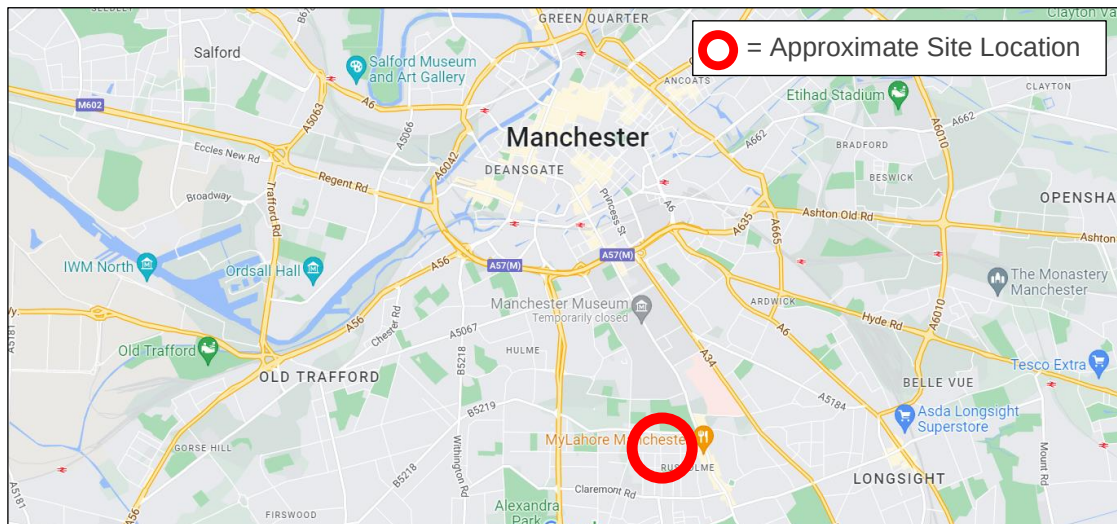
For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.



4.0 Site Description

4.1 Location

The site is located in Manchester and falls within the jurisdiction of Manchester City Council. See Location Map below.



Location Map (©maps.google.com)

4.2 Description

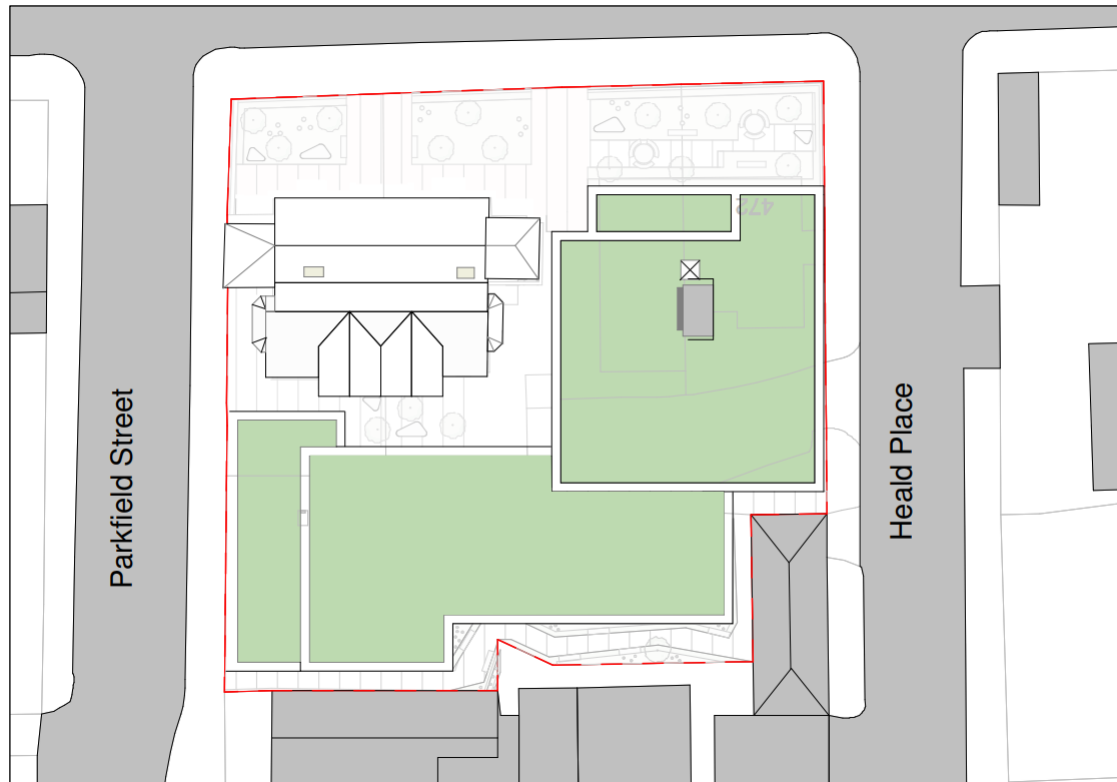
The site lies on Moss Lane East in Manchester. There are currently 2No. existing buildings on site, 1No. is proposed to be demolished and turned into an 8 storey block of flats. See Site Plan below.



Site Plan (©earth.google.com)



5.0 Proposed Development



Proposed Site Plan (c/o Carson Sall)

6.0 Planning Policy, Standards & Guidance

6.1.1 National Planning Policies

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 and guidance as detailed in the following sections.

A detailed summary of each of the above National Planning Policies is provided in Appendix B for reference.



6.2 Standards & Guides

6.2.1 ProPG: Planning & Noise

ProPG: Planning & Noise ‘Professional Practice Guidance on Planning & Noise’ was issued in May 2017 with the primary goal of assisting the delivery of sustainable residential 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”.

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.
 - **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 BS 8233 (see below) with the addition of an $L_{Amax,f}$ requirement for bedrooms at night, as below.

“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 45 dB $L_{Amax,F}$ 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.”



6.2.2 BS 8233:2014

British Standard 8233: 2014 “Sound insulation and noise reduction for buildings” recommends design criteria for internal ambient noise levels for dwellings providing a reasonable or good level of protection from external noise. It states that it is desirable that ambient noise levels do not exceed the following guidelines:

Activity	Location	Desirable Internal Ambient Noise Levels	
		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 $L_{Aeq,8hour}$

Note 1: the above provides recommended levels for overall noise in the design of a building. However, 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: 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.

Note 3: 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.

Note 4: The levels detailed in the table above are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise and are not appropriate in all locations. Where atypical external noise levels are measured (ie high levels of traffic during certain times of the night) an appropriate alternative assessment period (eg 1 hour) and an assessment of individual night time events in terms of SEL or $L_{Amax,F}$ may be more suitable.

For outdoor living spaces, BS 8233 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 $L_{Aeq,T}$, 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 and 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.



6.2.3 World Health Organisation (WHO)

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.

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

6.2.4 Acoustics, Ventilation & Overheating Residential Design Guide

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 65 dB 60 dB 55 dB 50 dB High Medium Low Negligible 55 dB 50 dB 45 dB	↑ Increasing risk of adverse effect Use of opening windows as primary means of mitigating overheating is not likely to result in adverse effect	Recommended Optional Not required

© ANC 2020. AVO Level 1 Assessment

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.

6.2.5 Building Regulations Approved Document O (Approved Doc 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:

- Limiting unwanted solar gains in summer.
- 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.

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

6.2.6 BS 4142:2014

BS 4142: 2014 describes methods for rating and assessing the effects of outdoor sound levels, of an industrial and/or a commercial nature, *“on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident”*.

The impact of a specific sound is indicated by subtracting the existing background noise level from the rating level (i.e. noise level from the proposed items of plant/machinery/etc plus any acoustic feature corrections). The standard states that:

- “a difference of around +10dB or more is likely to be an indication of a significant adverse impact”;
- “a difference of around +5dB is of marginal significance is likely to be an indication of an 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”.

The noise from the new development is expressed in terms of a rating level and given as a $L_{Aeq,T}$ noise level. The existing background noise level is expressed in terms of a $L_{A90,T}$ noise level. T is the assessment time interval, which is 1-hour for operations during daytime hours (07:00 to 23:00) and 15-minutes for operations during night-time hours (23:00 to 07:00).



BS 4142:2014 states that if a noise source contains an 'acoustic feature', such as tonality, intermittency or impulsiveness, an appropriate penalty should be applied.

6.3 Local Planning Guidance

6.3.1 Consultation

Manchester City Council give criteria for noise from various types of development in their document Planning & Noise Technical Guidance 2015. In relation to the project, the following sections are highlighted.

6.3.2 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.



6.3.3 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.



7.0 Baseline Noise Surveys

7.1 Procedure

Unattended noise monitoring was undertaken on site over a 6-day period to establish full daytime and night-time noise levels over a typical weekday and weekend period. The monitoring was carried out between 11:30 hours on Thursday 30th June 2022 and 01:00 hours on Monday 4th July 2022 with equipment set up to record broadband and spectral (octave band) sound pressure levels over discrete 5 and 15-minute periods.

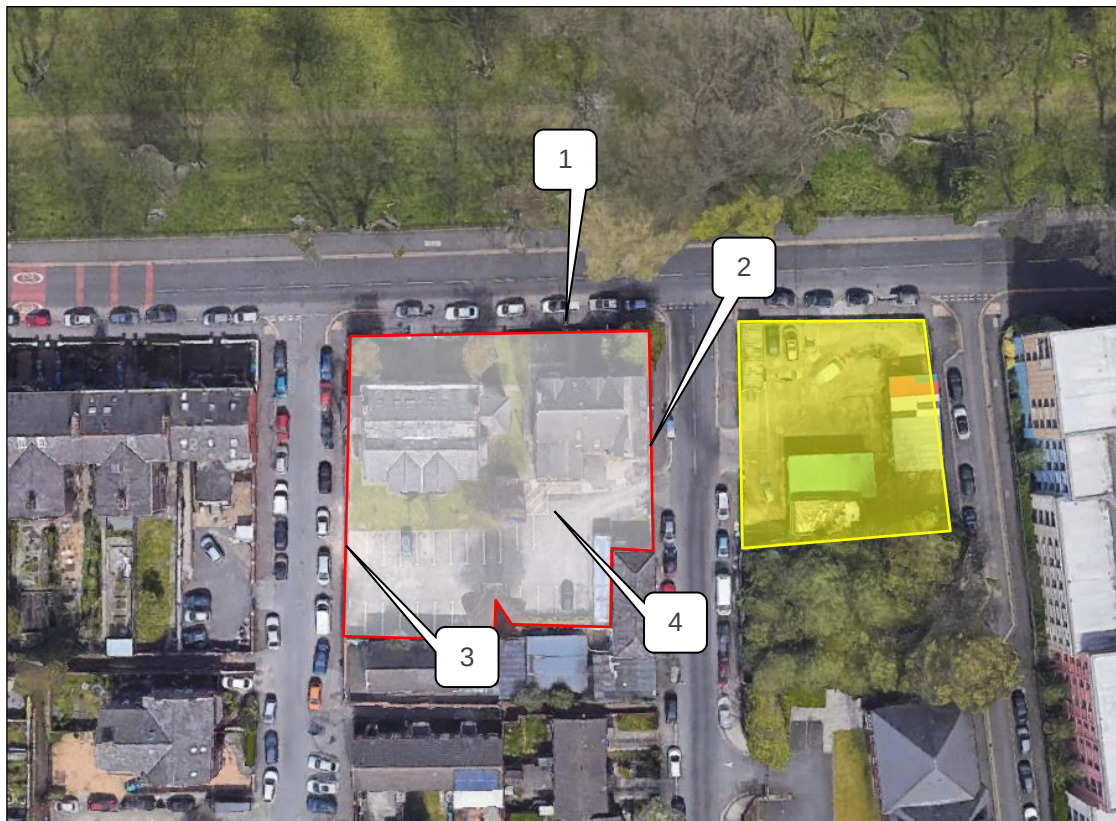
Additional manned measurements were performed between 11:30 hours and 11:45 hours on Thursday 30th June 2022 and between 12:00 hours and 13:30 hours on Wednesday 6th July 2022 with the purpose of establishing specific noise levels associated with the operation of nearby car wash and noise levels across the site.

The surveys were performed by Thea Strother. All measurements were collated in general accordance with BS 7445-1:2003 *Description and Measurement of Environmental Noise*.

7.2 Measurement Positions

The measurement positions were as described and illustrated below.

Position	Type	Description
1	Unattended	To the north of the site, approx. 3 m from the nearside edge of Moss Lane East. Microphone in free-field conditions approx. 2.5m above ground.
2	Attended	To the east of site, approx. 13m from the nearside edge of the carwash and 1.5m above the ground. The microphone was in façade conditions, approx. 1m from the façade of site.
3	Attended	To the southwest of site, approx. 4m from the nearside kerb edge and 1.5m above the ground. The microphone was in free-field conditions, greater than 3m from the nearest large vertical reflecting surface.
4	Attended	To the south of site, approx. 18m from the nearside kerb edge and 1.5m above the ground. The microphone was in free-field conditions, greater than 3m from the nearest large vertical reflecting surface.



Site Plan (© maps.google.co.uk)

7.3 Weather Conditions

For the unattended survey between Thursday 30th June and Monday 4th July 2022, local weather reports indicated no notable periods of prolonged and/or heavy rainfall, with temperatures ranging from 11 °C (night) to 18°C (day) and wind speeds less than 6 m/s. During our time on site, skies were overcast, wind conditions were light and road surfaces were largely dry.

During both attended surveys Thursday 30th June 2022 and Wednesday 6th July 2022, the weather was generally clear and dry with no periods of rainfall and moderate winds.

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 (Unattended)	Type 1 Data Logging Sound Level Meter	Larson Davis	LxT	4569	10/06/2022
2 (Attended)	Type 1 Data Logging Sound Level Meter	Larson Davis	LxT	6490	10/06/2022



Position	Description	Manufacturer	Type	Serial Number	Last Calibration
3 (Attended)	Type 1 Data Logging Sound Level Meter	Larson Davis	LxT	5103	10/06/2022

The unattended sound level meter was installed inside small security boxes with the microphone protruding approximately 6cm out of the box. The security boxes were fixed to a lamp post (on the side facing the road). 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 survey. No significant deviations occurred (not more than 0.3 dB).

7.5 Results

7.5.1 Unattended Survey

The results of the unattended survey have been plotted on Time History Graph 29829/TH1 enclosed. The graph presents the 15 minute A-weighted (dBA) L_{90} , L_{eq} and L_{max} levels at Position 3 throughout the duration of the survey.

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_{AFmax} values are the '15th highest' 5-minute value. All results are free-field levels.

Position	Daytime (07:00 – 23:00 hrs)		Night-time (23:00 – 07:00 hrs)			
	$L_{Aeq,16hr}$	L_{A90}	$L_{Aeq,8hr}$	L_{A90}	Ventilation L_{Amax}	Overheating L_{Amax}
1	66	55	64	44	83	90

¹External L_{AFmax} noise level not normally exceeded more than 10 times a night. This is considered to be the ventilation design case.

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 overheating design case when assessing opening windows as a means of overheating control.

7.5.2 Attended Surveys

The following table summarises noise levels recorded at each of the manned measurement positions and presented as free-field levels.



Position	Date	Period	Sound Pressure Level (dB)			
			L _{Aeq,T}	L _{A10,T}	L _{A90,T}	L _{Amax,T}
2	30/06/2022	11:33 – 11:35	62	64	59	68
		11:35 – 11:36	60	63	52	66
		11:36 – 11:46	54	57	45	72
3	06/07/2022	12:16 – 12:26	50	52	46	60
		12:41 – 12:52	51	53	48	63
		13:09 – 13:19	51	53	46	63
4	06/07/2022	12:29 – 12:40	58	61	50	74
		12:53 – 13:08	53	56	46	73
		13:20 – 13:30	54	57	49	69

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 traffic noise along Moss Lane East and noise from the jet wash when it was in use along the east boundary of the site.

Occasional vehicle movements were noted along Parkfield Street and Heald Place which may have some influence on noise levels along the west and south facades during periods where the jet wash was not in use. Several airplane flyovers were noted to be audible during our time on site and would likely have influence on the incident noise levels across the site as a whole.

8.0 Industrial Noise Impacts

8.1 Overview

Our assessment considers assessment methodologies set out within BS 4142:2014 and adopts industry standard acoustic corrections for distance, screening, directionality and reflections between noise sources and noise sensitive receptors.

In accordance with BS 4142, assessment periods of 1 hour will be taken during the daytime (07:00-23:00). Full calculation data and assumptions are discussed below.

8.2 BS 4142 Assessment

The following tables present the results of a BS 4142:2014 assessment for a typical worst-case daytime period for both adjacent industrial premises. Fully detailed calculation sheets are available upon request.



8.3 Adjacent Industrial Sites

8.3.1 Car Wash

To inform an assessment of noise impact from this premises reference has been made to the measured noise data obtained at position 2 with the microphone situated at representative positions of the nearest worst affected façade of the proposed dwellings. Based on the measurement locations, the measured noise levels are considered to capture noise levels from the car wash premises at locations representative of the worst affected future residential windows.

Whilst measurement location 1 was broadly unattended, it is understood that the car wash premises was open and operational during at least 2no of the 4no. day survey, and during the install/collection it was confirmed to be in use. Our survey data indicates noise generating activities from the car wash are not clearly discernible against long term measurements at Position 1. However, whilst on site there were multiple periods of subjectively audible activity from the car wash occurred for approximately 5-10 minutes sporadically over a period of up to 2 hours.

It is therefore considered that noise impact from the industrial premises can be appropriately assessed.

8.3.2 Car Wash Assessment

The initial BS4142:2014 assessment for the Car Wash site, east of the proposed site, is presented in the tables below. We have assumed that on a busy day the car wash can be operational for a full 1 hour period undertaking noisy activities.

Results		Relevant Clause	Commentary
Specific sound level at receptor	$L_{Aeq,1hour} = 60 \text{ dB}$	7.3.8 7.3.9 7.3.10	Corrected for 1 hour reference period from several discrete measurements of the industrial premises.
Background sound level	$L_{A90,1hour} = 52 \text{ dB}$	8.1.1 8.1.3 8.3	The background sound level measured at the proposed development site between the hours of 09:00 and 19:00, and is considered to be uninfluenced by the presence of industrial
Assessment made during the daytime so reference period is 1 hour		7.2	
Acoustic feature correction	+ 6 dB	9.2	The noise emanating from the car wash premises was noted to be intermittent and impulsive in nature, however was noted to be perceptible at the proposed development site due to continuous road traffic noise providing masking.
Rating level	66 dB	9.2	Calculated by adding acoustic feature corrections to the specific sound level.
Excess of rating over background sound level	14 dB	11	
Assessment indicates likelihood of a significant adverse impact to residents without noise mitigation measures.		11	The excess of the rating level over the background level is very high, mitigation measures must therefore be assessed further to ensure good internal acoustic conditions.



Results		Relevant Clause	Commentary
Uncertainty of the assessment	Low	10	The background sound level is based on repeatable measurements made over the duration of a number of days. The measurements of noise from the industrial unit are taken from the source noise measurements of noise attributed to the car wash.

9.0 Achieving Internal Noise Levels

9.1 Proposed Criteria

With reference to the acoustic standards and guidelines as reviewed in Section 6.0, we propose external noise intrusion levels from environmental sources be controlled so as to not exceed the following criteria.

Activity	Location	Desirable Ambient Criteria	
		07:00 – 23:00	23:00 – 07:00
Resting	Living Rooms	L _{Aeq,16hour} 35 dB	-
Dining	Dining Room/Area	L _{Aeq,16hour} 40 dB	-
Sleeping (Daytime Resting)	Bedroom	L _{Aeq,16hour} 35 dB	L _{Aeq,8hour} 30 dB L _{Amax} 45 dB ^[1]

[1] regular noise events such as trains, aircraft (10-15th highest)

Section 8.3 of this report considers industrial impacts in line with BS 4142 and confirms that adverse impacts on future occupants on the development could be avoided with suitably specified facades to secure good internal noise levels. Where industrial noise could 'contribute' to incident external noise levels on a given façade but do not 'dominate', the above internal noise limits should be met. However, where the industrial noise has the potential to dominate the external noise climate, we would advise that industrial noise intrusion achieves limits 5 dB lower than those presented above.

The above shall be subject to the final approval of Manchester City Council

9.2 Assessment of Open Windows

In order to assess the ventilation requirements for the site, we have calculated the internal noise levels with the windows open taking into account the calculated incident noise levels and the typical level of attenuation provided by an open window.

In this regard, BS 8233:2014 states that: "If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB". Taking this reduction into account the calculated internal noise levels are set out for each measurement position below:



Façade Zone	Calculated Internal Noise Levels (Windows Open) (dB)		
	Day-time $L_{Aeq,16h}$	Night-time $L_{Aeq,8h}$	Night-time L_{Amax}
N	50	48	64
S	39	37	58
E	47	46	57
W	36	35	48

Based on the above, a reliance upon openable windows as a means of background ventilation is unlikely to be suitable across the development as internal noise levels in all facade zones, with exception of the west façade, would likely exceed the proposed criteria in Section 9.1.

As such, suitable façade specifications for glazing and ventilators would be required to achieve suitable internal noise levels with windows closed whilst maintaining suitable ventilation rates. These are discussed in Section 9.3.

9.3 Preliminary Guidance for Windows & Ventilators

9.3.1 Overview

The current façade design proposals allow for cavity masonry external walls with punched-in double glazed windows. Background ventilation will be provided to each apartment by means of whole-house MVHR / constant mechanical extract ventilation (MEV) and trickle ventilators in window heads (1 x 2,500 mm² min. per habitable room). Windows will be openable for purge ventilation.

Our calculations follow BS 8233 procedures and consider the typical apartment room dimensions and window sizes, as per the latest design drawings (at the time of writing).

9.3.2 Preliminary Specifications

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:

Façade Zone		Façade Element	Preliminary Minimum Sound Reduction Specification
A	Red	Window	33 dB $R_w + C_{tr}$
		Ventilator	39 $D_{new} + C_{tr}$
B	Orange	Window	30 dB $R_w + C_{tr}$
		Ventilator	36 $D_{new} + C_{tr}$

Façade Zone		Façade Element	Preliminary Minimum Sound Reduction Specification
C	Green	Window	27 dB $R_w + C_{tr}$
		Ventilator	33 D _{new} + C _{tr}

Note: At detailed design stage octave band acoustic specifications will need to be developed, and it will be essential that the prospective glazing/cladding system suppliers can demonstrate compliance with these specifications, rather than simply offering generic glazing configurations as described above.

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



Plan showing the extent of glazing requirements at all levels.

9.3.3 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
33	Uprated double glazed system e.g. 7/12/6 mm.
30	double glazed system e.g. 10/16/4 mm.
27	double glazed system e.g. 6/16/6 mm.



9.3.4 Example Ventilation Solutions

Example ventilation solutions commensurate with achieving the sound insulation performances are discussed below.

Ventilator Specification, $D_{\text{new}} + C_{\text{tr}}$ (dB)	Example Configuration
42	High performance in-wall acoustic ventilator with absorption, or a mechanically assisted supply & extract solution (e.g. local MVHR).
39	High performance in-wall acoustic ventilator, or a mechanically assisted supply & extract solution (e.g. local MVHR).
36	1 x 2,500mm ² standard hit-miss trickle vent per habitable room, or a mechanically assisted supply & extract solution (e.g. local MVHR).
33	1 x 2,500mm ² standard hit-miss trickle vent per habitable room, or a mechanically assisted supply & extract solution (e.g. local MVHR).

The preliminary performance specifications included above are based on the provision of either full MVHR for rooms or 1no. ventilator only per habitable room as required. If additional numbers of ventilators are required to achieve the ventilation rates, the performance requirement for the individual ventilators will need to increase.

The table below provides guidance on the increase in performance specification required for additional numbers of ventilators.

Number of Ventilators	Performance Increase on Ventilator Specifications Stated Above
1	+0 dB
2	+3 dB
3	+5 dB
4	+6 dB

9.4 Ventilation & Overheating

9.4.1 Acoustics, Ventilation & Overheating Residential Design Guide

The above presents solutions to satisfy the proposed internal ambient noise limits within dwellings during normal ventilation conditions where windows are closed but ventilators or MVHR systems, to meet Part F minimum ventilation requirements, are operational.

Based on the guidance set out in Section 6.2.4 a level 1 assessment of the site 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 Noise Level 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 and the calculated noise levels across the site the following mark-ups have been produced which show the risk categories across each façade of the proposed development.



Plan Indicating the AVO Guide Risk Categories

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. Commercial and Industrial noise sources are outside the scope of AVO however, it may also be prudent to consider rooms in the **Green** zone to the south of the new build portion of the scheme 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.



9.4.2 Building Regulations Approved Document O

Section 9.3 presents solutions to satisfy the proposed internal ambient noise limits within dwellings during normal ventilation conditions where windows are closed but ventilation systems to meet Part F minimum ventilation requirements are operational.

During purge requirements (ie to remove odour / smell, or at user discretion), windows will be openable as acoustic conditions are not considered to be a concern during such a time.

The remaining ventilation condition relates to overheating, whereby dwellings may require a higher number of air changes (i.e. higher ventilation rate) to achieve thermal comfort. During such instances, unlike for purge conditions, acoustic comfort remains a consideration therefore the overheating strategy should be designed with this in mind. For this development, the strategy to mitigate overheating is to incorporate over-sized MVHR units with a manual boost button, supplemented with attenuated façade openings.

Currently there are 2 No documents which stipulate acoustic criteria for overheating conditions; Approved Document O (ADO) which took effect on 15 June 2022, and The Acoustics, Ventilation and Overheating Residential Design Guide (Version 1.1) (AVO) was issued in January 2020 by the Association of Noise Consultants (ANC) and the Institute of Acoustics (IOA). Given that ADO is legislation and AVO is guidelines, we will base our assessment on the criteria set out in ADO.

Based on the measured noise levels and the results of the acoustic modelling, traditional open windows as a form of overheating mitigation are unlikely to provide sufficient attenuation across proportions of the site due to the elevated noise climate, notably road traffic and commercial noise along the north and east of the site.

As such, an exercise has been carried out to establish if providing an attenuated façade opening would result in the ADO limits being achieved. Based on our calculations and measured noise levels, the attenuation provided by the attenuated façade openings would need to be as follows in each zone to comply with the requirement of the ADO.

Façade Zone		Façade Element	Preliminary Minimum Sound Reduction Specification
A	Red	Open Attenuated Façade Opening Panel	23 dB D _w



Façade Zone		Façade Element	Preliminary Minimum Sound Reduction Specification
B	Yellow	Open Attenuated Façade Opening Panel	20 dB D _w
C	Green		12 dB D _w

For Red and Yellow façade zones the specification may be achievable by an opening panel/window but remains at the higher performance of what could reasonably be expected through a specially selected attenuated ventilation panel. We recommend this is reviewed further as the design progresses, and further information regarding potential for overheating is known.

Ultimately, the above does not advocate for sealed facades but highlights at an early stage measures to reduce reliance on open windows would be a sensible design item. Suitable measures could be, but are not limited to , solar rated glazing, or through fenestration design. It can be assisted with mechanical ventilation too, such as oversized MVHR with a manual summer boost function (as is understood to be proposed).

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.

For the Yellow façade zone, the use of attenuated façade openings as a means of overheating control is likely to achieve the criteria within internal spaces.

Within the Green façade zone, the specification is likely commensurate with that of an attenuated façade opening as this performance is only a marginal betterment of a traditional open window.

10.0 Outdoor Living Spaces

On this scheme, there is no proposals for private outdoor living spaces relating to the development.



11.0 Development-Generating Noise Impacts

11.1 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)
48	39

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.

11.1.1 Plant Noise Mitigation Measures

Given the nature of the development, the only significant plant items are likely to be serving the amenity spaces, including air extraction for kitchens and toilets, air conditioning condenser units, etc. For residential spaces, noise from localised mechanical ventilation will be negligible.

For central plant compounds/outlets, provisions shall be made for the selection of low noise equipment, silencers, enclosures, screens and other acoustic attenuation measures where necessary. The positioning of plant areas should be carefully considered, bearing in mind the likelihood of the nearest receptors being the development's own ground/first floor residential windows.

At this stage it is envisaged that the risk of excessive building services noise can be mitigated by design and this could be secured by a suitably worded condition of planning.

11.2 Amenity Unit Operations

At ground floor level there are a number of amenity spaces are proposed as part of the development, however, the exact uses of these units have not yet been confirmed. Considering the prevailing environmental noise climate at the site, we would expect that noise egress via the unit frontage from most general uses 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 as follows:



Period	Amenity noise break-out Limit, L_{Aeq} (dB)
Daytime (07:00-23:00)	43 ¹
Night-time (23:00-07:00)	39 ¹

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

Furthermore, noise transfer through the separating floor structure (and associated flanking paths) from the ground floor spaces to first floor dwellings shall be considered. Once final uses have been confirmed for each space, an assessment of noise transfer to structurally connected habitable rooms shall be carried out which considers typical noise levels within the amenity areas and the sound insulation performance of the separating construction

For noise transfer to apartments above, the design intent should be to ensure operational L_{max} noise transfer to apartments does not exceed a level at least 5 dB lower than the anticipated background L_{90} noise level in each octave band.

12.0 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 national and local planning policies.

Appropriate target internal noise levels have been proposed. These are achievable using conventional mitigation measures. Mitigation advice, including the use of suitably specified glazing and acoustically attenuated ventilation, have been recommended to reduce to a minimum the adverse impact on health and quality life arising from environmental noise.

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

Appendix A – Acoustic Terminology

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 –National Planning Policies

National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) was first published in 2012, replacing the existing Planning Policy Guidance Note 24 (PPG24) “Planning and Noise”, and sets out the government’s planning policies for England and how these are expected to be applied.

The latest revision of the NPPF (July 2021) states that planning system should contribute to, and enhance, the natural and local environment by (amongst others) *“preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land stability.”*

NPPF advises that planning policies and decisions should ensure:

“...new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.” [In doing so they should] *“mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life”* and *“identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.”*

“...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.”

The NPPF makes reference to the Noise Policy Statement for England.

Noise Policy Statement for England (NPSE)

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 the NPPF as 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.

Planning Practice Guidance on Noise (PPG)

Planning Practice Guidance (PPG) under the NPPF has been published by the Government as a web based resource. 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:

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No effect	No Observed Effect	No specific measures required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

Moss Lane East

Position 1

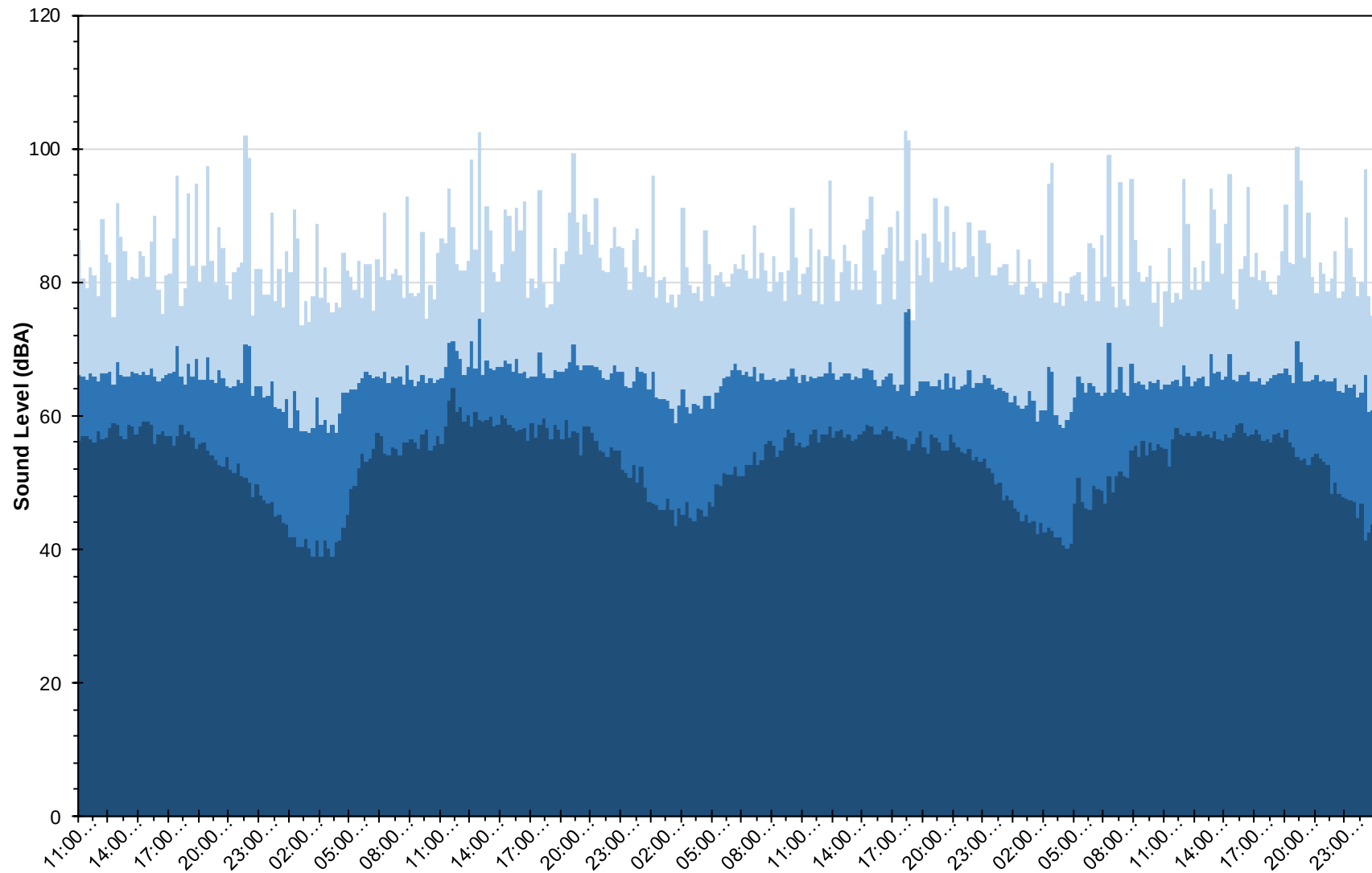
L_{eq} , L_{max} and L_{90} Noise Levels

Thursday 30 June 2022 to Monday 4 July 2022

LA_{max}

LA_{eq}

LA₉₀



Date and Time

29829/TH1