Noise Impact Assessment

Site Address: 27-29 Middleton Road, Crumpsall, Manchester, M8 5DT

Client Name: Debtal Architecture

Project Reference No: NP-009981

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01	--

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Delivering sustainable development by promoting good health and well-being through effective management of noise.

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1. Introduction

NOVA Acoustics Ltd has been commissioned to prepare a noise impact assessment for the change of use of a large residential building to a place of worship ('the Proposed Development') at 27-29 Middleton Road, Crumpsall, Manchester, M8 5DT ('the Site').

The applicant is intending to submit a planning application to the Local Planning Authority ('LPA'), Manchester City Council. This report assesses the sites suitability for the proposal and provides supplementary technical information for controlling noise emissions from the site.

A noise survey has been undertaken to establish the prevailing ambient and background sound levels at the Proposed Development. The findings have subsequently been used to assess the suitability of the site for the intended use. Measures required to mitigate noise impact have been assessed in accordance with the relevant performance standards, legislation, policy and guidance.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

Standards, Legislation, Policy & Guidance

The following performance standards, legislation, policy and guidance have been considered to ensure good acoustic design in the assessment:

- Policy DM1 from the LPA's Local Development Framework: 'Core Strategy Development Plan Document', Adopted 11th July 2021.
- National Planning Policy Framework (2023).
- Noise Policy Statement for England (2010).
- British Standard BS4142:2014+A1:2019 – 'Methods on rating and assessing industrial and commercial sound'.
- IEMA 'Guidelines on Noise Impact'

Further information on the legislation can be found in Appendix B.

Local Authority Guidance

Core Strategy Development Plan Document

Upon consultation of the Local Authorities Core Strategy and Policies document, Policy DM1 was identified as being applicable to the Proposed Development. The policy states:

"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.*
- *Impact on the surrounding areas in terms of the design, scale, and appearance of the proposed development. Development should have regard to the character of the surrounding area.*
- *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.*

[…]"

Any elements of the aforementioned policy that are not related to noise have been excluded for conciseness.

Proposal Brief

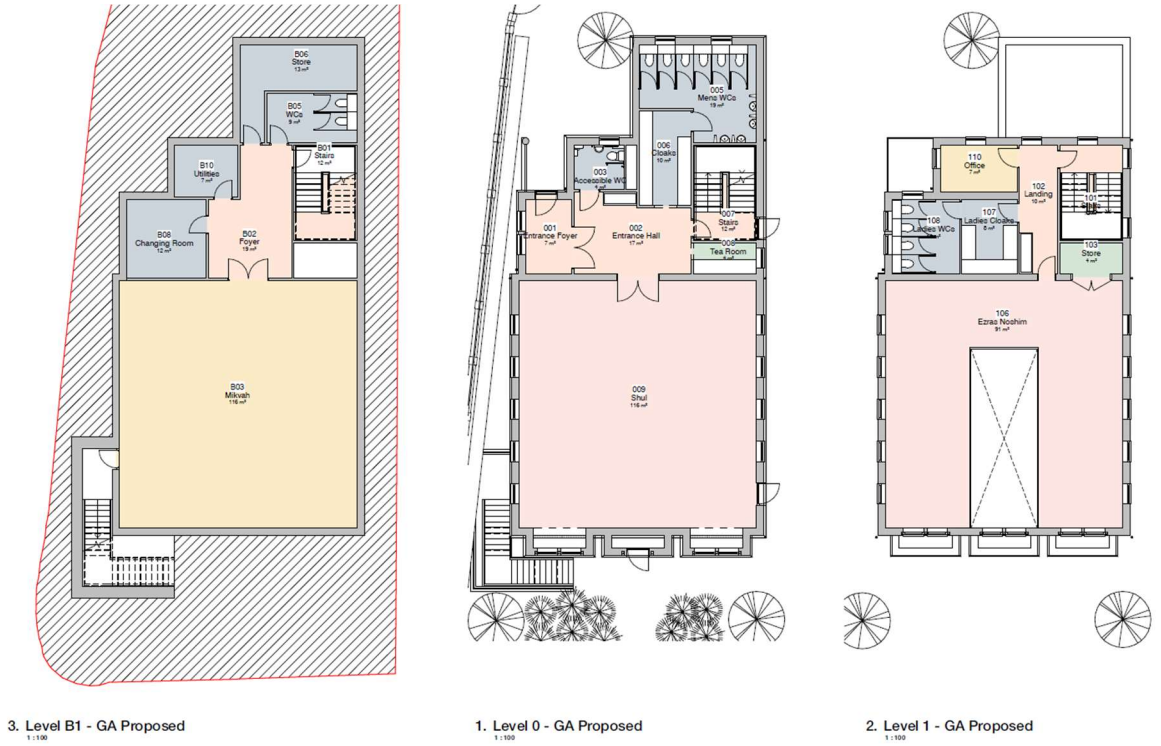
The proposal is for the change of use of a large residential building to a Synagogue (Use Class F). It is understood that the proposed plans include an extension and alterations to the existing external envelope of the building accompanied by internal layout changes. The plans also include an increase to the amount and size of the glazing, of which a minimum sound insulation specification is outlined further within this report.

The basement is to contain a Mikvah (a ritual bath or bathing place), which is expected to be minimal in terms of noise breakout. Above the Mikvah shall be the main double height religious congregation space, with the Shul located on the ground floor and Ezras Noshim partially located on the first floor. Ancillary areas such as changing rooms, toilets, an office and circulation areas are all located to the east of the development.

The Client has informed NOVA Acoustics of the following:

- The maximum capacity will be limited to seventy patrons.
- The operational hours are to be limited to daytime use only, with prayer sessions strictly between 07:00 – 10:00 and 16:00 – 21:00 on Sunday – Friday; and 08:00 – 13:00 and 16:00 – 21:00 on Saturdays and Festival days.
- No live or amplified music is to be played.
- On site parking will be available to the rear.

Figure 1 below shows the layout of the Proposed Development.



Drawing Ref No. DA21055 003 from 'Debtal Architecture'

Figure 1 – Proposed Development

External fixed plant, such as that for ventilation purposes, may be required as part of the development. Whilst the assessment of plant noise emissions falls outside the scope of this report, in the interest of protecting nearby residential amenity, a maximum plant noise limit level has been set within Section 6 of this report.

2. Environmental Noise Survey

Measurement Methodology

To understand the prevailing noise climate at the Site, a long-term unattended baseline noise survey has been undertaken. The following table outlines the measurement dates and particulars.

Further information regarding the equipment used and the meteorological conditions during the surveyed period are available in Appendix D.

Location	Survey Dates	Measurement Particulars
MP1	22 - 25/09/2023	Equipment affixed to a lamppost to the south of the site. Measurement height approximately 4 m above local ground, with the microphone in free-field conditions.

Table 1 – Measurement Methodology

The figure below outlines the site surroundings and measurement location:

Imagery ©2022 Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map data ©2022

Figure 2 – Measurement Locations and Site Surroundings

A number of NSRs have been identified, with the most notable being No. 31 Middleton Road, which is a residential property approximately 6m north of the Proposed Development. This is referred to as NSR1.

Context & Subjective Impression

The Proposed Development is situated in a primarily residential area within the northern outskirts of Manchester. Residential properties are within close proximity in all directions.

The Site itself is located on the junction where Moxley Road adjoins Middleton Road, with both roads running parallel with the eastern and southern boundaries respectively. Middleton Road is understood to support a moderate number of vehicles and have relatively consistent traffic flows; whereas Moxley Road acts as a quiet residential road with occasional and sporadic vehicle movements.

Observations made on-site indicated that road traffic noise from Middleton Road was the dominant contributor. Excluding road noise, no other notable noise sources were identified. The existing noise climate was described as being moderate to low.

Environmental Noise Results Summary

The following table outlines the background sound levels measured during the survey that will inform the assessment. The time history results can be found in Appendix D.

As a conservative approach, the lowest $L_{A90,15min}$ measured during the daytime operation periods has been used as the representative background sound level.

Location	Measurement Period ('T')	Octave Frequency Band (Hz, dB)							Overall (dBA)
		63	125	250	500	1k	2k	4k	
MP1	Lowest $L_{90,15min}$ (Day)	49	45	44	41	41	36	28	45

Table 2 – Environmental Noise Survey Results Summary

The histogram used to determine the background $L_{A90,15min}$ is presented in Figure 3 below. As can be seen in the graph, the modal background value is around 15 dB higher than the lowest reported above, further emphasizing the conservative nature of the noise breakout assessment.

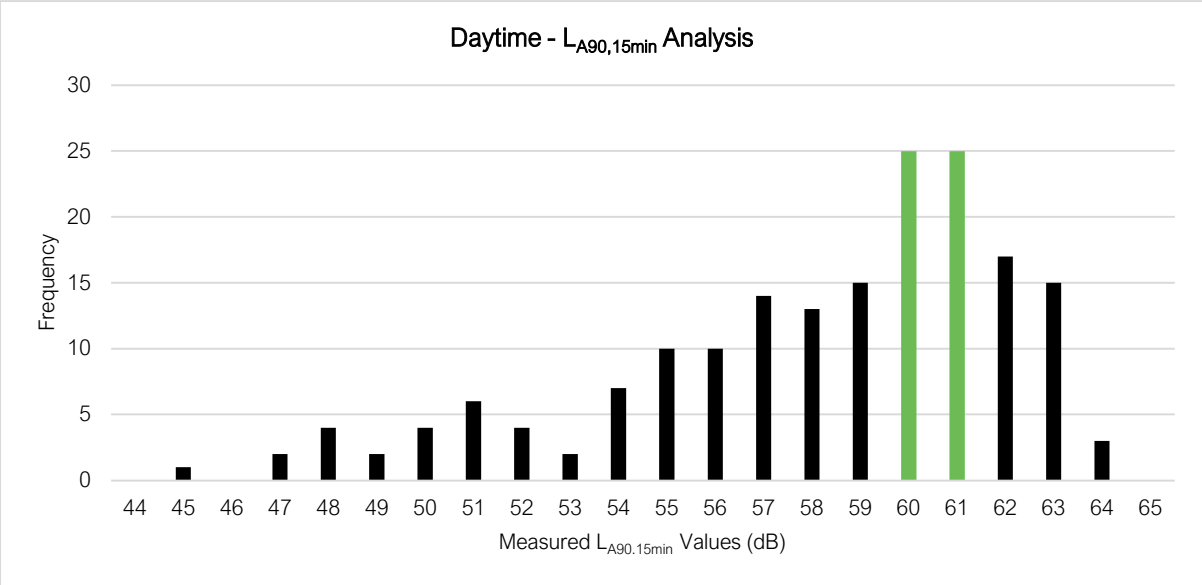


Figure 3 – Background Sound Level Analysis (During Proposed Operational Hours)

3. Predicted Internal Noise Level

In the following section, the noise breakout from the proposed development is assessed. The noise breakout assessments have been conducted in line with the operating hours stated in Section 2 on Page 5.

The table below outlines 1/1 L_{eq} octave frequency band 'raised' speech noise levels obtained from ANSI 3.5:1997.

Description	Octave Band (Hz, dB)							Overall (dBA)
	63	125	250	500	1k	2k	4k	
L_W of 1 No. Raised Voice	48	59	70	75	72	64	57	75
L_W of 70 No. Raised Voices	66	77	88	93	80	82	76	94

Table 3 – Predicted Sound Power Level of 70 No. Patrons

The following table presents the total unweighted sound pressure levels expected within the main double height congregational area when occupied by seventy patrons. The total reverberant sound pressure level incident on the front façade (where noise breakout will be most prominent) has been calculated assuming the following surface finishes:

- Plastered brick walls,
- Lino or other acoustically reflective flooring,
- Suspended plasterboard ceiling.

This assessment does not include any additional absorption within the space from absorptive furnishings or people and is such is considered to be worst-case.

Description	Octave Band (Hz, dB)							Overall (dBA)
	63	125	250	500	1k	2k	4k	
Shul & Ezras Noshim: L_P at Façade	63	70	80	87	83	74	67	87

Table 4 – Predicted Internal Sound Pressure Levels

4. Assessment of Noise Breakout

Noise breakout levels have been assessed outside the nearest NSR window, which is NSR1 to the north.

Glazed elements are typically seen to be the weakest component in the façade when considering the transmission of sound. The elevation drawings for the Proposed Development highlight the replacement of multiple windows, and the addition of multiple new windows directly overlooking NSR1. As such, a minimum glazing specification is outlined in the following sections to ensure that the overall sound insulation performance of the façade is not compromised.

Adopted Criteria

To achieve relative inaudibility within the closest residential NSRs, the L_{eq} associated with noise breaking out of the proposed development should be controlled to not exceed the measured L_{90} seen in Table 2 (excluding site operations) in each octave frequency band at the most affected NSR window.

Roofing Specification

The existing roof construction is unknown, however, to ensure that the roof provides sufficient levels of sound insulation, it is recommended that the overall roof construction achieves at least 42 dB R_W. NOVA can provide more specific design advice once the existing construction is known.

Glazing Specification

Due to the high predicted internal noise levels and the percentage of glazed area proposed overlooking the nearest NSR, glazing upgrades will be required to sufficiently control noise breakout.

Note that the below specification applies to all glazed doors and framing elements.

Example Configuration	Octave Band (Hz, dB)							Overall (dBA)
	63	125	250	500	1k	2k	4k	
Double Glazing: 10mm Glass / 16mm Argon Cavity / 6mm Glass	23	24	24	32	37	37	44	31 (R_W + C_{tr})

Table 5 – Minimum Glazing Specification of Congregational Areas

The above specification has been determined with careful consideration to the attenuation provided in the 250Hz and 500Hz frequency bands, due to sound levels associated with speech being particularly prevalent at these frequencies.

Small variations in octave band performance may be permissible, excluding at 250Hz and 500Hz, providing they are compensated for in neighbouring octave bands.

Noise Breakout Assessment

The calculations have been conducted assuming the following:

- The northern façade is anticipated to the be dominant source of noise breakout at the NSRs. It is assumed that this will be constructed of 200mm brickwork and enhanced double glazing as per the minimum specification outlined in Table 5 above.
- For the purposes of the assessment, it is assumed that all windows and doors will remain closed.
- Calculations have been undertaken in accordance with BS12354-4:2000.
- The sound power level of the element has been calculated using the formula: $L_W = L_{P,in} + C_d - R' + 10*log(S)$, where;
    - S is the surface area of the element in m^2,
    - C_d is the correction for the difference between reverberant internal conditions and non-reverberant external conditions (-6, in accordance with BS12354),
    - R' is the transmission loss provided by the façade.
- The total attenuation due to propagation, A_{tot}, is calculated using formula E.2 presented in BS12354-4.

The tables below present the noise breakout assessment from the worst-case hall at the most affected receptor (NSR1).

Description	Octave Band (Hz, dB)							Overall (dBA)
	63	125	250	500	1k	2k	4k	
Shul & Ezras Noshim; L_p at Facade	63	70	80	87	83	74	67	67
Composite SRI of Façade (R')	29	30	30	38	43	43	50	--
Diffusivity Correction (C_d)	-6							--
Sound Power of Façade	48	54	64	63	54	45	31	62
Total Propagation Attenuation	-23 (A_{tot})							--
Noise Breakout Level at NSR1	25	31	41	40	31	22	8	39
Lowest Measured L_{90}	49	45	43	41	41	36	28	45
Exceedance	**-24**	**-14**	**-2**	**-1**	**-9**	**-14**	**-20**	**-5**

Table 6 – Noise Breakout Assessment – NSR1

Discussion

As can be seen in the assessment above, provided the glazing meets the minimum specification detailed in Table 5, the resulting noise breakout levels are precited to be below the prevailing background sound levels at the closest NSR in all octave frequency bands. This is an indication that the proposed development would be unlikely to adversely affect the amenity of the closest NSRs and would be classed as 'No Observed Effect Level' ('NOEL') when assessed in accordance with the NPSE and NPPF.

5. BS4142 Noise Impact Assessment

It is possible that additional external fixed plant could be required to service the proposed development (i.e., air conditioning units or a mechanical ventilation system) as the noise breakout assessment has assumed that all windows and doors remain closed for the duration of operations. As such, the following plant limit level should be adhered to. The plant limit level has been defined to ensure all noise emissions do not exceed the lowest background sound level at the closest NSRs during the proposed operational periods. When assessed in accordance with BS4142 this indicates 'Low Impact' and achieves 'No Observed Effect Level' ('NOEL') when assessed with the NPSE and NPPF.

Description	Operational Hours (dBA)
MP1 Lowest Background Sound Level ($L_{A90,15min}$)	45
Maximum Rating Plant Noise Level Limit at NSRs	40

Table 7 – BS4142 Plant Noise Level Limit

The above limit is based on plant only being active during operational hours. Should plant be operable outside of these hours, the plant rating limit level should be updated to account for background variation during other applicable periods of the day or night.

Recommendations:

The following section outlines the mitigation measures that are necessary to reduce the impact of any proposed plant.

- The cumulative rating level of all plant should not exceed of 40 dBA as determined 1m from the façade of the nearest NSR during the operational hours.
- The plant limit level is inclusive of any rating penalties that should be applied to account for audible characteristics of the sound that are perceived to cause increased annoyance, such as tonality or intermittency, in line with BS4142 recommendations.
- Any plant should be placed sympathetically to the surrounding residential receptors, with placements with a direct line of site to the nearby NSRs prohibited unless unavoidable. Plant should not be placed on the northern façade overlooking NSR1.
- The plant should be installed on appropriate anti vibrational mounts.
- Plant should be installed as per the manufacturers guidance and be regularly maintained to ensure that plant is working at optimal capacity.

Once the plant has been specified, a suitably qualified person should assess whether the plant noise limit levels can be achieved. Further acoustic design and mitigation may be required once specified.

6. Noise from Access

The drawings indicate that the existing parking area to the rear of the Development Site is to be retained, however the capacity of the parking is to be slightly reduced due to some of the existing land being occupied by the proposed extension. Additionally, the two existing parking spaces to the front of the building off Middleton Road shall also be removed. Vehicle movements on site shall not be an intensification above the previous capacity and are therefore not anticipated to have a negative impact on the nearest NSRs.

The Development Site is observed to be within close proximity to two bus stops on Middleton Road, with buses scheduled during the operational hours of the Proposed Development. Public pathways are present along both Middleton Road and Moxley Road, allowing for patrons to safely access the Site on foot. It is therefore a reasonable assumption that a portion of the patrons will access the Site via methods excluding private vehicles, such as by foot or public transport.

Given the reasonably small size of the development, a full assessment of the impact on the surrounding road network is thought to be unnecessary. As the operating times are restricted and the expectant number of trip generations as a result of the development are minimal compared to what is currently on the neighbouring roads, no significant increase in road noise would be expected.

Patrons using the external areas will be made aware that the venue has residential neighbours and that shouting and raised voices are unacceptable. If patrons frequently violate this, they should be asked to move inside the venue.

7. Conclusion and Action Plan

The proposed development has been assessed against the acoustic design criteria and a sound insulation scheme has been provided to ensure the criteria has been achieved.

The outcome of this assessment is that the Proposed Development is likely to have a low acoustic impact, which when assessed in line with NPSE and NPPF guidance equates to the 'No Observed Effect Level' threshold. This is a positive indication that the site is suitable for the proposed use.

The following 'Action Plan' is outlined to ensure the design considerations and specifications from this report are duly implemented:

1. The upgraded glazing specification outlined in Table 5 should be implemented prior to the first operations and retained throughout the lifetime of the development.
2. The roof should achieve at least the value stated in Section 4 and any remedial work retained throughout the lifetime of the development. This would be achieved with standard roof tiles and a voided loft.
3. All amplified speech and music and any live music is to be strictly prohibited.
4. All façade openings to the main congregational areas during times of prayer should remain closed at all times.
5. Any external fixed plant that may be installed should not exceed the plant noise limit level presented in Section 5. These are inclusive of any BS4142 acoustic feature corrections. Once the plant units are specified the noise emissions should be calculated by an appropriately qualified person to ensure that the limit levels are achieved.
6. Plant should not be located on the northern façade with a direct line of site to NSR1 unless this is completely unavoidable.

The findings of this report will require written approval from the Local Authority prior to work commencing.

Appendix A – Acoustic Terminology

A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure given by the following formula in decibels (dBA). $L_{pA} = 10 \log_{10} (pA/p_0)^2$. Where: pA is the A-weighted sound pressure in pascals (Pa) and $p0$ is the reference sound pressure (20 μPa)
Background Sound	Underlying level of sound over a period, T, which might in part be an indication of relative quietness at a given location
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within a specified time interval, T, has the same mean-squared sound pressure as the sound under consideration that varies with time
Facade level	Sound pressure level 1 m in front of the facade
Free-field level	Sound pressure level away from reflecting surfaces
Indoor ambient noise	Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants
Noise Criteria	Numerical indices used to define design goals in a given space
Noise Rating (NR)	Graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves
Octave Band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit
Percentile Level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting "F", which is exceeded for N% of a specified time interval
Rating Level, $L_{Ar,Tr}$	Equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise
Reverberation time, T	Time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped
Sound Pressure, p	root-mean-square value of the variation in air pressure, measured in pascals (Pa) above and below atmospheric pressure, caused by the sound
Sound Pressure Level, L_p	Quantity of sound pressure, in decibels (dB), given by the formula: $L_p = 10\log_{10}(p/p_0)^{2.}$ Where: p is the root-mean-square sound pressure in pascals (Pa) and $p0$ is the reference sound pressure (20 μPa)
Weighted sound reduction index, R_w	Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies

Appendix B – Standards, Legislation, Policy, and Guidance

This report is to be primarily based on the following standards, legislation, policy and guidance.

B.1 – National Planning Policy Framework (2023)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2023. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 174e, it states:

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;

Paragraph 185 states:

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 impact 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; and*
c) *Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

B.2 – Noise Policy Statement for England (2010)

Paragraph 185 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision 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.

To achieve this vision the Statement identifies the following three 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;
- Where possible, contribute to the improvement of health and quality of life.

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that "significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development".

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: "all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur."

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise. This can be related to the third aim above, which seeks: "where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

B.3 – BS8233:2014 'Guidance on Sound insulation and noise reduction for buildings'

BS8233 provides guidance on noise levels from sources without specific character in the built environment, based on the recommendations of the World Health Organization; specifically, 'WHO Guidelines on Community Noise, 1999'. The Guidelines on Community Noise (1999) document defines community noise to include noise from "industries" and "construction". The desirable criteria levels of steady state, "anonymous" noise in unoccupied spaces within dwellings, from sources such as road traffic, mechanical services and other continuously running plant, are tabulated below.

BS8233:2014 Internal Ambient Noise Level Criteria			
Activity	Location	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Resting	Living Room	35 dB $L_{Aeq,16hour}$	--
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	--
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB L_{AFmax}*

Table 8 – BS8233:2014 Internal Ambient Noise Level Criteria

**ProPG:2017 states that's good acoustic design can be used so that individual noise events do not normally exceed 45 dB L_{AFmax} more than 10 time a night within noise sensitive rooms such as bedrooms. However, where it is not reasonably practicable to achieve the guideline then the judgment 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.*

It is noted, however, that where development is considered necessary or desirable, despite external noise level above WHO guidelines, the above target levels may be relaxed by up to 5 dB.

General recommendations for mitigation to enable these targets to be achieved are provided, including the use of bunds and barriers to reduce external noise and space planning and sound insulation for the control of internal noise levels.

For this assessment, the above criteria are considered to be the 'LOAEL' as defined in the NPSE in Appendix B.

B.4 – ProPG: Planning and Noise (2017)

ProPG Planning and Noise published May 2017 by the Association of Noise Consultants (ANC) was produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. ProPG aims to encourage better acoustic design of new residential developments promoting good health and wellbeing through the effective management of noise. It therefore outlines four key elements which should be considered in the assessment of noise: • 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".

Appendix C – Proposed Elevations

Figure 4 – Proposed Elevations

Appendix D – Environmental Survey

D.1 – Time History Noise Data

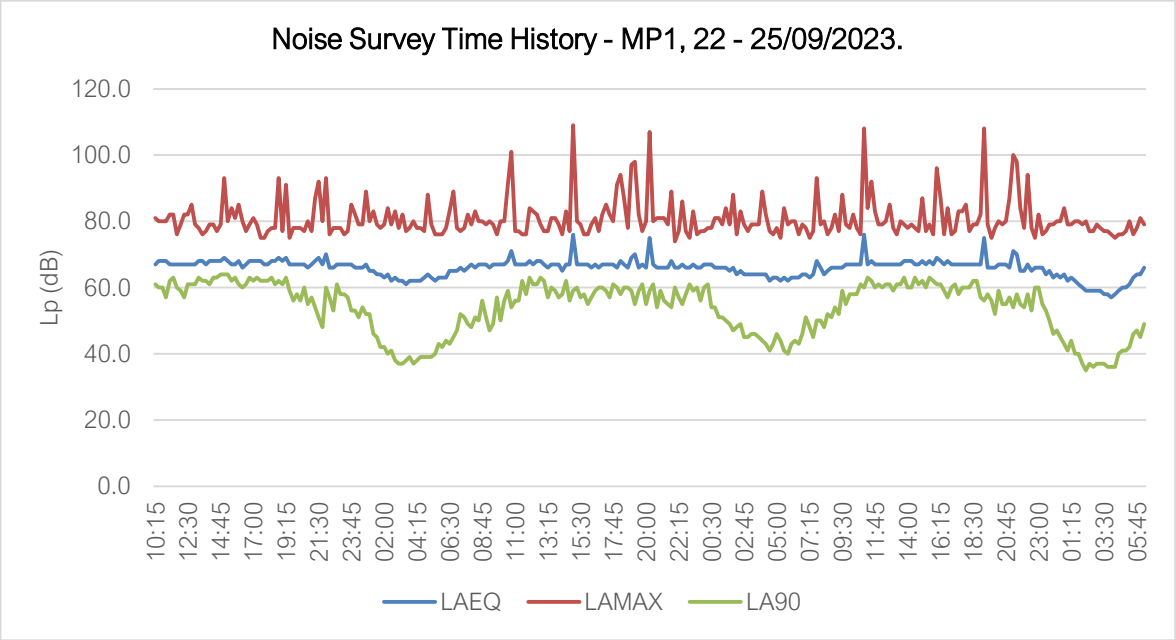


Figure 5 – MP1 Noise Survey Time History

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
CESVA SC420 Class 1 Sound Level Meter	T252917	≤0.1
CESVA CB006 Class 1 Calibrator	901997	

Table 9 – Surveying Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤0.1 dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

D.3 – Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localised records of weather conditions were taken. However, all measurements have been compared with met office weather data of the area, specifically the closest weather station, and the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445

Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather Conditions – Booth Hall (Approx. 3km NEE of Site)				
Time Period	Air Temp (^{0}C)	Rainfall (mm/h)	Prevailing Wind Direction	Wind Speed (m/s)
22/09/2022: 00:00 – 23:59	6.5 – 14.8	1.7	WSW	0.0 – 3.3
23/09/2022: 00:00 – 23:59	6.5 – 16.3	0.0	SW	0.0 – 2.9
24/09/2022: 00:00 – 23:59	11.4 – 18.7	1.8	SSW	0.0 – 5.4
25/09/2022: 00:00 – 23:59	11.4 – 20.3	0.0	SW	0.0 – 6.3

Table 10 – Weather Conditions

Note that equipment was fitted with its proprietary environmental weather gear, including wind muff suitable for wind speeds up to 8 m/s^{-1}.

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