

Portico Library
Noise Impact
Assessment
P01
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1.0 INTRODUCTION

Max Fordham LLP (MFLLP) have been appointed to undertake a noise assessment for the renovation works at the Portico Library, on 57 Mosley Street (M2 3HY), Manchester.

Project Summary

The ground floor of the building is currently occupied by a pub/restaurant accessible via Mosely Street (where the main entrance is); the actual library is on the first floor and accessible via internal stairs from a side door on Charlotte Street. The spaces on the basement level are partially used by the library and by the pub/restaurant.

The works are subsequently to the re-appropriation from the Portico Library of the whole building (basement and the ground floor level) at the end of the pub's lease period.

At the end of the works, the basement will house a kitchen, staff office, WCs, changing places archives; the ground floor will be occupied by a flexible exhibition space/café, while the first floor will remain as the main library and event space.

The renovations aim for a more sustainable building (designed to be ready for a net zero carbon future). This include potential interventions at the facade, structural alteration and new ventilation/heating system to be more energy efficient.

Part of the proposal is to install 1no. external air source heat pump units on a flat roof deck at the back of the building.

Objectives

This noise impact assessment is to form part of the planning application package and addresses the following objectives:

- To review relevant legislation, policy and guidance documents.
- To establish the Local Authority's acoustic requirements for the proposed development.
- To undertake an environmental noise survey at a selected position.
- To establish representative day and night-time background sound level ($L_{A90,15min}$) limits from the development to be identified with reference to the requirements of the Local Authority.
- To propose atmospheric plant sound emission limits at the nearest noise sensitive receptors for subsequent use in designing building services proposals in order to comply with the requirements of the Local Authority.
- To assess the noise emissions from the proposed plant based upon data with which we are provided, and comment upon the acceptability against these limits in line with the British Standards 4142:2014 "Methods for rating and assessing industrial and commercial sound".
- To advise on noise control measures if required.

A glossary of the technical terminology used in this report is provided in the Appendix 6.1 at the end of this document.

2.0 LEGISLATION, POLICY AND GUIDANCE

2.1 National Planning Policy

National Planning Policy Framework

The NPPF was last updated in December 2024 and sets out the government's planning policies for England and how these are expected to be applied. It provides a framework within which locally prepared plans can provide for sufficient housing and other development in a sustainable manner.

It states in paragraph 187 e) of the NPPF that planning policies and decisions should contribute to and enhance the natural and local environment by *“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”*.

Furthermore, it states in paragraphs 198 and 200 that planning policies and decisions 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 (paragraph 198 a)).
- Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason (paragraph 198 b)).
- Be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed (paragraph 200).

The NPPF refers to the Noise Policy Statement for England 2010.

Noise Policy Statement for England 2010

The Noise Policy Statement for England 2010 (NPSE) sets out the government’s long-term noise policy 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”* (paragraph 1.6).

The NPSE states that *“excessive noise can have wide-ranging impacts on the quality of human life, health (for example owing to annoyance or sleep disturbance) and use and enjoyment of areas of value such as quiet places and areas with high landscape quality”*.

The NPSE cites the following aims in the Explanatory Note section:

- First aim of the NPSE: Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of government policy on sustainable development.
- Second aim of the NPSE: Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of government policy on sustainable development.
- Third aim of the NPSE: Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of government policy on sustainable development.

The NPSE also states that *“examples of noise management can be found in many areas including reducing noise source; the use of the land use and transport planning systems, compensation measures, the statutory nuisance and licensing regimes and other related legislation”* (paragraph 2.2).

The NPSE introduces guidance to assist in defining adverse impacts:

- 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 noise.
- LOAEL – Lowest Observed 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.

The NPSE acknowledges “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” (paragraph 2.15).

Planning Practice Guidance 2024

The Planning Practice Guidance 2024 (PPG) sets out the government's planning policies for England and how these are expected to be applied.

The government’s planning practice guidance web pages provide advice on various issues, including noise (<https://www.gov.uk/guidance/noise--2>). When considering when noise is relevant to planning, the advice (published in March 2014 and last updated in July 2019) states that “noise needs to be considered when new development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced)” (paragraph: 001, reference ID: 30-001-20190722, revision date: 22 07 2019).

The planning practice guidance web pages include further explanation of the effect level categories introduced in the NPSE and explore how actions, such as a requirement for noise mitigation or prevention of a development, might be assessed with respect to whether or not noise levels are considered above the category thresholds. The noise exposure hierarchy table from the noise guidance (see Figure 1) summarises the noise exposure hierarchy based on the likely average response of those affected (paragraph: 005, reference ID: 30-005-20190722, revision date: 22 07 2019).

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
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

Figure 1: Noise exposure hierarchy table, from the NPSE.

Summary

In summary, national planning policy does not provide quantitative advice, such as absolute noise level limits. Thus, authorities still generally interpret and express national and local non-quantitative policies by issuing quantitative noise-related planning conditions.

2.2 Local Policy

Manchester's Local Development Framework – Core Strategy Development Plan Document (DPD)

The Core Strategy, adopted by Manchester City Council on 11th July 2012, sets out key policies for the Manchester development over a period of 15 years (from 2012 to 2027).

In regard to noise issue, an extract from Policy DM 1 - *Development Management* is given below:

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

- 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.”

Manchester City Council Planning & Noise – Technical Guidance

The guidance (issued in December 2015) aims to provide help and advice in relation to noise in a planning context to encourage good acoustic design. It outlines what is expected in relation to current guidance and policy with the aspiration that new developments achieve the highest possible standards without compromising the health and wellbeing of people that live and work within the City of Manchester.

Relevant sections are reported below:

- 3.6.1.5 Industrial / commercial developments

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

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

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

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

- 3.6.1.5.1 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.

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.

- 5.3 Noise control

All reasonable noise control measures should be designed and implemented to ensure that noise level requirements are met. Where possible noise should be controlled at its source. e.g. selecting a quieter equipment specification.

Developers can also consider the design and layout of a development to see if changes would reduce the levels of noise emitted from the development or protect residents from the impact of externally generated noise.

For example, increasing the distance between the noise source and noise sensitive building, orientating a residential building so that bedrooms do not face or overlook a busy road, or placing non sensitive buildings or structures between a noise source and noise sensitive use.

Any proposals to reduce noise at source, by the design and layout of a development, or by building treatments such as acoustic glazing or ventilation should be supported by full calculations to indicate the likely level of noise reduction.

- 5.3.1.2 Screening

Complete enclosure of the noise source or receiver is the most effective form of barrier (providing it is impervious and sufficiently heavy). The walls and roof of a building usually perform this function for a noise sensitive development whereas acoustically enclosing plant or equipment may be applicable for noise making developments.

Barriers or acoustic screens that are not complete enclosures (e.g. screens/fences) are normally most effective when tall, long, sound-absorbent and close to either the noise source or receiver.

It is vital that an acoustic barrier does not have any gaps within it, as even a small gap or hole in the barrier at ground level is sufficient to render it ineffective.

- 5.3.1.4 Plant and Equipment

Noise from external plant, equipment or servicing items are assessed when determining planning applications. Typical equipment in both commercial and residential developments includes items such as air conditioning plant, retail refrigeration plant or lift motors.

Industrial developments are much more varied with the types of plant and equipment being entirely related to the industry in question.

The design aim here should be to meet the criterion in section 3.6.1.5.1. Consideration should initially be given to selecting the most low noise emitting models of plant and equipment possible. If this is not feasible, then it

may be advisable to consider relocating noisy plant and equipment to a less noise sensitive area of the site and/or away from multiple reflecting surfaces.

It may also be possible to erect acoustic shielding around any necessary plant and equipment to contain noise and prevent it causing problems off-site. Some equipment may require additional acoustic mitigation measures to control the impacts from tonal noise or intermittent operation.

The use of any plant and equipment overnight usually causes an increase in noise sensitivity, so it may be advisable to limit use during night time periods if possible.

Consideration of the above measures at an early stage of the planning process is likely to progress an application more swiftly.

2.3 Guidance and Standards

British Standard 4142

British Standard 4142:2014 – ‘*Methods for rating and assessing industrial and commercial sound*’ sets out the methodology for rating and assessing sound of an industrial and commercial nature, which includes sound from fixed installations, such as mechanical and electrical plant and equipment.

In BS 4142, a noise rating is determined and compared with the existing local background sound level based on several more cumulative acoustic feature corrections to apply where appropriate. For example, if the noise includes a distinguishable tone, impulse, intermittency or other readily distinguishable sound characteristic, then additional cumulative penalties ranging from 0 to 9 dB may be applied depending on the type of noise.

BS 4142 seeks to determine a representative background sound level stating that “*the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*”.

The assessment of the impact depends upon the margin by which the rating level of the specific sound source exceeds the background sound level but also promotes a consideration of the context in which the sound occurs when making an assessment. BS 4142 states that an initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level, while considering the following points:

- a) Typically, the greater this difference, the greater the magnitude of the impact.
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

Note then, a BS 4142 assessment may deduce a low impact where the specific sound level is below the background sound level.

3.0 NOISE SURVEY

3.1 Site Context

The Portico Library (the Site) is situated on 57 Mosley Street (M2 3HY), within a central dense-built business area in the centre of Manchester. It is bounded to the West by the Metrolink line, to the South by Charlotte Street, and to the East by Back George Street; approx. 200 m to the East is Portland Street.

Figure 2 shows a view of the site context (included location of the noise survey for further reference).

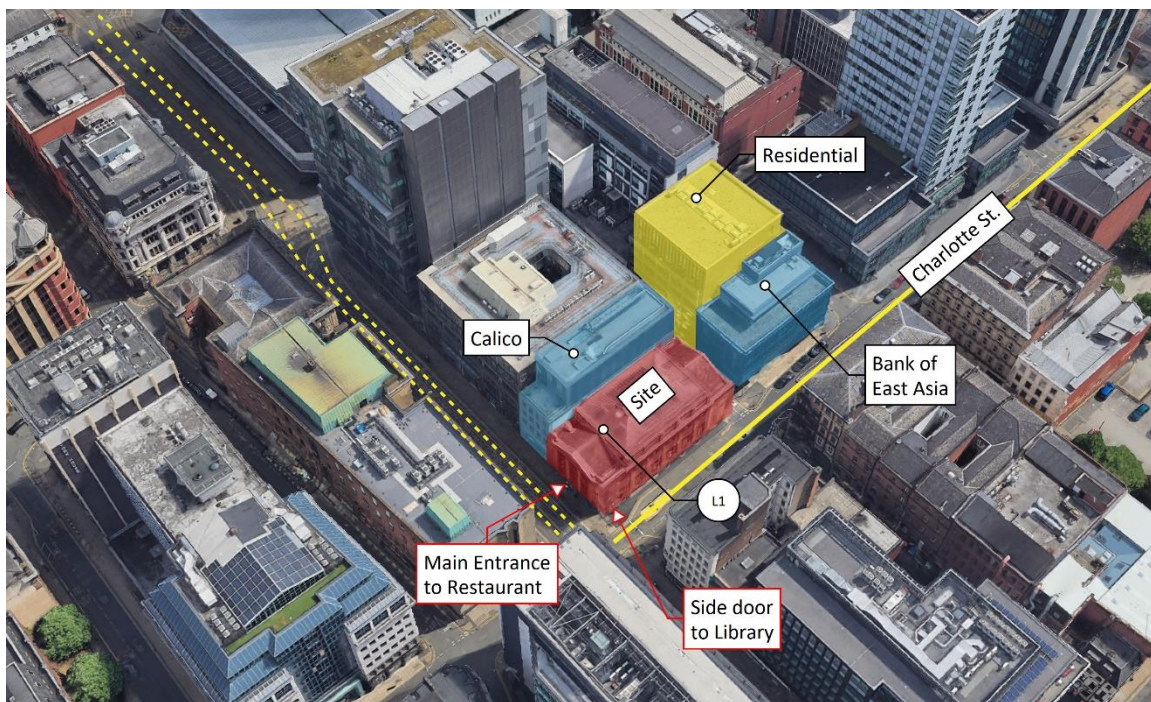


Figure 2: Aerial view of the Site and its surroundings, including measurement location L1 for reference.

3.2 Noise Survey Procedure

A long-term unattended noise survey was undertaken on-site to establish the baseline noise environment of the application site and to determine its suitability for the proposed development.

Methodology

Noise levels were monitored on the roof level of the building (location L1 on Figure 2) for a minimum of 24hrs to characterise the ambient noise level on site during daytime (07:00-23:00) and night-time (23:00-07:00).

The survey noise survey was undertaken from 13:00 hours on Saturday 29 to 09:00 hours on Monday 31 March 2025. Noise levels were monitored and stored continuously over 15-minute time interval with a fast time-weighting and a rating sample of 1 second.

Measurements were taken continuously of the A-weighted (dBA) mean noise level ($L_{Aeq,15min}$), the maximum ($L_{AFmax,15min}$) noise level, and the background ($L_{AF90,15min}$) noise level.

The noise survey was undertaken in accordance with BS 7445.

Measurement Locations

The location chosen was at the roof of the building (location L1 as depicted in Figure 2). Picture of the setting up are given in the Appendix 6.4 at the end of this document.

Weather Conditions

The weather conditions during the survey period have been found suitable for undertaking measurements of sound levels, with no significant periods of rainfall or strong breezes (<5 m/s) for the duration of the survey.

Noise Sources

Dominant noise sources were noted to be tram noise, road traffic noise along the surrounding road network; noticeable but not predominant was noise from building services (i.e. existing external plant) serving the existing surrounding buildings.

Measurement Equipment

Long-term (unattended) noise survey was taken using a Norsonic 140 Class 1 sound level meter as per the specification given in BS 61672-1:2013 – ‘*Electroacoustics. Sound level meters – Specifications*’. The sound level meter uses a Norsonic 1225 free-field response microphone and a Norsonic 1209 microphone preamplifier. A Norsonic 1251 Class 1 portable sound calibrator (complying with BS 60942:2018 – ‘*Electroacoustics. Sound calibrators*’) was used to calibrate the sound level meter.

No significant calibration deviation occurred; details of the noise survey equipment are provided in the Appendix 6.2 on Table 4.

3.3 Noise Survey Results

Long-term Measurements

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, it was noted that noise climate is mainly dominated by road traffic noise from the surrounding road network, as well as tram noise.

Any plant is already present and in operation would be considered part of the noise climate. As such, the noise levels measured are considered representative for the purposes of establishing plant noise limits.

Results (rounded to the nearest whole decibel) are summarised on Table 1.

Table 1: Long-term noise survey results.

Table 2: Long-term noise survey results					
Location	Date	Time period	L _{Aeq,T} (dBA) ^[1]	L _{AF90,15min} (dBA) ^[2]	L _{AFmax,15min} (dBA) ^[3]
L1	29/03/2025 to 31/03/2025	Daytime (07:00 to 23:00)	61	54	83
		Night-time (23:00 to 07:00)	57	48	80
^[1] logarithmic average of the noise levels during the entire duration of the survey ^[2] the 40 th percentile value of the L _{AF90,15min} data values ^[3] the 90 th percentile value of the L _{AFmax,15min} data values					

The external *background* sound noise levels on Table 1 give an indication of the typical lowest noise levels likely to be experienced at the site. These levels are used to set plant noise limits at the nearest sensitive receptors.

Time history of the long-term noise survey is given in Appendix 6.3.

4.0 PLANT NOISE ASSESSMENT

The plant noise emissions should be designed to meet the Planning & Noise – Technical Guidance document issued by the Manchester City Council alongside statutory noise nuisance legislation.

4.1 Representative Background Noise Level

BS 4142:2014 aims to determine a representative background noise level and states that “*the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*”. A definitive method for selecting a representative background noise level is not prescribed in BS 4142, although an example is presented whereby the modal value from a statistical analysis of L_{A90} data is used.

The “representative” background noise level ($L_{A,90,T}$) from the noise survey has been used to assess the plant noise limit given as a rating level ($L_{Aeq,r}$) in line with BS 4142:2014.

The following considerations have been made:

- The measurement location was chosen to be as close as possible to the nearest sensitive receptor. Therefore, the background noise level estimated is considered appropriate for this scope.
- The 40th percentile of the $L_{A90,15\text{ min}}$ measurements are considered to be “representative” of background noise levels. The highest 20% of values are discounted to ensure outlying erroneous values are not included and then the median of the remaining values (hence, 40th percentile) is considered to be representative of the background noise.

The representative background noise level for daytime and night-time hours was found to be:

- Daytime (07:00 to 23:00): 54 dBA.
- Night-time (23:00 to 07:00): 48 dBA.

Levels have taken from the long-term noise survey at location L1 (results in Table 1).

4.2 Plant Noise Emission Criteria

Based on the representative L_{A90} sound levels measured and the requirements of the Local Authority, it is proposed that the cumulative atmospheric plant noise shall not exceed the noise rating level limits given in Table 2 when assessed in accordance with BS 4142:2014 with corrections applied for any plant emitting noise of a tonal or irregular quality.

Table 2: Plant noise level limits at the nearest NSR.

	Representative background noise level (dBA) ^[1]	Noise rating level limit for plant equipment ($L_{A,r,T,r}$ dBA)
Daytime (07:00 to 23:00)	54	49
Night-time (23:00 to 07:00)	48	43

The above criteria are to be achieved with all of the proposed plant operating simultaneously.

In accordance with BS 4142:2014, meeting the rating level limits set out in Table 2 is an indication of the specific sound source having a low impact at the most exposed sensitive receptor.

4.3 Plant Noise Impact Assessment

The following assessment is meant to summarise the predictions of atmospheric noise emissions from the proposed plant to the nearest noise sensitive receptors.

The overall plant noise will be dependent on the total number of plant items, their location in relation to nearest noise sensitive receptors, and the proposed operational hours.

Proposed Plant

The primary plant is located on the roof level and comprises 1No. AERMEC NRG0704XH-EV-J-W4 air source heat pump (ASHP). Technical data gives a Sound Power Level of 78.6 dBA (46.5 dBA Sound Pressure Level at 10 m).

Noise Sensitive Receptors

With reference to Figure 2, given the location of the plant deck, the receptors identified as the buildings subject to noise impact are the two office buildings (CALICO and Bank of East Asia) and the residential property.

Given the locality of these receptors to the plant deck, and understood that the plant will be running 24/7, the residential development is the most affected from the noise radiated by the air source heat pump, with night-time considered the worst-case scenario.

Therefore, plant noise rating level for the ASHP will be assessed against the residential building to achieve night-time noise rating level limit.

Plant Noise Assessment

Based on the Sound Power Level data provided, the location of the plant deck and the distance to the sensitive receptor façade, Table 3 describes the predicted noise rating level without any acoustic design measures and with no acoustic feature correction applied to the plant noise egress.

Table 3: Plant Noise Assessment

Sound Level	
1No. AERMEC NRG0704XH-EV-J-W4	78.6 dBA (sound power level)
Sound Propagation Correction due to distance (at 13m)	30 dB
Sound Pressure Level at the receptor	49 dBA
BS 4142 Acoustic Feature Correction	0 dB
Rating Level at Receptor	$49+0 = 49 \text{ dB (L}_{Ar})$
Proposed Plant Noise Rating Level Limit	43 dB (L_{Ar})
Excess over the Noise Level Limit	$49-43 = 6 \text{ dB}$

The overall rating level exceeds the limit by 6 dB. Therefore noise emission shall be mitigated to meet the target.

4.4 Plant Noise Control Strategy

All items of plant should be acoustically treated as necessary in order to achieve the noise limits as given on Table 2 at most noise sensitive premises in accordance with BS 4142:2014+A1:2019.

External Plant (Roof level)

An acoustic screen which blocks direct line of sight to the residential balconies/windows is required to reduce the plant noise to the required level. The screen can be louvred to allow airflow but should have a sound reduction rating of at least 12dB R_w .

4.5 Vibration Control Strategy

All rotating and vibrating machinery (e.g. fans, pumps, motors, chillers etc.) will be installed on vibration isolation systems so the plant does not propagate noticeable vibration into occupied spaces or give rise to unacceptable radiated noise levels.

5.0 SUMMARY AND CONCLUSION

Max Fordham LLP (MFLLP) have been appointed to provide advice on acoustic matters relating to the planning application for the Portico Library, on 57 Mosley Street (M2 3HY), Manchester.

An environmental noise survey was undertaken on-site to establish the current prevailing noise environment at the application site.

The representative on site daytime and night-time $L_{A90,15min}$ background sound levels have been assessed. These have been used to establish plant noise level targets in line with the Local Authority's requirements.

The atmospheric plant sound emission limits from the primary plant equipment shall not exceed the following noise rating levels (which includes any acoustic character associated with the mechanical services plant) at the most noise sensitive premises when measured in accordance with BS 4142:2014+A1:2019:

- Daytime (07:00 to 23:00): 49 dBA $L_{Ar,Tr}$
- Night-time (23:00 to 07:00): 43 dBA $L_{Ar,Tr}$

The assessment indicates that noise control strategy such as an acoustic screen is required in order to achieve the proposed noise criteria and therefore the anticipated Local Authority requirements.

6.0 APPENDIX

6.1 Glossary

A-WEIGHTED SOUND PRESSURE LEVEL (SPL), L_A (dBA). A-weighted SPL values (or noise levels) are weighted in a way that approximates the frequency response of the human ear and allows sound levels to be expressed as a single-figure value.

BACKGROUND SOUND LEVEL, $L_{A90,T}$ (dBA). The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval, T, measured using time weighting and quoted to the nearest whole number of decibels.

EQUIVALENT CONTINUOUS A-WEIGHTED SPL, $L_{Aeq,T}$ (dBA). Energy weighted average of the A-weighted sound pressure level over a time period, T. The level of a notional continuous sound that would deliver the same A-weighted sound energy as the actual fluctuating sound over the course of the defined time period, T.

MAXIMUM A-WEIGHTED SPL, L_{Amax} (dBA). The maximum A-weighted sound pressure level measured. If not specified, usually assumed to mean L_{AFmax} , i.e. L_{Amax} determined with a 'fast' (F) sound level meter time constant of 125 ms.

NOISE RATING LEVEL, $L_{A,r,T}$ (dBA). The A-weighted specific sound level plus any adjustment for characteristic features of the sound, for example, if the sound features impulsive or tonal components.

PERCENTILE NOISE LEVEL $L_{A1,T}$, $L_{A10,T}$, $L_{A90,T}$ (dBA). The value of the A-weighted sound pressure level that is exceeded for N% of any given time interval, T. For example, $L_{A1,T}$ is the value that is exceeded for 1% of the measurement period.

SOUND PRESSURE LEVEL (SPL), L (dB). The sound level measured on a logarithmic scale, with unit decibel dB. A free-field SPL refers to a level determined far enough from surfaces or façades, apart from the ground, so as not to be influenced by reflections from those surfaces.

SOUND REDUCTION INDEX, R (dB). The sound reduction index of an element, such as a wall, floor, door or window describes the proportion of incident sound that is not transmitted by that element. R varies with frequency and can be expressed either in terms of the fraction of incident sound energy that is transmitted or in terms of the difference in SPL on either side of the element.

SPECIFIC SOUND LEVEL, $L_s = L_{Aeq,T_r}$ (dBA). The equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r .

SPECIFIC SOUND SOURCE. The sound source being assessed.

SPECTRUM ADAPTATION TERM C_{tr} (dB). A correction to be added to, for example, R_w values to account for the effect of enhanced low frequency content typical of urban traffic noise spectra. Thus, sound reduction index values can be quoted as $R_w + C_{tr}$.

WEIGHTED SOUND REDUCTION INDEX, R_w (dB). A value calculated from the frequency dependent values of sound reduction index, measured in a laboratory and weighted according to a method described in BS EN ISO 717-1. This allows the sound reduction of an element to be expressed in terms of a single value.

6.2 Survey Equipment

Noise Survey

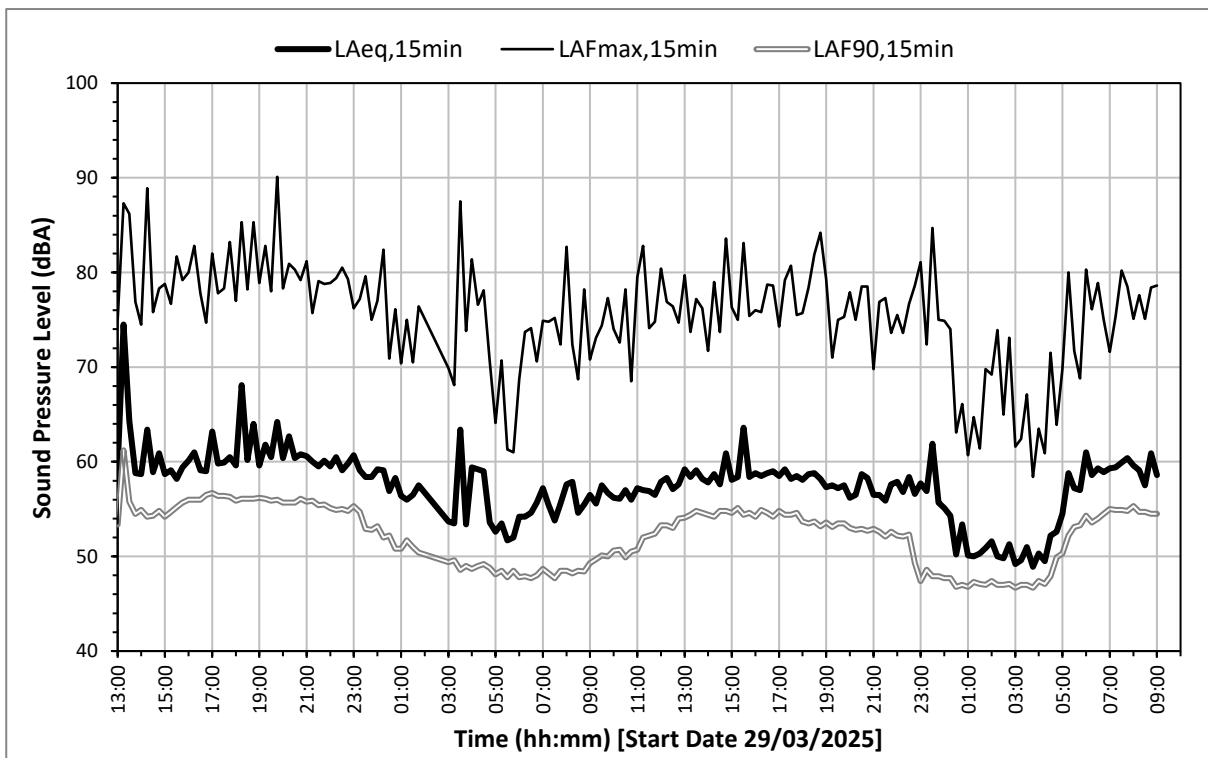
The Norsonic sound level meters were calibrated by an accredited United Kingdom Accreditation Service (UKAS) laboratory in accordance with the laboratory requirements of UKAS on the dates specified in Table 4.

Table 4: Details of the noise survey equipment.

Item	Make/type/serial no.	Date calibrated	Calibration due	Certificate no.
Class 1 Sound Level Meter	Norsonic/140 S/N 1406755	23/05/2024	23/05/2026	U47902
Microphone Preamplifier	Norsonic/1209 S/N 21284	23/05/2024	23/05/2026	U47902
Microphone	Norsonic/1225 S/N 579797	23/05/2024	23/05/2026	U47901
Calibrator(hired)	Norsonic/1251 S/N 30753	02/10/2024	02/10/2025	U48885

Copy of the calibration certificates of the noise survey equipment are held by MFLLP and are available upon request.

6.3 Survey Graph



6.4 Survey Photos



Figure 3: View of the external site (tram line to the left and Charlotte St. to the right).



Figure 4: Measurement location of L1.