2-6 LEEKE STREET

Plant Noise Assessment (Option 2)

Reference: 13916.RP02.PNA.0
Prepared: 8th October 2024
Revision Number: 0

McDonald Architects Ltd.
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Plant Noise Assessment (Option 2)

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Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	8th October 2024	Kuruvila Kudilil Anto	Martin Raisborough

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The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting-out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and again will need to be developed in to full working drawings by the lead designer to incorporate all other design disciplines.

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Contents

1.0 INTRODUCTION

RBA Acoustics has been appointed by McDonald Architects to undertake a noise impact assessment in relation to the proposals to install a number of new plant items at the property at 2-6 Leeke Street in London, WC1. The assessment is required to support a planning application for the installation of the new plant items. London Borough of Camden requires consideration be given to atmospheric noise emissions from the proposed equipment at the nearest affected noise-sensitive property.

RBA Acoustics has undertaken measurements of the prevailing noise conditions at the site and to determine the atmospheric noise emissions in accordance with London Borough of Camden's requirements. This report presents the results of the noise measurements, associated criteria and provides the required assessment.

This report occasionally employs technical acoustic terminology. A glossary of acoustic terminology is presented in Appendix A.

2.0 SITE DESCRIPTION

2-6 Leeke Street is located on the corner junction of the A201, Kings Cross Road and Leeke Street. The site is bounded by Kings Cross Road to the east, Leeke Street to the south, and adjoining commercial buildings to the west and north. The junction between King's Cross Road and the A501, Pentonville Road, lies approximately 190 metres to the north of the site, while Kings Cross St Pancras Rail Station lies approximately 380 metres to the north-west of the site.

The noise climate around the building is typical of a central urban location, with heavy vehicular traffic along Kings Cross Road. There are minimal vehicle movements along Leeke Street. There is a railway line located within 45 metres southwest of the site, however no trains were audible while attending the site. The noise climate at the rear of the site is low due to the screening provided by the subject property and adjoining buildings.

The nearest noise sensitive property to the site is that located at 175 Kings Cross Road, approximately 8 metres to the north of the site.

The site is shown in relation to its surroundings in the site plan in Figure A in Appendix B.

3.0 ASSESSMENT CRITERIA

3.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) states that, with respect to noise, planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- Mitigate and reduce to a minimum, other adverse impacts on health and quality of life arising from noise from a new development, including through the use of conditions;
- Recognise that development will often create some noise and existing business wanting to develop in continuance of their business should not have unreasonable restrictions put upon them because of changes in nearby land uses since they were established; and
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

The guidance contained within the NPPF further determines that consideration should be given to the Noise Policy Statement for England (DEFRA, March 2010).

3.2 Noise Policy Statement for England (NPSE, March 2010)

The NPSE attends to three types of noise;

- "Environmental noise" which includes noise from transportation sources;
- "Neighbour noise" which includes noise from inside and outside people's homes; and
- "Neighbourhood noise", which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street.

In line with the aims determined in the NPPF, the NPSE determines three aims;

1. 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;
2. 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; and,
3. 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 guidance detailed within the NPSE relates a number of key phrases with regards to adverse effects which can be applied to noise impacts as used by the World Health Organisation.

- **NOEL – No Observed Effect Level** - The level below which no health effect or detrimental impact on the quality of life is observed.
- **LOAEL – Lowest Observed Adverse Effect Level** - The level at which adverse effects on health and quality of life can be detected
- **SOAEL – Significant Observed Adverse Effect Level** - The level above which significant adverse effects on health and quality of life occur.

The guidance indicates that it is not possible to have a single objective noise-based measure that defines SOAEL, and as such the SOAEL is likely to be different for different noise sources and receptors. The document indicates that further research is required to establish what may constitute a significant adverse impact on health and quality of life from noise.

While the NPSE determines the NOEL, LOAEL and SOAEL descriptions, the document indicates that, unlike other environmental disciplines, there are currently no European or national noise limits which have to be met, although the NPSE states that "there can be specific local limits for specific developments" allowing for negotiation.

3.3 Planning Practice Guidance - Noise

The Planning Practice Guidance for noise 2014 (updated July 2019) broadly considers the same issues as demonstrated within both the NPPF and the NPSE with regards to noise within the planning realm. The information detailed within the PPG indicates that noise should be considered when:

- New developments may create additional noise; and/ or,
- New developments would be sensitive to the prevailing acoustic environment.

The guidance indicates that Local Planning Authorities should take account of the acoustic environment and in doing so consider:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and,
- Whether or not a good standard of amenity can be achieved.

The impact of noise is rated within the policy document in terms of the relative 'Observed Effect Level', defined in line with the guidance within the NPSE. Based upon this, the Planning Practice Guidance provides the following matrix of likely average response:

Table 1 - PPG Observed Effect Levels

Perception	Example of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and Intrusive	Noise can be heard and causes small changes in behaviour and/ or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/ or attitude, e.g. avoiding certain activities during periods of intrusion: where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life	Significant Observed Adverse Effect	Avoid

	diminished due to change in character of the area.		
Noticeable and very disruptive	Extensive and regular changes in behaviour and/ or an ability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/ awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

3.4 BS 4142:2014 'Method for Rating and Assessing Industrial & Commercial Sound'

BS4142:2014 *Methods for rating and assessing industrial and commercial sound* describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

- sound from industrial and manufacturing processes
- sound from fixed installations which comprise mechanical and electrical plant and equipment
- sound from the loading and unloading of goods and materials at industrial and/or commercial premises
- sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The methods described within BS4142:2014 use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

The standard is also applicable to determine rating levels for sound of an industrial or commercial nature at proposed new dwellings or premises used for residential premises. The standard is only appropriate for the assessment of external sound levels.

The assessment method described in BS4142:2014 is based on the continuous sound pressure level produced by a specific source ($L_{Aeq,Tr}$) at the assessment location. Appropriate corrections allowing for any tonality, impulsivity, other characteristics or intermittency of the specific sound source are then applied to derive the rating level ($L_{Ar,Tr}$). The rating level is then compared to the background sound level ($L_{A90,T}$) to produce the relative difference, or excess of rating level over background sound level. BS4142:2014 quantifies the estimated impact from the excess as:

a) *Typically the greater this difference, the greater the magnitude of impact.*
b) *A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
c) *A difference of around +5dB 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.*

3.5 London Borough of Camden – Plant Noise Requirements

The requirements of London Borough of Camden's Planning Guidance Amenity regarding new building services plant are understood to be as follows:

> *"Developments proposing plant, ventilation, air extraction or conditioning equipment and flues will need to provide the system's technical specifications to the Council accompanying any acoustic report. "BS4142 Method for rating Industrial and Commercial Sound" contains guidance and standards which should also be considered within the acoustic report."*

Further relevant criteria of London Borough of Camden has been extracted from the Camden Local Plan:

Planning conditions will be imposed to require that plant and equipment which may be a source of noise is kept working efficiently and within the required noise limits and time restrictions. Air conditioning will only be permitted where it is demonstrated that there is a clear need for it after other measures have been considered (Policy CC2 Adapting to climate change). Conditions may also be imposed to ensure that attenuation measures are kept in place and are effective throughout the life of the development.

Emergency equipment such as generators which are only to be used for short periods of time will be required to meet the noise criteria of no more than 10dB above the background level (L90 15 minutes). During standby periods, emergency equipment will be required to meet the usual criteria for plant and machinery. Conditions to this effect may be imposed in instances where emergency equipment forms part of the application.

3.6 Criteria to be Adopted for This Assessment

Based on the above guidance documents and requirements, the guidance from BS 4142 is considered appropriate for the assessment of noise from the new mechanical extract plant impacting upon the adjacent residential properties.

For the purposes of this assessment and considering the context of the local environment (it a mix of commercial and residential uses) it is considered that these response levels may be correlated to the effect levels within NPSE and PPG, as presented in Table 2.

Table 2 – BS 4142 Correlated Effect Levels with NPSE and PPG

BS4142 Rating Level		NPSE	PPG
> +8dB		SOAEL	Unacceptable Adverse Effect / Significant Observed Adverse Effect
> 0dB < +8dB		LOAEL / SOAEL	Observed Adverse Effect
>-5dB < 0dB		LOAEL	No Observed Adverse Effect
< -5dB		NOEL	No Observed Adverse Effect

Based on the above, it is recommended that cumulative noise from the proposed plant items do not exceed a level 5dB below the otherwise background sound level, as assessed in accordance with BS 4142.

4.0 ENVIRONMENTAL NOISE MONITORING

Monitoring of the prevailing background noise was undertaken over the following 24-hour period:

- 10:00 hours Tuesday 24 September to 10:00 hours Wednesday 25 September 2024.

Measurements were made of the L_{A90}, L_{Amax} and L_{Aeq} noise levels over 15-minute sample periods. A summary of acoustic terminology is included in **Error! Reference source not found.**.

4.1 Measurement Location

In order to determine the background noise climate at the nearest affected residential receptors to the site, the equipment was installed at the north-western boundary of the site, close to the rear elevation of the noise sensitive properties.

The sound level meter was secured to the boundary wall, with the connecting microphone mounted on an A-Frame such that it was approximately 7 metres above the ground to avoid any reflections from the fencing panels. The prevailing noise climate at this location was considered representative of the background noise climate at the rear windows of nearest noise sensitive receptors.

Continuous measurements of the L_{A90}, L_{Amax} and L_{Aeq} noise levels were made over sample periods of 15 minutes duration throughout the survey period.

The measurement location is illustrated on the site plan in site plan in Figure B in Appendix B.

4.2 Noise Climate

The noise climate around the microphone position (northwestern boundary) was typically quiet and noise was typically from occasional buses passing by from King's Cross Road, on the opposite side of the site building.

4.3 Instrumentation

For information regarding the equipment used for the measurements please refer to Appendix C.

The sound level meter was calibrated both prior to and on completion of the survey with no calibration drifts observed. The sound level meter and field calibrator have been laboratory calibrated within the last 2 years, while the field calibrator has undergone and additional in-house calibration check within the past year.

4.4 Weather Conditions

Weather conditions throughout the survey were conducive to the measurement of environmental sound.

As the survey was unattended, detailed records of weather conditions throughout the survey were not able to be recorded, however, it is understood from weather reports from nearby stations that weather conditions remained mostly dry and still throughout the survey, however, rain-affected periods were excluded from the calculations.

4.5 Results

The full results of the measured sound levels are shown as time-histories on the Graphs presented in Appendix D.

The lowest measured $L_{A90,\ 15min}$ periods over the entire survey period are summarised in Table 3 below.

Table 3 – Measured Sound Levels

Measurement Period	Typical lowest $L_{A90,15min}$ (dB)	L_{eq} (dBA)
Daytime (10:15 – 23:00)	40	54
Night-time (23:00 – 07:00)	35	46

The results of the above measurements will be used in the subsequent analysis of plant noise.

5.0 PLANT NOISE IMPACT ASSESSMENT

5.1 Plant Noise Emission Limits

Based on the guidance and adopted assessment criteria in Section 3.6, and the typically lowest noise levels representative of those at the nearest affected noise sensitive properties in Table 3, the following plant noise emission limits are recommended.

Table 4 – Recommended Plant Noise Emission Limits

Period	Typical lowest $L_{A90,15min}$ (dB)
Daytime (07:00 – 23:00)	35dB $L_{Ar,T}$
Night-time (23:00 – 07:00)	30dB $L_{Ar,T}$

These limits are to be achieved at 1 metre from the façade of the nearest noise sensitive due to operation of the extract fan at representative worst-case duty. The limits are based on achieving a rating noise level 10dB below the current background sound level, which will be in line with "NOEL", with reference to NPSE guidance and "No Observed Adverse Effect", with reference to PPG.

5.2 Proposed Plant Items

The following items of plant are proposed at various locations around the northwest corner of the site as part of the ongoing refurbishment.

Table 5 – Proposed Extract Fan

Ref.	Manufacturer - Model	Plant Type
CU1 – CU4	DAIKIN - RXYSA5AV1	Condenser
CU5	DAIKIN - EPRA16DV37	Condenser
MVHR (4 Off)	DAIKIN - VAM800J8	MVHR

There are four MVHR units proposed internally for each floor of the building, with fresh air inlet and exhaust air ducted terminations for each unit through the rear facade of the building

The condensers are proposed on the roof of the building, towards the rear elevation.

5.3 Noise Levels

Information regarding the noise levels of the proposed plant has been provided by the mechanic engineer, EEP. Corrections have been made to the data provided for the MVHR's as the data has been provided for beneath the units only, with open ducts within the same space. The in-duct sound power levels have been estimated using suitable corrections based on the manufacturer's data provided.

The associated plant noise levels used for this assessment are detailed as follows:

Table 6 – Plant Noise Levels

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)							dBA
		125	250	500	1k	2k	4k	8k	
CU1 – CU4	Lp at 1 metre	56	57	53	53	45	40	35	52
CU5	Lp at 1 metre	43	51	47	41	32	27	20	43
MVHR inlet and outlet vents at grille	In-duct Lw	62	62	55	55	53	57	59	63

Review of the octave band data provides no indication of any tonal characteristics associated with the proposed plant.

5.4 Mitigation

In order that noise from plant may be sufficiently reduced, it is recommended that the following mitigation measures be implemented.

Induct Silencers

In order to ensure noise from the kitchen extract and supply duct terminations meet local authority requirements, the adoption of in-duct silencers should be considered, capable of achieving the following insertion losses:

Table 7 – Proposed Attenuators

Location	Example Specification		Transmission Loss (dB) at Octave Band Centre Frequency (Hz)							
	Free area (%)	Length (mm)	63	125	250	500	1k	2k	4k	8k
Fresh Air Inlet & Exhaust	35	600	3	6	10	14	20	19	14	13

Acoustic Screen

An acoustic louvred screen should be installed around the roof mounted condensers. The screen should be of equal hight to the top of the condensers and should meet the minimum performance specification in terms of insertion losses in each octave band, as provided in Table 8.

Table 8 – Minimum Required Performance for Rooftop Louvred Screen

Minimum Required Insertion Loss for Acoustic Louvred Screen (dB) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
6	7	10	18	31	28	26	25

A solid acoustic barrier will also be acceptable in achieving the above requirements.

5.5 Calculation of Noise Levels at Nearest Residential Window

Our calculation method for predicting noise levels from the proposed plant at the nearest residential windows, based on the information stated above, is summarised below.

- Source Term SPL / SWL
- 20LogR Distance Attenuation
- Directivity
- Reflections
- Attenuators
- Screening

The results of the calculations indicate the following noise levels at the nearest affected residential windows:

Table 9 – Predicted Noise Levels

Plant Details	Predicted Noise Level @ Nearest Noise-Sensitive Receptor		
	Specific Noise Level ($L_{Aeq, T}$)	Rating Corrections	BS 4142 Rating Noise Level
CU1 – CU4	25	0	25dB $L_{Ar, T}$
CU5	12	0	12dB $L_{Ar, T}$
Inlet & Outlet vents for MVHR's	29	0	29dB $L_{Ar, T}$
Total BS4142 Rating Noise Level at Receptor			**31dB $L_{Ar, T}$**

Adoption of the above mitigation measures in Section 5.4 is expected to ensure that noise levels at the nearest affected noise sensitive properties are in accordance with the recommended noise emission limit in Section 5.1 during the daytime.

It is not expected that the plant will be in operation during the night time period (23:00 to 07:00) and so no further mitigation measures are considered necessary.

5.6 Control of Vibration

In addition to the control of airborne noise transfer, it is also important to consider the transfer of noise as vibration to adjacent properties (as well as to any sensitive areas of the same building).

We would typically advise that fans be isolated from the supporting structure by means of either steel spring isolators or rubber footings. For particularly sensitive locations, or when on lightweight structures the mounts should ideally be caged and be of the restrained type.

It is important the isolation is not "short-circuited" by associated pipework, ductwork or conduits. To this end, any conduits should be looped and flexible connectors should be introduced between the condenser and any associated pipework. Pipework should be supported by brackets containing neoprene inserts.

5.1 Uncertainty

Uncertainty is an unavoidable feature of measurements in the field, which can be subject to many factors; the weather typically being the most significant of which with respect to the measurement of sound. Uncertainty is also unavoidable in the prediction of sound levels, where naturally, before the scenario being considered becomes a reality, a number of assumptions need to be relied upon. There is also the uncertainty of people's reactions, which can be influenced by a number of factors, not just the magnitude or character of the sound in question.

In keeping with the scale of each project, therefore, it is the aim of RBA Acoustics to minimise uncertainty at each stage as far as reasonably practicable. With this is mind, RBA Acoustics follow the best practise methodologies based on the guidance within BS 4142:2014 and our experience in undertaking assessments of these nature.

Crucially, it has been determined that environmental noise measurements have been undertaken by suitably qualified staff, using in calibration equipment and avoiding adverse weather conditions.

The predictions have also been undertaken by suitably qualified staff, whilst using the best available information, an industry standard calculation method, and the most applicable calculation procedures.

Notwithstanding this, naturally some uncertainty remains. Given the sheer number of factors involved, however, it is not feasible to place a value on the level of uncertainty, without resulting in an unhelpful range of possible outcomes. It is the professional position of RBA Acoustics that uncertainty has been kept to a realistic minimum and that the outcome of this assessment is sufficiently representative.

6.0 CONCLUSIONS

RBA Acoustics has been appointed by McDonald Architects to undertake a noise impact assessment in relation to the proposals to install a new plant items at the property at 2-6 Leeke Road. The assessment is required to support a planning application for the proposed plant items and requires consideration be given to atmospheric noise emissions from the proposed equipment at the nearest noise-sensitive property.

Baseline environmental sound monitoring was undertaken at the site between Tuesday 24 September to Wednesday 25 September 2024 to ascertain current prevailing sound levels close to the nearest existing noise sensitive receptors to the proposed new external noise generating plant items. The closest residential receptors have been identified to be those located at the rear of the building at 175 King's Cross Road, with the entire rear façade considered as a noise sensitive receptor.

The baseline environmental noise levels have been used to set noise emission limits for the new plant items based on national noise policy guidelines and British Standard 4142 in other that there may be no significant impact on the nearby noise sensitive properties.

Based on the details of the plant to be installed at the property and noise impact assessment has been undertaken. Mitigation measured for the plant have been recommended in Sections 5.4 of this report in order than noise from the plant may be suitably controlled. Based on the recommended mitigation measures, the results of our assessment suggest that noise from the operation of the proposed plant is expected to be at least 5dB below the otherwise prevailing background sound level and in line with "NOEL", with reference to NPSE guidance and "No Observed Adverse Effect", with reference to PPG.

Appendix A - Acoustic Terminology

dB	Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
dB(A)	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
L_{eq}	L_{eq} is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (1 hour).
L_{Aeq}	The level of notional steady sound which, over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measured over that period.
L_{An} (e.g L_{A10}, L_{A90})	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during the measurement period, T. It is commonly used to measure the effect of very short duration bursts of noise, such as for example sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the general level of, say, traffic noise, but because of their very short duration, maybe only a very small fraction of a second, may not have any effect on the L_{eq} value.

Appendix B – Site Plans

2-6 LEEKE STREET

Site Location Plan

Pro

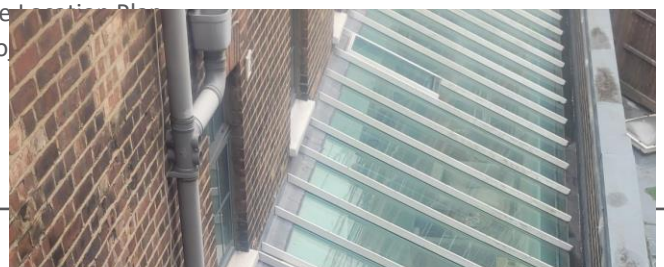

Figure A

8th October 2024

Not to Scale

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2-6 LEEKE STREET
Monitoring Location
Project 13916

Figure B
8th October 2024
Not to Scale

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Appendix C –Instrumentation

The following equipment was used for the measurements

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Valid Until
Norsonic Type 1 Sound Level Meter	Nor140	1407792	U45990	17 November 2025
Norsonic Pre Amplifier	1209	23227		
Norsonic ½“ Microphone	1225	469028	45989	17 November 2025
Norsonic Sound Calibrator	1251	125525797	U45988	17 November 2025

Appendix D – Results of Noise Monitoring Survey

2-6 Leeke Street

L_{Aeq} Time History

Unattended Measurement Position - Tuesday 24 September to Wednesday 25 September 2024

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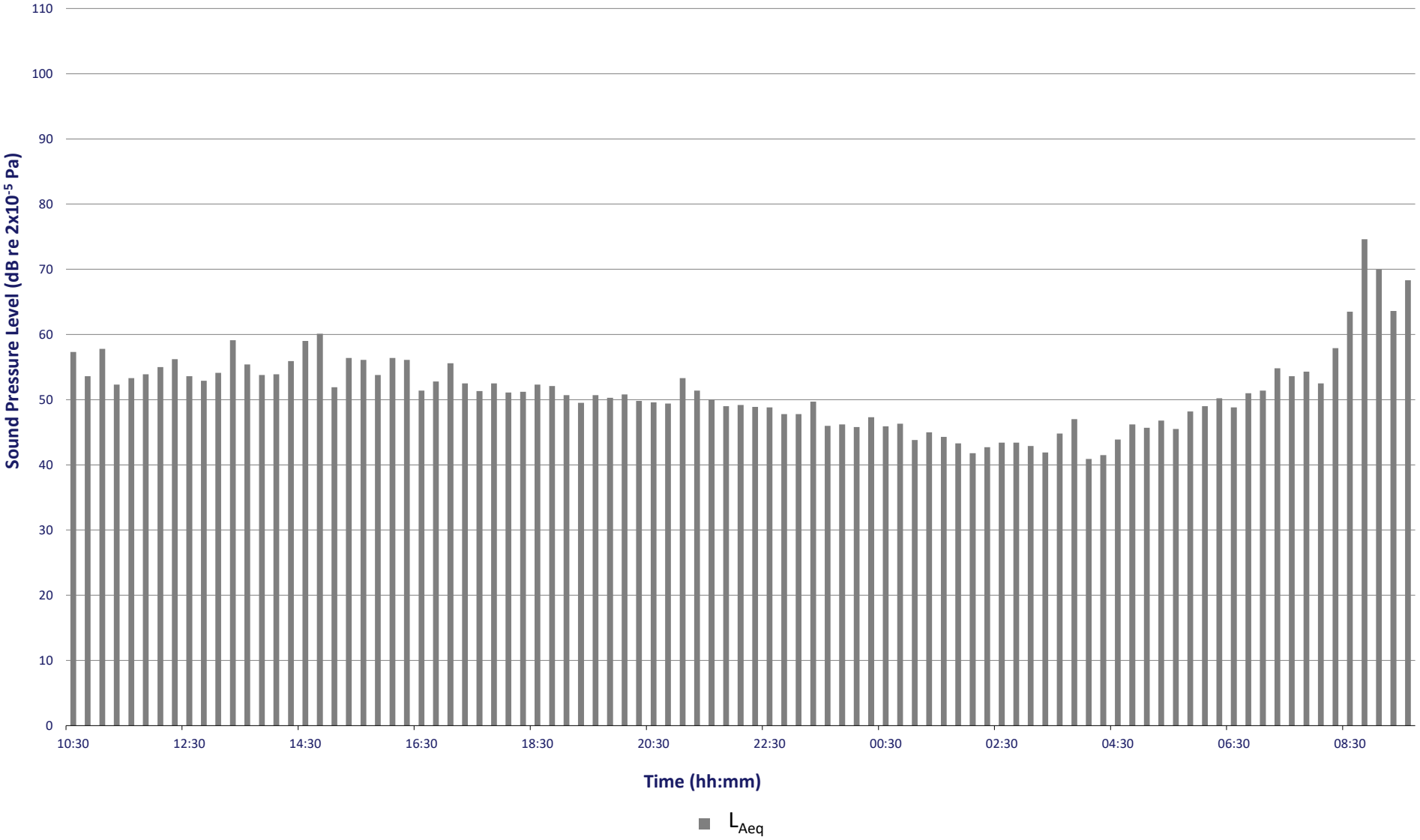
Graph 1



2-6 Leeke Street

$L_{Amax,f}$ and L_{A90} Time History

Unattended Measurement Position - Tuesday 24 September to Wednesday 25 September 2024

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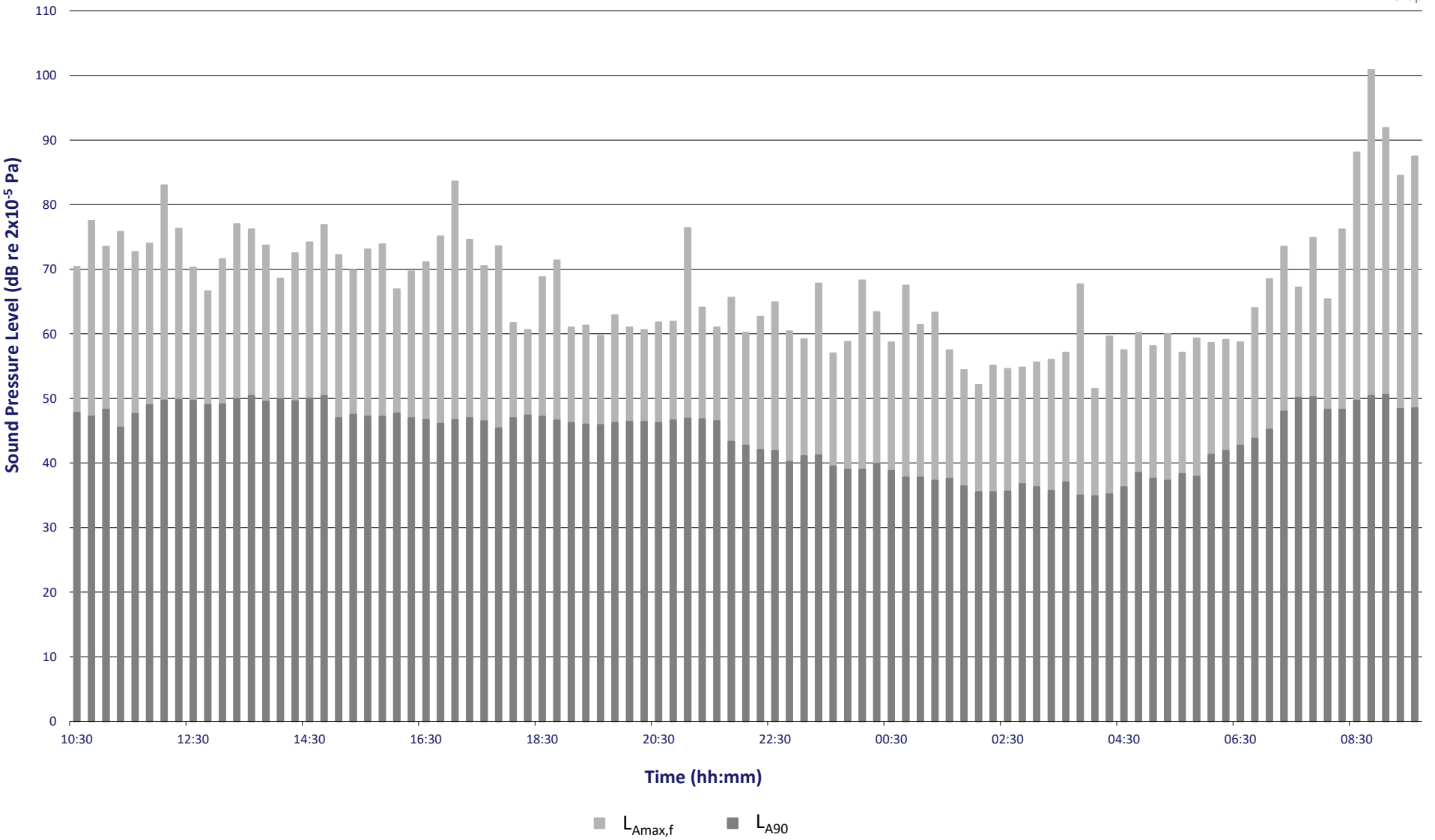
Graph 2



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