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NEW ROOFTOP EQUIPMENT
PICCADILLY STATION, MANCHESTER
PLANT NOISE ASSESSMENT

On behalf of:
Rider Levett Bucknall

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PLANT NOISE ASSESSMENT

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Version	Date	Author	Checked by	Notes
1	24.06.26	G Zelenovic MSc MIOA Consultant	D Quinn BSc FIOA Managing Director	Initial issue

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1. INTRODUCTION

1.1 Hepworth Acoustics Ltd was commissioned by Rider Levett Bucknall to carry out a noise impact assessment in connection with a proposed planning application for two items of new building services equipment on the roof of Piccadilly Tower, Manchester Piccadilly Railway Station, Manchester, M1 2BP.

1.2 The building s bounded by car parking to the north, Fairfield Street to the south, railway tracks to the east and Whitworth Street to the west. The proposals are for two new air conditioning condensers. The site is in a busy city centre location, but there are some dwellings including apartments/hotels rooms in high rise buildings in the vicinity. The nearest dwellings/hotel bedrooms are the upper floor bedrooms of the Motel One hotel located around the Piccadilly Central bar at the corner of Whitworth Street and London Road as indicated in **Figure 1**.

1.3 The assessment has been based on an ariel view image as provided by Rider Levett Bucknall dated May 2026, the proposed services equipment will be installed within an existing louvred plant room on the roof of Piccadilly Tower as indicated as indicated in **Figure 1.**

1.4 The noise assessment has included:

- An inspection of the site and surrounding area;
- Measurement of the prevailing noise climate of the area over a full 24-hour midweek period;
- Calculation of potential noise levels outside the nearest dwellings form the proposed new building services plant/equipment;
- Assessment of the likely noise impact from the new plant/equipment by reference to relevant standards and guidance; and
- Recommendation of appropriate noise mitigation measures, if necessary.

1.5 The various acoustics indices referred to in this report are described in **Appendix A**. All noise levels in the text have been rounded to the nearest decibel as fractions of a decibel are imperceptible.

2. ACOUSTIC CRITERIA

BS 4142:2014+A1:2019

2.1 British Standard 4142:2014+A1:2019, 'Methods for rating and assessing industrial and commercial sound' is the appropriate guidance for assessing the potential noise impact at residential locations from commercial sources.

2.2 BS 4142 requires a 'rating' level ($L_{Ar,Tr}$) calculated from the operation of the noise source to be compared with the background sound level ($L_{A90,T}$) which is measured in the absence of the noise source. The noise is evaluated over a 1-hour period for daytime operations (i.e. 07:00 - 23:00 hours) and 15-minute period for night-time operations (i.e. 23:00 - 07:00 hours).

2.3 The rating level ($L_{Ar,Tr}$) is based on the 'specific' sound level ($L_{Aeq,Tr}$) attributed to the operating noise source, with 'character corrections' added for sound sources where "certain acoustic features can increase the significance of impact" when present at residential locations.

2.4 The acoustic character correction, where necessary, applied to the specific sound level in order to obtain the rating level and can take into account tonality, intermittency, impulsivity and characteristics otherwise distinctive against the prevailing noise climate in the area.

2.5 An initial estimate of the potential noise impact from the operating noise source is determined by comparing the difference between the rating level and the background sound level.

2.6 Regarding the outcome of the initial estimate, BS 4142 states that:

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

2.7 BS 4142 also states in respect of background sound levels that "*it is important to ensure that values are reliable and suitably represent the particular circumstances and periods of interest... the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*".

2.8 BS 4142 states that all pertinent factors must be taken into account regarding the context in which the noise occurs, including but not limited to:

- The absolute level of sound;
- The character and level of the residual sound compared to the character of the specific sound; and
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will incorporate design measures that ensure good internal and/or outdoor acoustic conditions such as acoustic screening.

2.9 The initial numerical assessment and the context are then both taken into account when determining the potential noise impact.

Local Authority Guidance

2.10 Manchester City Council have well-established noise criteria with respect to plant/equipment noise that states:

> *'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'*

3. NOISE SURVEY

3.1 A baseline noise survey was carried out over a weekday to include evening and night-time periods. The purpose of the baseline noise survey was to establish the existing residual and background noise climate of the area during periods of interest.

3.2 The noise survey took place over 24-hours commencing at 14:00 on Tuesday 16 June 2026 using a NTi Audio XL2 'Class 1' sound analyser (serial no. A2A-20361-E0) with environmental case and microphone environmental windshield. The calibration level of the meter was checked before and after the survey with no calibration deviation observed.

3.3 The noise measurements were taken as a series of consecutive 15-minute periods at a location on the roof of the building where noise levels were considered to be generally unaffected by existing rooftop plant/equipment and broadly representative of the noise climate at the upper floor bedrooms of the Motel One at the corner of Whitworth Street and London Road. The noise measurement equipment was setup on the roof of the Piccadilly Tower building with the microphone extended on a pole 1m from the building façade towards London Road. The measurement location is shown in **Figure 1**. Audio recordings were also taken to assist with the identification of significant noise sources.

3.4 The prevailing noise climate at the measurement location was found to be dictated by traffic noise from the surrounding road and rail network. As noted above, noise generated from the existing equipment on the roof of Piccadilly Tower was not audible at the measurement location.

3.5 Full results of the noise survey are shown in **Appendix B**, with representative residual and background sound levels for key periods summarised below. **Table 1** summarises.

Table 1: Summary of Measured Noise Levels(dB)

Period	$L_{Aeq,15\ min}$		$L_{A90,15\ min}$	
	Range	Average	Average	Mode
Daytime (07:00 – 23:00)	61 - 69	63	58	58
Night-time (23:00 – 07:00)	54 - 64	59	53	50

3.6 Taking into account the results of the noise survey as summarised in **Table 1**, and accounting for the fact that the equipment could operate at any time, we have adopted 50 dB $L_{A90,T}$ as the representative background sound level for the purposes of this assessment.

4. NOISE ASSESSMENT

4.1 Since the new plant/equipment could operate at any time, the following assessment has focused on the night-time period as a worst-case. The night-time is the worst-case due to the lower background noise level than in in the daytime/evening.

Upgraded Fixed Plant/Equipment

4.2 The proposed building services equipment, , will operate on a demand basis throughout 24 hours as per the existing. The following worst-case manufacturer's noise emissions, in terms of sound pressure level at 1m distance, have been provided by Rider Levett Bucknall as follows:

- Mitsubishi PURY P200YNW A2 – 59 dBA at 1 metre;
- Mitsubishi PURY-P250YNW-A2 – 64 dBA at 1 metre.

4.3 For the purposes of this assessment, it is assumed that the units will operate simultaneously and for the full duration of the assessment period, however this is a worst-case assumption, particularly during the night-time period, i.e. 23:00-07:00 hours, when demand will likely be reduced.

4.4 In determining the likely resulting noise levels outside the nearest/most-exposed hotel bedrooms, a correction for attenuation of sound over distance has been included. No corrections have been included for any screening or potential restricted angle of view, when in reality these would most likely would be present, to ensure a robust assessment.

4.5 Furthermore, in respect of BS 4142, no character corrections have been applied since the calculated Specific Sound Level is considerably lower than the lowest measured ambient noise level and therefore any character would not be perceptible. As such the Rating level is equivalent to the Specific Sound Level and can be compared to the existing background sound levels as follows as shown in **Table 2.**

Table 2: Calculation of specific sound/rating level outside dwellings

Description	Octave band centre frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
PURY-P200YNW									
PURY-P200YNW at 1m	77	61	61	58	51	47	44	42	**59**
Distance Attenuation at 50m	-34	-34	-34	-34	-34	-34	-34	-34	
Resulting Specific Level	43	27	27	24	17	13	10	8	**25**
PURY-P250YNW									
PURY-P250YNW at 1m	77	65	65	63	57	52	53	46	**64**
Distance Attenuation at 50m	-34	-34	-34	-34	-34	-34	-34	-34	
Resulting Specific Level	43	31	31	29	23	18	19	12	**30**
Cumulative noise level outside the nearest hotel rooms									
Cumulative Rating Level	46	32	32	30	24	19	20	13	**31**
Background Sound Level	55	51	48	46	46	42	35	26	**50**
Difference	**-9**	**-19**	**-16**	**-16**	**-22**	**-23**	**-16**	**-12**	**-19**

4.6 We therefore conclude that, in terms of BS 4142, the new plant/equipment will result in a 'low' impact, and the Manchester City Council criterion will be met by a considerable margin.

Uncertainty

4.7 With any process of noise measurement and assessment there are always uncertainties which can affect the results. BS 4142 requires that uncertainty be considered when carrying out an assessment. Due to the significant complexity and scope of the contributing parameters to the assessment, a numerical figure of uncertainty has not been provided as this can often be misleading.

4.8 Instead, we have provided a list of potential uncertainties and steps taken in the assessment to minimise these uncertainties as far as practically possible:

4.9 The assessment is based on predicted noise impact using noise emissions data provided by the manufacturer, but there is some inherent uncertainty around the propagation of noise once the equipment is installed on site. To offset this, the calculations have been based upon the manufacturer's worst-case noise emissions specification and assume all equipment is operating continuously, even though the equipment will in actual fact operate intermittently. Furthermore, only allowances for distance attenuation have been considered when calculating noise impact at the nearest hotel bedrooms.

4.10 The residual noise climate in the area is generally steady and dominated by noise from road and rail traffic which reduces the potential uncertainty that extraneous noise can introduce when quantifying residual and background sound levels. The background sound level may vary according to time of year and meteorological conditions on different days but measuring under dry and calm or light wind conditions reduces this uncertainty and tends to give worst-case conditions for a robust assessment.

4.11 All of the instrumentation used in the noise survey was 'Class 1' and fully calibrated (traceable), with field calibration checks before and after the surveys. Therefore, it is concluded that overall uncertainty has no appreciable effect on the outcome of the assessment.

Conclusion

4.12 In conclusion, the proposed new building services plant/equipment would not result in any unacceptable harm to residential amenity by reason of noise disturbance based on the outcome of the assessment and hence no mitigation is warranted.

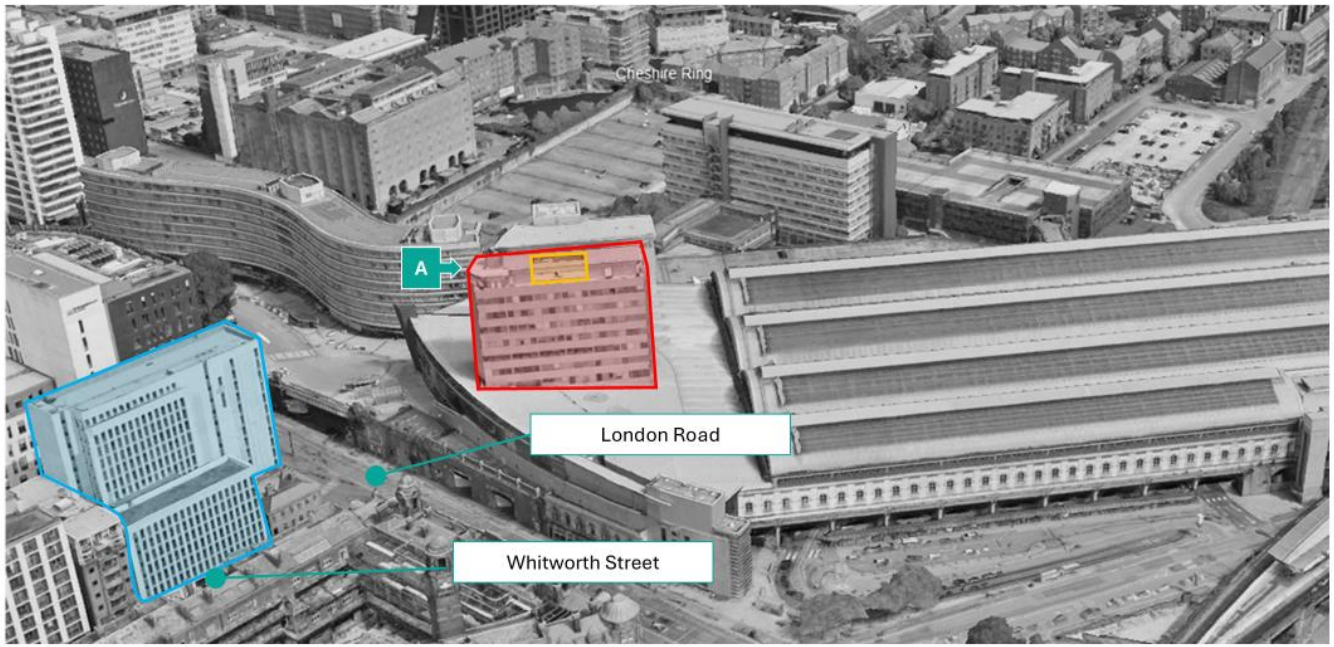
5. SUMMARY

5.1 Hepworth Acoustics Ltd was commissioned by Rider Levett Bucknall to carry out a noise impact assessment in connection with a proposed planning application for new building services plant/equipment at Piccadilly Tower, Manchester Piccadilly Railway Station, Manchester, M1 2BP.

5.2 This assessment has involved carrying out a baseline noise monitoring survey and evaluating potential noise impacts associated with the proposals.

5.3 The BS 4142 assessment indicates that there will be a low impact from the new equipment and calculations predict that the Manchester City Council's noise control criterion will be met.

5.4 It is therefore concluded that there will be no unacceptable noise impact from the operation of the proposed plant/equipment.



Do not scale from this figure

Key:

- Piccadilly Tower
- Location of existing plant compound (proposed location of new plan/ equipment).
- Nearest noise sensitive receptor – Motel One guest bedrooms
- A - Noise measurement position

Project: P26-121

Ref: **Figure 1**

Title: Site location, & noise measurement position

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APPENDIX A: ACOUSTICS UNITS & INDICES

Sound and the decibel

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dBA.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kiloHertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

Glossary of Terms

When a noise level is constant and does not fluctuate, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices can be used. There are also a number of ways to describe sound insulation performance.

The indices used in this report are described below:

L_p **Sound Pressure Level:** A logarithmic ratio between a squared sound pressure quantity and the square of the human threshold of hearing ($2x10^{-5}$ Pa). This relates to the sound level at a specific position at a single point in time.

L_{pA} **A-weighted Sound Pressure Level:** The Sound Pressure Level (L_p) with the frequency spectrum adjusted to account for the average human hearing response at difference frequencies for a moderate sound pressure range.

$L_{Aeq,T}$ **A-weighted Equivalent Continuous Sound Level:** An average of the total sound pressure measured over a specified time period (T). In other words, $L_{Aeq,T}$ is the level of a steady sound which has the same total A-weighted sound pressure as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for most forms of environmental noise.

L_{Amax} **Maximum A-weighted Sound Level with Fast Time-weighting:** The maximum A-weighted sound pressure level during the measurement period, using the Fast time-weighting of 125ms. L_{Amax} used in this report refers throughout to L_{AFmax} with the Fast time weighting, denoted L_{AFmax} or $L_{Amax,f}$ in other documents but L_{Amax} in BS 8233:2014 standard notation.

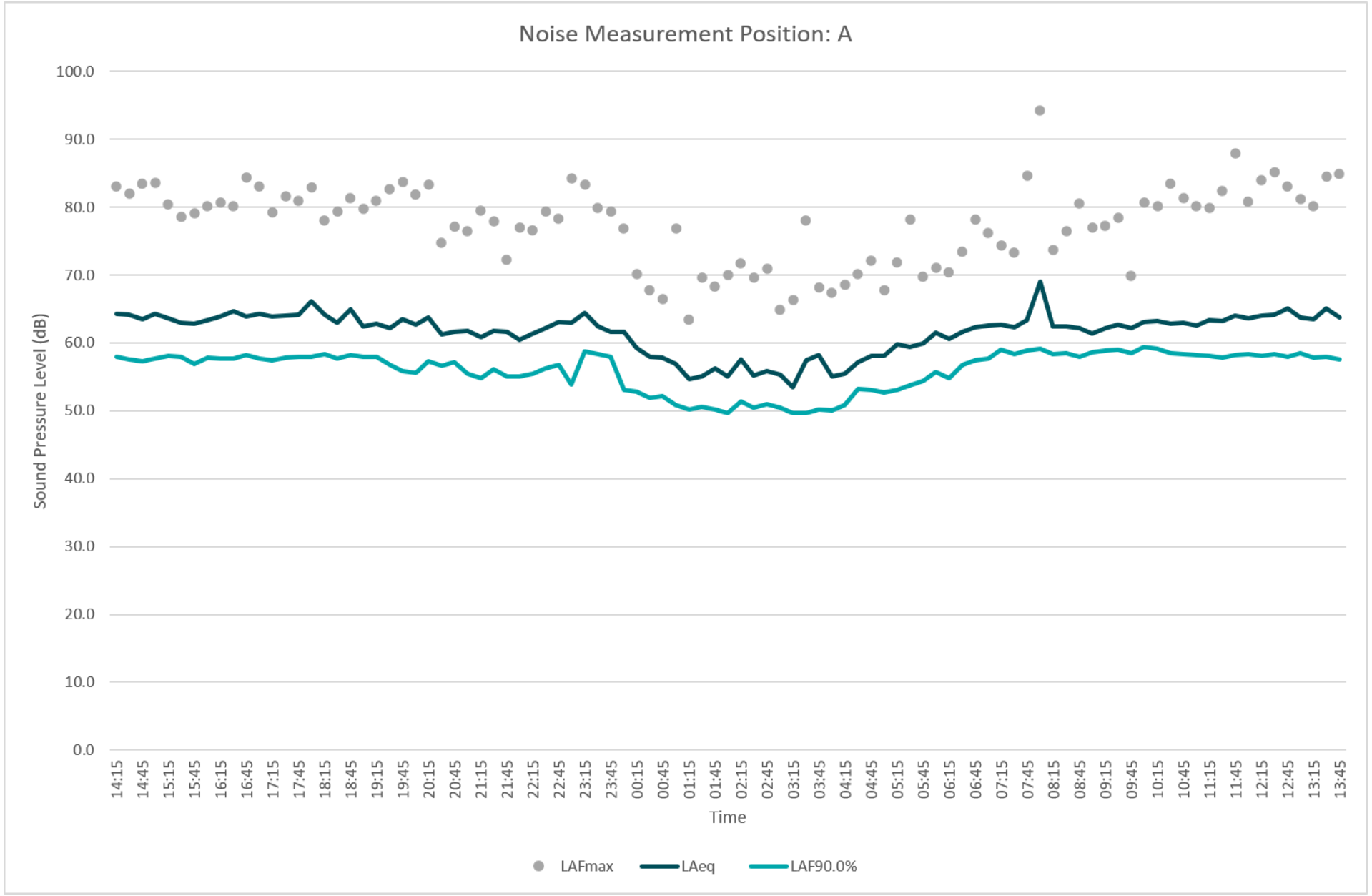
$L_{A90,T}$ **A-weighted 90 Percentile Level:** The A-weighted sound level exceeded for 90% of a measurement time period (T). $L_{A90,T}$ is generally used as a measure of Background Sound Level.

$L_{Ar,Tr}$ **Rating Level:** An A-weighted value most commonly used in BS 4142 assessments, which is the sound level of the noise source under assessment, at the assessment location, evaluated over the reference assessment period (T_r) and includes numerical adjustments for the characteristic features of the sound.

APPENDIX B: NOISE SURVEY RESULTS

Date(s)	Tuesday 16 June to Wednesday 17 June 2026.
Equipment	NTi Audio XL2-TA 'Class 1' sound analyser (s/n: A2A-20361-E0) with associated calibrator(s) and tripod(s)/environmental outdoor monitoring kit(s)
Weather	Daytime: 20 °C, partially overcast, dry, wind <3 m/s Night-time: 14 °C, partially overcast, dry, wind <3 m/s

Chart(s) overleaf


Noise Measurement Position: A
Sound Pressure Level (dB)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
14:15
14:45
15:15
15:45
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12:45
13:15
13:45
Time
LAFmax
LAeq
LAF90.0%