

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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AP House, 35 King Street

Noise planning report

London, Manchester, Edinburgh, Birmingham, Belfast, Leeds, Bristol

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A	7 May 24		JP	MH
B	19 Jun 24	Minor amendments and inclusion of calculations	JP	MH

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Summary

Sandy Brown has been commissioned to provide acoustic advice in relation to the proposed development at 35 King Street, Manchester, M2 7AT, United Kingdom. The proposals are to provide a high-quality refurbishment of the original Georgian property, bringing it back into use as a retail store based on a townhouse concept. The proposals include extension of an existing roof terrace.

An environmental noise survey has been carried out to determine the existing sound levels in the area. The noise survey was performed between 09:55 on 26 April 2024 and 08:40 on 30 April 2024

The representative background sound levels measured during the survey were $L_{A90,15min}$ 48 dB during the day and $L_{A90,15min}$ 41 dB at night.

Based on the requirements of the Manchester City Council (MCC) and on the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises does not exceed $L_{Aeq,15min}$ 43 dB during the day, and $L_{Aeq,15min}$ 36 dB during the night.

These limits are cumulative, and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features, a penalty based on the type and impact of those features will be applied, and the limits will be more stringent than those set.

A plant noise assessment has been carried out, with the proposed attenuation measures in place, the total noise level from all new items of externally mounted building services plant is expected to comply with the day and night time criteria set by Manchester City Council.

Based on the results of the noise survey, noise limits for amplified music have been set. Electronic limiters are recommended to ensure levels cannot exceed those given.

Guidance on occupancy of the roof terrace has been provided based on assessments of people talking during daytime and evening hours.

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1 Introduction

Sandy Brown has been commissioned to provide acoustic advice in relation to the proposed development at 35 King Street, Manchester, M2 7AT, United Kingdom.

As part of this, an environmental noise survey is required, the purpose of which is to establish the existing background sound levels in the vicinity of nearby noise sensitive premises and to set appropriate limits for noise egress from building services plant.

This report presents the survey method and results, a discussion of acceptable limits for noise emissions from building services plant and an assessment of terrace noise egress limits.

2 Site description

2.1 The site and its surrounding

The site location in relation to its surroundings is shown in Figure 1.

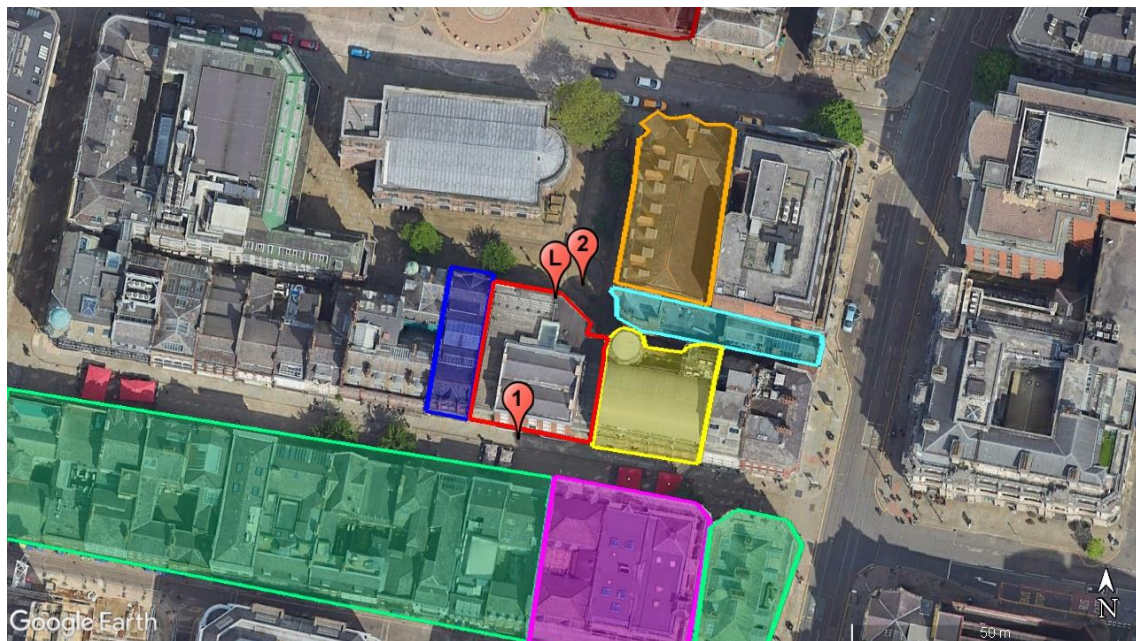


Figure 1 Aerial view of site (courtesy of Google Earth Pro)

2.2 Adjacent premises

The site is surrounded by mostly commercial premises with some of these premises housing offices in the upper floors. The nearest noise sensitive receptors to the site during the daytime are offices in St Ann's House, highlighted in dark blue and offices in the upper floors of 37 King

St, highlighted in yellow. The nearest residential noise sensitive premises are St Ann's Square apartments, approximately 50 m north of the site, highlighted in dark red.

The site is in close to a public house, Mr Thomas's Chop House, highlighted in Cyan, it is understood that outdoor seating is used to the rear of the public house in warm weather. This would have a bearing on noise levels at the site. The site also overlooks St Ann's church. Further commercial premises are highlighted in orange and green. Of these, it is understood that a change of use of properties at 55-68 King Street is proposed to residential, which is highlighted in pink.

3 Development proposals

The proposed development involves a high-quality refurbishment of the original Georgian property, bringing it back into use as a retail store based on a townhouse concept. The proposals include extension of an existing roof terrace.

4 Building services noise egress criteria

4.1 Standard guidance

BS 4142:2014:+A1:2019 *Methods for rating and assessing industrial and commercial sound* (BS 4142) provides a method for assessing noise from items such as building services plant against the existing background sound levels at nearby noise sensitive premises.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background sound level, it is an indication of having a low impact.

If the noise contains 'attention catching features' such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

4.2 Local Authority criteria

Manchester City Council (MCC) stipulates the following in regard to plant noise egress:

'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'.

5 Terrace noise

It is understood that amplified sound may be played on the roof terrace

Manchester City Council stipulates the following in terms of terrace noise:

‘The scheme proposed shall include measures such as acoustic lobbies at access and egress points of the premises, sound limiters linked to sound amplification equipment, the capacity of use of the terrace at any one time and specified maximum noise levels’.

Manchester City Council also provides the following guidance in the documents ‘Planning and Noise’ (October 2022):

‘A planning application for a new entertainment venue that is structurally detached from other building uses should demonstrate that music noise from the proposal will not be ‘audible’ in nearby residential properties, assuming that the residential properties in question have their windows open. The criterion here is:

Entertainment noise ($L_{Aeq,5min}$) should be controlled to 5dB below the typical background noise level (L_{A90}) in each octave band at the nearest noise sensitive location’.

6 Noise survey method

The survey included unattended and attended noise measurements.

6.1 Unattended measurements

Unattended noise monitoring was undertaken at the site over 5 days.

Details of the equipment used and the noise indices measured are provided in Appendix A.

The unattended measurements were taken over 15 minute periods between 09:55 on 26 April 2024 and 08:40 on 30 April 2024.

The measurement position used during the survey was on the existing roof terrace. It is indicated in Figure 1, denoted by the letter ‘L’. A photograph showing the measurement location is provided in Figure 2.



Figure 2 Photograph of unattended measurement position on existing roof terrace

This location was chosen to be reasonably representative of noise levels at the site and outside the nearest noise sensitive premises.

6.2 Attended measurements

Attended sample measurements were taken at 2 locations around the site. These are indicated in Figure 1 as positions 1 and 2. The attended measurements were carried out on 26 April 2024, over 5 minute periods.

At each position the microphone was mounted on a tripod approximately 1.2 m above the ground level and at least 1.5 m from any other reflective surface. Details of the equipment used and the noise indices measured are provided in Appendix A.

Dominant noise sources occurring during the measurements were noted to be construction noise egress from nearby ongoing works, trams passing by and traffic from both King Street and St Ann St.



Figure 3 Photograph of attended measurement position 1

6.3 Weather conditions

Weather conditions during the survey are described in Appendix A.

7 Noise survey results

7.1 Observations

The dominant noise sources observed at the site during the survey were from construction noise egress from nearby ongoing works, trams passing by and traffic from both King Street and St Ann St.

Less significant noise sources included pedestrians walking past the measurement position and distant sirens.

7.2 Noise measurement results

7.2.1 Unattended measurement results

A graph showing the results of the unattended measurements is provided in Appendix B.

Ambient noise levels measured during the unattended survey are presented in Table 1.

Measured minimum background sound levels are given in Table 2

Table 1 Ambient noise levels measured during the unattended survey

Date	Day (07:00 – 23:00)	Night (23:00 – 07:00)
	$L_{Aeq,16h}$ (dB)	$L_{Aeq,8h}$ (dB)
Friday 26 April 2024	-	50
Saturday 27 April 2024	53	52
Sunday 28 April 2024	53	50
Monday 29 April 2024	55	50
Tuesday 30 April 2024	-	-
Average	54	51

[1] Measurement not made over full period due to monitoring start and end time (the measurement on 26 April 24 was over 13 hours, and on 30 April 2024 over 2 hours); not included in the average.

Table 2 Minimum background sound levels measured during the unattended survey

Date	Day (07:00 – 23:00)	Night (23:00 – 07:00)
	$L_{A90,15min}$ (dB)	$L_{A90,15min}$ (dB)
Friday 26 April 2024	45 ^[1]	40
Saturday 27 April 2024	43	40
Sunday 28 April 2024	43	41
Monday 29 April 2024	45	40
Tuesday 30 April 2024	49 ^[1]	-

^[1] Measurement not made over full period due to monitoring start and end time.

The lowest background sound levels measured during the survey were $L_{A90,15min}$ 43 dB during the day and $L_{A90,15min}$ 40 dB at night.

In line with BS 4142:2014+A1:2019, representative background sound levels have been determined using statistical analysis of the continuous measurements.

Day and night statistical analysis of representative values for the site are given in Figure 4.

Figure 4 Day and night statistical analysis of unattended measurements From this analysis, the representative background sound levels measured during the survey were $L_{A90,15min}$ 48 dB during the day and $L_{A90,15min}$ 41 dB at night.

7.2.2 Attended measurement results

Noise levels and key sources recorded during the attended measurements are summarised in Table 3. These were taken as facade measurements.

Table 3 Noise levels and key noise sources from attended measurements

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,5min}$	$L_{AFmax,5min}$	$L_{A90,5min}$	
1	09:46	59	71	54	Traffic noise egress from King St
	09:51	57	67	54	Trams noise from Cross St
	09:56	59	85	53	Low frequency rumble from construction vehicles drove background sound level.
2	10:04	57	80	52	Tram noise from Cross St still audible but much quieter due to screening
	10:09	57	66	52	Construction site
	10:14	57	71	51	Plant noise subjectively barely audible.

7.3 Basic limits

Based on the above criteria and the measurement results, the cumulative noise level from the operation of all new plant should not exceed the limits set out in Table 4.

The limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises and are presented as facade levels. In this case these limits would apply at St Ann's House and 37 King Street.

Table 4 Plant noise limits at 1 m from the nearest noise sensitive premises

Time of day	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,15min}$ (dB)
Day (07:00-23:00)	43
Night (23:00-07:00)	36

^[1] The limits set out in Table 4 do not include any attention catching features. Penalty corrections for attention catching features may be significant and will need to be considered as the building services design progresses. This is discussed in Appendix C

7.4 Plant noise assessment

Calculations have been undertaken to determine if the proposed plant items meet plant noise egress limits at the nearest noise sensitive receptor, The Furniture Practice offices, approximately 7 m east of the rooftop.

A summary of the sound power levels of the proposed rooftop plant items are set out in Table 5.

Table 5 Summary of proposed plant item sound power levels

Plant item	Sound power levels, L_w (dB)							Total sound power level, L_w (dB)
	Octave band centre frequency (Hz)							
	125	250	500	1000	2000	4000	8000	
Daikin RXYSQ4TV9	68	68	66	64	59	54	43	68
Daikin RXYSQ6TV9	69	68	67	66	63	58	47	70
Daikin RXYSQ6TV9	69	68	67	66	63	58	47	70
Daikin RXYSQ6TV9	69	68	67	66	63	58	47	70
Daikin HZAG35A	66	62	62	57	50	45	39	62

As a worst-case scenario, it has been assumed that all the units will be operating at the same time, in the plant area closest to the nearest noise sensitive receptor. The locations of the plant items are shown in Figure 5, highlighted in red.

A 2.2 m high acoustic screen is proposed to attenuate the plant items. The approximate location of this is indicated in Figure 5. This has been incorporated into the desktop calculations. The proposed screen should be a 15 kg/m² solid and continuous construction.

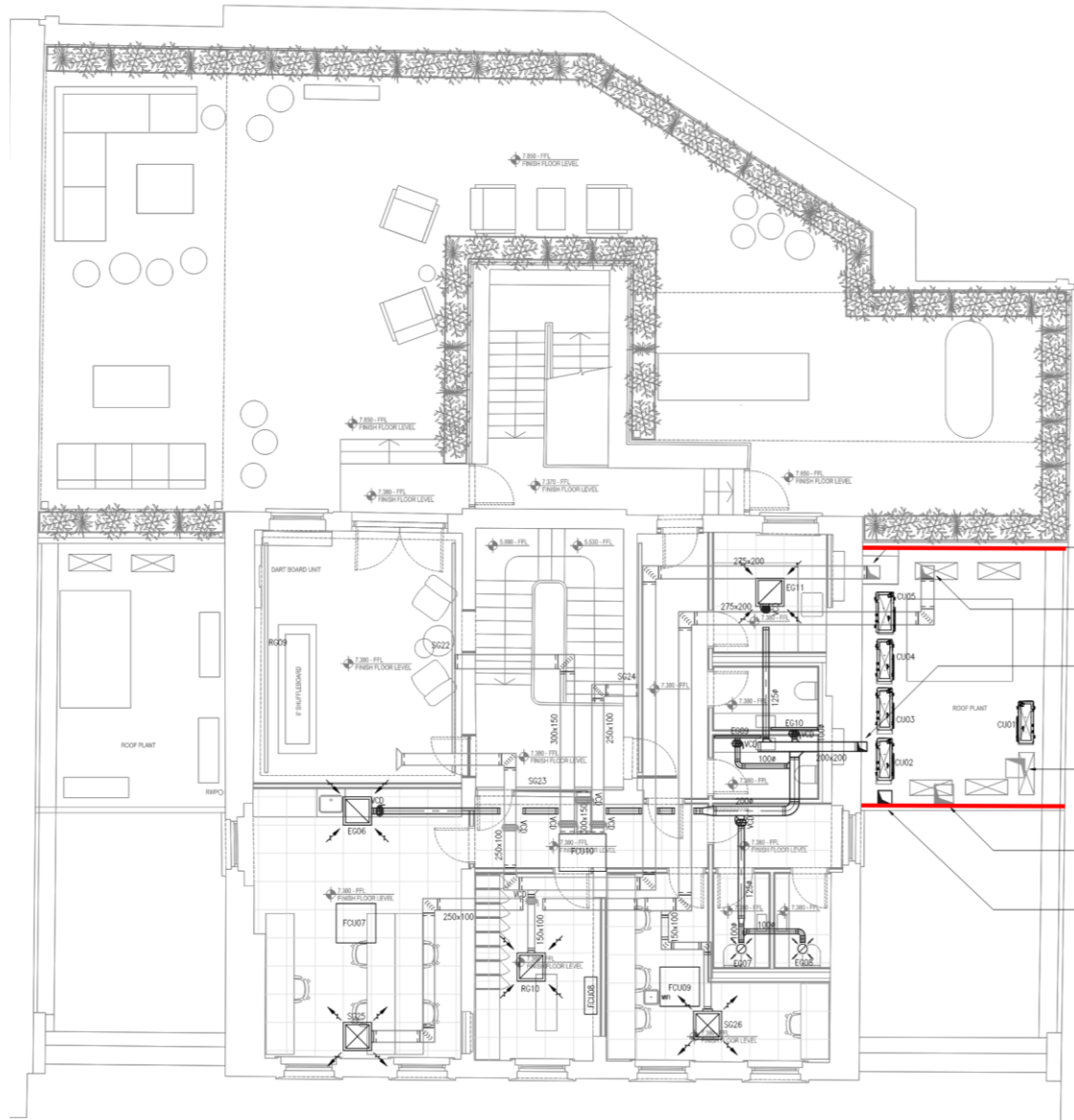


Figure 5 Screenshot of rooftop plant items

The predicted worst-case sound pressure levels at the facade of the nearest noise sensitive receptor are provided in Table 6. The calculations for each noise sensitive receptor are given in Appendix D.

Table 6 Predicted sound pressure levels at nearest noise sensitive receiver

Noise sensitive receiver	Daytime limit, $L_{Aeq,15min}$ (dB)	Nighttime limit, $L_{Aeq,15min}$ (dB)	Predicted sound pressure level at receptor, L_{Aeq} (dB)
57 King Street 4th floor offices	43	N/A	40
St. Ann's Square apartments	43	36	23
58-66 King St	43	36	33

8 Terrace noise assessment

8.1 Amplified sound

Based on the criteria set out in Table 4 and the measurement results, the cumulative noise level resulting from amplified sound egress at 1 m from the most affected windows of the nearest noise sensitive premises should not exceed 5 dB below the existing background level (L_{A90}).

Residential premises are considered to be noise sensitive at all times. Retail units and offices are considered to be noise sensitive during the daytime. It is understood that the nearby office premises are traditional working spaces, and it is therefore it is reasonable to assume that they will be occupied from 07:00 to 19:00 hours during weekdays.

Based on the above, the amplified sound noise egress limits during weekdays are set out in Table 7.

Table 7 Amplified sound limits at 1 m from the nearest noise sensitive receptors - weekday

Time of day	Maximum amplified noise limits, $L_{eq,5min}$ (dB)							
	Octave band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
Daytime (07:00-19:00)	60	63	61	58	55	50	42	35
Evening (19:00-23:00)	76	75	74	71	67	61	52	46

When nearby offices are not in use, such as during weekends, maximum amplified noise limits at St Ann's Square Apartments and 58-66 King Street are set out in Table 8.

Table 8 Amplified sound limits at 1 m from the nearest noise sensitive receptors - weekend

Time of day	Maximum amplified noise limits, $L_{eq,5min}$ (dB)							
	Octave band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
Daytime (07:00-23:00)	76	75	74	71	67	61	52	46
Evening (23:00-07:00)	67	66	65	62	59	54	47	43

The nearest affected facade during the daytime is to the 4th floor offices of 37 King Street, which overlooks the terrace. The nearest night-time noise sensitive premises is 58-66 King Street, which has recently changed in use to a residential property.

It is understood that the operational hours of the terrace would be from 09:00 to 19:00, with occasional events until 22:00, mostly in warmer weather.

For guidance, amplified music played on the terrace should be background music. Electronic limiters should be used to control the level of amplified sound such that the limits in Table 7 are not exceeded. The audio system installed on the terrace should consist of small, well-distributed loudspeakers that face towards the patrons on the terrace. Loudspeakers should be highly directional as to minimise noise transmission from the terrace to noise sensitive receptors. No subwoofers should be used.

8.2 Terrace patron noise

The proposed rooftop plan drawings show small seating areas on the west side of the terrace, approximately between 10 and 18 m from the office overlooking the site. For this assessment it has been assumed that one third of patrons on the terrace will be speaking simultaneously at any given time. It is also assumed that patrons would be evenly distributed throughout the terrace area.

As a guideline, during the daytime on weekdays while the overlooking office is occupied, our calculations indicate that between 5 and 13 people could be talking simultaneously (depending on whether with raised voices or normal voices).

During the evenings (19:00-23:00) and weekends, assuming one-third of patrons would be talking simultaneously this would correspond to between 15 and 39 people on the terrace. It is understood that the terrace area will not be used at nighttime (23:00-07:00). Example calculations of maximum occupancy are summarised in Table 9. A tolerance of 5 dB has been used for the residential receptor to minimise risk of any disturbance.

Table 9 Calculation of sound pressure levels with maximum occupancy

	Octave band centre frequency, Hz							
	63	125	250	500	1k	2k	4k	Total, (dBA)
Calculation of maximum terrace occupancy during daytime (07:00-19:00)								
Sound power level of one normal male voice	54	54	59	61	59	55	46	63
Sound power level of 5 voices (ie, one third of occupants speaking simultaneously)	61	61	66	68	66	62	53	70
Distance attenuation to overlooking offices (10-18m)	-31	-31	-31	-31	-31	-31	-31	-
Facade correction at receptor	3	3	3	3	3	3	3	-
Total sound pressure level at overlooking office facade	34	31	36	38	36	32	23	40
Calculation of maximum terrace occupancy during evenings (19:00-23:00)								
Sound power level of one raised voice	54	56	67	71	59	62	57	70
Sound power level of 13 raised voices (ie, one third of occupants using raised voices simultaneously)	61	67	76	82	68	72	68	81
Distance attenuation to St. Anns Square Apartments	-42	-42	-42	-42	-42	-42	-42	-
Facade correction at receptor	3	3	3	33	3	3	3	-
Total sound pressure level at St Ann’s Square Apartments	23	25	36	39	28	31	26	38

It is likely that the outdoor seating area of Mr Thomas's Chop House will be in use in the summer months and as a result background sound levels will be higher than the measurements taken as part of the noise survey. As a result, occupancy levels could likely be increased due to higher existing background levels.

8.3 Use of lobbied doors

As the proposed noise sources on the roof terrace are external, the requirement for use of lobbied doors to the terrace would not be applicable for the control of external noise emissions.

9 Conclusion

The representative background sound levels from the noise survey were $L_{A90,15min}$ 48 dB during the day, and $L_{A90,15min}$ 41 dB during the night.

Based on the requirements of the Local Authority, the relevant plant noise limits at the worst affected existing noise sensitive premises are L_{Aeq} 43 dB during the day, and L_{Aeq} 36 dB during the night.

These limits are cumulative, and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features, the limits will be more stringent than those set out above. If plant items contain tonal or attention catching features, a penalty based on the type and impact of those features will be applied.

A plant noise assessment has been carried out, with the proposed attenuation measures in place, the total noise level from all new items of externally mounted building services plant is expected to comply with the day and night time criteria set by Manchester City Council.

Based on the results of the noise survey, noise limits for amplified music have been set. Electronic limiters are recommended to ensure levels cannot exceed those given.

Guidance on occupancy of the roof terrace has been provided based on assessments of people talking during daytime and evening hours.

Appendix A

Survey details

Equipment

The unattended and attended noise measurements were taken using a Rion NL-52 sound level meter and a Brüel & Kjær2250 sound level meter, respectively.

Calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
<i>Unattended measurements</i>				
Sound level meter	NL-52/01143564	Rion	15 Dec 24	TCRT22/1766
Microphone	UC-59/10153	Rion	15 Dec 24	TCRT22/1766
Pre-amp	NH-25/43581	Rion	15 Dec 24	TCRT22/1766
Calibrator	NC-74/34257023	Rion	15 Dec 24	TCRT22/1765
<i>Attended measurements</i>				
Sound level meter	2250/3011964	Brüel & Kjær	11 Sep 25	UCRT23/2163 UCRT23/2167
Microphone	4189/3100176	Brüel & Kjær	11 Sep 25	UCRT23/2163 UCRT23/2167
Pre-amp	ZC0032/26376	Brüel & Kjær	11 Sep 25	UCRT23/2163 UCRT23/2167
Calibrator	4231/3019123	Brüel & Kjær	11 Sep 25	UCRT23/2162

^[1] Calibration of the meters used for the measurements is traceable to national standards. Calibration certificates for the sound level meter(s) used in this survey are available upon request.

Calibration checks were carried out on the meters and their measurement chains at the beginning and end of the survey. No significant calibration deviation occurred.

Noise indices

Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a fast time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg, L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS 7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures*.

Weather conditions

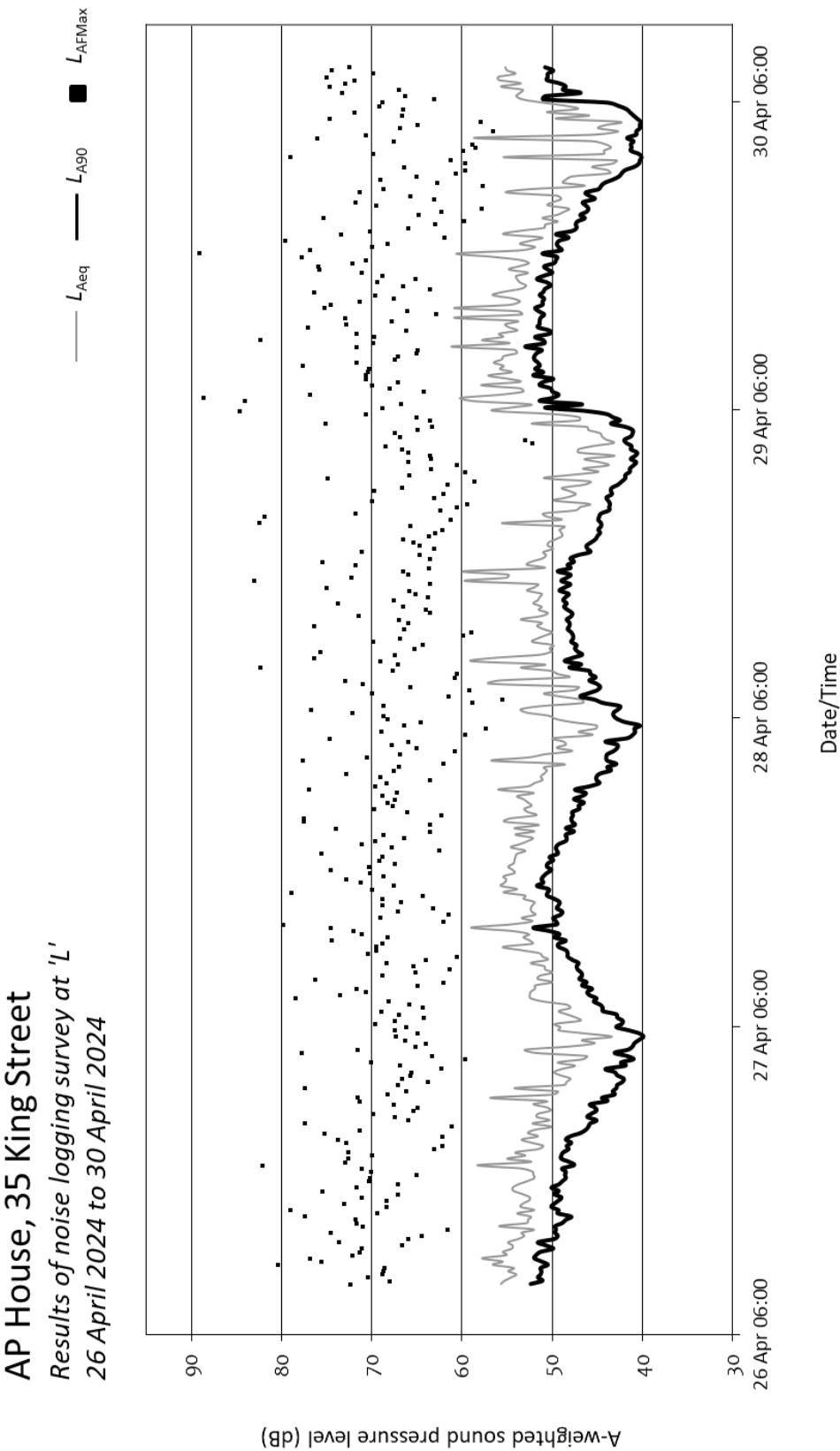
During the attended noise measurements, the weather was generally clear and dry and no rain occurred. Wind speeds were measured at each position and varied between 5 m/s and 1 m/s.

During the unattended noise measurements, weather reports for the area indicated that temperatures varied between 6°C at night and 14°C during the day, and the wind speed was less than 9 m/s.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

Results of unattended measurements at Location 'L'



Appendix C

BS 4142 corrections for attention catching features

The following applies where plant noise is assessed in accordance with BS 4142:2014+A1:2019.

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), penalty corrections should be applied based on the type and impact of the features.

If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible.

Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor:

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible.

For noise which is equally both impulsive and tonal, then both features can be accounted for by linearly summing the corrections for both characteristics.

If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

If a subjective assessment of tonality is not appropriate, an objective assessment can be made by analysis of time-averaged, third-octave band sound pressure levels. A noise source is deemed to be tonal if the level in a third-octave band exceeds the level in adjacent third-octave bands by the level differences given below:

- 15 dB in the low frequency third-octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency third-octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency third-octave bands (500 Hz to 10000 Hz).

If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.

Appendix D

Plant noise egress calculations

