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Consultants in Acoustics, Noise & Vibration

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Redevelopment of 135-149 Shaftesbury Avenue

Environmental noise survey report

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Version	Date	Comments	Author	Reviewer
A	6 Nov 17		Adam Page	Mark Howarth
B	13 Nov 17	Additional measurements	Adam Page	Mark Howarth
C	19 Dec 17	Additional section on rooftop noise egress	Adam Page	Mark Howarth

Summary

Sandy Brown has been commissioned by Capitalstart Limited to provide acoustic advice in support of the planning application for the proposed redevelopment of 135-149 Shaftesbury Avenue, WC2H 8AH.

An environmental noise survey has been carried out to determine the existing sound levels in the area. The data collected is used to determine appropriate plant noise limits in line with the requirements of Camden Council.

A noise survey was performed between 27 and 29 October 2017 and between 9 and 13 November 2017.

The minimum background sound levels measured during the survey were $L_{A90,15}$ 49 dB during the daytime and $L_{A90,15}$ 47 dB at night.

Based on the requirements of Camden Council 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 $L_{Aeq,15min}$ 39 dB during the daytime, and $L_{Aeq,15min}$ 37 dB during the night. These limits are cumulative, and apply with all plant operation 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.

Noise egress from the rooftop bar has been assessed and noise limits following Camden Council's requirement have been set.

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1 Introduction

Sandy Brown has been commissioned by Capitalstart Limited to provide acoustic advice in support of a planning application for the proposed development at the 135-149 Shaftesbury Avenue, WC2H 8AH.

As part of this, an environmental noise survey is required, the purpose of which is to establish existing sound levels in the vicinity of the site.

The collected data is used to set appropriate limits for noise egress from building services plant. It will also inform the design of building envelope elements to control noise transfer into the building.

This report presents the survey method, results of the environmental noise survey, and sets limits for noise emission from building services plant as well as noise limits for entertainment noise associated with the rooftop bar.

2 Site description

2.1 The site and its surrounding

The site location in relation to its surroundings is shown in Figure 1. The measurement positions and nearest residential location (highlighted in pink) are also shown in Figure 1.

The cinema is situated on Shaftesbury Avenue, which has constant and generally slow moving traffic during the daytime. The other roads surrounding the site are Stacey Street, St Giles Passage and New Compton Street. Road traffic is less frequent on these roads and they are mainly used by delivery drivers and by drivers turning or parking their vehicles. Motorbike parking is available on New Compton Street; hence scooters and motorbikes regularly pass by the site.

Aircraft pass over the site fairly regularly, and it is assumed these are flying to / from London City Airport.

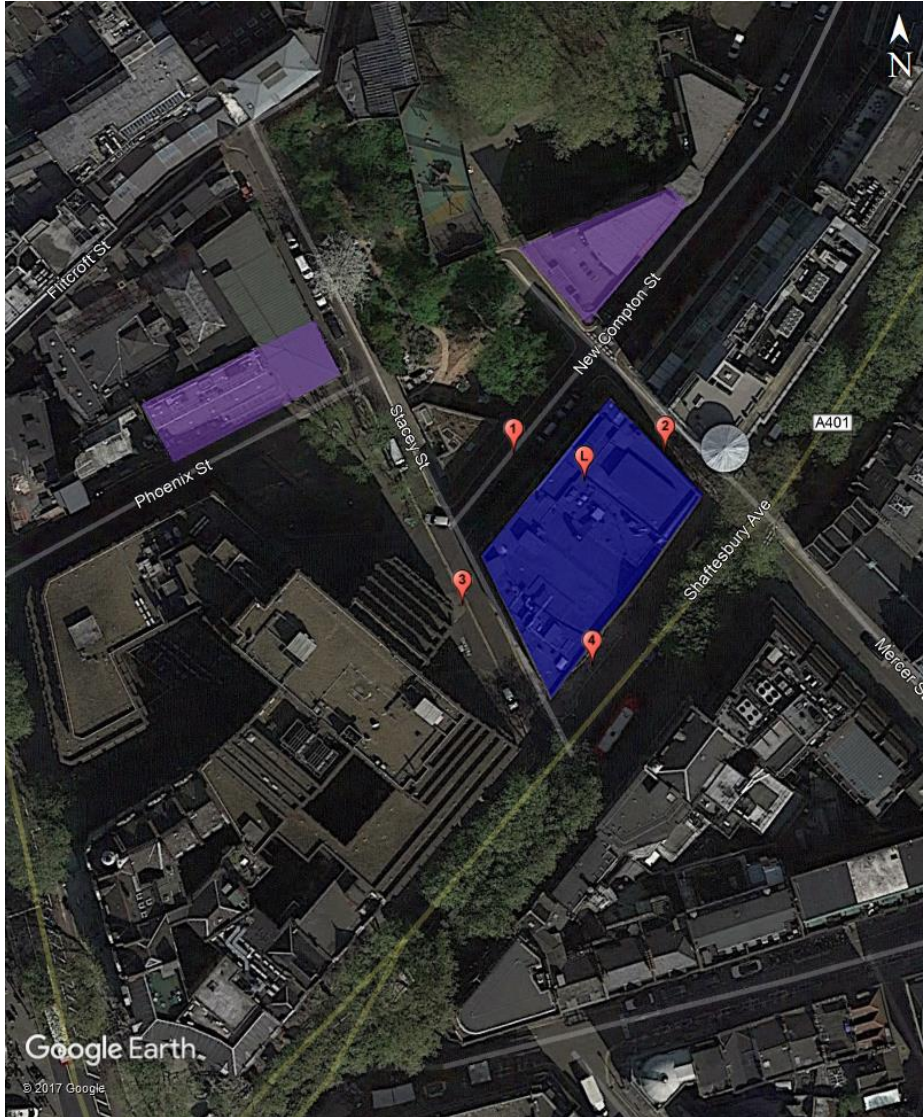


Figure 1 Site map (courtesy of Google Earth Pro)

2.2 Adjacent premises

The nearest residential location is Pendrell House, an apartment building on New Compton Street. Pendrell House is situated approximately 15m north of the site and is shown in purple in Figure 1. Other nearby dwellings are the apartments within 1 and 1A Phoenix Street, which are approximately 40 north west of the site and also shown in purple in Figure 1. There are commercial buildings directly opposite the site on Stacey Street, St Giles Passage and Shaftesbury Avenue.

3 Method

Details of the equipment used, the noise indices and the weather conditions during the survey are provided in Appendix A. Further information on the specific survey method is provided in this section.

3.1 Unattended measurements

Unattended noise monitoring was undertaken at the site over five days to determine the existing background sound levels in the vicinity of nearby noise sensitive premises.

The unattended measurements were performed over 15 minute periods between 11:15 on 27 October 2017 and 10:15 on 31 October 2017. Due to high wind speeds interfering with measurement equipment the noise levels measured between 08:30 on 29 October and 10:15 on 31 October 2017 have been discounted.

Further measurements were performed between 11:15 on 9 November 2017 and 10:00 on 13 November 2017.

The equipment was installed and collected by Adam Page.

The unattended measurement position used during the survey is indicated in Figure 1 as 'L'. A photograph showing the logging measurement location is provided Figure 2. This location was chosen to be reasonably representative of the noise levels experienced by the nearest noise sensitive premises.

The microphone was mounted on a tripod approximately 1.5 m above the roof level and 1 m from one other hard reflective surface.



Figure 2 Unattended measurement location L1

3.2 Attended measurements

Attended sample measurements were performed by Adam Page at a number of locations around the site. These are indicated in Figure 1 as positions 1 to 4. The attended measurements were carried out on 27 and 31 October 2017, over 15 minute periods, with the purpose of determining existing noise levels from road traffic and other noise sources in the area.

In each case the microphone was mounted on a tripod approximately 1.5 m above the ground level and 1 m from one other reflective surface.

4 Measurement results

4.1 Observations

The dominant noise sources observed at the site during the survey consisted of road traffic noise from Shaftesbury Avenue, and from vehicles accessing Stacey Street, St Giles Passage and New Compton Street.

Less significant noise sources included aircraft passing over the site and plant noise from surrounding buildings.

4.2 Unattended measurement results

The results of the unattended noise measurements are summarised in the following tables. A graph showing the results of the unattended measurements is provided in Appendix B.

The day and night time ambient noise levels measured during the unattended survey are presented in Table 1. The results presented are façade noise levels.

Table 1 Ambient noise levels measured during the survey

Date	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)
	$L_{Aeq,16h}$ (dB)	$L_{Aeq,8h}$ (dB)
Friday 27 October 2017	* 60	54
Saturday 28 October 2017	57	55
Thursday 9 November 2017	-	55
Friday 10 November 2017	59	56
Saturday 11 November 2017	58	54
Sunday 12 November 2017	58	53

* Measurement not made over full period due to monitoring start time

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The minimum background sound levels measured during the unattended survey are given in Table 2.

Table 2 Minimum background sound levels measured during the survey

Date	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)
	$L_{A90,15min}$ (dB)	$L_{A90,15min}$ (dB)
Friday 27 October 2017	*55	48
Saturday 28 October 2017	49	47
Thursday 9 November 2017	*55	48
Friday 10 November 2017	53	50
Saturday 11 November 2017	52	47
Sunday 12 November 2017	50	48

*Measurement not made over full period due to monitoring start time

The lowest background sound levels measured during the survey were $L_{A90, 15min}$ 49 dB during the daytime and $L_{A90, 15min}$ 47 dB at night.

4.3 Attended measurement results

The sound pressure levels recorded during the attended measurements are summarised in Table 3.

The dominant noise sources noted during the measurements are also described in Table 3.

All the attended measurements were performed over 15 minute periods. All results include facade reflections.

Table 3 Attended measurement results

Position	Start time / date	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
S1	13:20 / 27-10-17	62	82	55	Road traffic on Shaftesbury Avenue, vehicles on New Compton Street, reverse alarms, plant noise from louvres at the back of cinema, aircraft
S1	14:26 / 27-10-17	65	90	55	
S1	08:45 / 31-10-17	65	79	57	
S2	13:37 / 27-10-17	65	85	60	Road traffic on Shaftesbury Avenue, vehicles on St Giles Passage, aircraft
S2	15:12 / 27-10-17	67	89	58	
S2	09:00 / 31-10-17	70	83	60	
S3	12:45 / 27-10-17	68	92	59	Road traffic on Shaftesbury Avenue, vehicles on Stacey Street, plant noise hum just audible, aircraft, car park gates opening, delivery van doors
S3	13:53 / 27-10-17	67	87	59	
S3	15:27 / 27-10-17	66	87	58	
S4	13:02 / 27-10-17	73	93	65	Road traffic constant and dominant, aircraft, HGV reversing, sirens, pedestrians talking
S4	14:09 / 27-10-17	77	106	64	
S4	14:55 / 27-10-17	72	95	64	

5 Building services noise egress limits

5.1 Local Authority criteria

The relevant Camden Council requirement is outlined in *Appendix 3 of the Camden Local Plan, June 2017*. In relation to commercial noise the following is stated:

Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion).

5.2 Limits

5.2.1 Basic limits

Based on the above criteria and the measurement results, the cumulative noise level resulting from the operation of all new plant at 1 m from the worst affected windows of the nearest noise sensitive premises should not exceed the limits set out in Table 4.

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)
Daytime (07:00-23:00)	39
Night-time (23:00-07:00)	37

The limits set out in Table 4 do not include any attention catching features. Camden Council require limits to be 5 dB lower if the noise source is tonal. Further penalties for attention catching features will need to be considered as the building services design progresses. This is discussed further in Section 5.2.2.

5.2.2 Attention catching features

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), the plant should be designed to achieve a limit below those set out above, based on the type and impact of the features.

Where the plant noise contains tonal elements, Camden Council require limits to be reduced by a correction of 5 dB.

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 taken into account 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 is not appropriate then an objective assessment can be made. A noise source is deemed to be tonal if the time averaged sound pressure level in a one-third octave band exceeds the level in adjacent one-third octave bands by the level differences given below:

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

5.3 Assessment

At this stage, no information is available in relation to the proposed installation of building services plant, and this will need to be assessed in detail as the design progresses. If the proposed plant is designed to achieve the noise level limits in Table 4, Camden Council's requirements will be met. It is considered that achieving these noise limits can be governed by an appropriately worded planning condition.

6 Rooftop bar noise egress

A rooftop bar is proposed for the development, a plan showing this is presented in Figure 3. It is considered that the nearest receptors to the rooftop bar will be the offices directly opposite the development on Shaftesbury Avenue, and directly west of the development on Stacey Street.

The nearest residential dwellings are the apartments within Pendrell House, New Compton Street and 1 /1A Phoenix Street, as shown in purple in Figure 1.

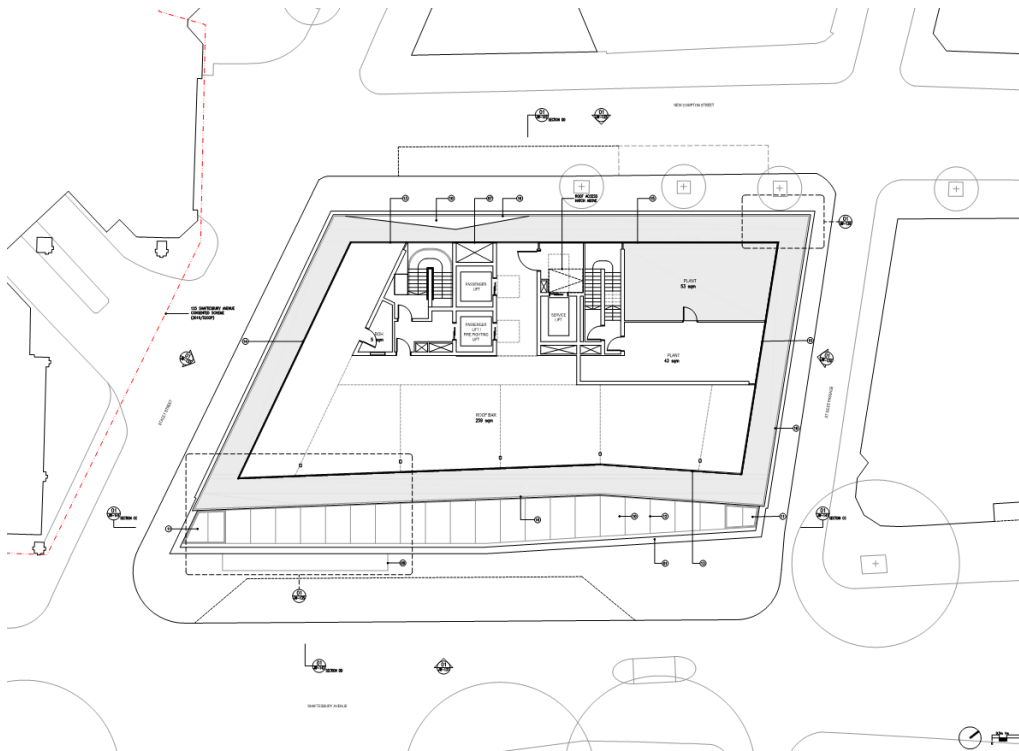


Figure 3 Rooftop bar location plan

6.1 Criteria

The *Camden Local Plan June 2017* outlines guidance on assessing the impact of noise and vibration from food, drink, entertainment and leisure noise.

Generally the sources of noise and vibration which need to be included in an assessment are: amplified or unamplified music, human voices, footfall and general activity.

Appendix 3: Noise Thresholds, outlines noise level limits within amenity areas and defines the level of impact entertainment noise will have. These are presented in Table 5.

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Table 5 DP28 Noise limits for places of entertainment on adjoining residential sites

Existing noise sensitive receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings	Garden used for amenity (free field)	Day	The higher of 55 dB $L_{Aeq,5min}$ or 10 dB below existing $L_{Aeq,5min}$ without entertainment noise	56dB to 60dB $L_{Aeq,5min}$ Or 9dB to 3dB below existing $L_{Aeq,5min}$ without entertainment noise	The higher of 61 dB $L_{Aeq,5min}$ Or 2db below existing $L_{Aeq,5min}$ without entertainment noise
Dwellings	Garden used for amenity (free field)	Evening	The higher of 50dB $L_{Aeq,5min}$ Or 10db below existing $L_{Aeq,5min}$ Without entertainment noise	51dB to 55dB $L_{Aeq,5min}$ Or 9dB to 3db below existing $L_{Aeq,5min}$ Without entertainment noise	The higher of 56dB $L_{Aeq,5min}$ Or 2dB below existing $L_{Aeq,5min}$ Without entertainment noise
Dwellings	Garden used for amenity (free field)	Night	The higher of 45dB $L_{Aeq,5min}$ Or 10db below existing $L_{Aeq,5min}$ Without entertainment noise	46dB to 50dB $L_{Aeq,5min}$ Or 9db to 3db below existing $L_{Aeq,5min}$	The higher of 51db $L_{Aeq,5min}$

Based on the noise survey results and the above criteria, the cumulative noise level as a result of noise egress due to noise from external entertainment should not exceed the noise levels in Table 6.

In order to meet the day time, evening and night time requirements set out in Table 5, a noise level limit of 10dB below the lowest L_{Aeq} level, measured during the corresponding period, has been targeted.

Table 6 Noise level limits for entertainment noise at the nearest residential receptor

Period	Free field sound pressure level L_{Aeq} (dB), within nearest garden / amenity area
Daytime (07:00 – 23:00)	40
Evening (19:00-23:00)	43
Night (23:00 – 07:00)	37

Table 7 and Table 8 present approximate noise level limits on the roof for both unscreened and screened noise sources. The exact limits on the roof will be set depending on speaker locations to ensure the limits outside dwellings are met.

Table 7 Approximate noise level limits for entertainment noise on the roof of the development assuming no screening

Period	Free field sound pressure level L_{Aeq} (dB), on roof
Daytime (07:00 – 23:00)	63
Evening (19:00-23:00)	66
Night (23:00 – 07:00)	61

Table 8 Approximate noise level limits for entertainment noise on the roof of the development with screening

Period	Free field sound pressure level L_{Aeq} (dB), on roof
Daytime (07:00 – 23:00)	73
Evening (19:00-23:00)	76
Night (23:00 – 07:00)	71

These noise levels limits would be suitable for low to medium level background music. If live music, DJs etc. are proposed then these would be subject to the requirements of Code of Practice for Environmental Noise Control at Concerts published by the Chartered Institute of Environmental Health.

7 Conclusion

A noise survey has been carried out to determine the existing background sound levels in the vicinity of the site and surrounding noise sensitive premises. The representative background sound levels were $L_{A90,15min}$ 49 dB during the day, and $L_{A90,15min}$ 47 dB during the night.

On the basis of the requirements of the Local Authority, the relevant plant noise limits at the worst affected existing noise sensitive premises would be L_{Aeq} 39 dB during the day, and L_{Aeq} 37 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 indicated in Section 5.2.2 will be applied, and the limits will be more stringent than those set out above.

If the proposed plant is designed to achieve the noise level limits in Table 4, Camden Council's requirements will be met. It is considered that this can be governed by an appropriately worded planning condition.

Noise egress from the rooftop bar has been assessed and noise limits following Camden Council's requirement have been set.

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Appendix A

Survey details

Equipment

A RION NL-52 sound level meter was used to undertake the initial unattended measurements. A RION NL-32 sound level meter was used to undertake the additional unattended measurements.

The attended measurements were carried out using an NTi X12 and a B&K 2250 sound level meter. The calibration details for the equipment used during the survey are provided in Table A1.

Calibration of the sound level meters used for the tests is traceable to national standards. The calibration certificates for the sound level meters used in this survey are available upon request.

The sound level meters and microphones were calibrated at the beginning and end of the measurements using their respective sound level calibrators. No significant deviation in calibration occurred.

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Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-52/00320633	Rion	11 May 18	1605234
Microphone	UC-59/03382	Rion	11 May 18	1605234
Pre-amp	NH-25/10641	Rion	11 May 18	1605234
Calibrator	N7-74/34125430	Rion	3 May 18	1605223
Sound level meter	XL2-TA/A2A-09251-E0	NTi Audio	10 Feb 19	1702079
Microphone	MC230/8391	NTi Audio	10 Feb 19	1702079
Pre-amp	MA220/5159	NTi Audio	10 Feb 19	1702079
Calibrator	SVA30A/10565	Svantek	6 Feb 19	1702068
Sound level meter	2250/3011096	Brüel & Kjær	16 Mar 19	UCRT17/1150, UTRC17/1152
Microphone	4189/3060575	Brüel & Kjær	16 Mar 19	UCRT17/1150, UTRC17/1152
Pre-amp	ZC0032/25430	Brüel & Kjær	16 Mar 19	UCRT17/1150, UTRC17/1152
Calibrator	4231/3017675	Brüel & Kjær	10 Mar 19	UCRT17/1122
Sound level meter	NL-32/00623769	Rion	06 Oct 19	TCRT17/1656
Microphone	UC-53A/319244	Rion	06 Oct 19	TCRT17/1656
Pre-amp	NH-21/36677	Rion	06 Oct 19	TCRT17/1656
Calibrator	NC-74/34336009	Rion	05 Oct 19	TCRT17/1649

Noise indices

The equipment was set to record a continuous series of broadband sound pressure levels. 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 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.

The L_{A90} is considered most representative of the background sound level for the purposes of complying with any local authority requirements.

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 BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures.*

Weather conditions

During the attended measurements carried out on 27 and 31 October 2017, the weather was generally clear and dry and no rain occurred. Wind speeds varied between approximately 1 m/s and 3 m/s.

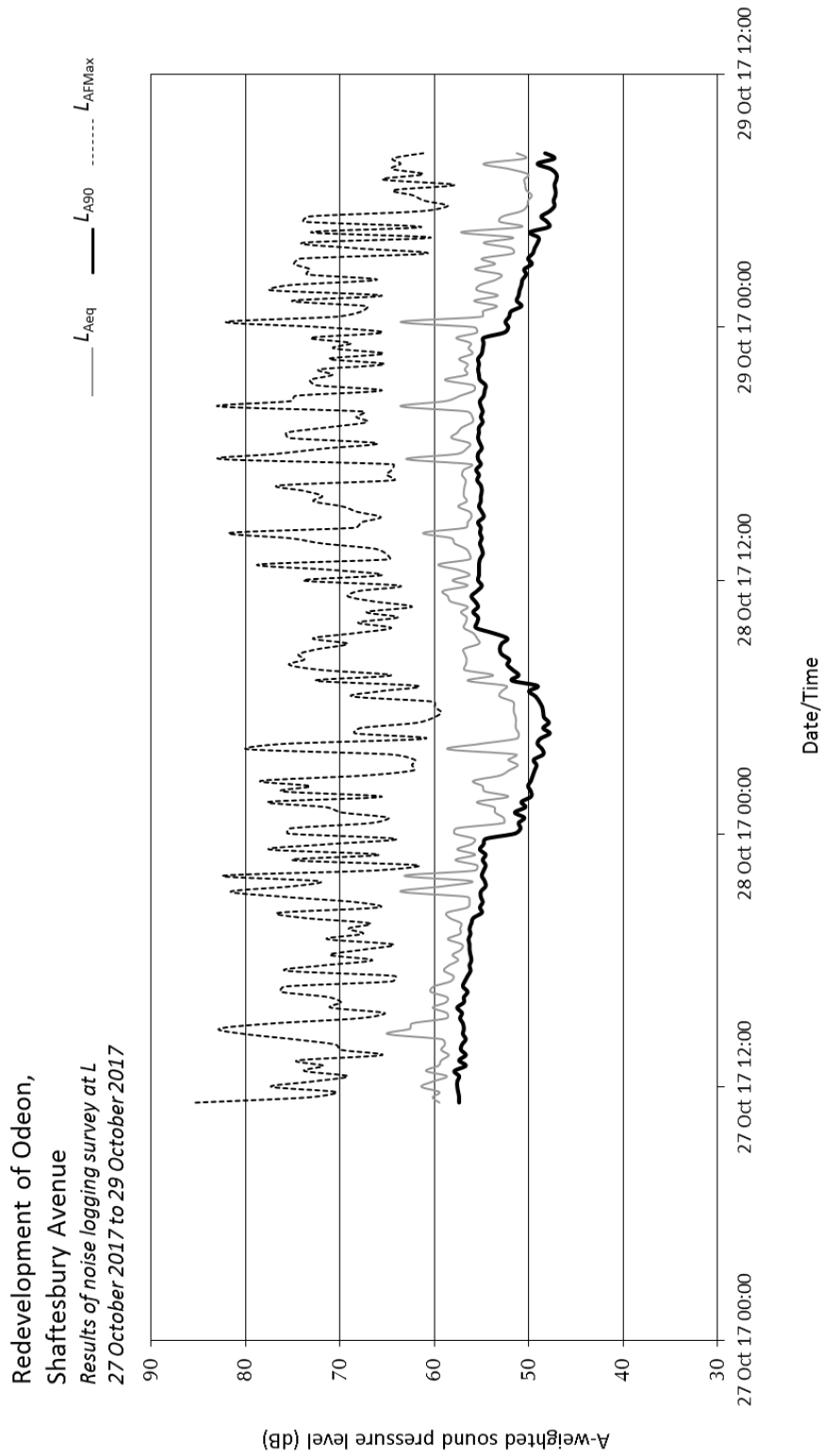
During the unattended noise measurements between 27 October 2017 and 31 October 2017, weather reports for the area indicated that temperatures varied between 5°C at night and 15°C during the day, and no rain occurred. The wind speed on 29 October 2017 was generally quite high, and for periods was up to 9 m/s. This interfered with measurement equipment and therefore measurements undertaken after 08:30 on 29 October 2017 to 31 October 2017 were discounted from the results.

Appendix B

Results of unattended measurements at Location L

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Redevelopment of ODEON,
Shaftesbury Avenue
Results of noise logging survey at L
9 November 2017 to DAY 13 November 2017

