Consultants in Acoustics, Noise & Vibration

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# Royal Free Hospital, London

Noise survey and plant noise egress assessment

London, Manchester, Edinburgh, Birmingham, Belfast, Leeds

post@sandybrown.com www.sandybrown.com

Sandy Brown Ltd Registered in England & Wales No. 13227735

Registered Office: 55 Charterhouse Street, London EC1M 6HA

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Version	Date Comments		Author	Reviewer	
А	17 Feb 24		John Sails	Andrew Long	

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## Summary

Sandy Brown has been commissioned CFES Ltd to provide acoustic advice in relation to the proposed development at Royal Free Hospital, London, NW3 2QG.

An environmental noise survey has been carried out to determine the existing sound levels in the area. The noise survey was performed between 12:32 on 31 January 2024 and 14:17 on 6 February 2024.

The representative background sound levels measured during the survey were  $L_{A90,15min}$  53 dB during the day and  $L_{A90,15min}$  52 dB at night.

Based on the requirements of the 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  $L_{Aeq,15min}$  46 dB during the day, and  $L_{Aeq,15min}$  45 dB during the night. These have been corrected relative to the measured free-field background sound levels by the addition of 3 dB (as per the guidance provided in BS 8233:2014 Section G.2.1).

An initial assessment of the proposed temporary AHU unit has been carried out. The results of the assessment show that the noise levels at the nearest noise sensitive receptor are 3 dB above the local authority's standard planning plant noise limits.

It is recommended that this minor exceedance be discussed with the Environmental Health Officer at Camden Council, taking into account the temporary nature of the proposed installation.

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# Contents

1	Introduction	5
2	Site description	5
3	Development proposals	6
4	Building services noise egress criteria	7
5	Noise survey method	7
6	Noise survey results	9
7	Assessment	. 11
8	Conclusion	. 14
Ap	pendix A	. 15
	Survey details	. 15
Ap	pendix B	. 18
	Results of unattended measurements at Location 'L'	. 18
Ap	pendix C	. 20
	Manufacturers octave band noise data	. 20

## 1 Introduction

Sandy Brown has been commissioned CFES Ltd to provide acoustic advice in relation to the proposed development at Royal Free Hospital, London, NW3 2QG.

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, and a discussion of acceptable limits for noise emissions from building services plant.

### 2 Site description

#### 2.1 The site and its surrounding

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

The site is to the rear of the Royal Free Hospital on Rowland Hill Street. The proposed location of the Air Handling Unit (AHU) is highlighted in green within Figure 1.

The nearest noise sensitive premises are Belle Vue Hampstead which is located directly south of the proposed AHU location, and his highlighted in blue within Figure 1.

To the west of the proposed AHU location runs the main road, Haverstock Hill. Along this road runs a row of combined residential and commercial premises, which are highlighted in yellow within Figure 1. To the east of site lies the south carpark for the hospital.

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

## 3 Development proposals

It is understood that a temporary AHU is required to support the day theatres within the hospital. Due to the logistics of the site, the AHU is required to be located externally, adjacent to residential premises. The proposed AHU is to be a Trane IH85 unit.

## 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

In relation to noise egress from industrial and commercial noise sources, London Borough of Camden's local plan (June 2017) states:

"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 (15 dB if tonal components are present) should be considered as design criterion."

Based on the extract from Camden Local Plan, all external plant must be designed such that the cumulative noise 1 m away from the windows of the nearest noise sensitive receptors is 10 dB below the representative measured background level ( $L_{A90, 15 \text{ min}}$ ).

### 5 Noise survey method

#### 5.1 Unattended measurements

Unattended noise monitoring was undertaken at the site over 6 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 12:32 on 31 January 2024 and 14:17 on 6 February 2024.

The measurement position used during the survey is indicated in Figure 1, denoted by the letter 'L'. A photograph showing the measurement location is provided in Figure 2. This location was chosen to be reasonably representative of noise levels at the site and outside the nearest noise sensitive premises.

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Figure 2 Unattended measurement location 'L'

#### 5.2 Weather conditions

Weather conditions during the survey are described in Appendix A.

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### 6 Noise survey results

#### 6.1 Observations

The dominant noise sources observed at the site during the survey were from building works along the balcony during the daytime (07:00-18:00) and distant building services from nearby rooftops and at lower floor levels.

Given the orientation of the fixed noise sources in respect of both the noise survey location and the nearest noise sensitive receptors, the noise levels at the measurement location are considered to be representative of those likely to be experienced at the nearby receptors (to which it was not possible to gain access).

Less significant noise sources included road noise from Haverstock Hill and noise from Rosary Roman Catholic Primary School.

#### 6.2 Noise measurement results

#### 6.2.1 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. The measurements are considered to be free field.

Table 1 Ambient noise levels measured during the unattended survey

Date	Day (07:00 – 23:00)	Night (23:00 – 07:00)			
	L <sub>Aeq,16h</sub> (dB)	L <sub>Aeq,8h</sub> (dB)			
Wednesday 31 January 2024	-	54			
Thursday 1 February 2024	62	54			
Friday 2 February 2024	60	53			
Saturday 3 February 2024	55	53			
Sunday 4 February 2024	55	54			
Monday 5 February 2024	60	55			
Average	58	54			

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Date	Day (07:00 – 23:00)	Night (23:00 – 07:00)			
	L <sub>A90,15min</sub> (dB)	L <sub>A90,15min</sub> (dB)			
Wednesday 31 January 2024	53 <sup>[1]</sup>	52			
Thursday 1 February 2024	53	51			
Friday 2 February 2024	53	52			
Saturday 3 February 2024	53	52			
Sunday 4 February 2024	53	53			
Monday 5 February 2024	53	53			
Tuesday 6 February 2024	54 <sup>[1]</sup>	-			

Table 2 Minimum background sound levels measured during the unattended survey

<sup>[1]</sup> Measurement not made over full period due to monitoring start and end time.

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 3

Figure 3 Measured background sound level  $L_{A90}$  (dB) for both day and night

From this analysis, the representative background sound levels measured during the survey were  $L_{A90,15min}$  53 dB during the day and  $L_{A90,15min}$  52 dB at night.

#### 6.3 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 3.

The limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises and are presented as facade levels. These have been corrected relative to the measured free-field background sound levels by the addition of 3 dB (as per the guidance provided in BS 8233:2014 Section G.2.1). In this case these limits would apply at the northern facade of Belle Vue.

Table 3 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, <i>L</i> <sub>Aeq,15min</sub> (dB)				
Day (07:00-23:00)	46				
Night (23:00-07:00)	45				

#### 7 Assessment

#### 7.1 Proposed plant items

The proposed plant items within the development proposal are:

• Train IH085 Air Handling Unit (AHU) located externally within a loading bay to the south of the hospital.

The installation location of the proposed unit is given within Figure 4.

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Figure 4 Location of proposed plant for Day Theatres 1 & 2

The noise data for the AHU is given within Appendix C.

#### 7.2 Proposed mitigation

As a part of the temporary AHU installation, a temporary acoustic barrier is proposed to be set up around the entire unit. The specified product is an Echo Barrier H8, which is 3.5 m in height. This barrier is to be placed approximately 1 m away from the edge of the unit on all sides.

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#### 7.3 Noise egress assessment

#### 7.3.1 Nearest noise sensitive premises

The nearest noise sensitive receptor is the Belle Vue retirement home, located directly to the south of the proposed AHU location.

#### 7.3.2 Noise emission calculation summary

The octave band noise emission results are presented within Table 4. It is understood that the proposed plant will be in full operation during the day (07:00 - 23:00 hours) but will operate on a set back duty overnight.

Noise emissions from the plant are not anticipated to have any observable tonal or other attention catching features at the nearest noise sensitive premises.

The calculations consider reduction in noise due to distance and screening presented by the Echo Barrier H8 system, being installed at 1 m away from the edge of the unit.

Plant item		Octave-band centre frequency (Hz)						A-weighted	
	63	125	250	500	1k	2k	4k	8k	sound pressure level at 1 m from facade (dB)
Trane IH085	53	51	48	47	46	38	34	28	49

Table 4 Noise emissions levels at the nearest noise sensitive premises

The external plant noise emissions from the proposed AHU unit at the nearest noise sensitive receptor are expected to be 3 dB above the standard limit as set out by Camden Council for daytime operation.

Overnight, the set-back duty is likely to mean noise levels are within the local authority standard limits.

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## 8 Conclusion

The representative background sound levels measured during the survey were  $L_{A90,15min}$  53 dB during the day and  $L_{A90,15min}$  52 dB at night.

Based on the requirements of the Camden Council, the relevant plant noise limits at the worst affected existing noise sensitive premises are  $L_{Aeq}$  46 dB during the day, and  $L_{Aeq}$  45 dB during the night. These have been corrected relative to the measured free-field background sound levels by the addition of 3 dB (as per the guidance provided in BS 8233:2014 Section G.2.1).

An initial assessment of the proposed temporary AHU unit has been carried out. The results of the assessment show that the noise levels at the nearest noise sensitive receptor are 3 dB above the relevant noise limit during the day.

Overnight, the set-back duty is likely to mean noise levels are within the local authority standard limits.

It is recommended that this minor exceedance be discussed with the Environmental Health Officer at Camden Council, taking into account the temporary nature of the proposed installation.

# Appendix A

Survey details

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#### Equipment

The unattended noise measurements were taken using a Rion NL-52 sound level meter. Calibration details for the equipment used during the survey are provided in Table A1.

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number	
Sound level meter	NL- 52/00721067	Rion	3 Feb 25	TCRT23/1127	
Microphone	UC-59/22135	Rion	3 Feb 25	TCRT23/1127	
Pre-amp	NH-25/22173	Rion	3 Feb 25	TCRT23/1127	
Calibrator	NC- 75/35013646	Rion	25 Oct 24	TCRT22/1655	

Table A1 Equipment calibration data

<sup>[1]</sup> Calibration of the meters used for the measurements is traceable to national standards. Calibration certificates for the sound level meter 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*<sub>Aeq,*T*</sub> 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.* 

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#### Weather conditions

During the unattended noise measurements, weather reports for the area indicated that temperatures varied between  $4^{\circ}$ C at night and  $13^{\circ}$ C during the day, and the wind speed was less than 5 m/s.

These weather conditions are considered suitable for obtaining representative measurements.

# Appendix B

Results of unattended measurements at Location 'L'

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# Appendix C

Manufacturers octave band noise data

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Plant item	Octave-band centre frequency (Hz)						A-weighted		
	63	125	250	500	1k	2k	4k	8k	broadband level (dB)
Trane IH085	86	86	83	82	82	75	71	64	85

Table C1 Manufacturer's noise data (sound power levels, L<sub>w</sub> (dB))