SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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20-23 Greville Street

Plant noise assessment

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Version	Date	Comments	Author	Reviewer
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Summary

Sandy Brown has been commissioned by Groupwork to under in relation to the proposed development at 20-23 Greville Street, London, EC1N 8SS.

This report presents an assessment of noise emissions from the proposed rooftop plant items and sets out any necessary attenuation to achieve the noise limit requirements in accordance with the London Borough of Camden's (LBC) Planning Condition 15.

A noise survey was previously carried out at the site in November 2017 to determine the existing sound levels in the area. The representative free-field weekday background sound levels measured during the survey were $L_{A90,15min}$ 51 dB during the daytime, and $L_{A90,15min}$ 47 dB at night. The representative free-field weekend background sound levels measured during the survey were $L_{A90,15min}$ 49 dB during the daytime, and $L_{A90,15min}$ 46 dB at night.

The plant will operate between 07:00 and 22:30 Monday to Saturday and 09:00 to 22:30 on Sundays / Bank Holidays.

Based on the requirements of the London Borough of Camden 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 $L_{Aeq,15min}$ 42 dB during operation.

An assessment of the noise emissions from the proposed plant items has been undertaken at the nearest noise sensitive premises. If the required mitigation measures are undertaken noise emissions from the proposed plant will not exceed the requirements of Planning Condition 15 at any time.

Contents

1 Introduction

Sandy Brown has been commissioned by Groupwork to provide acoustic advice in relation to the proposed development at 20-23 Greville Street, London, EC1N 8SS.

An environmental noise survey was previously conducted at the site by Sandy Brown in 2017. The purpose of which was to establish the existing background sound levels in the vicinity of nearby noise sensitive premises and to set appropriate limits for noise emissions from building services plant. The details of the survey can be found in report *17483-R03-A Planning noise survey report*.

This report presents an assessment of noise emissions from the proposed rooftop plant items and sets out any necessary attenuation to achieve the noise limit requirements in accordance with the London Borough of Camden's (LBC) Planning Condition 15.

2 Site description

2.1 The site and its surrounding

The site location, highlighted in red, is shown in relation to its surroundings in Figure 1. The site is located in a mixed-use area, with commercial properties located on the lower floors and residential properties on higher floors. The nearest noise sensitive premises 7 Bleeding Heart Yard, 30 Greville Street and 25-27 Farringdon Road are highlighted in blue.

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

3 Building services noise emission criteria

3.1 London Borough of Camden

In relation to noise emissions from building services plant the London Borough of Camden's (LBC) Planning Condition 15 states the following:

> *"Prior to the installation of any items of fixed plant associated with the operation of the development, details of plant machinery and a noise report shall be submitted to and approved in writing by the Local Planning Authority. The measures shall ensure that the external noise level emitted from plant/machinery/equipment will be lower than the lowest existing background noise level by at least 10dBA, by 15dBA where the source is tonal, as assessed according to BS4142:2014 at the nearest and/or most affected noise sensitive premises, with all machinery operating together at maximum capacity.*
>
> *The report should reference the proposed noise limits included in Table 2 of the planning noise survey report dated 12 January 2018. A post installation noise assessment shall be carried out to confirm compliance with the noise criteria and additional steps to mitigate noise shall be taken, as necessary. Approved details shall be implemented prior to occupation of the development and thereafter be permanently retained."*

4 Plant noise limits – noise egress

Based on the requirements of Planning Condition 15 and the results of the survey set-out in *17483-R03-A Planning noise survey report*, the cumulative noise level resulting from the operation of all new plant should not exceed the limits set out in Table 1.

The limits apply at 1 m from the facade of the nearest noise sensitive premises.

Table 1 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)
Weekday	
Daytime (07:00-23:00)	44
Night-time (23:00-07:00)	40
Weekend	
Daytime (07:00-23:00)	42
Night-time (23:00-07:00)	39

The noise limits in Table 1 do not include any penalties for noise emissions being tonal or containing attention catching features at the nearest noise sensitive premises.

5 Plant noise assessment

5.1 Proposed plant items

The proposed plant items are set-out in Table 2

Table 2 Proposed plant items

Plant item	No.	Manufacturer	Location
Air source heat pump (ASHP 1)	1	Mitsubishi	Rooftop plant area
Water cooled condenser (CU01 – 07)	7	Mitsubishi	Rooftop plant area
AHU (AHU 1 – 2)	2	VES	Rooftop plant area
Toilet extract fan (EF01 – 02)	2	TBC	Rooftop plant area
Restaurant extract fan	1	TBC	Rooftop plant area
Restaurant supply fan	1	TBC	Rooftop plant area
Kitchen extract fan	1	TBC	Rooftop plant area
Kitchen supply fan	1	TBC	Rooftop plant area

Installation locations for the proposed plant items are illustrated in the rooftop plant area layout in Figure 2.

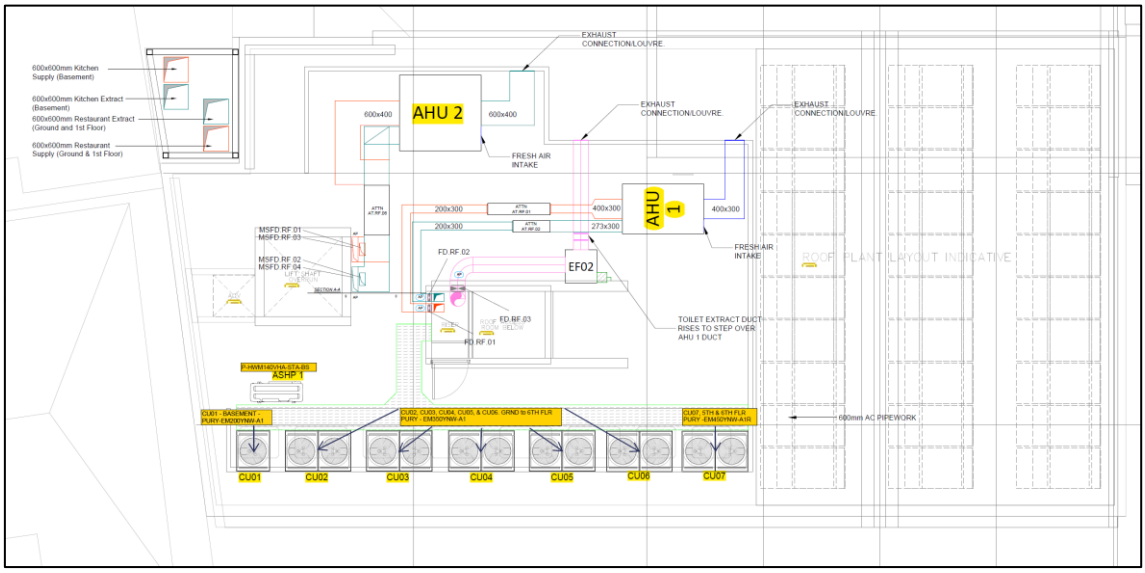

Figure 2 Proposed rooftop plant layout

Manufacturer's noise data for the proposed plant items is given in Table 3.

Table 3 Manufacturer's noise data, dB (sound pressure level, L_p; sound power level, L_w)

Plant item	Octave band centre frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
ASHP (L_p at 1m)	57	58	54	51	48	43	39	35	53
Condenser (CU01) (L_p at 1m)	77	61	61	58	51	47	44	42	59
Condenser (CU02 - 06) (L_p at 1m)	69	64	64	62	57	52	47	40	63
Condenser (CU07) (L_p at 1m)	74	64	67	65	60	55	50	46	66
AHU 1 Fresh air intake (L_w)	81	80	72	68	61	58	52	50	70
AHU 1 Exhaust (L_w)	76	76	70	66	67	63	57	50	71
AHU 1 case breakout (L_w)	68	65	59	38	33	29	24	17	53
AHU 2 Fresh air intake (L_w)	76	74	73	72	65	62	57	55	72
AHU 2 Exhaust (L_w)	70	72	73	72	72	71	62	57	77
AHU 2 case breakout (L_w)	63	60	60	42	38	36	29	23	53

5.2 Assessment

5.2.1 Nearest noise sensitive premises

The nearest noise sensitive premises are:

- 7 Bleeding Heart Yard
- 30 Greville Street
- 25 – 27 Farringdon Road

5.2.2 Plant operational hours

The plant will operate between 07:00 and 22:30 Monday to Saturday and 09:00 to 22:30 on Sundays / Bank Holidays.

5.2.3 Cumulative noise emission calculation summary

Cumulative noise emission results for each noise sensitive premises are given in Table 4

Full calculation stages are provided in Appendix B.

Based on the proposed operational hours noise emissions have been assessed against the weekend daytime noise limit given in Table 1.

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

The calculations consider any reduction in noise due to duct losses, distance, screening from building massing and in-duct attenuators.

Table 4 Cumulative noise emission levels at the nearest noise sensitive premises

	Calculated sound pressure level at 1 m from facade, L_{Aeq} (dB)		
Plant item	7 Bleeding Heart Yard	30 Greville Street	25 – 27 Farringdon Road
ASHP	17	22	23
Condenser (CU01)	25	29	29
Condenser (CU02 - 06)	34	33	40
Condenser (CU07)	30	29	34
AHU 1 Fresh air intake	26[1]	20[1]	12[1]
AHU 1 Exhaust	21[1]	8[1]	8[1]
AHU 1 case breakout	23	16	12
AHU 2 Fresh air intake	28[1]	21[1]	15[1]
AHU 2 Exhaust	30[1]	16[1]	18[1]
AHU 2 case breakout	18	12	11
Toilet extract fans (EF01)	34[2]	27[2]	25[2]
Toilet extract fans (EF02)	34[2]	27[2]	25[2]
Restaurant extract fan	31[3]	22[3]	25[3]
Restaurant supply fan	31[3]	22[3]	25[3]
Kitchen extract fan	31[3]	22[3]	25[3]
Kitchen supply fan	31[3]	22[3]	25[3]
Cumulative noise level	42	37	42

[1] Including in-duct attenuator.

[2] Based on a fan selection not exceeding a sound power noise limit of L_w 60 dBA at the atmosphere termination.

[3] Based on a fan selection not exceeding a sound power noise limit of L_w 57 dBA at the atmosphere termination.

5.2.4 Required mitigation measures

To comply with the requirements of Planning Condition 15 the attenuation measures set out below are necessary.

AHU-1 and AHU-2 require in-duct attenuation in both the fresh air intake (FAI) and exhaust (EXH) branches. Minimum insertion losses and indicative sizing for the attenuators are given in Table 5.

Each selection for the toilet extract fans (EF01 and EF02) must not exceed a sound power noise limit of L_w 60 dBA at the atmosphere termination. This includes any reduction in noise due duct losses and in-duct attenuators.

Each selection for the restaurant and kitchen extract and supply fans must not exceed a sound power noise limit of L_w 57 dBA at the atmosphere termination. This includes any reduction in noise due duct losses and in-duct attenuators.

Table 5 AHU-1 and AHU-2 – indicative attenuator requirements

Branch	Typical dimensions (mm)			Octave-band centre frequency (Hz)							
	W	H	L	63	125	250	500	1k	2k	4k	8k
FAI and EXH	600	400	600	3	5	10	17	16	12	8	5

5.3 Conclusion

An assessment of the noise emissions from the proposed plant items has been undertaken at the nearest noise sensitive premises. If the required mitigation measures are undertaken noise emissions from the proposed plant will not exceed the requirements of Planning Condition 15 at any time.

Appendix A - Glossary of terms

Sound levels

The following is a list of terms used in this report described:

dB Decibel - A logarithmic scale applied to acoustic units such as sound pressure and sound power.

dB(A) The sound level in dB incorporating a frequency weighting (“A” weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Values in dB(A) broadly agree with people’s assessment of loudness.

Hertz (Hz) – Unit of frequency, equal to one cycle per second, related to the pitch of a sound.

L_{PA} The "A" weighted sound pressure level in dB (re 20 Pa). This value must be accompanied by a distance from the source.

L_{WA} The "A" weighted sound power level in dB (re 1 picowatt).

$L_{A90,T}$ The "A" weighted sound pressure level exceeded 90% of the measurement period (T) over which a noise is measured. It is used in BS 4142 to define "background noise level".

$L_{Aeq,T}$ Equivalent "A" Weighted sound pressure level of a steady noise that has the same acoustic energy as a fluctuating noise over the measurement period. It can be considered the average noise level.

L_{Amax} The highest “A" weighted sound pressure level measured in the period with either fast (L_{AFmax}) or slow (L_{ASmax}) time weightings.

Appendix B – Calculation stages

7 Bleeding Heart Yard

Comments	Octave band centre frequency (Hz)								Rating 1		Rating 2
	63	125	250	500	1k	2k	4k	8k			
ASHP											
ASHP Lp at 1m	57	58	54	51	48	43	39	35	L_A=	53	
Distance correction (17 m)	-25	-25	-25	-25	-25	-25	-25	-25			
Screening from building massing	-8	-9	-12	-15	-18	-21	-24	-24			
Facade correction	3	3	3	3	3	3	3	3			
ASHP Lp at premises 1	**28**	**26**	**21**	**15**	**9**	**1**	**-6**	**-11**	**L_A=**	**17**	
CU01											
CU01 Lp at 1m	77	61	61	58	51	47	44	42	L_A=	59	
Distance correction (17 m)	-25	-25	-25	-25	-25	-25	-25	-25			
Screening from building massing	-8	-9	-12	-15	-18	-21	-24	-24			
Facade correction	3	3	3	3	3	3	3	3			
CU01 Lp at premises 1	**48**	**30**	**27**	**21**	**12**	**4**	**-1**	**-4**	**L_A=**	**25**	
CU02 to 06											
CU02 Lp at 1m	69	64	64	62	57	52	47	40	L_A=	63	
CU03 Lp at 1m	69	64	64	62	57	52	47	40	L_A=	63	
CU04 Lp at 1m	69	64	64	62	57	52	47	40	L_A=	63	
CU05 Lp at 1m	69	64	64	62	57	52	47	40	L_A=	63	
CU06 Lp at 1m	69	64	64	62	57	52	47	40	L_A=	63	
Lp sum	76	70	71	68	63	58	53	47	L_A=	70	
Distance correction (17 m)	-25	-25	-25	-25	-25	-25	-25	-25			
Screening from building massing	-8	-9	-12	-15	-18	-21	-24	-24			
Facade correction	3	3	3	3	3	3	3	3			
CU02 to 06 Lp at premises 1	**47**	**39**	**38**	**32**	**24**	**16**	**8**	**1**	**L_A=**	**34**	
CU07											
CU07 Lp at 1m	74	64	67	65	60	55	50	46	L_A=	66	
Distance correction (17 m)	-25	-25	-25	-25	-25	-25	-25	-25			
Screening from building massing	-8	-9	-12	-15	-18	-21	-24	-24			
Facade correction	3	3	3	3	3	3	3	3			
CU07 Lp at premises 1	**45**	**33**	**34**	**29**	**21**	**13**	**5**	**0**	**L_A=**	**30**	
AHU01											
AHU-01 FAI											
AHU-01 FAI Lw	81	80	72	68	61	58	52	50	L_A=	70	
Duct losses	-10	-5	-2	-1	0	0	0	0			
Distance correction (10 m)	-20	-20	-20	-20	-20	-20	-20	-20			
Directivity (Q = 2)	3	3	3	3	3	3	3	3			
-11	-11	-11	-11	-11	-11	-11	-11	-11			
Directivity (90 degrees)	-2	-2	-2	-2	-2	-2	-2	-2			
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5			
Attenuator	-3	-5	-10	-17	-16	-12	-8	-5			
Facade correction	3	3	3	3	3	3	3	3			
AHU-01 FAI Lp at premises 1	**36**	**38**	**28**	**18**	**13**	**14**	**12**	**13**	**L_A=**	**26**	
AHU-01 Exhaust											
AHU-01 Exhaust Lw	76	76	70	66	67	63	57	50	L_A=	71	
Duct losses	-13	-9	-11	-13	-9	-8	-8	-8			
Distance correction (10 m)	-20	-20	-20	-20	-20	-20	-20	-20			
Directivity (Q = 2)	3	3	3	3	3	3	3	3			
-11	-11	-11	-11	-11	-11	-11	-11	-11			
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5			
Attenuator	-3	-5	-10	-17	-16	-12	-8	-5			

Facade correction	3	3	3	3	3	3	3	3		
AHU-01 EXH Lp at premises 1	**30**	**32**	**19**	**6**	**12**	**13**	**11**	**7**	**L_A=**	**21**
AHU-01 Breakout										
AHU-01 breakout Lw	68	65	59	38	33	29	24	17	L_A=	53
5-sided box calc at 10m (see calc)	-32	-32	-32	-32	-32	-32	-32	-32		
Directivity (Q = 2)	3	3	3	3	3	3	3	3		
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5		
Facade correction	3	3	3	3	3	3	3	3		
AHU-01 breakout Lp at premises 1	**37**	**34**	**28**	**7**	**2**	**-2**	**-7**	**-14**	**L_A=**	**23**
AHU-02										
AHU-02 FAI										
AHU-02 FAI Lw	76	74	73	72	65	62	57	55	L_A=	72
Duct losses	-8	-4	-1	0	0	0	0	0		
Distance correction (9 m)	-19	-19	-19	-19	-19	-19	-19	-19		
Directivity (Q = 2)	3	3	3	3	3	3	3	3		
-11	-11	-11	-11	-11	-11	-11	-11	-11		
Directivity (90 degrees)	-2	-2	-2	-2	-2	-2	-2	-2		
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5		
Attenuator	-3	-5	-10	-17	-16	-12	-8	-5		
Facade correction	3	3	3	3	3	3	3	3		
AHU-02 FAI Lp at premises 1	**34**	**34**	**31**	**24**	**18**	**19**	**18**	**19**	**L_A=**	**28**
AHU-02 Exhaust										
AHU-02 EXH Lw	70	72	73	72	72	71	62	57	L_A=	77
Duct losses	-10	-6	-6	-7	-4	-4	-4	-4		
Distance correction (9 m)	-19	-19	-19	-19	-19	-19	-19	-19		
Directivity (Q = 2)	3	3	3	3	3	3	3	3		
-11	-11	-11	-11	-11	-11	-11	-11	-11		
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5		
Attenuator	-3	-5	-10	-17	-16	-12	-8	-5		
Facade correction	3	3	3	3	3	3	3	3		
AHU-02 EXH Lp at premises 1	**28**	**32**	**28**	**19**	**23**	**26**	**21**	**19**	**L_A=**	**30**
AHU-02 Breakout										
AHU-02 breakout SWL (no SPL @ 1 m	63	60	60	42	38	36	29	23	L_A=	53
5-sided box calc at 9m	-36	-36	-36	-36	-36	-36	-36	-36		
Directivity (Q = 2)	3	3	3	3	3	3	3	3		
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5		
Facade correction	3	3	3	3	3	3	3	3		
AHU-02 breakout Lp at premises 1	**28**	**25**	**25**	**7**	**3**	**1**	**-6**	**-12**	**L_A=**	**18**
EF01 & 02										
Lw limit									L_A=	60
Distance correction (11 m)										-21
Directivity (Q = 2)										3
-11										-11
Façade reflection										3
No of units (2)										3
EF01 & 02 Lp at premises 1									**L_A=**	**37**
Restaurant & kitchen fans										
Lw limit									L_A=	57
Distance correction (11 m)										-21

Directivity (Q = 2)		3
-11		-11
Façade reflection		3
No of units (4)		6
Restaurant & kitchen fans Lp at premises 1	**L_A=**	**37**
Cumulative Lp at premises 1	**L_A=**	**42**

30 Greville Street

Comments	Octave band centre frequency (Hz)								Rating 1		Rating 2
	63	125	250	500	1k	2k	4k	8k			
ASHP											
ASHP Lp at 1m	57	58	54	51	48	43	39	35	L_A=	53	
Distance correction (21 m)	-26	-26	-26	-26	-26	-26	-26	-26			
Screening from building massing	-5	-6	-6	-7	-8	-10	-13	-16			
Facade correction	3	3	3	3	3	3	3	3			
ASHP Lp at premises 2	**28**	**29**	**25**	**21**	**16**	**9**	**3**	**-4**	**L_A=**	**22**	
CU01											
CU01 Lp at 1m	77	61	61	58	51	47	44	42	L_A=	59	
Distance correction (21 m)	-26	-26	-26	-26	-26	-26	-26	-26			
Screening from building massing	-5	-6	-6	-7	-8	-10	-13	-16			
Facade correction	3	3	3	3	3	3	3	3			
CU01 Lp at premises 2	**48**	**32**	**31**	**27**	**19**	**13**	**8**	**2**	**L_A=**	**29**	
CU02 to 06											
CU02 Lp at 1m	69	64	64	62	57	52	47	40	L_A=	63	
CU03 Lp at 1m	69	64	64	62	57	52	47	40	L_A=	63	
CU04 Lp at 1m	69	64	64	62	57	52	47	40	L_A=	63	
CU05 Lp at 1m	69	64	64	62	57	52	47	40	L_A=	63	
CU06 Lp at 1m	69	64	64	62	57	52	47	40	L_A=	63	
Lp sum	76	70	71	68	63	58	53	47	L_A=	70	
Distance correction (19 m)	-26	-26	-26	-26	-26	-26	-26	-26			
Screening from building massing	-8	-9	-12	-15	-18	-21	-24	-24			
Facade correction	3	3	3	3	3	3	3	3			
CU02 to 06 Lp at premises 2	**46**	**38**	**37**	**31**	**23**	**15**	**7**	**0**	**L_A=**	**33**	
CU07											
CU07 Lp at 1m	74	64	67	65	60	55	50	46	L_A=	66	
Distance correction (19 m)	-26	-26	-26	-26	-26	-26	-26	-26			
Screening from building massing	-8	-9	-12	-15	-18	-21	-24	-24			
Facade correction	3	3	3	3	3	3	3	3			
CU07 Lp at premises 2	**44**	**32**	**33**	**28**	**20**	**12**	**4**	**-1**	**L_A=**	**29**	
AHU01											
AHU-01 FAI											
AHU-01 FAI Lw	81	80	72	68	61	58	52	50	L_A=	70	
Duct losses	-10	-5	-2	-1	0	0	0	0			
Distance correction (24 m)	-28	-28	-28	-28	-28	-28	-28	-28			
Directivity (Q = 2)	3	3	3	3	3	3	3	3			
-11	-11	-11	-11	-11	-11	-11	-11	-11			
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5			
Attenuator	-3	-5	-10	-17	-16	-12	-8	-5			
Facade correction	3	3	3	3	3	3	3	3			
AHU-01 FAI Lp at premises 2	**30**	**32**	**22**	**12**	**7**	**8**	**6**	**7**	**L_A=**	**20**	
AHU-01 Exhaust											
AHU-01 Exhaust Lw	76	76	70	66	67	63	57	50	L_A=	71	
Duct losses	-13	-9	-11	-13	-9	-8	-8	-8			
Distance correction (24 m)	-28	-28	-28	-28	-28	-28	-28	-28			
Directivity (Q = 2)	3	3	3	3	3	3	3	3			
-11	-11	-11	-11	-11	-11	-11	-11	-11			
Directivity correction (180 degrees)	-5	-5	-5	-5	-5	-5	-5	-5			
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5			
Attenuator	-3	-5	-10	-17	-16	-12	-8	-5			

Facade correction	3	3	3	3	3	3	3	3		
AHU-01 EXH Lp at premises 2	**17**	**19**	**6**	**-7**	**-1**	**0**	**-2**	**-6**	**L_A=**	**8**
AHU-01 Breakout										
AHU-01 breakout Lw	68	65	59	38	33	29	24	17	L_A=	53
5-sided box calc at 24m	-39	-39	-39	-39	-39	-39	-39	-39		
Directivity (Q = 2)	3	3	3	3	3	3	3	3		
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5		
Facade correction	3	3	3	3	3	3	3	3		
AHU-01 breakout Lp at premises 2	**30**	**27**	**21**	**0**	**-5**	**-9**	**-14**	**-21**	**L_A=**	**16**
AHU-02										
AHU-02 FAI										
AHU-02 FAI Lw	76	74	73	72	65	62	57	55	L_A=	72
Duct losses	-8	-4	-1	0	0	0	0	0		
Distance correction (27 m)	-29	-29	-29	-29	-29	-29	-29	-29		
Directivity (Q = 2)	3	3	3	3	3	3	3	3		
-11	-11	-11	-11	-11	-11	-11	-11	-11		
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5		
Attenuator	-3	-5	-10	-17	-16	-12	-8	-5		
Facade correction	3	3	3	3	3	3	3	3		
AHU-02 FAI Lp at premises 2	**26**	**26**	**23**	**16**	**10**	**11**	**10**	**11**	**L_A=**	**21**
AHU-02 Exhaust										
AHU-02 EXH Lw	70	72	73	72	72	71	62	57	L_A=	77
Duct losses	-10	-6	-6	-7	-4	-4	-4	-4		
Distance correction (27 m)	-29	-29	-29	-29	-29	-29	-29	-29		
Directivity (Q = 2)	3	3	3	3	3	3	3	3		
-11	-11	-11	-11	-11	-11	-11	-11	-11		
Directivity correction (180 degrees)	-5	-5	-5	-5	-5	-5	-5	-5		
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5		
Attenuator	-3	-5	-10	-17	-16	-12	-8	-5		
Facade correction	3	3	3	3	3	3	3	3		
AHU-02 EXH Lp at premises 2	**13**	**17**	**13**	**4**	**8**	**11**	**6**	**4**	**L_A=**	**16**
AHU-02 Breakout										
AHU-02 breakout SWL (no SPL @ 1 m	63	60	60	42	38	36	29	23	L_A=	53
5-sided box calc at 27m	-42	-42	-42	-42	-42	-42	-42	-42		
Directivity (Q = 2)	3	3	3	3	3	3	3	3		
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5		
Facade correction	3	3	3	3	3	3	3	3		
AHU-02 breakout Lp at premises 2	**22**	**19**	**19**	**1**	**-3**	**-5**	**-12**	**-18**	**L_A=**	**12**
EF01 & 02										
Lw limit									L_A=	60
Distance correction (26 m)										-28
Directivity (Q = 2)										3
-11										-11
Façade reflection										3
No of units (2)										3
EF01 & 02 Lp at premises 2									**L_A=**	**30**
Restaurant & kitchen fans										
Lw limit									L_A=	57
Distance correction (32 m)										-30

Directivity (Q = 2)		3
-11		-11
Façade reflection		3
No of units (4)		6
Restaurant & kitchen fans Lp at premises 2	**L_A=**	**28**
Cumulative Lp at premises 2	**L_A=**	**37**

25 – 27 Farringdon Road

Comments	Octave band centre frequency (Hz)								Rating 1		Rating 2
	63	125	250	500	1k	2k	4k	8k			
ASHP											
ASHP Lp at 1m	57	58	54	51	48	43	39	35	L_A=	53	
Distance correction (25 m)	-28	-28	-28	-28	-28	-28	-28	-28			
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5			
Facade correction	3	3	3	3	3	3	3	3			
ASHP Lp at premises 3	**27**	**28**	**24**	**21**	**18**	**13**	**9**	**5**	**L_A=**	**23**	
CU01											
CU01 Lp at 1m	77	61	61	58	51	47	44	42	L_A=	59	
Distance correction (25 m)	-28	-28	-28	-28	-28	-28	-28	-28			
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5			
Facade correction	3	3	3	3	3	3	3	3			
CU01 Lp at premises 3	**47**	**31**	**31**	**28**	**21**	**17**	**14**	**12**	**L_A=**	**29**	
CU02 to 06											
CU02 Lp at 1m	69	64	64	62	57	52	47	40	L_A=	63	
CU03 Lp at 1m	69	64	64	62	57	52	47	40	L_A=	63	
CU04 Lp at 1m	69	64	64	62	57	52	47	40	L_A=	63	
CU05 Lp at 1m	69	64	64	62	57	52	47	40	L_A=	63	
CU06 Lp at 1m	69	64	64	62	57	52	47	40	L_A=	63	
Lp sum	76	70	71	68	63	58	53	47	L_A=	70	
Distance correction (25 m)	-28	-28	-28	-28	-28	-28	-28	-28			
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5			
Facade correction	3	3	3	3	3	3	3	3			
CU02 to 06 Lp at premises 3	**46**	**41**	**41**	**39**	**34**	**29**	**24**	**17**	**L_A=**	**40**	
CU07											
CU07 Lp at 1m	74	64	67	65	60	55	50	46	L_A=	66	
Distance correction (31 m)	-30	-30	-30	-30	-30	-30	-30	-30			
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5			
Facade correction	3	3	3	3	3	3	3	3			
CU07 Lp at premises 3	**42**	**32**	**35**	**33**	**28**	**23**	**18**	**14**	**L_A=**	**34**	
AHU01											
AHU-01 FAI											
AHU-01 FAI Lw	81	80	72	68	61	58	52	50	L_A=	70	
Duct losses	-10	-5	-2	-1	0	0	0	0			
Distance correction (34 m)	-31	-31	-31	-31	-31	-31	-31	-31			
Directivity (Q = 2)	3	3	3	3	3	3	3	3			
-11	-11	-11	-11	-11	-11	-11	-11	-11			
Directivity correction (180 degrees)	-5	-5	-5	-5	-5	-5	-5	-5			
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5			
Attenuator	-3	-5	-10	-17	-16	-12	-8	-5			
Facade correction	3	3	3	3	3	3	3	3			
AHU-01 FAI Lp at premises 3	**22**	**24**	**14**	**4**	**-1**	**0**	**-2**	**-1**	**L_A=**	**12**	
AHU-01 Exhaust											
AHU-01 Exhaust Lw	76	76	70	66	67	63	57	50	L_A=	71	
Duct losses	-13	-9	-11	-13	-9	-8	-8	-8			
Distance correction (34 m)	-31	-31	-31	-31	-31	-31	-31	-31			
Directivity (Q = 2)	3	3	3	3	3	3	3	3			
-11	-11	-11	-11	-11	-11	-11	-11	-11			
Directivity correction (90 degrees)	-2	-2	-2	-2	-2	-2	-2	-2			
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5			

Attenuator	-3	-5	-10	-17	-16	-12	-8	-5		
Facade correction	3	3	3	3	3	3	3	3		
AHU-01 EXH Lp at premises 3	**17**	**19**	**6**	**-7**	**-1**	**0**	**-2**	**-6**	**L_A=**	**8**
AHU-01 Breakout										
AHU-01 breakout Lw	68	65	59	38	33	29	24	17	L_A=	53
5-sided box calc at 34m	-42	-42	-42	-42	-42	-42	-42	-42		
Directivity (Q = 2)	3	3	3	3	3	3	3	3		
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5		
Facade correction	3	3	3	3	3	3	3	3		
AHU-01 breakout Lp at premises 3	**27**	**24**	**18**	**-3**	**-8**	**-12**	**-17**	**-24**	**L_A=**	**12**
AHU-02										
AHU-02 FAI										
AHU-02 FAI Lw	76	74	73	72	65	62	57	55	L_A=	72
Duct losses	-8	-4	-1	0	0	0	0	0		
Distance correction (30 m)	-30	-30	-30	-30	-30	-30	-30	-30		
Directivity (Q = 2)	3	3	3	3	3	3	3	3		
-11	-11	-11	-11	-11	-11	-11	-11	-11		
Directivity correction (180 degrees)	-5	-5	-5	-5	-5	-5	-5	-5		
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5		
Attenuator	-3	-5	-10	-17	-16	-12	-8	-5		
Facade correction	3	3	3	3	3	3	3	3		
AHU-02 FAI Lp at premises 3	**20**	**20**	**17**	**10**	**4**	**5**	**4**	**5**	**L_A=**	**15**
AHU-02 Exhaust										
AHU-02 EXH Lw	70	72	73	72	72	71	62	57	L_A=	77
Duct losses	-10	-6	-6	-7	-4	-4	-4	-4		
Distance correction (30 m)	-30	-30	-30	-30	-30	-30	-30	-30		
Directivity (Q = 2)	3	3	3	3	3	3	3	3		
-11	-11	-11	-11	-11	-11	-11	-11	-11		
Directivity correction (90 degrees)	-2	-2	-2	-2	-2	-2	-2	-2		
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5		
Attenuator	-3	-5	-10	-17	-16	-12	-8	-5		
Facade correction	3	3	3	3	3	3	3	3		
AHU-02 EXH Lp at premises 3	**15**	**19**	**15**	**6**	**10**	**13**	**8**	**6**	**L_A=**	**18**
AHU-02 Breakout										
AHU-02 breakout SWL (no SPL @ 1 m	63	60	60	42	38	36	29	23	L_A=	53
5-sided box calc at 30m	-43	-43	-43	-43	-43	-43	-43	-43		
Directivity (Q = 2)	3	3	3	3	3	3	3	3		
Near line of sight screening	-5	-5	-5	-5	-5	-5	-5	-5		
Facade correction	3	3	3	3	3	3	3	3		
AHU-02 breakout Lp at premises 3	**21**	**18**	**18**	**0**	**-4**	**-6**	**-13**	**-19**	**L_A=**	**11**
EF01 & 02										
Lw limit									L_A=	60
Distance correction (26 m)										-30
Directivity (Q = 2)										3
-11										-11
Façade reflection										3
No of units (2)										3
EF01 & 02 Lp at premises 3									**L_A=**	**28**
Restaurant & kitchen fans										

Lw limit	L_A=	57
Distance correction (32 m)		-27
Directivity (Q = 2)		3
-11		-11
Façade reflection		3
No of units (4)		6
Restaurant & kitchen fans Lp at premises 3	**L_A=**	**31**
Cumulative Lp at premises 3	**L_A=**	**42**