clarke saunders | acoustics
specialist consultants

REPORT AS9143.161013.NIA

10-11 LINCOLN'S INN FIELDS
LONDON

NOISE IMPACT ASSESSMENT

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List of Attachments

1.0 INTRODUCTION

Planning approval is being sought for the installation of new (replacement) plant at 10-11 Lincoln's Inn Fields, London.

Clarke Saunders Associates has been commissioned by Dunmore Investments Limited to undertake an environmental noise survey in order to measure the prevailing background noise climate at the site. The background noise levels measured will be used to determine daytime and night-time noise emission limits for new building services plant in accordance with the planning requirements of Camden Council.

2.0 SURVEY PROCEDURE & EQUIPMENT

A survey of the existing background noise levels was undertaken on the 2nd floor flat roof of the existing building at the location shown in site plan AS9143/SP1. Measurements of consecutive 5-minute L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels were taken between 12:00 hours on Tuesday 11th and 11:05 hours on Thursday 13th October 2016.

These measurements will allow suitable noise criteria to be set for the new building services plant, dependent on hours of operation.

The following equipment was used during the course of the survey:

- Rion data logging sound level meter type NA28;
- Rion sound level calibrator type NC-74.

The calibration of the sound level meter was verified before and after use. No significant calibration drift was detected.

The weather during the survey was mainly dry with light winds, which made the conditions suitable for the measurement of environmental noise.

Measurements were made generally in accordance with ISO 1996-2:2007 *Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels*.

Please refer to Appendix A for details of the acoustic terminology used throughout this report.

3.0 RESULTS

Figures AS9143/TH1-TH2 show the L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels as time histories at the measurement position.

4.0 DISCUSSION

The background noise climate at the property is determined by existing building services plant in the area and road traffic noise in the surrounding streets. The original consented plant associated with 10-11 Lincoln's Inn Fields had been removed at the time of the survey and therefore was not operational.

The dominant noise source is from extract plant associated with the Rosewood Hotel, which discharges at basement/street level on Whetstone Park. The microphone for the survey was positioned such that the background noise levels captured would be as similar as possible to those that would be expected on the hotel façade (the nearest sensitive receptor), had logistics allowed for this i.e. there was no direct line of sight between the microphone and the hotel extract louvres.

Measured minimum background noise levels are shown in Table 4.1 below.

Monitoring period	Minimum $L_{A90,5mins}$
07:00 - 23:00 hours	49 dB 12-10-16 22:55
23:00 - 07:00 hours	45 dB 13-10-16 3:40

Table 4.1 - Minimum measured background and average noise levels **[dB ref.**

5.0 DESIGN CRITERIA

5.1 Local Authority Requirements

It is understood that Camden Council currently requires new plant to be 5dB below the background level:

> *Noise levels at a point 1 metre external to sensitive facades shall be at least 5dB(A) less than the existing background measurement (L_{A90}), expressed in dB(A) when all plant/equipment (or any part of it) is in operation unless the plant/equipment hereby permitted will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters, thumps), then the noise levels from that piece of plant/equipment at any sensitive façade shall be at least 10dB(A) below the L_{A90}, expressed in dB(A).*

It is not expected that tonal noise will be generated by the proposed plant units and so the plant noise emissions criteria that should not be exceeded at the nearest noise sensitive receiver should be set to the proposed levels detailed in Table 5.1.

Location	Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
Nearest Sensitive Receptor	L_{Aeq} 44 dB	L_{Aeq} 40 dB

Table 5.1 - Proposed design noise criteria **[dB ref. 20µPa]**

5.2 BS8233:2014 *Guidance on sound insulation and noise reduction for buildings*

The guidance in this document indicates suitable noise levels for various activities within residential and commercial buildings.

The relevant sections of this standard are shown in the following table:

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq, 16\ hour}$	-
Dining	Dining Room	40 dB $L_{Aeq, 16\ hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16\ hour}$	30 dB $L_{Aeq, 8\ hour}$

Table 5.2 - Excerpt from BS8233: 2014 **[dB ref. 20µPa]**

6.0 PREDICTED NOISE IMPACT

6.1 Proposed plant

The selected replacement air-conditioning plant has been confirmed as:

- 6 no. Daikin VRV Condensing Units Type REYQ8T;
- 1 no. Daikin VRV Condensing Units Type REYQ12T;
- 1 no. Daikin Split System Condensing Units Type RXS50L;
- 1 no. Daikin Split System Condensing Units Type ERQ125/AV1.

Noise levels generated by the condensers to be installed have been confirmed by the manufacturer as follows:

Freq (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
Lp @ 1m (dB)	60	58	58	57	52	47	49	38	58
	59	66	60	62	54	50	44	37	61
	46	47	44	40	37	34	26	18	42
	63	55	54	52	48	43	37	31	53

Table 6.1 - Source noise data **[dB ref. 20µPa]**

The location of the plant to be installed is shown on site plan AS9143/SP1.

6.2 Predicted noise levels

The plant is proposed to be in use during normal office hours only. No night-time (i.e. 23:00 – 07:00) use is anticipated; however the assessment has been carried out for night-time as well as daytime for robustness. It has been assumed that the units would be operating at half duty during the night-time.

The nearest noise sensitive receptor is the Rosewood Hotel, as shown on the indicative site plan AS9143/SP1.

All floor levels up to and including Level 4 will benefit from screening by the plant enclosure, which provides a barrier 2m above the flat roof level. The windows on Level 5 do not benefit from any barrier screening.

The cumulative noise levels at the most affected receptor positions have been assessed following procedures in BS4142:2014 *Methods for rating and assessing industrial and commercial sound*, using the noise data above. These are shown below for daytime and night-time in Table 6.2 and Table 6.3 respectively.

Location	Predicted Noise Level, $L_{eq,T}$	Daytime Criterion (07:00 – 23:00 hours)
Rosewood Hotel 2nd Floor	L_{Aeq} 40 dB	L_{Aeq} 44 dB
Rosewood Hotel 4th Floor	L_{Aeq} 39 dB	
Rosewood Hotel 5th Floor	L_{Aeq} 42 dB	

Table 6.2 – Predicted Noise Level and Criteria Summary - DAYTIME **[dB ref. 20µPa]**

Location	Predicted Noise Level, $L_{eq,T}$	Night-time (23:00 – 07:00 hours)
Rosewood Hotel 2nd Floor	L_{Aeq} 37 dB	L_{Aeq} 40 dB
Rosewood Hotel 4th Floor	L_{Aeq} 36 dB	
Rosewood Hotel 5th Floor	L_{Aeq} 39 dB	

Table 6.3 – Predicted Noise Level and Criteria Summary – NIGHT-TIME **[dB ref. 20µPa]**

A summary of calculations is shown for Level 2, Level 4 and Level 5 in Appendices B.1, B.2 and B.3 respectively.

6.3 Comparison to BS8233:2014 Criteria

Tables 6.2 and 6.3 clearly show that predicted noise levels from the plant are within the BS8233 internal noise criteria.

BS8233 assumes a loss of approximately 15dB for a partially open window. The external noise levels shown in Tables 6.2 and 6.3 would result in an internal noise levels that would meet the levels shown in Table 5.2.

7.0 CONCLUSION

An environmental noise survey has been undertaken at 10-11 Lincolns Inn Fields, London by Clarke Saunders Associates between Tuesday 11th and Thursday 13th October 2016.

Measurements have been made to establish the current background noise climate. This has enabled daytime and night-time design criteria to be set for the control of plant noise emissions to noise sensitive properties, in accordance with Camden Council's requirements.

Data for replacement air conditioning units have been used to predict the noise impact of the new plant on neighbouring noise sensitive properties.

Compliance with the noise emission design criterion has been demonstrated. No further mitigation measures are, therefore, required for external noise emissions.

Mary Day

Mary Day MIOA

CLARKE SAUNDERS ASSOCIATES

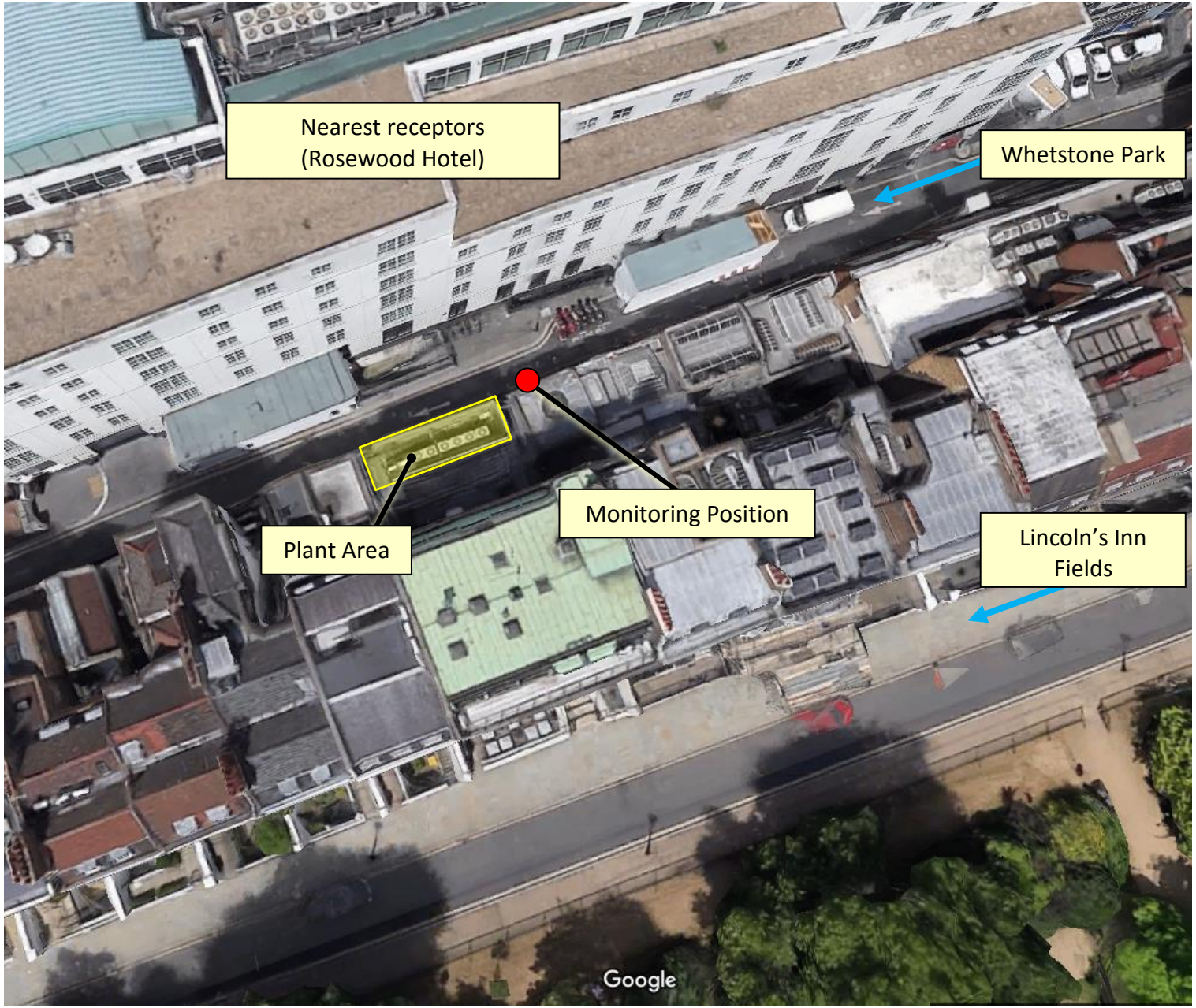
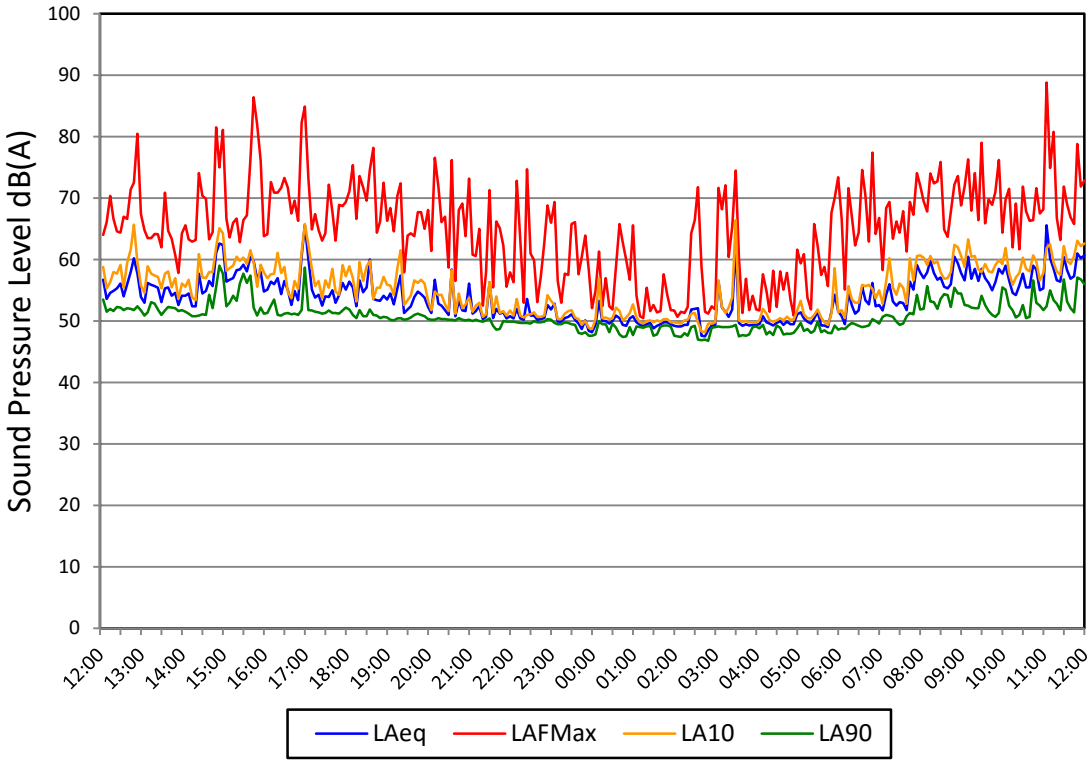


Figure AS9143/SP1

10-11 Lincoln's Inn Fields, London

Environmental Noise Time History

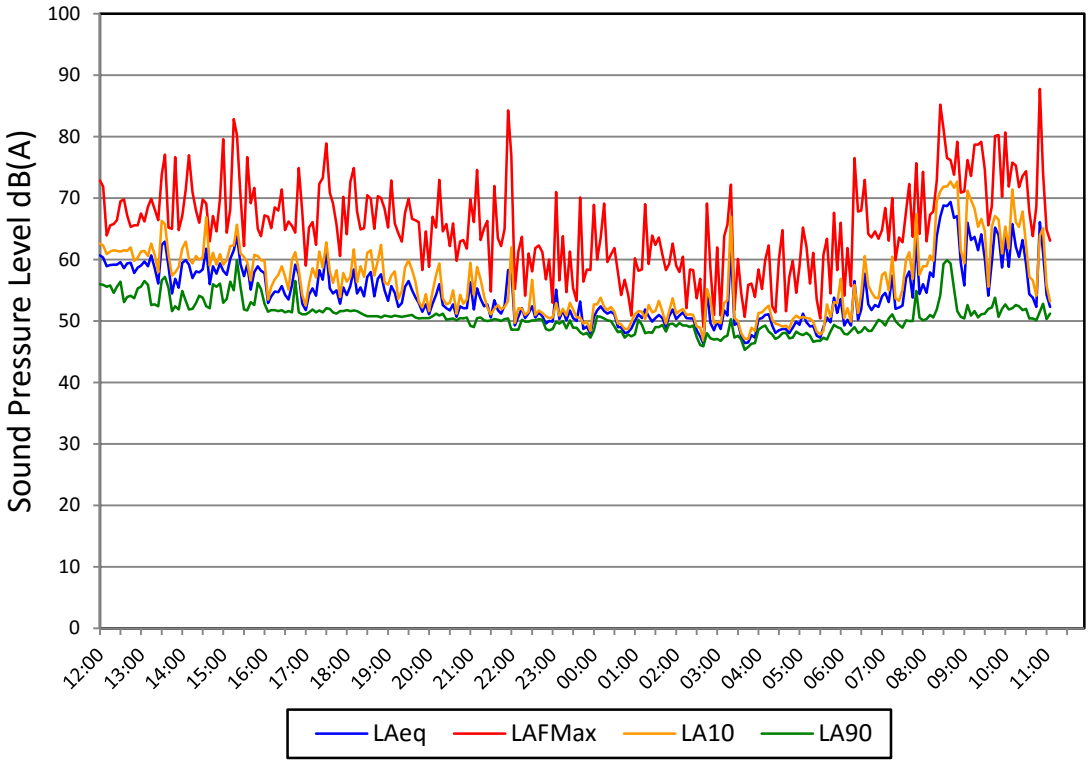


Tuesday 11 October to Wednesday 12 October 2016

Figure AS9143/TH1

10-11 Lincoln's Inn Fields, London

Environmental Noise Time History



Wednesday 12 October to Thursday 13 October 2016

Figure AS9143/TH2

APPENDIX A

ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND SOUND

1.1 Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

Sound	Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.
Noise	Sound that is unwanted by or disturbing to the perceiver.
Frequency	The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.
dB(A):	Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or L_A.
L_{eq} :	A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc). The concept of L_{eq} (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction. Because L_{eq} is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.
L_{10} & L_{90} :	Statistical L_n indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, L_{10} is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, L_{90} is the typical minimum level and is often used to describe background noise. It is common practice to use the L_{10} index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.

1.2 Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band. In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000

1.3 Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from

traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in environmental sound level can be given.

INTERPRETATION

Change in Sound Level dB	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

1.4 Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in sound level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a tall barrier exists between a sound source and a listener, with the barrier close to the listener, the listener will perceive the sound as being louder if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the sound would seem quieter than if he were standing. This is explained by the fact that the "effective screen height" is changing with the three cases above. In general, the greater the effective screen height, the greater the perceived reduction in sound level.

Similarly, the attenuation provided by a barrier will be greater where it is aligned close to either the source or the listener than where the barrier is midway between the two.

APPENDIX B.1
AS9143 - 10-11 Lincoln's Inn Fields, London
Noise Impact Assessment To Rosewood Hotel (Level 2)

CU01 & CU02		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin REYQ8T	Lp @ 1m	60	58	58	57	52	47	49	38	**58**
No. of units	2	3	3	3	3	3	3	3	3	
Total		63	61	61	60	55	50	52	41	
Distance Loss	To 9m	-19	-19	-19	-19	-19	-19	-19	-19	
Minimum Directivity Loss		-3	-3	-3	-3	-3	-3	-3	-3	
Minimum Screening Loss		-8	-9	-11	-14	-17	-18	-18	-18	
Level at receiver		34	30	28	24	16	28	30	19	**34**

CU03		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
REYQ12T	Lp @ 1m	59	66	60	62	54	50	44	37	**61**
Distance Loss	To 8m	-18	-18	-18	-18	-18	-18	-18	-18	
Minimum Directivity Loss		-3	-3	-3	-3	-3	-3	-3	-3	
Minimum Screening Loss		-8	-9	-12	-14	-17	-18	-18	-18	
Level at receiver		30	36	28	26	16	29	23	16	**32**

CU04 & CU05		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin REYQ8T	Lp @ 1m	60	58	58	57	52	47	49	38	**58**
No. of units	2	3	3	3	3	3	3	3	3	
Total		63	61	61	60	55	50	52	41	
Distance Loss	To 8m	-18	-18	-18	-18	-18	-18	-18	-18	
Minimum Directivity Loss		-3	-3	-3	-3	-3	-3	-3	-3	
Minimum Screening Loss		-8	-9	-12	-14	-17	-18	-18	-18	
Level at receiver		34	31	29	25	17	29	31	20	**35**

CU06 & CU07		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin REYQ8T	Lp @ 1m	60	58	58	57	52	47	49	38	**58**
No. of units	2	3	3	3	3	3	3	3	3	
Total		63	61	61	60	55	50	52	41	
Distance Loss	To 8m	-18	-18	-18	-18	-18	-18	-18	-18	
Minimum Directivity Loss		-3	-3	-3	-3	-3	-3	-3	-3	
Minimum Screening Loss		-8	-9	-11	-14	-17	-18	-18	-18	
Level at receiver		34	30	28	25	17	28	30	20	**34**

CU08		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin RXS50L	Lp @ 1m	46	47	44	40	37	34	26	18	**42**
Distance Loss	To 8m	-18	-18	-18	-18	-18	-18	-18	-18	
Minimum Screening Loss		-8	-10	-12	-15	-18	-18	-18	-18	
Level at receiver		20	19	13	6	1	15	7	0	**18**

CU09		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin ERQ125/AV1	Lp @ 1m	63	55	54	52	48	43	37	31	**53**
Distance Loss	To 10m	-20	-20	-20	-20	-20	-20	-20	-20	
Minimum Screening Loss		-7	-8	-10	-12	-15	-18	-18	-18	
Level at receiver		37	27	24	20	13	5	17	11	**23**

Cumulative Level at Receiver (Daytime)	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
	41	**39**	**35**	**32**	**23**	**34**	**35**	**25**	**40**
							Daytime Criterion		**44**

Cumulative Level at Receiver (Night-time)	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
	38	**36**	**32**	**29**	**20**	**31**	**32**	**22**	**37**
(Includes for 50% duty)							**Night-time Criterion**		**40**

APPENDIX B.2
AS9143 - 10-11 Lincoln's Inn Fields, London
Noise Impact Assessment To Rosewood Hotel (Level 4)

CU01 & CU02		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin REYQ8T	Lp @ 1m	60	58	58	57	52	47	49	38	**58**
No. of units	2	3	3	3	3	3	3	3	3	
Total		63	61	61	60	55	50	52	41	
Distance Loss	To 11m	-21	-21	-21	-21	-21	-21	-21	-21	
Minimum Directivity Loss		-3	-3	-3	-3	-3	-3	-3	-3	
Minimum Screening Loss		-5	-5	-5	-5	-5	-5	-5	-5	
Level at receiver		34	32	32	31	26	21	23	12	**32**

CU03		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
REYQ12T	Lp @ 1m	59	66	60	62	54	50	44	37	**61**
Distance Loss	To 10m	-20	-20	-20	-20	-20	-20	-20	-20	
Minimum Directivity Loss		-3	-3	-3	-3	-3	-3	-3	-3	
Minimum Screening Loss		-5	-5	-5	-5	-5	-5	-5	-5	
Level at receiver		31	38	32	33	25	21	16	9	**33**

CU04 & CU05		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin REYQ8T	Lp @ 1m	60	58	58	57	52	47	49	38	**58**
No. of units	2	3	3	3	3	3	3	3	3	
Total		63	61	61	60	55	50	52	41	
Distance Loss	To 10m	-20	-20	-20	-20	-20	-20	-20	-20	
Minimum Directivity Loss		-3	-3	-3	-3	-3	-3	-3	-3	
Minimum Screening Loss		-5	-5	-5	-5	-5	-5	-5	-5	
Level at receiver		35	33	33	32	26	21	23	13	**33**

CU06 & CU07		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin REYQ8T	Lp @ 1m	60	58	58	57	52	47	49	38	**58**
No. of units	2	3	3	3	3	3	3	3	3	
Total		63	61	61	60	55	50	52	41	
Distance Loss	To 11m	-20	-20	-20	-20	-20	-20	-20	-20	
Minimum Directivity Loss		-3	-3	-3	-3	-3	-3	-3	-3	
Minimum Screening Loss		-5	-5	-5	-5	-5	-5	-5	-5	
Level at receiver		35	33	33	32	26	21	23	13	**33**

CU08		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin RXS50L	Lp @ 1m	46	47	44	40	37	34	26	18	**42**
Distance Loss	To 11m	-21	-21	-21	-21	-21	-21	-21	-21	
Minimum Screening Loss		-5	-5	-5	-5	-5	-5	-5	-5	
Level at receiver		20	21	18	14	11	8	0	0	**16**

CU09		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin ERQ125/AV1	Lp @ 1m	63	55	54	52	48	43	37	31	**53**
Distance Loss	To 12m	-21	-21	-21	-21	-21	-21	-21	-21	
Minimum Screening Loss		-5	-5	-5	-5	-5	-5	-5	-5	
Level at receiver		37	28	28	25	21	16	10	4	**27**

Cumulative Level at Receiver (Daytime)	**42**	**41**	**39**	**38**	**32**	**28**	**28**	**18**	**39**
								Daytime Criterion	**44**

Cumulative Level at Receiver (Night-time)	**39**	**38**	**36**	**35**	**29**	**25**	**25**	**15**	**36**
(Includes for 50% duty)								**Night-time Criterion**	**40**

APPENDIX B.3
AS9143 - 10-11 Lincoln's Inn Fields, London
Noise Impact Assessment To Rosewood Hotel (Level 5)

CU01 & CU02		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin REYQ8T	Lp @ 1m	60	58	58	57	52	47	49	38	**58**
No. of units	2	3	3	3	3	3	3	3	3	
Total		63	61	61	60	55	50	52	41	
Distance Loss	To 13m	-22	-22	-22	-22	-22	-22	-22	-22	
Minimum Directivity Loss		-3	-3	-3	-3	-3	-3	-3	-3	
Level at receiver		38	36	36	35	29	24	26	16	**36**

CU03		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
REYQ12T	Lp @ 1m	59	66	60	62	54	50	44	37	**61**
Distance Loss	To 13m	-22	-22	-22	-22	-22	-22	-22	-22	
Minimum Directivity Loss		-3	-3	-3	-3	-3	-3	-3	-3	
Level at receiver		34	41	35	36	28	24	19	12	**36**

CU04 & CU05		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin REYQ8T	Lp @ 1m	60	58	58	57	52	47	49	38	**58**
No. of units	2	3	3	3	3	3	3	3	3	
Total		63	61	61	60	55	50	52	41	
Distance Loss	To 13m	-22	-22	-22	-22	-22	-22	-22	-22	
Minimum Directivity Loss		-3	-3	-3	-3	-3	-3	-3	-3	
Level at receiver		38	36	36	35	29	24	26	16	**36**

CU06 & CU07		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin REYQ8T	Lp @ 1m	60	58	58	57	52	47	49	38	**58**
No. of units	2	3	3	3	3	3	3	3	3	
Total		63	61	61	60	55	50	52	41	
Distance Loss	To 13m	-22	-22	-22	-22	-22	-22	-22	-22	
Minimum Directivity Loss		-3	-3	-3	-3	-3	-3	-3	-3	
Level at receiver		38	36	36	35	29	24	26	16	**36**

CU08		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin RXS50L	Lp @ 1m	46	47	44	40	37	34	26	18	**42**
Distance Loss	To 13m	-22	-22	-22	-22	-22	-22	-22	-22	
Level at receiver		24	25	21	17	14	11	3	0	**20**

CU09		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin ERQ125/AV1	Lp @ 1m	63	55	54	52	48	43	37	31	**53**
Distance Loss	To 14m	-23	-23	-23	-23	-23	-23	-23	-23	
Level at receiver		40	32	31	29	25	20	14	8	**30**

Cumulative Level at Receiver (Daytime)	**45**	**44**	**42**	**42**	**36**	**31**	**31**	**21**	**42**
								Daytime Criterion	**44**

Cumulative Level at Receiver (Night-time)	**42**	**41**	**39**	**39**	**33**	**28**	**28**	**18**	**39**
(Includes for 50% duty)								**Night-time Criterion**	**40**