Cole Jarman

35 Great Queen Street

Plant Noise Assessment

Report 15/0712/R1

35 Great Queen Street

Plant Noise Assessment

Report 15/0712/R1

Japan Centre Group Limited

8a Kingly Street
Soho
London
W1B 5PQ

Issue	Description	Date	Prepared by	Checked by
0	1st Issue	11th December 2015	Tim Fox	Matthew White

Prepared by

Checked by

Cole Jarman Limited Reg. in England and Wales No. 7102436
t +44 (0)1932 829007 **f** +44 (0)1932 829003
John Cree House, 24B High Street, Addlestone, Surrey, KT15 1TN
e info@colejarman.com **w** www.colejarman.com

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Attachments

1 Introduction

1.1 It is proposed to install new mechanical services plant items on the rear roof as part of the refurbishment of 35 Great Queen Street, London, into a Japan Centre food outlet.

1.2 Cole Jarman have been appointed to carry out a noise survey to quantify background noise levels representative of those at noise sensitive receptors that will potentially be most exposed to the proposed plant.

1.3 This report details the survey that was undertaken and presents the results of a subsequent assessment of plant noise emissions.

2 Site Description

2.1 The site and surrounding area are shown on the attached site plan 15/0712/SP1. The area in which the site is located falls under the jurisdiction of the London Borough of Camden.

2.2 35 Great Queen Street is located in a mixed retail and residential area. The A4200 is located is located to the east of Great Queen Street.

2.3 There is an external first floor rear roof, where the plant is currently proposed to be located. Residential windows from Parker Street overlook this area and will be the most exposed to noise from the proposed plant items.

3 Noise Survey

3.1 **Methodology and Instrumentation**

3.1.1 Unattended noise measurements were taken at a single location over a period of 24 hours commencing at 11h00 on Wednesday 2nd December 2015.

3.1.2 The measurement position is shown on the attached site plan 15/0712/SP1 and described below. It was chosen to quantify background noise levels representative of the nearest noise sensitive receiver.

- MP1 – Free-field position on the rear roof, 1.5m above the roof.

3.1.3 During the survey, measurements of the L_{Aeq}, L_{Amax} and L_{A90} indices were taken over consecutive 15 minute periods (see Glossary of Acoustic Terms for an explanation of the noise units used).

3.1.4 Noise measurements were taken using the equipment listed in table T1.

Item	Manufacturer	Type
Sound Level Analyser	Norsonic	140
Acoustic Calibrator	Norsonic	1251
Weatherproof windshield	Norsonic	1212

T1 Equipment used during unattended noise survey.

3.1.5 The microphone was fitted with a windshield and the sound level meter was calibrated before and after the survey to ensure a consistent and acceptable level of accuracy was maintained throughout. No significant drift in levels was observed.

3.1.6 Weather conditions at the start and finish of the survey period were noted to be mild, mostly clear and dry with little wind and are not believed to have varied significantly throughout.

3.2 Results

3.2.1 The results of the noise survey measurements are shown in the attached time history figure 15/0712/TH01.

3.2.2 When setting up and collecting the unattended monitor, the noise sources affecting the site was noted to be plant items for neighbouring properties. Local traffic noise was also audible.

3.2.3 The minimum daytime and night time background levels recorded are as set out in the following table.

Location	Minimum Background Noise Levels Measured, dB $L_{A90,15min}$	
	Daytime (0700-2300 only)	Night time (2300-0700)
MP1 Rear roof	43	40

T2 Minimum background noise levels measured

4 Plant Noise Limits

4.1 The London Borough of Camden's local development policy DP28 states that noise levels from plant should not exceed 5 dB(A) below the existing minimum background noise level, L_{A90} during the relevant period of operation.

4.2 Hence, the derived plant noise limits for the proposed mechanical services plant are shown in the following table:

Location	Noise Emission Limit, dB	
	Daytime (0700-2300 only)	**Night time (24-hour)**
AP1 Residences overlooking rear roof	38	35

T3 Plant noise emission limits at the nearest residential properties.

4.3 If the noise emitted from the plant items has a distinguishable, discrete continuous tone, then a 5 dB penalty should be applied to the noise limits for the offending plant item.

5 Plant Noise Assessment

5.1 Proposed Installation

5.1.1 It is proposed to install four condensing units on the rear first floor roof. A main supply and extract fan are proposed as well as a toilet extract fan.

5.1.2 A list of the proposed plant and associated noise levels used in the assessment can be found on the attached schedule 15/0712/PNS1.

5.1.3 Octave band data suggests that the condensing units CU1 and CU3 could be tonal in nature, therefore a 5 dB tonality correction has been applied to the offending plant in accordance with the local council requirements.

5.1.4 It has been stated that plant should only be running during the daytime hours and hence the daytime limit has been used for the assessment.

5.2 Assessment

5.2.1 Our calculations have taken into account duct, radiation and distance losses, as well as a façade correction.

5.2.2 Outline mitigation for the plant have been considered to achieve suitable external noise levels.

Supply and Extract Fans

5.2.3 Atmospheric side silencers are specified to the intake for the supply fan, SF1 and to the exhaust for the extract fan, EF1. The silencers must meet the insertion losses specified in the following table.

	Octave Band Centred Frequency (Hz)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Minimum Transmission Loss (dB)	9	17	29	46	50	50	49	34

T4 Minimum octave band transmission losses to be achieved by silencer.

5.2.4 It is expected that these losses would be achieved with a silencer of 1.8m long. However, the insertion losses should be taken as the design criteria, and not the silencer length. Any proposed silencer should be confirmed to achieve the stated insertion losses at a minimum.

5.2.5 It should be ensured, also, that the silencer does not introduce substantial pressure drops such that the fan duty would increase to serve the space, or such that regenerated noise is created across the silencer.

5.2.6 A silencer is not required for the toilet extract fan, EF2.

Condensing Units

5.2.7 For all of the condensing units, an enclosure should be designed for the units, to meet the insertion losses specified in the following table.

	Octave Band Centred Frequency (Hz)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Minimum Transmission Loss (dB)	12	13	20	29	36	37	39	39

T5 Minimum octave band transmission losses to be achieved by enclosure.

5.2.8 Manufactures data shows that these transmission losses can be typically achieved with an *Environ* enclosure. It must be ensured that any enclosure used meets the performance provided within the table above and provides adequate airflow to the units.

Resultant Noise Levels

5.2.9 Based on the mitigation measures described above, we predict noise levels at the assessment position, as present in the table below alongside the plant noise limit. Details of the calculations can be found in the attached Appendix A.

Location	Predicted Noise Level, dB(A)	Plant Noise Emission Limit, dB(A)
AP1 - Residential Residential houses opposite on Park Street	37	38

T6 Proposed plant noise emission levels at the nearest residential windows

5.2.10 The above table shows, with the previously stated mitigation in place, that the noise levels are predicted to meet the criteria of the Local Authority noise emission requirements.

6 Conclusions

6.1 It is proposed to install new mechanical services plant items on the rear roof as part of the refurbishment of 35 Great Queen Street, London, into a Japan Centre food outlet.

6.2 An environmental noise survey has been undertaken at the site in order to quantify the sources and nature of the existing noise climate.

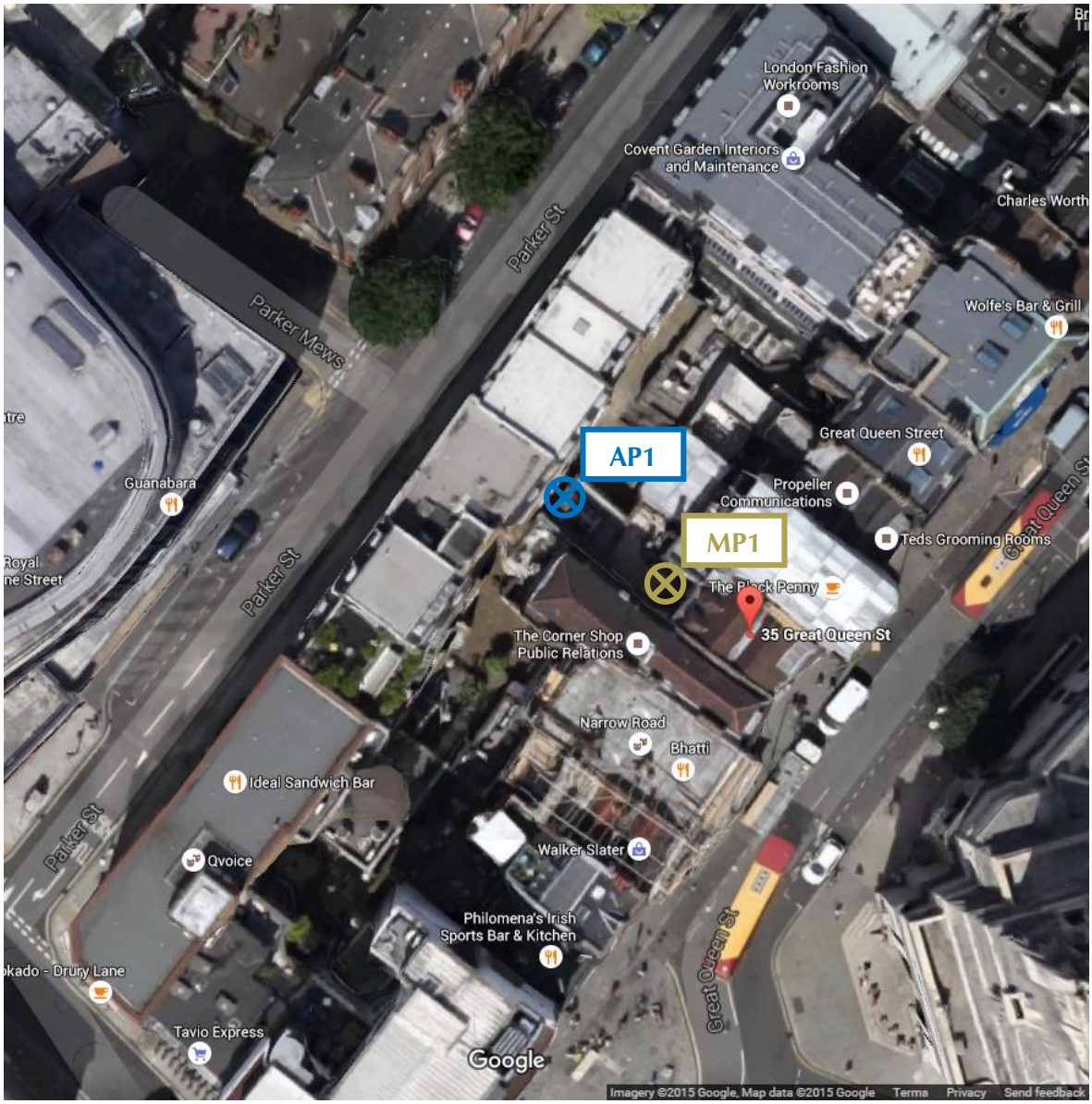
6.3 Based upon the results of the survey, suitable noise emission limits for new mechanical services plant have been proposed in accordance with the Local Authority requirements.

6.4 An assessment of noise from the proposed new plant items has been undertaken to help specify the mitigation required to keep noise levels below the criteria at the nearest residential receptors.

End of Section

Cole Jarman

Figure 15/0712/SP1



Title: Site plan showing measurement and assessment positions

Project: 35 Great Queen Street

Date: December 2015

Scale: Not to scale

Cole Jarman Limited Reg. in England and Wales No. 7102436
t +44 (0)1932 829007 **f** +44 (0)1932 829003

John Cree House, 24B High Street, Addlestone, Surrey, KT15 1TN
e info@colejarman.com **w** www.colejarman.com

Noise Level Time History at Position MP1, 2 to 3 December 2015

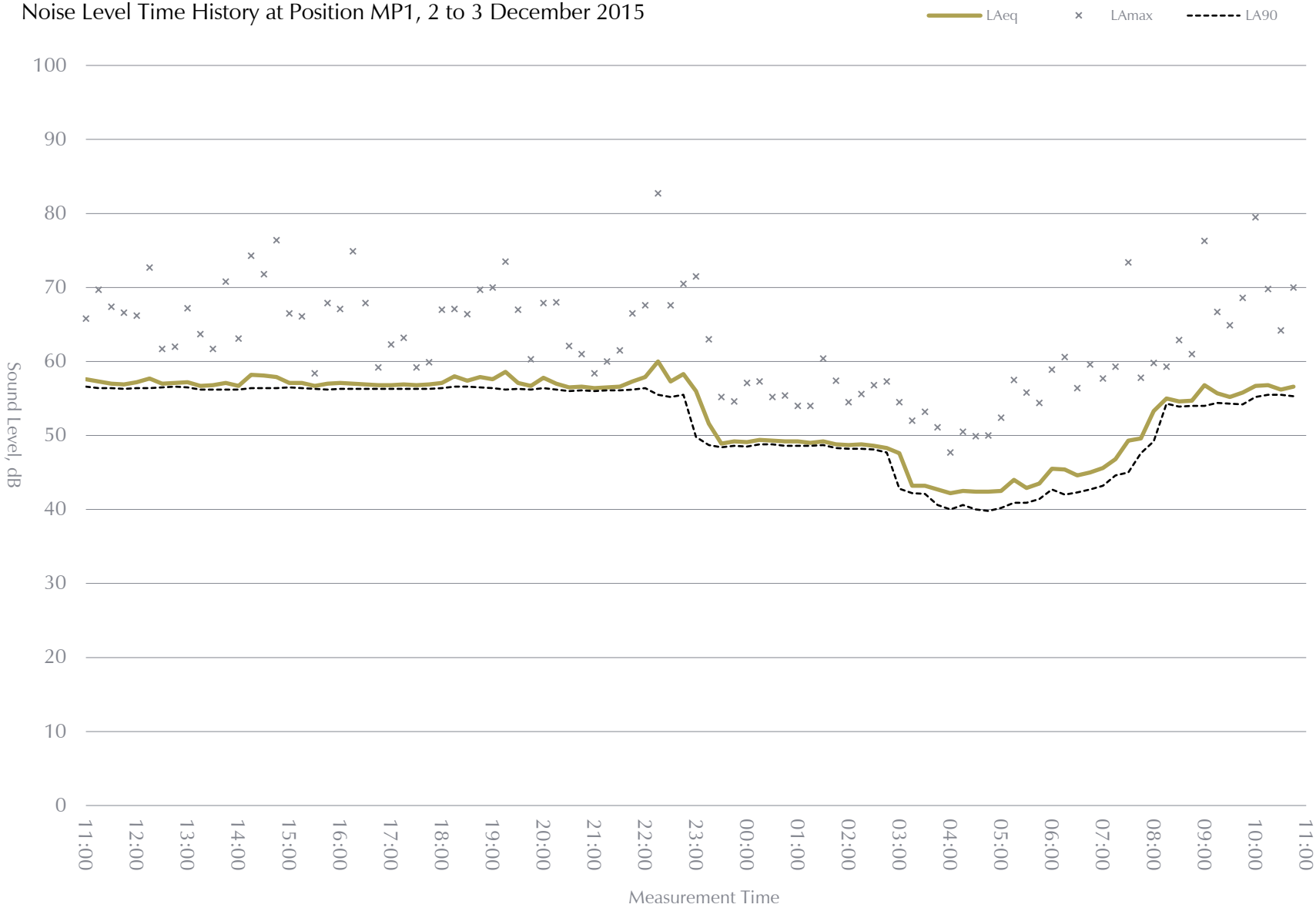


Figure 15/0712/TH01

Schedule of Plant and Air Handling Equipment Sound Levels, dB

Reference	Description	Data Source [1]	Noise Level Type	Noise Levels (dB)							
				63	125	250	500	1k	2k	4k	8k
CU1	Mitsubishi MUZ-GF60VE	Man	Sound Pressure, Lp @ 1m	56	62	56	51	50	48	40	33
CU2	Mitsubishi SUZ-KA25VA4	Man	Sound Pressure, Lp @ 1m	51	53	50	44	42	39	32	26
CU3	Mitsubishi SUZ-KA71VA4	Man	Sound Pressure, Lp @ 1m	56	62	56	51	50	48	40	33
CU4	Mitsubishi SUZ-KA25VA4	Man	Sound Pressure, Lp @ 1m	51	53	50	44	42	39	32	26
SF1	Helios VARW 500/4	Man	Sound Power, Lw	82	82	88	87	86	83	76	68
EF1	Helios VARW 500/4	Man	Sound Power, Lw	82	82	88	87	86	83	76	68
EF2	Helios HRFW 200/4	Man	Sound Power, Lw	40	40	39	37	36	35	32	26

Notes

1 - Man refers to data supplied by the equipment manufacturer or supplier, Emp refers to data calculated using empirical formulae, and Meas refers to data measured by Cole Jarman

Glossary of Acoustic Terms

L_{Aeq}:

The notional steady sound level (in dB) which over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measurement over that period. Values are sometimes written using the alternative expression dB(A) L_{eq}.

L_{Amax}:

The maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise when occasional loud noises occur, which may have little effect on the L_{Aeq} noise level. Unless described otherwise, L_{Amax} is measured using the "fast" sound level meter response.

L_{A10} & L_{A90}:

If non-steady noise is to be described, it is necessary to know both its level and degree of fluctuation. The L_{An} indices are used for this purpose. The term refers to the A-weighted level (in dB) exceeded for n% of the time specified. L_{A10} is the level exceeded for 10% of the time and as such gives an indication of the upper limit of fluctuating noise. Similarly L_{A90} gives an indication of the lower levels of fluctuating noise. It is often used to define the background noise.

L_{A10} is commonly used to describe traffic noise. Values of dB L_{An} are sometimes written using the alternative expression dB(A) L_{n}.

L_{AX}, L_{AE} or SEL

The single event noise exposure level which, when maintained for 1 second, contains the same quantity of sound energy as the actual time varying level of one noise event. L_{AX} values for contributing noise sources can be considered as individual building blocks in the construction of a calculated value of L_{Aeq} for the total noise. The L_{AX} term can sometimes be referred to as Exposure Level (L_{AE}) or Single Event Level (SEL).

Appendix A

Subject: **Calculation Sheets**
Project: **35 Great Queen Street**
Date: **December 2015**

CU1 to AP1

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - CU1									
Sound Pressure Levels @ 1m		**56.0**	**62.0**	**56.0**	**51.0**	**50.0**	**48.0**	**40.0**	**33.0**
Full Conformal Area									
Distance (m)	1.0								
Type - Semi-anechoic									
		12.6	*12.6*	*12.6*	*12.6*	*12.6*	*12.6*	*12.6*	*12.6*
Tonality Correction									
Single Figure	5.0								
		5.0	*5.0*	*5.0*	*5.0*	*5.0*	*5.0*	*5.0*	*5.0*
Mitigation Measure									
Mitigation Measure - Enclosure									
		-12.0	*-13.0*	*-20.0*	*-29.0*	*-36.0*	*-37.0*	*-39.0*	*-39.0*
Point Source Radiation Loss									
Radiation - Quarterspherical									
Loss	5.0								
		-5.0	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*
Point Source Distance Loss									
Start Distance (m)	1.0								
End Distance (m)	8.0								
		-18.1	*-18.1*	*-18.1*	*-18.1*	*-18.1*	*-18.1*	*-18.1*	*-18.1*
Facade Reflection									
Reflection (dB)	3.0								
		3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
External Receiver								
External Receiver - AP1								
Sound Pressure, Lp	**41.6**	**46.6**	**33.6**	**19.6**	**11.6**	**8.6**	**-1.4**	**-8.4**

CU2 to AP1

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - CU2									
Sound Pressure Levels @ 1m		**51.0**	**53.0**	**50.0**	**44.0**	**42.0**	**39.0**	**32.0**	**26.0**
Full Conformal Area									
Distance (m)	1.0								
Type - Semi-anechoic									
		11.8	*11.8*	*11.8*	*11.8*	*11.8*	*11.8*	*11.8*	*11.8*
Mitigation Measure									
Mitigation Measure - Enclosure									
		-12.0	*-13.0*	*-20.0*	*-29.0*	*-36.0*	*-37.0*	*-39.0*	*-39.0*
Point Source Radiation Loss									
Radiation - Quarterspherical									
Loss	5.0								
		-5.0	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*
Point Source Distance Loss									
Start Distance (m)	1.0								
End Distance (m)	8.0								
		-18.1	*-18.1*	*-18.1*	*-18.1*	*-18.1*	*-18.1*	*-18.1*	*-18.1*
Facade Reflection									
Reflection (dB)	3.0								
		3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
External Receiver									
External Receiver - AP1									
Sound Pressure, Lp		**30.8**	**31.8**	**21.8**	**6.8**	**-2.2**	**-6.2**	**-15.2**	**-21.2**

CU3 to AP1

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - CU3									
Sound Pressure Levels @ 1m		**56.0**	**62.0**	**56.0**	**51.0**	**50.0**	**48.0**	**40.0**	**33.0**
Full Conformal Area									
Distance (m)	1.0								
Type - Semi-anechoic									
		12.6	*12.6*	*12.6*	*12.6*	*12.6*	*12.6*	*12.6*	*12.6*
Tonality Correction									
Single Figure	5.0								
		5.0	*5.0*	*5.0*	*5.0*	*5.0*	*5.0*	*5.0*	*5.0*
Mitigation Measure									
Mitigation Measure - Enclosure									
		-12.0	*-13.0*	*-20.0*	*-29.0*	*-36.0*	*-37.0*	*-39.0*	*-39.0*
Point Source Radiation Loss									
Radiation - Quarterspherical									
Loss	5.0								
		-5.0	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*
Point Source Distance Loss									
Start Distance (m)	1.0								
End Distance (m)	8.0								
		-18.1	*-18.1*	*-18.1*	*-18.1*	*-18.1*	*-18.1*	*-18.1*	*-18.1*
Facade Reflection									
Reflection (dB)	3.0								
		3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
External Receiver								
External Receiver - AP1								
Sound Pressure, Lp	**41.6**	**46.6**	**33.6**	**19.6**	**11.6**	**8.6**	**-1.4**	**-8.4**

CU4 to AP1

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - CU4									
Sound Pressure Levels @ 1m		**51.0**	**53.0**	**50.0**	**44.0**	**42.0**	**39.0**	**32.0**	**26.0**
Full Conformal Area									
Distance (m)	1.0								
Type - Semi-anechoic									
		11.8	*11.8*	*11.8*	*11.8*	*11.8*	*11.8*	*11.8*	*11.8*
Mitigation Measure									
Mitigation Measure - Enclosure									
		-12.0	*-13.0*	*-20.0*	*-29.0*	*-36.0*	*-37.0*	*-39.0*	*-39.0*
Point Source Radiation Loss									
Radiation - Quarterspherical									
Loss	5.0								
		-5.0	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*
Point Source Distance Loss									
Start Distance (m)	1.0								
End Distance (m)	8.0								
		-18.1	*-18.1*	*-18.1*	*-18.1*	*-18.1*	*-18.1*	*-18.1*	*-18.1*
Facade Reflection									
Reflection (dB)	3.0								
		3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
External Receiver									
External Receiver - AP1									
Sound Pressure, Lp		**30.8**	**31.8**	**21.8**	**6.8**	**-2.2**	**-6.2**	**-15.2**	**-21.2**

Calculation Sheet 15/0712/CS5

SF1 to AP1

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - SF1									
Sound Power Levels		**82.0**	**82.0**	**88.0**	**87.0**	**86.0**	**83.0**	**76.0**	**68.0**
Mitigation Measure									
Mitigation Measure - Silencer									
		-9.0	*-17.0*	*-29.0*	*-46.0*	*-50.0*	*-50.0*	*-49.0*	*-34.0*
End Reflection									
Width/Diameter	500.0								
Length	500.0								
Rec or Circ - Circular									
Free or Flush - Free Space									
		0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Point Source Radiation Loss									
Radiation - Hemispherical									
		-8.0	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*
Point Source Distance Loss									
End Distance (m)	8.0								
		-18.1	*-18.1*	*-18.1*	*-18.1*	*-18.1*	*-18.1*	*-18.1*	*-18.1*
Facade Reflection									
Reflection (dB)	3.0								
		3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
External Receiver									
External Receiver - AP1									
Sound Pressure, Lp		**50.0**	**42.0**	**36.0**	**18.0**	**13.0**	**10.0**	**4.0**	**11.0**

EF1 to AP1

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - EF1									
Sound Power Levels		**82.0**	**82.0**	**88.0**	**87.0**	**86.0**	**83.0**	**76.0**	**68.0**
Rect Unlined Duct Losses CJ									
Width (mm)	500.0								
Height (mm)	500.0								
Length (m)	3.2								
		-2.4	*-1.9*	*-1.0*	*-0.5*	*-0.5*	*-0.5*	*-0.5*	*-0.5*
Mitigation Measure									
Mitigation Measure - Silencer									
		-9.0	*-17.0*	*-29.0*	*-46.0*	*-50.0*	*-50.0*	*-49.0*	*-34.0*
End Reflection									
Width/Diameter	500.0								
Length	500.0								
Rec or Circ - Circular									
Free or Flush - Free Space									
		0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Point Source Radiation Loss									
Radiation - Hemispherical									
		-8.0	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*
Point Source Distance Loss									
End Distance (m)	9.0								
		-19.1	*-19.1*	*-19.1*	*-19.1*	*-19.1*	*-19.1*	*-19.1*	*-19.1*

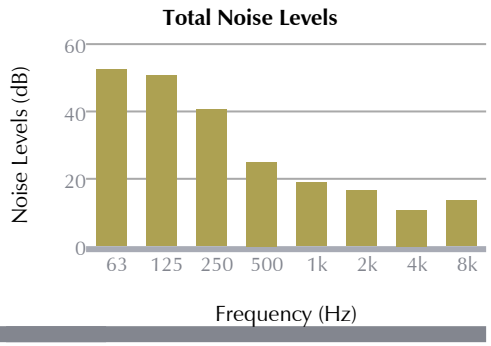
		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Facade Reflection									
Reflection (dB)	3.0								
		3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
External Receiver									
External Receiver - AP1									
Sound Pressure, Lp		**46.5**	**39.0**	**34.0**	**16.5**	**11.5**	**8.5**	**2.5**	**9.5**

Calculation Sheet 15/0712/CS7

EF2 to AP1

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF2									
Sound Power Levels		**40.0**	**40.0**	**39.0**	**37.0**	**36.0**	**35.0**	**32.0**	**26.0**
End Reflection									
Width/Diameter	500.0								
Length	500.0								
Rec or Circ - Circular									
Free or Flush - Free Space									
		0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Point Source Radiation Loss									
Radiation - Hemispherical									
		-8.0	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*
Point Source Distance Loss									
End Distance (m)	9.0								
		-19.1	*-19.1*	*-19.1*	*-19.1*	*-19.1*	*-19.1*	*-19.1*	*-19.1*
Facade Reflection									
Reflection (dB)	3.0								
		3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
External Receiver									
External Receiver - AP1									
Sound Pressure, Lp		**15.9**	**15.9**	**14.9**	**12.9**	**11.9**	**10.9**	**7.9**	**1.9**

Project Name	35 Great Queen Street
Project Reference	15/0712
Receiver Reference	AP1
Description	AP1
Noise Limit	38
dBA	37.2



Reference	Noise Levels (dB)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
EF1	46.5	39	34	16.5	11.5	8.5	2.5	9.5
EF2	15.9	15.9	14.9	12.9	11.9	10.9	7.9	1.9
SF1	50	42	36	18	13	10	4	11
CU1	41.6	46.6	33.6	19.6	11.6	8.6	-1.4	-8.4
CU2	30.8	31.8	21.8	6.8	-2.2	-6.2	-15.2	-21.2
CU3	41.6	46.6	33.6	19.6	11.6	8.6	-1.4	-8.4
CU4	30.8	31.8	21.8	6.8	-2.2	-6.2	-15.2	-21.2

Cole Jarman Limited Reg. in England and Wales No. 7102436
t +44 (0)1932 829007 **f** +44 (0)1932 829003

John Cree House, 24B High Street, Addlestone, Surrey, KT15 1TN
e info@colejarman.com **w** www.colejarman.com