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THE LORE OF THE LAND, FITZROVIA

NOISE IMPACT ASSESSMENT

On behalf of:

The Fat Boy Pub Co.

Report No P18-171-R01v1
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1.0 INTRODUCTION

1.1 Hepworth Acoustics Ltd was commissioned by The Fat Boy Pub Co. to carry out a noise impact assessment of the proposed new mechanical equipment to be installed at The Lore of the Land public house (formerly The Lukin), 4 Conway Street, Fitzrovia, London W1T 6BB.

1.2 The assessment has been commissioned in connection with the planning application for the proposed development. The aim of this report is to assess whether the proposed new equipment will meet suitable limits for noise, and to make recommendations for noise mitigation where required.

1.3 The site is bounded by Conway Street to the south west. To the south east is Rebecca Hossack Art Gallery. The other buildings in the vicinity include offices and private residences. The most affected noise-sensitive premises, to the best of our knowledge, are the flats in County House. We have also taken into consideration the residences on Maple Street, the rear windows of which overlook The Lore of the Land and the location of the proposed equipment. A location plan is shown in Figure 1.

1.4 The three existing condensers on the first-floor flat roof to the rear of the premises are proposed to be replaced with new models and relocated to the third-floor flat roof. One new condenser is proposed to be added, serving the new freezer. The condensers can potentially operate 24 hours a day.

1.5 There will be also be new kitchen extract and supply fans installed within the existing pitched roof void, with the inlet and outlet louvers to be installed on the rear roof gable facing north east. This is expected to operate from around 10:00 to 23:00 daily.

1.6 This assessment is based on the drawing 3175/35, Revision C, from Pembrook Design, dated 2nd July 2018.

1.7 The various noise units and indices referred to in this report are described in Appendix I. All noise levels mentioned have been rounded to the nearest decibel, as fractions of decibels are imperceptible.

2.0 ACOUSTIC DESIGN CRITERIA

Camden Council

2.1 Camden Council has the following guidance in *Camden Planning Guidance: Amenity*, dated March 2018:

> *Developments proposing plant, ventilation, air extraction or conditioning equipment and flues will need to provide the system's technical specifications to the Council accompanying any acoustic report. 'BS4142 Method for rating Industrial and Commercial Sound'* [SIC] *contains guidance and standards which should also be considered within the acoustic report.*

2.2 The following additional guidance is included for industrial and commercial noise sources in *Appendix 3: Noise Thresholds* of the *Camden Local Plan 2017:*

> *A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. 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 the design criterion.*

2.3 BS 4142: 2014 '*Methods for rating and assessing industrial and commercial sound*' provides methods for rating and assessing sound of an industrial and/or commercial nature.

2.4 BS 4142 requires the 'rating' noise level for the operation to be compared with the background (L_{A90}) noise level in the absence of the operational noise being assessed.

2.5 The 'rating' level is derived based on the 'specific' L_{Aeq} noise level attributable to the operation with an '*acoustic feature*' penalty added for any noise sources which give rise to tonal, impulsive, intermittent, or other characteristics readily distinctive against the residual acoustic environment.

2.6 In the context of this development, we consider the guidance in BS 4142: 2014 to be appropriate so this will be adopted, along with Camden Council's 'Rating Level' criteria stated above.

2.7 Camden's Development Policy 28 (Noise and Vibration) recommends that noise levels from plant and machinery at 1 metre external to a sensitive façade should be < 5 dB(A) below background noise levels, or < 10 dB(A) below if the noise has a distinguishable discrete continuous note or distinct impulses.

3.0 ENVIRONMENTAL NOISE SURVEY

Survey Details and Results

3.1 Environmental noise measurements were carried out at the site at Location 1 marked on Figure 1, which is on the third-storey flat roof to the rear of the premises.

3.2 The description and measurement of environmental noise has been carried out in accordance with the guidance in BS 7445 *Description and measurement of environmental noise*, as stipulated in the *Camden Local Plan 2017*.

3.3 Noise measurements were taken between 19:45 on Tuesday 17th April and 14:45 on Thursday 19th April 2018.

3.4 The weather conditions throughout the noise survey were dry and overcast, with wind speeds below 5 m/s. Wind was from the south and east. Temperatures were between 10°C and 18°C. These were considered suitable conditions for the survey.

3.5 The noise measurements were taken in 'free-field' conditions with the microphone at approximately 1.5 metres above roof level. Measurements were taken in 15-minute samples for the duration of the survey.

3.6 The results of the noise survey are detailed in Appendix II in graphical form. The measured noise levels are summarised numerically in Table 1. The time periods are selected to show the relevant parts of the day and night when the proposed equipment will be operating.

Table 1: Background noise levels summary (dBA)

Location	Daytime (10:00 to 23:00)		Night-time (23:00 to 07:00)	
	Lowest $L_{A90,15mins}$	Modal $L_{A90,15mins}$	Lowest $L_{A90,15mins}$	Modal $L_{A90,15mins}$
1	48	55	44	46

Noise Sources

3.7 The dominant noise source during the day was noise from the existing mechanical plant located to the rear of the premises, which includes three condensers and a kitchen extract fan. The influence of the noise from the existing kitchen extract fan is noticeable between 10:00 and 21:00 in the chart in Appendix II.

3.8 When the mechanical equipment was not running, local road traffic became the dominant noise source.

Sound Level Meter Details

3.9 The noise monitoring was carried out using a Rion NL-31 Type 1 sound level meter (serial no. 01120844). The calibration level of the meter was checked before and after the survey with a Brüel & Kjær Type 4203 sound calibrator (serial no. 2412667). No significant calibration deviation was observed.

4.0 ASSESSMENT

4.1 The manufacturer's sound power level data by octave band of the proposed equipment is shown in Table 2.

Table 2: Proposed Equipment Octave Band Sound Power Level Data, dB L_w

Equipment	Type	Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Condenser A	Daikin RZQSG100L	58	58	66	67	66	63	59	51
Condenser B	Daikin RZQSG100L	58	58	66	67	66	63	59	51
Condenser C	Daikin RZQSG125L	60	60	64	66	67	62	58	51
Cooler Condenser	J&E Hall (existing)	58	56	62	62	62	60	55	50
New Kitchen Extract	Systemair MUBT 062 560 EC outlet	67	69	73	75	74	71	66	59
	Systemair MUBT 062 560 EC surroundings	50	51	56	58	57	54	49	42
New Kitchen Supply	Systemair MUBT 062 560 EC inlet	65	67	71	73	72	69	64	57
	Systemair MUBT 062 560 EC surroundings	50	51	56	58	57	54	49	42

4.2 Based on our experience of this type of equipment and the data in Table 2, we do not expect the new equipment to feature tonal or impulsive characteristics readily distinctive against the residual acoustic environment. Therefore, the Rating Level ($L_{Aeq,15min}$) is required not to exceed 10 dB(A) below the minimum external $L_{A90,15min}$ background noise at the nearest noise sensitive properties in accordance with the guidance in Appendix 3 of the *Camden Local Plan 2017*.

4.3 The assessment predicting the façade-incident emission level to compare to the corresponding background noise level for the new equipment at the window of the nearest residence is summarised in Table 3. This shows that with no mitigation measures the overall emission levels will be 4 dB(A) above background noise levels during the kitchen extract fans' proposed operating hours (i.e. 10.00 to 23.00 daily). The detailed calculation is in Appendix III.

Table 3: Total Predicted Noise Levels at Nearest Residential Window Without Mitigation

Description	dB(A)
Resultant condensers emission level at nearest residence window (dB $L_{Aeq,15mins}$)	43
Resultant new kitchen ventilation emission level at nearest residence window (dB $L_{Aeq,15mins}$)	51
Total emission level at nearest residence window without mitigation (dB $L_{Aeq,15mins}$)	52
Lowest background noise level, 10.00 to 23.00 (dB $L_{A90,15mins}$)	48
Comparison ($L_{Aeq,15mins} - L_{A90,15mins}$)	+4

4.4 As can be seen from Table 3, the emissions level without noise mitigation is calculated to be 4 dB(A) above the background noise level outside the window of the most-affected noise-sensitive premises. Noise mitigation measures will therefore be required.

4.5 To mitigate noise from the kitchen ventilation system, we recommend duct attenuators to be installed on the atmosphere side of the new kitchen supply and extract fans. The duct attenuators should be selected with the insertion loss values shown in Table 4.

Table 4: Duct attenuator minimum insertion loss values (dB)

Description	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Insertion loss	2	4	9	13	15	13	12

4.6 To reduce the noise impact of the condensers, we recommend installing a 1.5 metre high solid timber screen around the condensers, along the edge of the third-floor flat roof. The screen is to be imperforate (no gaps), sealed at the base, and with surface mass no less than 10 kg/m^2. Proprietary acoustic screening is recommended. Note that the purpose of this screen is to attenuate noise from the condensers, not for the kitchen ventilation outlets, which are at a higher level. The noise from the kitchen ventilation system is addressed with the duct attenuators described in Paragraph 4.5 and Table 4.

4.7 With the above measures, the rating level of the new equipment is predicted to be reduced by 13 dB(A) to 38 dB $L_{Aeq,15mins}$, which brings the total emission level at the nearest window down to 10 dB(A) below the lowest measured background noise level as shown in Table 5. This will therefore be compliant with the Local Authority's criteria. The detailed calculations including the effect of the noise mitigation measures are shown in Appendix III.

Table 5: Total Predicted Noise Levels at Nearest Residential Window With Mitigation

Description	dB(A)
Resultant condensers emission level at nearest residence window (dB $L_{Aeq,15mins}$)	25
Resultant new kitchen ventilation emission level at nearest residence window (dB $L_{Aeq,15mins}$)	38
Total emission level at nearest residence window with mitigation (dB $L_{Aeq,15mins}$)	38
Lowest background noise level, 10.00 to 22.00 (dB $L_{A90,15mins}$)	48
Comparison ($L_{Aeq,15mins} - L_{A90,15mins}$)	-10

4.8 When the condensers are operating at night (between 23:00 and 07:00) and hence the kitchen ventilation system is not operating, the predicted noise levels with mitigation are shown in Table 6.

Table 6: Predicted Night-time Condenser Noise at Nearest Residential Window With Mitigation

Description	dB(A)
Resultant condensers emission level at nearest residence window (dB $L_{Aeq,15mins}$)	25
Lowest measured night-time background noise level (dB $L_{A90,15mins}$)	44
Comparison ($L_{Aeq,15mins} - L_{A90,15mins}$)	-19

4.9 This shows that with the proposed mitigation measures, the condenser rating levels at night will be 19 dB(A) below the lowest background noise levels. This is therefore compliant with the Local Authority's noise requirements.

4.10 We recommend that all mechanical equipment is mounted on suitable vibration isolation mounts to control structure-borne noise. All vibration isolators should be specified to achieved isolation efficiency of 0.95 at 125 Hz. Ductwork and pipework should be connected to mechanical equipment using flexible connectors.

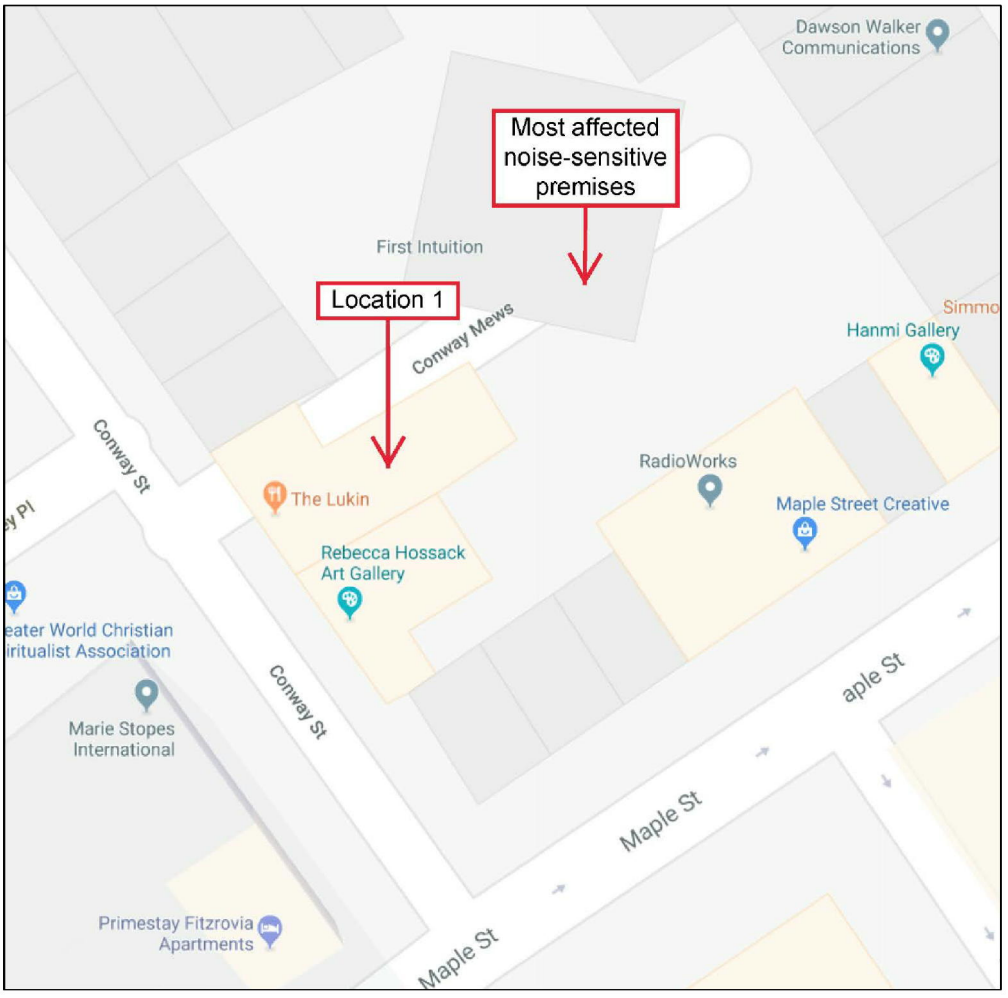
5.0 CONCLUSION

5.1 The Fat Boy Pub Co. appointed Hepworth Acoustics to assess the impact of noise on the neighbouring noise-sensitive premises from the proposed new equipment to be installed at The Lore of the Land, 4 Conway Street, Fitzrovia, London W1T 6BB.

5.2 A noise survey has been undertaken at the site and the background noise levels have been determined in accordance with the requirements of the *Camden Local Plan 2017*.

5.3 Using the noise data for the proposed equipment, the levels for the noise emissions at the nearest noise-sensitive premises has been predicted using the guidance in BS 4142: 2014. Suitable noise mitigation measures have been recommended to allow compliance with the noise requirements of the Local Authority.

Figure 1 – Location Plan



Appendix I: Noise Units & Indices

Sound and the decibel

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dBA.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kiloHertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

Glossary of Terms

When a noise level is constant and does not fluctuate, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices can be used. The indices used in this report are described below.

$L_{Aeq,T}$ This is the A–weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period, T. In other words, LAeq is the level of a continuous noise which has the same total (A–weighted) energy as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for all forms of environmental noise.

L_W This is the sound power level of a sound source, in decibels, which is 10 times the logarithm to the base 10 of the ratio of sound power radiated by the source to a reference power. The reference power is 1 picowatt (1×10^{-12} watt). The sound power level is the fundamental measure of the total sound energy radiated by a source per unit time.

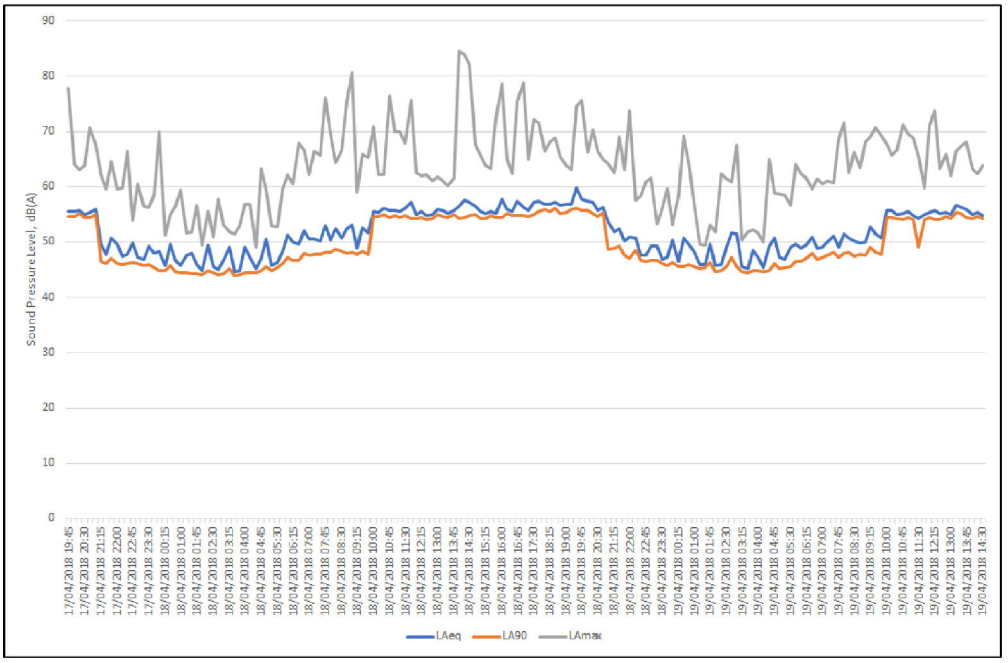
$L_{A90,T}$ This is the A–weighted noise level exceeded for 90% of the time period, T. L_{A90} is used as a measure of background noise.

Appendix II: Noise Survey Results

Location 1

Equipment:	Rion NL-31 'Type 1' sound level meter (serial no. 01120844) with tripod and windshield
Weather:	Dry, wind speed below 5 m/s

All levels in dB(A)



Appendix III: Noise Calculations

Without noise mitigation

Unmitigated										
Description	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dB(A)**	**Comments**
Kitchen Outlet Lw	67	69	73	75	74	71	66	59	59	Manufacturer's data
Duct attenuator	0	0	0	0	0	0	0	0		
Duct losses	0	0	0	0	0	0	0	0		Negligible
Louvre area	2	2	2	2	2	2	2	2		
End reflections	-4	-1	0	0	0	0	0	0		Woods Practical Guide to Noise Control, Fig 5.7
Louvre directivity	1.5	1.5	1.5	1.5	1	1	0	0		SRL Noise Control in Building Services, Fig 11.2
Distance attenuation	-32	-32	-32	-32	-32	-32	-32	-32		16 metres, hemispherical over hard ground
Resulting SPL from duct outlet	34.5	39.5	44.5	46.5	45	42	36	29	49	
Kitchen Inlet Lw	65	67	71	73	72	69	64	57		Manufacturer's data
Duct attenuator	0	0	0	0	0	0	0	0		
Duct losses	0	0	0	0	0	0	0	0		Negligible
Louvre area	2	2	2	2	2	2	2	2		
End reflections	-4	-1	0	0	0	0	0	0		Woods Practical Guide to Noise Control, Fig 5.7
Louvre directivity	1.5	1.5	1.5	1.5	1	1	0	0		SRL Noise Control in Building Services, Fig 11.2
Distance attenuation	-32	-32	-32	-32	-32	-32	-32	-32		16 metres, hemispherical over hard ground
Resulting SPL from duct inlet	32.5	37.5	42.5	44.5	43	40	34	27	47	
Kitchen supply fan case breakout Lw	50	51	56	58	57	54	49	42		Manufacturer's data
Kitchen extract fan case breakout Lw	50	51	56	58	57	54	49	42		
Total kitchen fan case breakout Lw	53	54	59	61	60	57	52	45		
Roof attenuation	-7	-11	-16	-23	-23	-24	-24	-27		Estimate for tiled roof
Distance attenuation	-32	-32	-32	-32	-32	-32	-32	-32		16 metres, hemispherical over hard ground
Resulting SPL from case breakout	14	11	11	6	5	1	-4	-14	10	
Condenser A Lw	58	58	66	67	66	63	59	51		
Condenser B Lw	58	58	66	67	66	63	59	51		
Condenser C Lw	60	60	64	66	67	62	58	51		
Cooler Lw	58	56	62	62	62	60	55	50		
Condenser total Lw	65	64	71	72	72	68	64	57		Manufacturer's data
Distance attenuation	-32	-32	-32	-32	-32	-32	-32	-32		16 metres, hemispherical over hard ground
Resulting SPL from condenser	32.6	32.2	38.8	39.9	39.6	36.2	32	24.8	44	
Total resulting SPL	38	42	47	49	48	45	39	32	52	

With noise mitigation

Mitigated										
Description	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dB(A)**	**Comments**
Kitchen Outlet Lw	67	69	73	75	74	71	66	59		Manufacturer's data
Duct attenuator	-2	-4	-9	-13	-15	-13	-12	-9		
Duct losses	0	0	0	0	0	0	0	0		Negligible
Louvre area	2	2	2	2	2	2	2	2		
End reflections	-4	-1	0	0	0	0	0	0		Woods Practical Guide to Noise Control, Fig 5.7
Louvre directivity	1.5	1.5	1.5	1.5	1	1	0	0		SRL Noise Control in Building Services, Fig 11.2
Distance attenuation	-32	-32	-32	-32	-32	-32	-32	-32		16 metres, hemispherical over hard ground
Resulting SPL from duct outlet	32.5	35.5	35.5	33.5	30	29	24	20	36	
Kitchen Inlet Lw	65	67	71	73	72	69	64	57		Manufacturer's data
Duct attenuator	-2	-4	-9	-13	-15	-13	-12	-9		
Duct losses	0	0	0	0	0	0	0	0		Negligible
Louvre area	2	2	2	2	2	2	2	2		
End reflections	-4	-1	0	0	0	0	0	0		Woods Practical Guide to Noise Control, Fig 5.7
Louvre directivity	1.5	1.5	1.5	1.5	1	1	0	0		SRL Noise Control in Building Services, Fig 11.2
Distance attenuation	-32	-32	-32	-32	-32	-32	-32	-32		16 metres, hemispherical over hard ground
Resulting SPL from duct inlet	30.5	33.5	33.5	31.5	28	27	22	18	34	
Kitchen supply fan case breakout Lw	50	51	56	58	57	54	49	42		Manufacturer's data
Kitchen extract fan case breakout Lw	50	51	56	58	57	54	49	42		
Total kitchen fan case breakout Lw	53	54	59	61	60	57	52	45		
Roof attenuation	-7	-11	-16	-23	-23	-24	-24	-27		Estimate for tiled roof
Distance attenuation	-32	-32	-32	-32	-32	-32	-32	-32		16 metres, hemispherical over hard ground
Resulting SPL from case breakout	14	11	11	6	5	1	-4	-14	10	
Condenser A Lw	58	58	66	67	66	63	59	51		
Condenser B Lw	58	58	66	67	66	63	59	51		
Condenser C Lw	60	60	64	66	67	62	58	51		
Cooler Lw	58	56	62	62	62	60	55	50		
Condenser total Lw	65	64	71	72	72	68	64	57		Manufacturer's data
Barrier attenuation	-9	-11	-13	-16	-19	-22	-25	-28		1.5 metre high solid timber screen
Distance attenuation	-32	-32	-32	-32	-32	-32	-32	-32		16 metres, hemispherical over hard ground
Resulting SPL from condenser	24	21	26	24	21	15	7	-3	25	
Total resulting SPL	35	38	38	36	32	31	26	22	38	