171 CAMDEN HIGH STREET, CAMDEN, LONDON NW1

Plant Noise Assessment

REPORT 7208/PNA
Prepared: 7 March 2016
Revision Number: 0

Adam Stuart
7 The Workshops
Pulloxhill Business Park
Greenfield Road
Bedfordshire
MK45 5BF

Plant Noise Assessment

171 CAMDEN HIGH STREET, CAMDEN, LONDON NW1

REPORT 7208/PNA
Prepared: 7 March 2016

Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	7 March 2016	Christopher Wilson	Paul Taylor

Terms of contract:

RBA Acoustics Ltd has prepared this report in accordance with our Scope of Works 7208/PT dated 5 January 2016. RBA Acoustics Ltd shall not be responsible for any use of the report or its contents for any purpose other than that for which it was provided. Should the Client require the distribution of the report to other parties for information, the full report should be copied. No professional liability or warranty shall be extended to other parties by RBA Acoustics Ltd without written agreement from RBA Acoustics Ltd.

In line with our Environmental Policy, up to two hard copies of the report will be provided upon request. Additional copies of the report, or further hard copies of revised reports, would be subject to an administrative cost of £20.00 (+VAT) per copy.

RBA ACOUSTICS

RBA ACOUSTICS
44 Borough Road
London SE1 0AJ
T. +44 (0) 20 7620 1950
W. www.rba-acoustics.co.uk

Contents

1.0 INTRODUCTION

In order to support the planning application for the location of new mechanical services equipment associated with a proposed restaurant at 171 Camden High Street, the London Borough of Camden requires consideration be given to atmospheric noise emissions from the proposed equipment at the nearest noise sensitive property.

RBA Acoustics have been commissioned to undertake measurements of the prevailing noise conditions at the site and to determine the atmospheric noise emissions in accordance with the standard Local Authority requirements. This report presents the results of the noise measurements, associated criteria and provides the required assessment.

2.0 ENVIRONMENTAL NOISE SURVEY

2.1 General

Monitoring of the prevailing background noise was undertaken between Friday 8 January and Tuesday 12 January 2016.

During the survey period, rain was noted to occur during the night of Sunday 10 January 2016. Otherwise, the weather conditions were generally appropriate for the noise measurement exercise, it being dry with light winds.

Measurements were made of the L_{A90}, L_{AMax} and L_{Aeq} noise levels over sample periods of 15 minutes duration.

2.2 Measurement Location

The microphone was positioned on a tripod, 1.5m above the first floor flat roof to the rear of 171 Camden High Street. The installation of the microphone is shown in Photo 7208/P1 and the measurement location is also detailed on the attached Site Plan 7208/SP1.

Noise levels at this position were affected by road traffic noise from Camden High Street and the adjacent properties building works. Building works were understood to be carried out during standard daytime hours only, and would not have affected evening or night time measurements. Therefore minimum measured noise levels would not have been affected.

2.3 Instrumentation

The following equipment was used for the measurements.

Table 7208/T1 – Equipment Details

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Expiry Date
01dB A&V Type 1 Sound Level Meter	Black Solo 01	65687	01671/2	10 February 2016
01dB A&V Pre Amplifier	PRE 21 S	20799		
01dB A&V ½" Microphone	MCE 212	94043		
01dB-Stell Calibrator	Cal 21	51231453(2013)	01671/1	10 February 2016

The sound level meter was calibrated both prior to and on completion of the survey with no calibration drift observed.

3.0 RESULTS

The noise levels recorded at the measurement position are shown as time-histories on the attached Graphs 7208/G1 and 7208/G2.

In order to ensure a worst-case assessment the lowest background L_{A90} (15 minutes) noise level measured has been used in our analyses. The lowest L_{A90} and the period averaged L_{Aeq} dB noise levels measured are summarised below.

Table 7208/T2 – Measured Levels

Measurement Period	Measured Sound Pressure Levels	
	Minimum $L_{90,15min}$ (dBA)	Average L_{eq} (dBA)
Daytime (07:00 – 23:00)	44	69
Night-Time (23:00 – 07:00)	42	52

*We have removed periods affected by construction noise from our analysis.

4.0 CRITERIA

The general requirements of Camden Council for noise from mechanical plant items are outlined within the LDF Camden Local Development Framework: Camden Development Policies (2010). Table E: *Noise levels from plant and machinery at which planning permission will not be granted.* This table is reproduced in Table 7208/T3 for convenience.

Table 7208/T3 – Table E from Camden LDF (2010)

Noise Description and measurement location	Period	Time	Noise Level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000 - 2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000 - 2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000 - 2400	10dB(A) <LA90
Noise at 1 metre external to a sensitive façade where LA90>60dB	Day, evening and night	0000 - 2400	55dB L_{Aeq}

In-line with the Camden Council's requirements, we propose that L_{Aeq} average noise levels at the nearest noise sensitive façade should be 5dB below the minimum $L_{A90,15min}$ noise level measured during the proposed plant operating hours.

Should any item of plant be noted to have characteristic acoustic features such as those described in Table 7208/T3, a further 5dB penalty should be applied to the applicable plant item.

Based on the standard Camden Council criteria, noise levels at the nearest residential receptor should therefore be below the criteria provided in Table 7208/T4.

Table 7208/T4 – Criteria Noise Levels

Measurement Period	Criteria Noise Level L_{Aeq} (dB)
Daytime (07:00 – 23:00)	39
Night-Time (23:00 – 07:00)	37

5.0 ASSESSMENT

Our assessment has been based upon the following information:

5.1 Mechanical Service Units

8No. Condenser Units comprising

- 6No. Toshiba RAV-SM564ATP-E (CU1-CU6)
- 2No. Toshiba RAV-SM1404ATP-E (CU7+CU8)

4No. Extract Fans comprising

- 1No.Systemair MUB062630D4-A2 IE2 (F8)
- 3No Systemair K200L (F2,F4,F6)

2No. Supply Fans comprising

- 1No.Systemair MUB062630D4-A2 IE2 (F1)
- 1No Systemair K200L (F5)

3No. Catering Condensers comprising (refrigeration and freezer)

- CAJ2464Z
- CAJ9513Z
- BMO-150-1

1No. Exhaust Fan

- This has not been specified yet, therefore a limit will be outlined in section 5.4 to ensure the required levels are met.

5.2 Position of Units

All units locations are shown in the attached Plant Plans 7208/PP1-5.

5.3 Hours of Operation

It is understood that all mechanical services are to be operational during the day and into the late evening. It is also understood that on occasion extended operation into the night will be required. Therefore to ensure an absolute worst case analysis we have assumed 24 hour operation for all units.

5.4 Noise Levels

Information regarding the noise levels of the various plant items has been provided by the manufacturers of the units. *

The octave band levels of the units are detailed as follows:

Table 7208/T5 – Manufacturer's Noise Levels

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Toshiba RAV-SM1404ATP-E (CU1-CU6)	L_p @ 1m	58	59	56	53	50	46	41	32
Toshiba RAV-SM564ATP-E (CU7+CU8)	L_p @ 1m	46	36	36	29	28	14	8	10
CAJ2464Z	L_w	-	52	53	56	60	69	60	57
CAJ9513Z	L_w	-	63	62	62	64	60	62	56
BMO-150-1	L_p @ 3m	49 dBA							
Systemair KL200	Supply in duct L_w	68	78	72	65	63	59	52	50
	Extract In-duct L_w	76	78	69	66	62	59	53	50
Systemair MUB062630D4-A2 IE2	Supply in duct L_w	99	91	88	84	80	76	71	66
	Extract In-duct L_w	101	93	90	86	82	78	73	68

*Where only overall noise data has been provided, we have based our calculations on typical octave-band noise levels representative of the overall noise levels.

5.5 Tonality

Review of the octave band data as detailed in Table 7208/T5 and the predicted noise levels referred to in the Appendix, concludes that there are no tonal characteristics associated with the proposed plant.

Accordingly the 5 dB subtraction from the background noise levels (under BS4142:1997) as referred to in Section 4.0 of this report does not need to be applied as there will be no audible tonal noise created.

5.6 Location of Nearest Noise Sensitive Windows

The nearest residential windows to the proposed roof plant area are at 3rd floor level to the south on Camden High Street. These windows will belong to the new residential development at 159-165 Camden High Street which is currently under construction. These windows are approximately 14m from the closest proposed rooftop plant item. We have assessed noise levels at this window as a worst-case, as this is the closest window to the proposed plant that will be located on the roof.

The nearest noise sensitive window to the rear lower plant area of the property is the rear 1st floor window of the residential property located at 154 Arlington Road. This window is approximately 30m from the closest proposed plant item at the ground floor level. We have assessed noise levels at this window as a worst-case, as this is the closest window to the proposed plant at the lower plant area.

The nearest noise sensitive windows are identified on Site Plan 7208/SP1.

5.7 Calculation of Noise Levels at Nearest Noise Sensitive Receptor

Our calculation method for predicting noise levels from the proposed plant at the nearest residential window, based on the information stated above, is summarised below.

- Source term SPL/SWL (as appropriate)
- Duct losses (ducted systems only)
- Grille end reflections (ducted systems only)
- Directivity / radiation
- Distance & screening attenuation

A calculation sheet is attached for further information in Appendix B.

The results of the calculations indicate the following noise levels at the nearest affected noise sensitive windows:

Table 7208/T6 – Predicted Noise Level

Receptor Location	Prediction (dBA)	Criterion (dBA)
159-165 Camden High Street	37	37
154 Arlington Road	37	37

As Table 7208/T6 indicates, noise from all the mechanical plant items meet the criterion noise levels at the nearest noise sensitive receptor assuming the following mitigation measures are adopted.

5.8 Attenuation Requirements

To reduce noise levels at the nearest residential façade we propose that attenuators are applied to the following items of plant:

Kitchen Extract-Induct Attenuator (F8)

We recommend the Kitchen extract is fitted with an acoustic attenuator. The attenuator should be capable of achieving the performance levels detailed in the specification below. An example of achieving this performance level is a 1500mm long attenuator with 30% free area, however, responsibility of the design should be undertaken by the supplier/M&E designer in accordance with the fan manufacturer's requirements so as to not to not create undue pressure on the fan unit.

Table 7208/T7 – Kitchen Extract Attenuator

Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
8	15	25	40	46	47	43	32

Kitchen Supply-Induct Attenuator (F1)

We recommend the Kitchen supply is fitted with an acoustic attenuator. The attenuator should be capable of achieving the performance levels detailed in the specification below. An example of achieving this performance level is a 1200mm long attenuator with 30% free area, however, responsibility of the design should be undertaken by the supplier/M&E designer in accordance with the fan manufacturer's requirements so as to not to not create undue pressure on the fan unit.

Table 7208/T8 – Kitchen Supply Attenuator

Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
6	10	20	31	37	32	31	17

Toilet Extract and Supply, Second Floor Prep Kitchen Extract and Supply (F2, F4, F5, F6)

We recommend the supply and extract fans outlined above are fitted with the following induct acoustic attenuator. The attenuator should be capable of achieving the performance levels detailed in the specification below. An example of achieving this performance level is a 600mm long attenuator with 40% free area, however, responsibility of the design should be undertaken by the supplier/M&E designer in accordance with the fan manufacturer's requirements so as to not to not create undue pressure on the fan unit.

Table 7208/T9 –Toilet Extract Attenuator

Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
3	5	9	13	15	16	11	9

In all cases, the attenuator cross-section should be appropriately sized to ensure the pressure drop is satisfactory. We would typically advise the pressure drop should not exceed 60Pa to ensure that self-generated noise is of an acceptable level. RBA would be pleased to review the proposed attenuator selection.

5.9 Vibration Control

In addition to the control of airborne noise transfer, it is also important to consider the transfer of noise as vibration to adjacent properties (as well as to any sensitive areas of the same building).

We would typically advise that condensing units and the AHU be isolated from the supporting structure by means of either steel spring isolators or rubber footings. For particularly sensitive locations, or when on lightweight structures the mounts should ideally be caged and be of the restrained type.

It is important the isolation is not "short-circuited" by associated pipework or conduits. To this end, any conduits should be looped and flexible connectors should be introduced between the condenser and any associated pipework. Pipework should be supported by brackets containing neoprene inserts.

6.0 CONCLUSION

Measurements of the existing background noise levels at the 171 Camden High Street have been undertaken. The results of the measurements have been used in order to determine the required criteria for atmospheric noise emissions from the plant to be installed at 171 Camden High Street.

The results of the assessment indicate atmospheric noise emissions from the plant are within the criteria required by the London Borough of Camden providing suitable mitigation measures are employed. As such, the proposed plant installations should be considered acceptable.

Appendix A - Acoustic Terminology

dB	Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
dB(A)	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
L_{eq}	L_{eq} is defined as 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 (1 hour).
L_{Aeq}	The level of notional steady sound which, over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measured over that period.
L_{An} (e.g L_{A10}, L_{A90})	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and 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 the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during the measurement period, T. It is commonly used to measure the effect of very short duration bursts of noise, such as for example sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the general level of, say, traffic noise, but because of their very short duration, maybe only a very small fraction of a second, may not have any effect on the L_{eq} value.

Appendix B – Plant Noise Calculations

Summary of Noise Levels at Nearest Noise Sensitive Receptor (Sound Pressure Levels)

Please note that the following values are subject to rounding errors.

Receive levels at 159-165 Camden High Street

Unit	Sound Level (dB) at Octave Band Centre Frequency (Hz)								Overall dBA
	63	125	250	500	1000	2000	4000	8000	
Systemair MUB062630D4-A2 IE2 Kitchen Extract	52	42	31	14	2	0	0	0	30
Systemair MUB062630D4-A2 IE2 Kitchen (Casing Breakout)	49	39	33	26	11	15	10	2	30
Systemair KL200 Ground Floor WC Extract	27	31	21	18	12	4	0	0	20
Systemair KL200 Second Floor WC Extract	32	36	27	24	18	10	6	5	26
Systemair KL200 Second Floor Prep Kitchen Extract	32	36	27	24	17	8	3	2	25
Systemair KL200 Second Floor Prep Kitchen Supply	24	36	30	23	18	8	2	2	26
Toshiba RAV-SM1404ATP-E (CU1-CU6)	36	37	34	31	28	24	19	10	33
Toshiba RAV-SM564ATP-E (CU7+CU8)	20	10	10	4	4	0	0	0	9
Total (dBA)									**37**

Receive Levels to the rear of 154 Arlington Road

Unit	Sound Level (dB) at Octave Band Centre Frequency (Hz)								Overall dBA
	63	125	250	500	1000	2000	4000	8000	
CAJ2464Z	-	14	16	18	23	31	22	20	33
CAJ9513Z	-	26	24	24	26	22	24	19	31
BMO-150-1	-	24	22	22	24	21	22	17	29
Systemair MUB062630D4-A2 IE2 Kitchen Supply	52	44	34	20	11	12	8	18	32
Total (dBA)									**37**

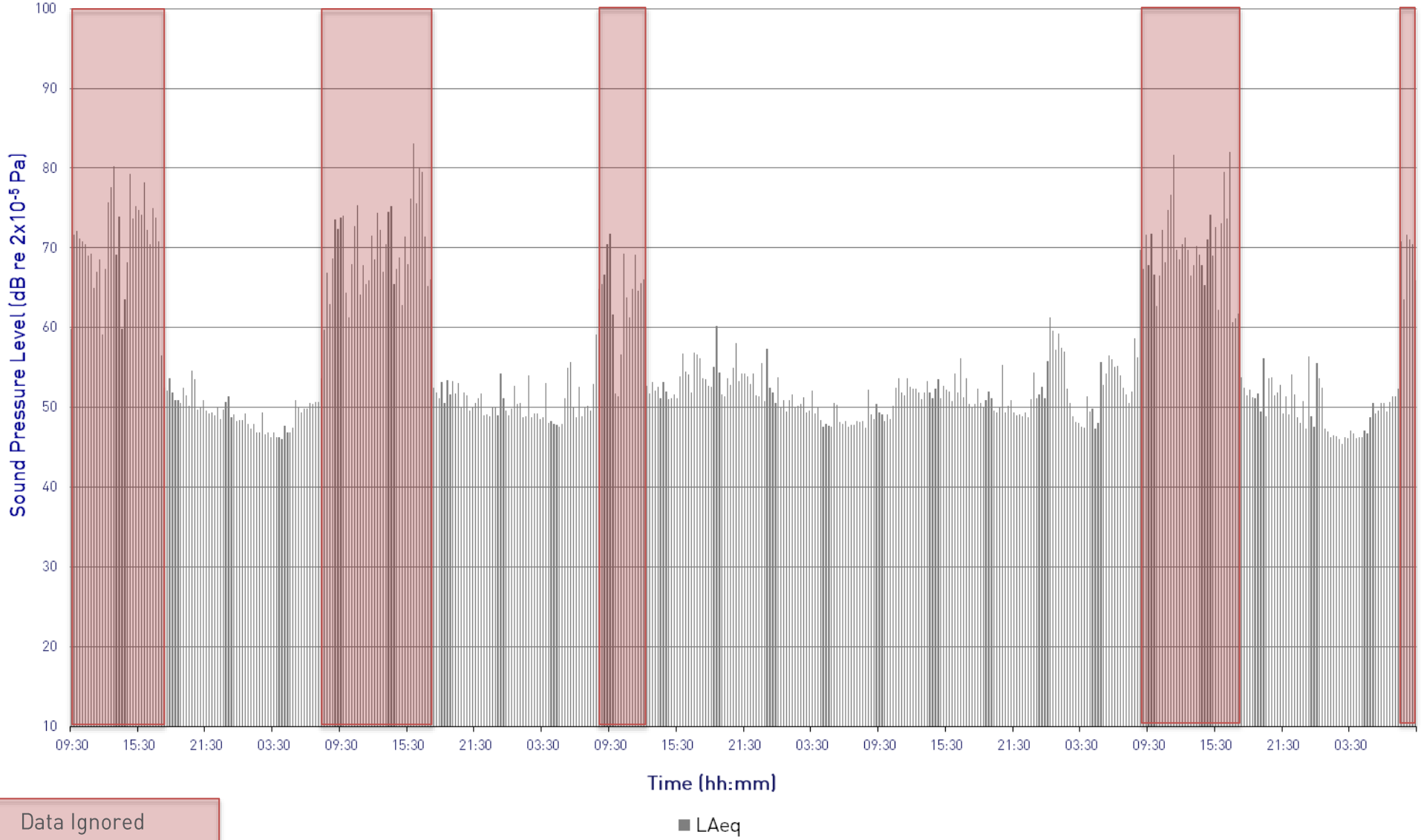
171 Camden High Street

L_{Aeq} Time History

Thursday 7 to Tuesday 12 January 2016

RBA ACOUSTICS

Graph 7208/G1



Data Ignored

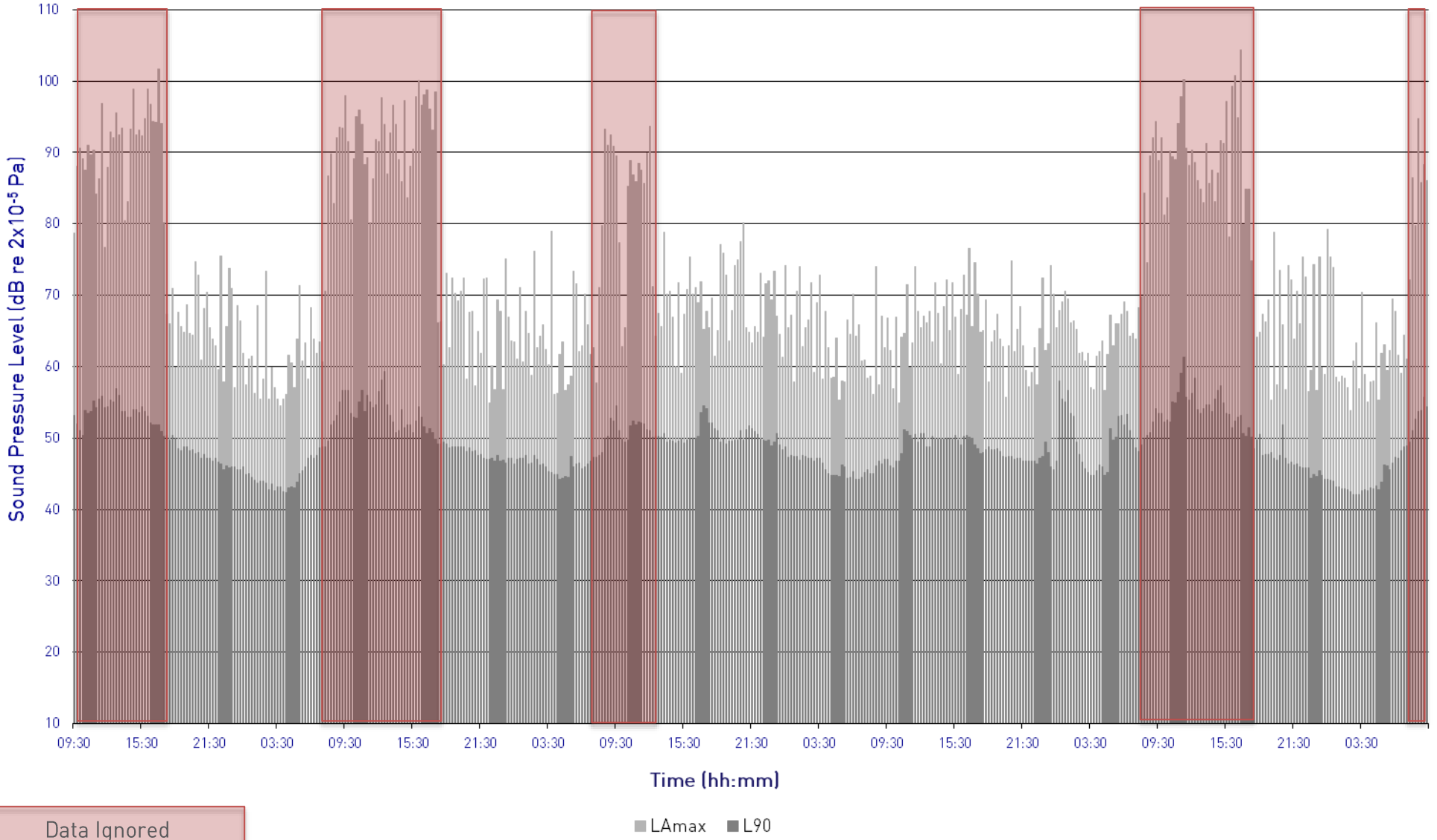
171 Camden High Street

L_{Amax} and L_{A90} Time History

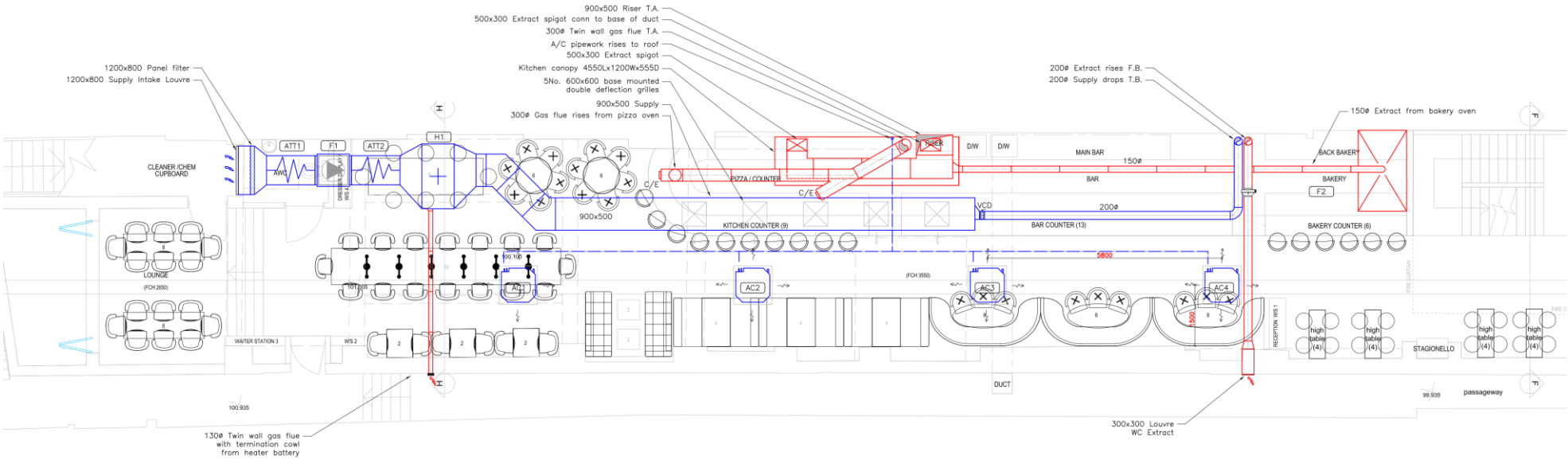
Thursday 7 to Tuesday 12 January 2016

RBA ACOUSTICS

Graph 7208/G2



Data Ignored



171 Camden High Street, Camden, London

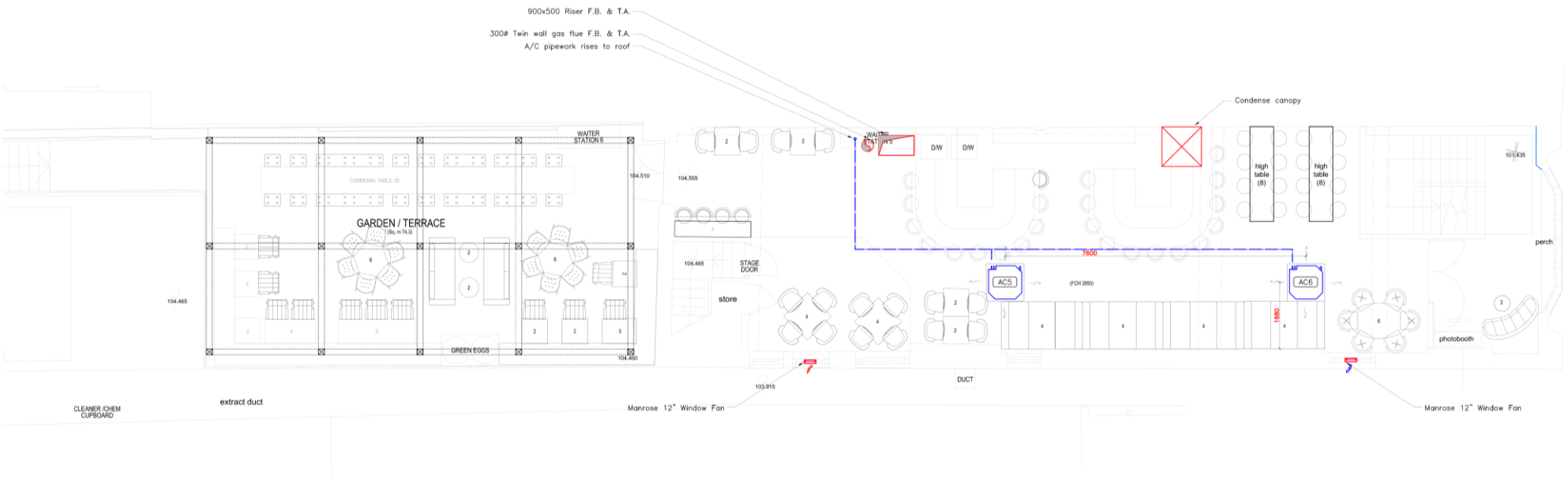
Ground floor plant plan

Plant Plan 7208/PP1

7 March 2016

Not to Scale

RBA ACOUSTICS



171 Camden High Street, Camden, London

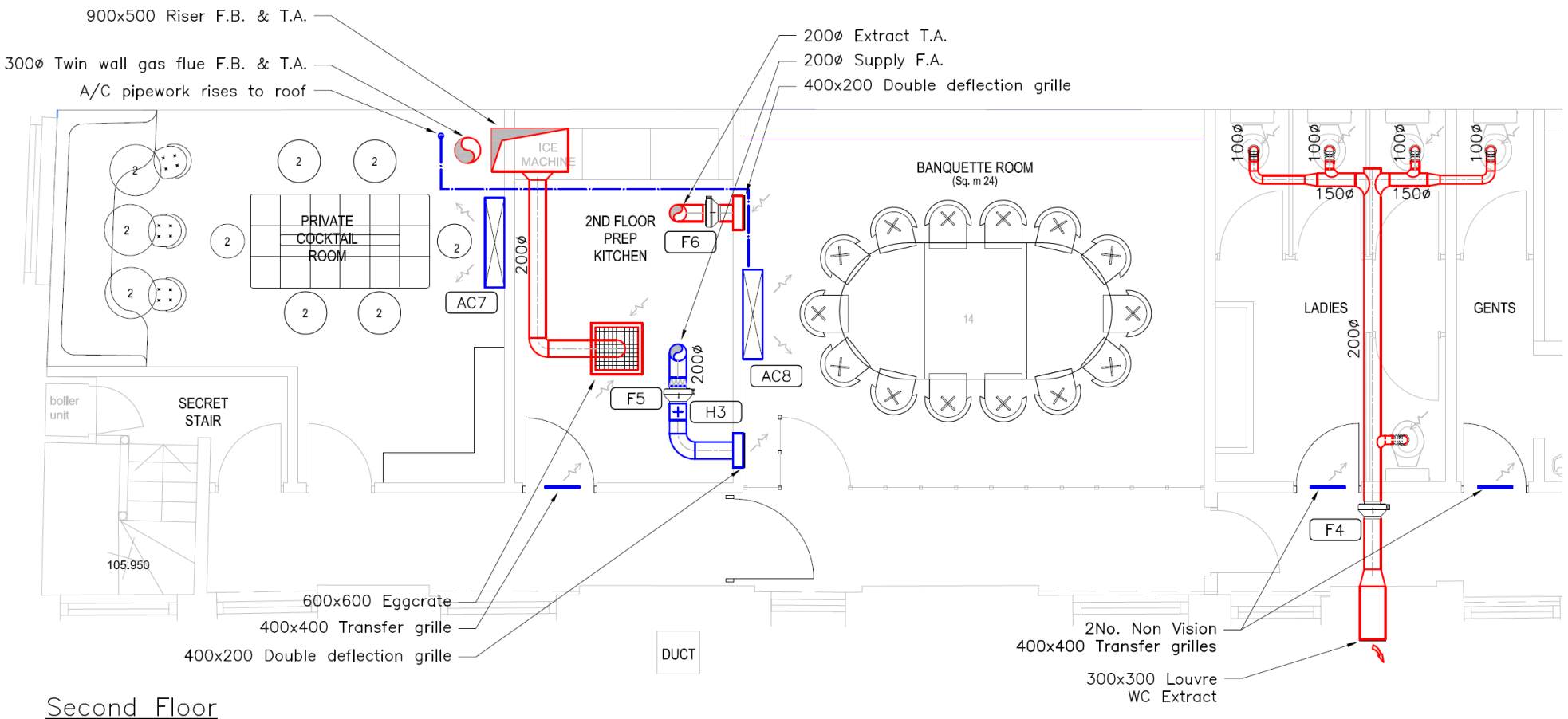
First floor plant plan

Plant Plan 7208/PP2

7 March 2016

Not to Scale

RBA ACOUSTICS



Second Floor

171 Camden High Street, Camden, London

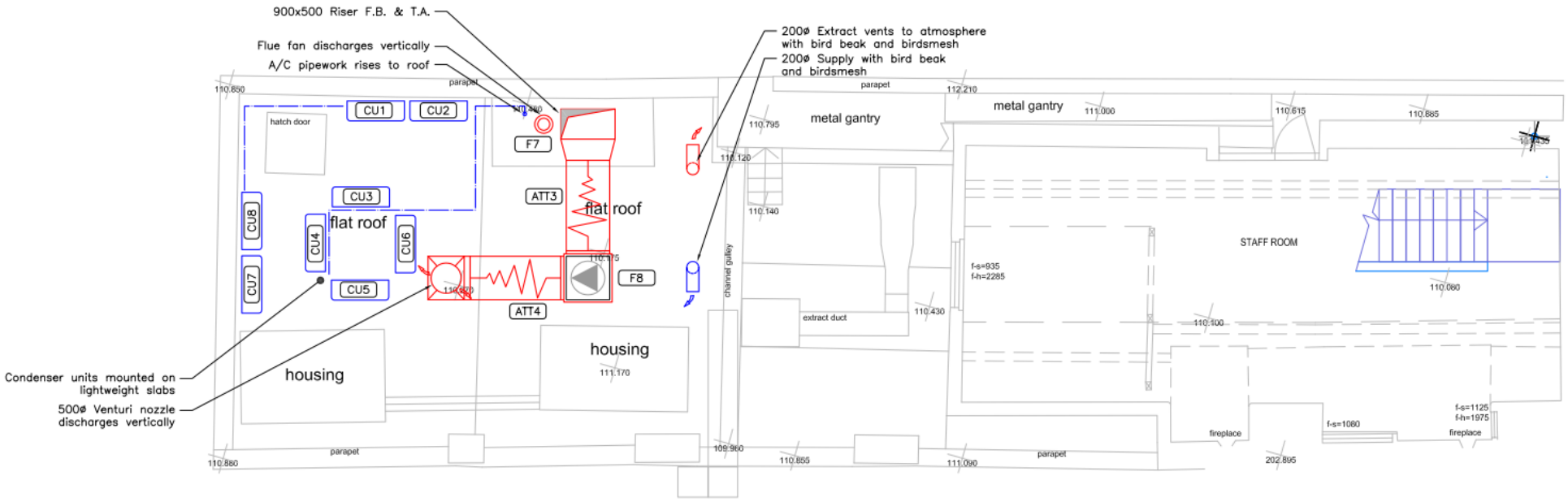
Second floor plant plan

Plant Plan 7208/PP3

7 March 2016

Not to Scale

RBA ACOUSTICS



Third Floor

171 Camden High Street, Camden, London

Third floor plant plan

Plant Plan 7208/PP4

7 March 2016

Not to Scale

RBA ACOUSTICS

171 Camden High Street, Camden, London

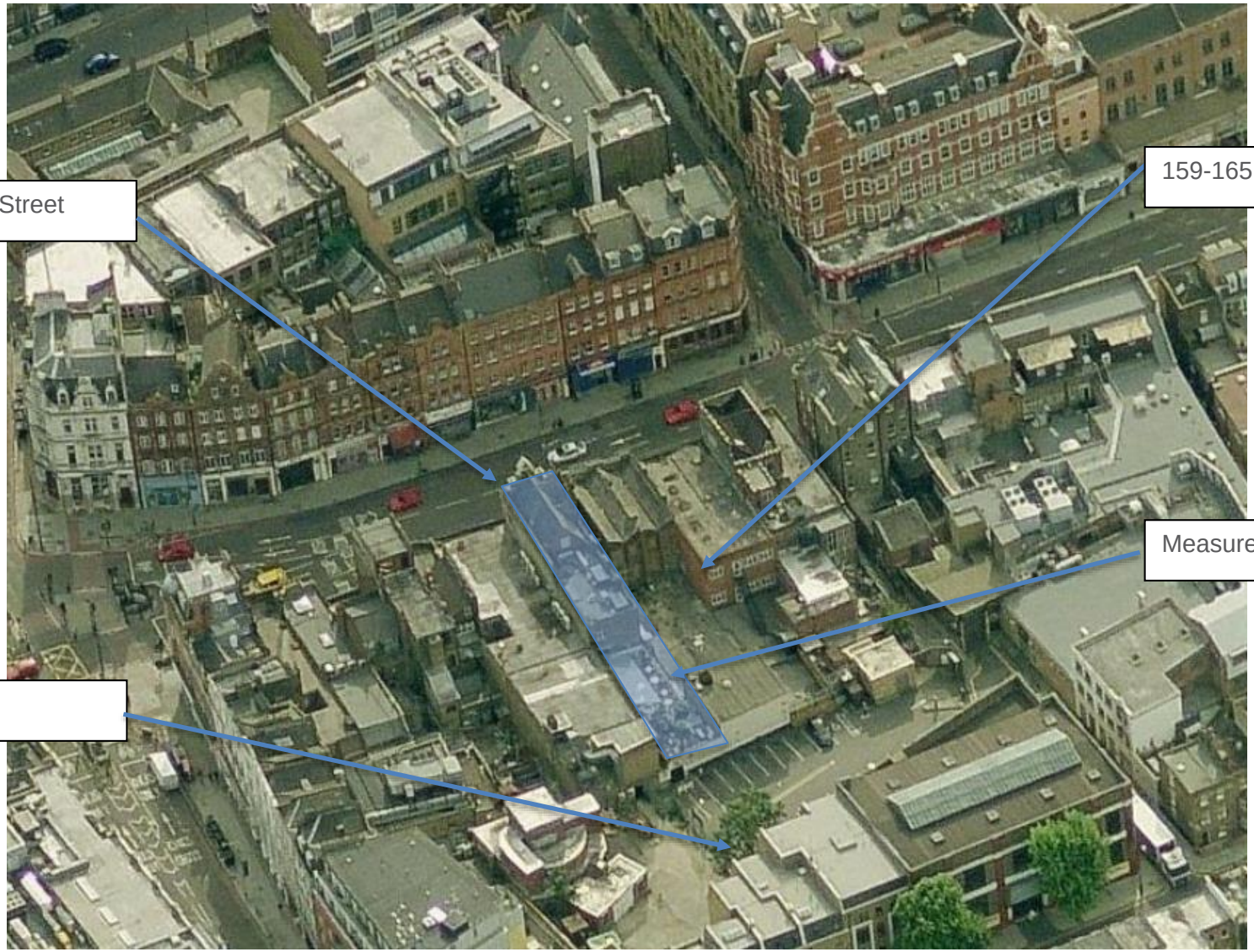
South Elevation

Plant Plan 7208/PP5

7 March 2016

Not to Scale

RBA ACOUSTICS



171 Camden High Street, Camden, London

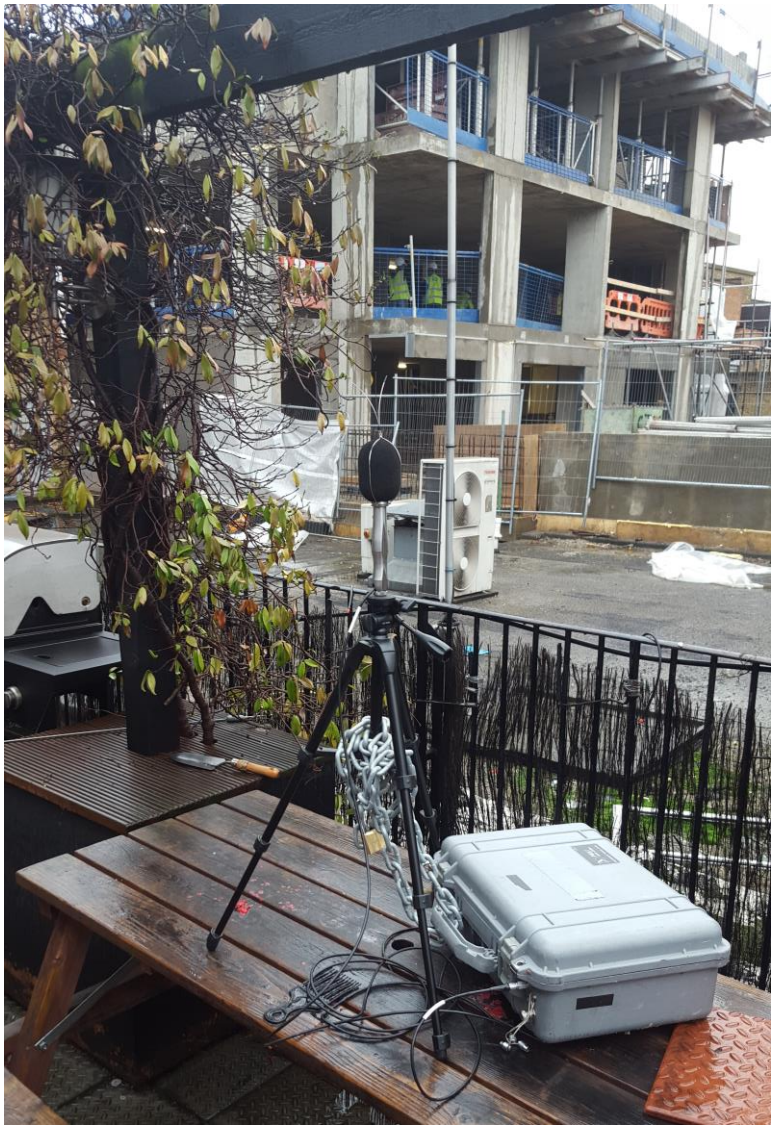
Site Plan

Site Plan 7208/SP1

7 March 2016

Not to Scale

RBA ACOUSTICS



171 Camden High Street, Camden, London

Photograph Detailing Measurement Position

Photograph 7208/P1

7 March 2016

Not to Scale

RBA ACOUSTICS

Graph 4374/G6

RBA ACOUSTICS
44 Borough Road
London SE1 0AJ

T. +44 (0) 20 7620 1950
W. www.rba-acoustics.co.uk