Brasserie Blanc
8 Charlotte Street

ENVIRONMENTAL NOISE SURVEY
& PLANT NOISE ASSESSMENT
REPORT 18334/PNA4 RevB

For:

Chapman Ventilation
2 Little Mundells
Welwyn Garden City
Hertfordshire
AL7 1EW

19 March 2014

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1.0 INTRODUCTION

New items of building services plant have been installed at Brasserie Blanc, Charlotte Street. The site lies within the London Borough of Camden and is surrounded by commercial and residential properties.

Hann Tucker Associates have therefore been commissioned to undertake a detailed environmental noise survey and assess the installed plant based on the results of the survey and the requirements of the Local Authority.

This report presents the survey methodology and assessment findings.

2.0 OBJECTIVES

To establish, by means of detailed 24 hour daytime and night-time fully automated environmental noise monitoring, the existing A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{max} environmental noise levels at a selected accessible position at the site, thought to be representative of the nearest affected property.

Based on the results of the noise survey, and in conjunction with the Local Authority, to recommend suitable plant noise emission criteria.

Using manned measurements and manufacturers data, to establish noise emissions from the installed plant.

To assess the impact of the installed plant on the neighbouring noise sensitive properties and comment on its acceptability.

3.0 SITE DESCRIPTION

3.1 Location

The site is located at 8 Charlotte Street and falls within the London Borough of Camden's jurisdiction. See Location Map below.

Location Map (maps.google.co.uk)

3.2 Description

The site comprises a terraced property bound to the west by Charlotte Street. Various commercial and residential properties adjoin the site in all other directions. See Site Plan below.

Site Plan (maps.google.co.uk)

4.0 ACOUSTIC TERMINOLOGY

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 METHODOLOGY

5.1 Unmanned Survey

5.1.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 10:15 hours on 20 June 2012 to 10:15 hours on 21 June 2012.

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately comment on the weather conditions throughout the entire survey period. However at the beginning and end of the survey period the wind conditions were calm. The sky was generally clear. We understand that generally throughout the survey period the weather conditions were similar to this. These conditions are considered suitable for obtaining representative measurement results.

Measurements were taken continuously of the A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{max} sound pressure levels over 15 minute periods.

5.1.2 Measurement Position

The noise level measurements were undertaken at 1No. position at the development site.

The microphone was attached to a pole and positioned to the rear of the site at first floor level.

The position was selected in order to assess the lowest noise levels at the development site for subsequent use in setting plant noise emission criteria and is shown on the plan below.

Plan Showing Unmanned Measurement Position (maps.google.co.uk)

5.1.3 Instrumentation

The instrumentation used during the survey is presented in the table below:

Description	Manufacturer	Type	Serial Number	Latest Verification
Type 1 Data Logging Sound Level Meter	Larson Davis	824	3542	LD calibration on 24/02/2012
Type 1 ½" Condenser Microphone	PCB	377B02	104675	LD calibration on 24/02/2012
Type 1 Calibrator	Larson Davis	CAL200	3082	LD calibration on 02/03/2012

The sound level meter, including the extension cable, was calibrated prior to and on completion of the survey. No significant change was found to have occurred (no more than 0.1dB).

The sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable. The microphone was fitted with a Larson Davis windshield.

5.2 Manned Survey

5.2.1 Procedure

Fully manned environmental noise monitoring was undertaken from approximately 09:00 hours to 10:00 hours on Thursday 27 September 2012 and between 10:00 hours and 11:00 hours on Tuesday 8 January 2013 in order to establish noise emissions from the installed plant.

During the survey periods the wind conditions were calm. The sky was clear. There was no rain during either survey. Road surfaces were dry throughout the survey periods.

Measurements were taken of the A-weighted (dBA) L_{eq} sound pressure levels. Atypical noises were excluded as far as reasonably possible. The noise levels measured are therefore assumed to be representative of the noise climate during the hour in which the measurements were taken

5.2.2 Measurement Positions

The noise level measurements were undertaken at 3No. positions around the development site. The measurement positions are described in the table below.

Position	Description
A	The microphone was positioned approximately 1 metre from the kitchen supply fan.
B	The microphone was positioned approximately 1 metre from the roof mounted Danfoss CU's.
C	The microphone was positioned approximately 1 metre from the roof mounted Toshiba CU's.

5.2.3 Instrumentation

The instrumentation used during the manned surveys are presented in the tables below:

Equipment	Model	Serial Number	Calibration Date
Precision Sound Analyser Meter	Brüel & Kjær Type 2260	2274840	University of Salford calibration on 25/10/2010
½ " Microphone	Brüel & Kjær Type 4189	2275232	University of Salford calibration on 25/10/2010
Sound Level Calibrator	Brüel & Kjær Type 4231	2308993	University of Salford calibration on 27/10/2011

Equipment	Model	Serial Number	Calibration Date
Precision Sound Analyser Meter	Brüel & Kjær Type 2260 with building acoustics module BZ 7204	2274840	University of Salford calibration on 07/11/2012
½ " Microphone	Brüel & Kjær Type 4189	2275232	University of Salford calibration on 07/11/2012
Sound Level Calibrator	Brüel & Kjær Type 4231	2308993	University of Salford calibration on 07/11/2012

The sound level meter was fitted with a Brüel and Kjær microphone windshield.

The sound level meter was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred.

6.0 RESULTS

The results of our unmanned survey have been plotted on Time History Graphs 18334/TH1 to 18334/TH2 enclosed, presenting the 15 minute A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{max} levels at the measurement position throughout the duration of the survey.

The lowest measured $L_{A90(15\ min)}$ noise levels are presented in the table below.

Lowest Measured $L_{A90(15\ min)}$ (dB re $2x10^{-5}$ Pa)	
Proposed Daytime Plant Operation Hours (09:00 – 00:00 hours)	**24 hours**
49	44

The results of the manned survey are presented in Section 9.1 of this report.

7.0 DISCUSSION OF NOISE CLIMATE

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period. However at the beginning and end of the survey period the dominant noise sources were noted to be local road traffic and nearby construction works.

8.0 PLANT NOISE EMISSION CRITERIA

We understand that the requirements of Camden Council are as follows:

> *"Noise levels at a point 1 metre external to sensitive façades shall be at least 5dBA less than the existing background measurement (L_{A90}), expressed in dBA when all plant/equipment are in operation. Where it is anticipated that any plant/equipment 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) special attention should be given to reducing the noise levels from that piece of plant/equipment at any sensitive façade to at least 10dBA below the L_{A90}, expressed in dBA."*

On the basis of the above and the survey results we thus propose the following plant noise emission limits to be achieved at 1m from the façades of the nearest neighbouring buildings for plant items which do not contain a tonal element:

Plant Noise Emission Criteria (dB re $2x10^{-5}$ Pa)	
Proposed Daytime Plant Operation Hours (09:00 – 00:00 hours)	**24 hours**
44dBA	39dBA

Following correspondence from the London Borough of Camden we understand that the installed Danfoss CU's are to be treated as having a 'tonal' element. As such, the following plant noise emission criteria should be achieved:

> *"Where it is anticipated that any plant/equipment 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) special attention should be given to reducing the noise levels from that piece of plant/equipment at any sensitive façade to at least 10dBA below the L_{A90}, expressed in dBA."*

Based on the above and the results of our unmanned noise survey (results presented in our Plant Noise Assessment Report dated 17 October 2012), we thus propose the following plant noise emission limits to be achieved at 1m from the façades of the nearest neighbouring buildings:

Plant Noise Emission Criteria (dB re $2x10^{-5}$ Pa)	
Proposed Daytime Plant Operation Hours (09:00 – 00:00 hours)	**24 hours**
39dBA	34dBA

It should be noted that the above plant noise emission limits are subject to approval from Camden Council.

9.0 PLANT NOISE ASSESSMENT

We understand that the following item of plant have been installed at Brasserie Blanc.

Plant Description	Location	Qty
Kitchen Extract Fan	Lightwell (proposed)	1
Kitchen Supply Fan	Rear façade (existing)	1
Danfoss CU	Roof (proposed)	2
Toshiba CU	Roof (existing)	3

9.1 Plant Noise Emissions

Whilst undertaking our manned survey, we measured the following plant noise levels on site.

Item of Plant	Measured Sound Pressure Level (dB re 2 x 10^{-5}Pa at Octave Centre Band Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Kitchen Supply Fan at 1m	65	63	60	62	52	48	42	37	61
2No. Danfoss CU* at 1m	62	56	54	47	44	41	37	29	51
3No. Toshiba CU at 1m	61	62	56	50	47	43	39	33	54

*Measurement taken in third octaves presented in Appendix B

The kitchen extract fan is to be re-located and re-ducted. For this reason we have selected to use manufacturer's noise data in lieu of on-site measurements.

Manufacturer's noise data is presented below.

Item of Plan	Manufacturer's In Duct Sound Power Level (dB re 10^{-12} W) at Octave Band Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Extract Fan Outlet	80	98	91	90	85	78	75	73

9.2 Plant Location

Plant locations have been taken from Chapman Ventilation's drawing ZBB7-05 RevB dated 16 October 2013, which can be found in the attached Site Plan 18334/SP1.

9.3 Mitigation Measures

The above drawing indicates that some noise mitigation measures are proposed for the installed plant.

9.3.1 Kitchen Extract Fan

The kitchen extract fan is to be relocated to the lightwell at lower ground level.

In order to control noise breakout from the fan an "Acoustic Capping" is to be constructed across the top of the lightwell effectively enclosing the fan within a plantroom.

The proposed cladding should comprise 50mm mineral wool with 2No. layers of solid board with a have a minimum mass per unit area of at least 10kg/m^2. This could be achieved using two or more layers of a wide range of materials including, for example, plywood or equivalent sheeting board to a suitable thickness required to achieve the mass per unit area. All junctions should be staggered.

Penetrations shall be treated so as to maintain the acoustic performance of the assembled structure.

All junctions between the "Acoustic Capping" and adjacent structures shall be made good and sealed with a heavy grout and/or dense non-hardening mastic.

The complete structure shall be wind and weather resistant to standards agreed with the Client.

The fan is to be fitted with atmospheric side in duct attenuator. Please find attached our Attenuator Schedule 18334/SS1.

9.3.2 Kitchen Supply Fan

The installed kitchen supply fan is set to be retained in its existing location.

In order that the installed plant be capable of achieving the requirements of the Local Authority we would advise the fan be clad with a mass layer cladding.

The proposed cladding should comprise 50mm mineral wool with 2No. layers of solid board with a have a minimum mass per unit area of at least 10kg/m^2. This could be achieved using two or more layers of a wide range of materials including, for example, plywood or equivalent sheeting board to a suitable thickness required to achieve the mass per unit area. All junctions should be staggered.

Doors, access panels and service penetrations shall be treated so as to maintain the acoustic performance of the assembled screen.

All junctions between the cladding and adjacent structures shall be made good and sealed with a heavy grout and/or dense non-hardening mastic.

The complete structure shall be wind and weather resistant to standards agreed with the Client. As we understand, this has now been installed on site.

9.3.3 Danfoss CU

The 2No. Danfoss CU are to be installed in a full acoustic enclosure. The proposed enclosure must be capable of limiting the plant noise levels to 40dBA at 1 metre when both Danfoss CU's are enclosed <u>together</u>

The above noise levels must be achieved when measured at 1 metre in any direction on site.

Providing the above specification is achieved on site the requirements of the Local Authority presented above should be complied with. Calculations are presented below.

9.4 Daytime Plant Noise Assessment (09:00 - 00:00 hours)

The installed plant is operating during the hours of 09:00 to 00:00.

9.4.1 Lower Ground Plant

Kitchen Extract Fan

The kitchen extract fan is to be relocated to a lightwell area with an "Acoustic Capping" above. The neighbouring windows are approximately 3 metres away. Our calculations are presented below.

Item of Plant	Sound Level at Octave Centre Band Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Extract Fan (SLW)	80	98	91	90	85	78	75	73	
Fan Casing	-10	-12	-15	-20	-25	-30	-35	-35	
"Acoustic Capping to lightwell"	-15	-18	-23	-28	-35	-38	-40	-40	
L_{prev}	36	46	29	18	0	-	-	-	
L_{pdir}	32	46	32	22	5	-	-	-	
Calculated Noise Level (SPL) at Neighbouring Facade	38	49	34	23	6	-	-	-	34

The above calculations for L_{prev} and L_{pdir} levels are calculated using in house modelling software.

Our calculations indicate that the installed plant should be considered to be achieve the daytime requirements of the Local Authority outlined in Section 8.0 once relocated.

Supply Fan

The kitchen supply fan is mounted on the rear facade of the restaurant. The neighbouring windows are approximately 2 metres away. Our calculations are presented below.

Item of Plant	Sound Pressure Level (dB re 2 x 10^{-5}Pa At Octave Centre Band Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Kitchen Supply Fan @ 1m	65	63	60	62	52	48	42	37	61
Mass Layer Cladding	-11	-11	-11	-11	-11	-11	-11	-11	
Distance Loss 2 metres	-6	-6	-6	-6	-6	-6	-6	-6	-6
Calculated Noise Level at Neighbouring Facade	48	46	43	45	35	31	25	20	44

Our calculations indicate that the installed plant is considered to achieve the daytime requirements of the Local Authority outlined in Section 8.0 once mitigation measures are implemented.

Combined Noise Levels (Lower Ground)

Item of Plant	Sound Pressure Level (dB re 2 x 10^{-5}Pa At Octave Centre Band Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Calculated Noise Level at Neighbouring Facade (All lower ground plant running)	48	51	44	45	35	31	25	20	44

Our calculations indicate that the installed plant is considered to be achieve the daytime requirements of the Local Authority outlined in Section 8.0 during the proposed operating hours.

9.4.2 Roof Mounted Plant

Kitchen Extract Grille

The kitchen extract fan is to be mounted in the lightwell area and ducted to discharge at roof level. The neighbouring windows are approximately 4 metres away. The duct work is to be fitted with a carbon filter. Having reviewed the manufacturers data for the proposed filter we do not envisage this addition affecting the in duct noise levels.

Our calculations are presented below.

Item of Plant	Sound Pressure Level (dB re 2 x 10^{-5}Pa At Octave Centre Band Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Fan In Duct SWL	80	98	91	90	85	78	75	73	
Proposed Attenuator	-9	-18	-31	-48	-50	-49	-44	-24	
Duct Losses	-1.4	-1.4	-1.4	-2.4	-3.6	-3.6	-3.6	-3.6	
Grille End Reflection	-4	-2	-	-	-	-	-	-	
Directivity Losses	-1	-2	-4	-20	-22	-22	-22	-22	
Divergence	-20	-20	-20	-20	-20	-20	-20	-20	
Calculated Noise Level (SPL) at Neighbouring Facade	45	55	35	-	-	-	-	3	39

Our calculations indicate that the installed plant should be considered to be achieving the daytime requirements of the Local Authority outlined in Section 8.0 once relocated and in duct attenuation is installed.

Danfoss CU

The 2No. Danfoss CU's are to be re-installed within an acoustic enclosure on the flat roof area to the rear of the restaurant. The neighbouring windows are approximately 5 metres away.

Our calculations are presented below.

Item of Plant	Sound Pressure Level (dB re 2 x 10^{-5}Pa At Octave Centre Band Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
2No. Enclosed Danfoss CU at 1m	51	45	43	36	33	30	26	18	40
Distance Loss 5 metres	-14	-14	-14	-14	-14	-14	-14	-14	
Calculated Noise Level at Neighbouring Facade	37	31	29	22	19	16	12	4	26

Our calculations indicate that the re-located and enclosed plant should be considered to be achieving the daytime requirements of the Local Authority outlined in Section 8.0.

Toshiba CU

The 3No. Toshiba CU's are installed on the flat roof area to the rear of the restaurant. The neighbouring windows are approximately 5 metres away. Our calculations are presented below.

Item of Plant	Sound Pressure Level (dB re 2 x 10^{-5}Pa At Octave Centre Band Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
3No. Toshiba CU at 1m	61	62	56	50	47	43	39	33	54
Distance Loss 5 metres	-14	-14	-14	-14	-14	-14	-14	-14	-14
Calculated Noise Level at Neighbouring Facade	50	48	42	36	33	29	25	19	40

Our calculations indicate that the installed plant should be considered to be achieving the daytime requirements of the Local Authority outlined in Section 8.0.

Combined Noise Levels (Roof Mounted Plant)

Item of Plant	Sound Pressure Level (dB re 2 x 10^{-5}Pa At Octave Centre Band Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Calculated Noise Level at Neighbouring Facade (All lower ground plant running)	51	56	43	36	33	29	25	19	43

Our calculations indicate that the installed plant are considered to be achieving the daytime requirements of the Local Authority outlined in Section 8.0.

9.5 24 Hour Plant

The following plant operates up to 24 hours a day.

Danfoss CU

The 2No. Danfoss CU's are to be re-installed within an acoustic enclosure on the flat roof area to the rear of the restaurant. The neighbouring windows are approximately 5 metres away.

Our calculations are presented below.

Item of Plant	Sound Pressure Level (dB re 2 x 10^{-5}Pa At Octave Centre Band Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
2No. Enclosed Danfoss CU at 1m	51	45	43	36	33	30	26	18	40
Distance Loss 5 metres	-14	-14	-14	-14	-14	-14	-14	-14	
Calculated Noise Level at Neighbouring Facade	37	31	29	22	19	16	12	4	26

Our calculations indicate that the installed plant is considered to be achieving the 24 hour requirements of the Local Authority outlined in Section 8.0 for plant containing a tonal element.

10.0 CONCLUSIONS

A detailed 24 hour daytime and night-time fully automated environmental noise survey has been undertaken in order to establish the currently prevailing environmental noise climate around the site.

Plant noise emission criteria have been recommended based on the results of the noise survey and in conjunction with the Local Authority.

An assessment has been carried out to determine the plant noise emissions at the nearest noise sensitive windows due to the installed/proposed to be relocated plant.

Mitigation advice has been given.

Calculations demonstrate that with the proposed mitigation advice implemented, the requirements of the Local Authority should be met at the nearest noise sensitive windows in all cases.

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Checked by
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Appendix A

The acoustic terms used in this report are as follows:

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.

dBA : 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 dBA level.

Because of being a logarithmic scale noise levels in dBA do not have a linear relationship to each other. For similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

L_{10} & L_{90}: If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln 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.

It is common practice to use the L_{10} index to describe traffic noise, as being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic noise.

L_{eq} : The concept of L_{eq} (equivalent continuous sound level) has up to recently been primarily used in assessing noise in industry but seems now to be finding use in defining many other types of noise, such as aircraft noise, environmental noise and construction noise.

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 (e.g. 1 hour).

The use of digital technology in sound level meters now makes the measurement of L_{eq} very straightforward.

L_{max} : L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

Appendix B

Measured Sound Pressure Level (dB re 2 x 10^{-5} Pa) at Third Octave Band Centre Frequency (Hz)	
Frequency (Hz)	L_{eq}(dB)
16	51
20	57
25	61
31.5	59
40	60
50	61
63	54
80	47
100	54
125	51
160	48
200	53
250	46
315	44
400	43
500	43
630	40
800	40
1000	40
1250	38
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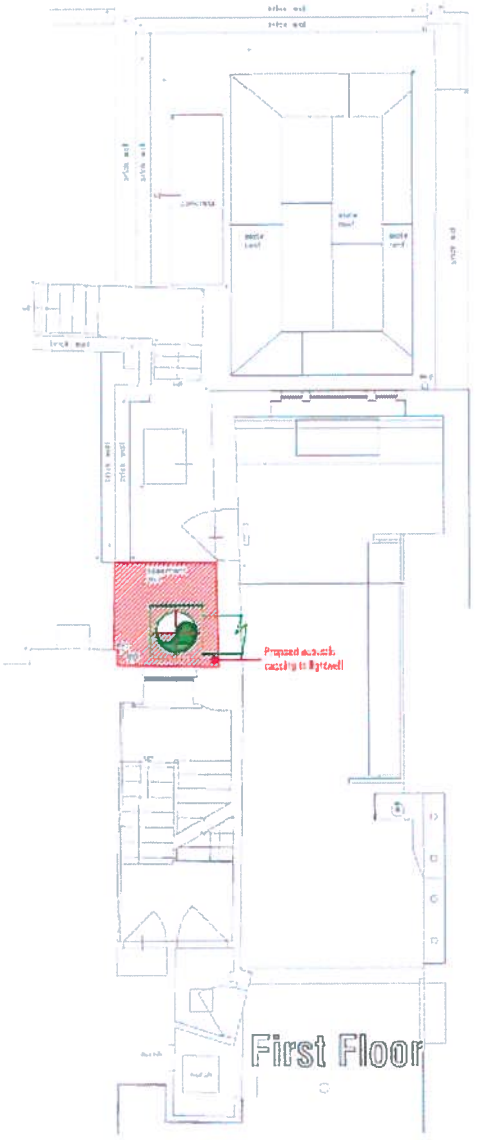
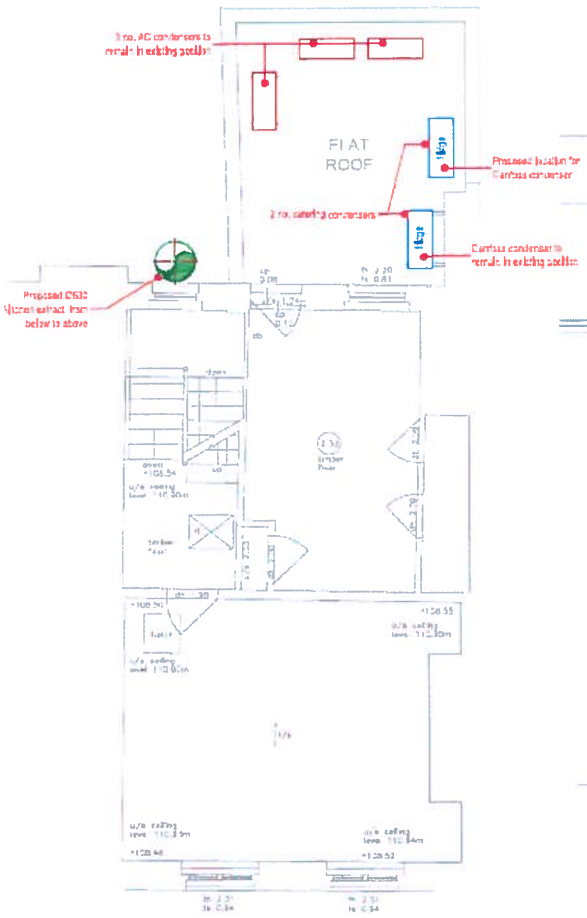
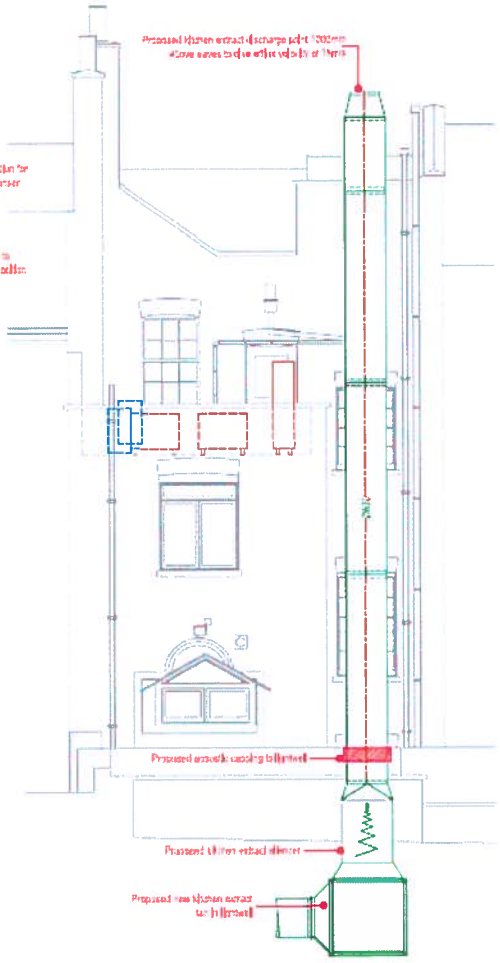
6300	27
8000	22
10000	21
12500	18



First Floor



Third Floor



Rear Elevation

Title : Proposed Ventilation Layout Third Floor & Rear Elevation	Project : Brasserie Blanc 8 Charlotte Street	Figure : 18334/SP1	
		Date : 13/02/2014	Scale : N.T.S

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ATTENUATOR SCHEDULE

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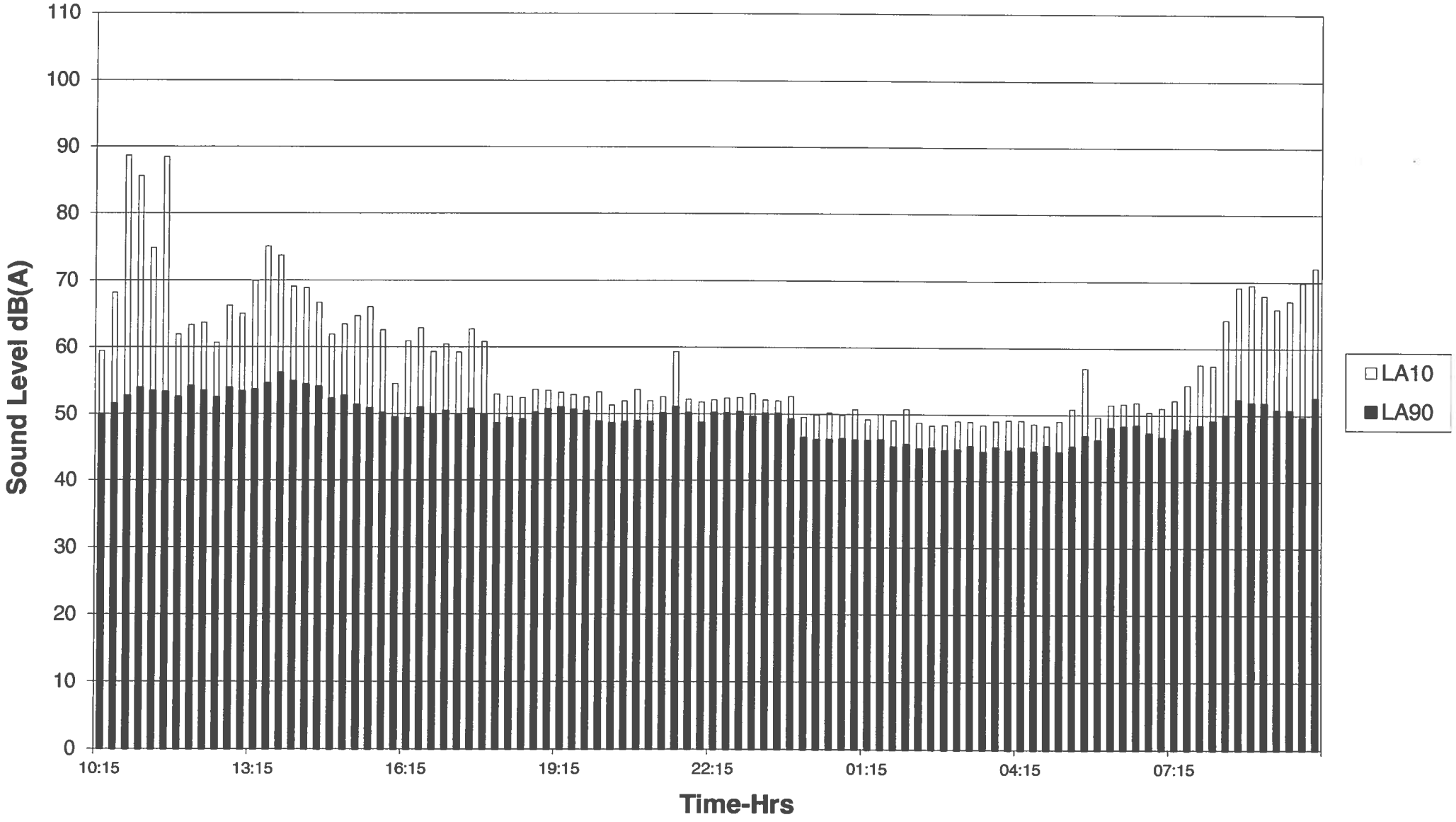
Brasserie Blanc
8 Charlotte Street

REF: HT18334/SS1

Revision: 0	Date: 13/02/2014	Comments: None													
Silencer Ref.	Description	No. Off	Dimensions (mm)			Vol. m^3/s	Max PD Pa	Minimum Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
			W	H	L			63	125	250	500	1k	2k	4k	8k
ATT 1	Extract Fan Atmospheric Side	1	760	760	2100	3.2	75	9	18	31	48	50	49	44	24

All silencers must comply with Hann Tucker Associates General Specification for Acoustic and Vibration Isolation Materials and Products (copy available upon request if not supplied).

Brasserie Blanc
Position 1
L_{A10} and L_{A90} Noise Levels
20/06/2012 - 21/06/2012



Time History Graph 18334/TH1

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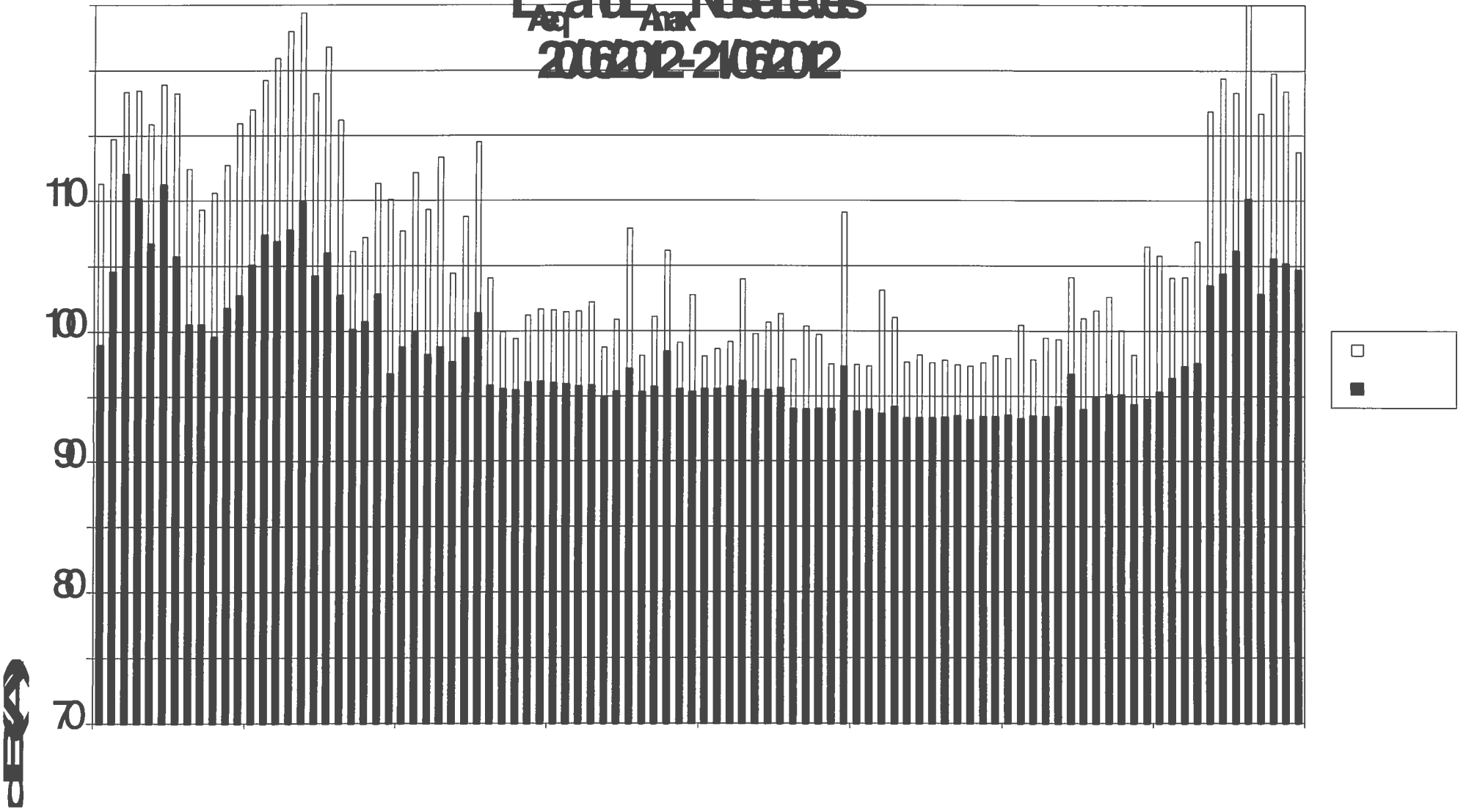
Position 1

L_{Aeq} and L_{Amax} Noise Levels

20/06/2012-21/06/2012



Time History Graph 18334/TH2