Report VA1575.160831.NIA

44 Cricklewood Broadway

Noise Impact Assessment

01 September 2016

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1. Introduction

It is proposed to install a new kitchen extract system at the rear of the premises at 44 Cricklewood Broadway, London, NW2 3ET.

Venta Acoustics has been commissioned by Mr M.N. Quaderi to undertake an assessment of the potential noise impact of the proposals in support of an application for planning permission.

An environmental noise survey has been undertaken to determine the background noise levels at the most affected noise sensitive receptors. These levels are used to undertake an assessment of the likely impact with reference to the planning requirements of Camden Council.

2. Design Criterion and Assessment Methodology

2.1 Consultation with the Local Authority

Camden Council have confirmed that their planning policy requirements that noise emissions from plant is at least 5dB below the local background noise level as assessed at the most affected noise sensitive receivers. Noise levels should also not exceed the background noise level by more than 1dB in any octave band between 63Hz and 8kHz. The requirements are summarised below.

> *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).*

2.2 BS8233:2014

BS8233 *Guidance on sound insulation and noise reduction for buildings* provides guidance as to suitable internal noise levels for different areas within residential buildings.

The relevant section of the standard is shown below in Table 2.1.

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 2.1 - Excerpt from BS8233: 2014 [dB ref. 20µPa]

3. Site Description

As illustrated on attached site plan VA1575/SP1, the site fronts onto Cricklewood Broadway and is located within a row of commercial premises, including established A1, A3, A4 and A5 uses, with residential units to the rear and above. A separate residential apartment block is located to the rear, separated from the site by a back yard and pedestrian path.

The most affected noise sensitive receivers are expected to be the rear facing windows of the residential units above the premises at 44 Crinklewood Broadway.

Existing building services plant and extract systems were noted serving the neighbouring commercial units.

4. Environmental Noise Survey

4.1 Survey Procedure & Equipment

In order to establish the existing background noise levels at the site, a noise survey was carried out taken between 14:00 hours on Friday 26th August and 10:50 hours on Tuesday 30th August 2016 at 2m above ground level at the location shown in site plan VA1575/SP1. This location was chosen to be representative of the background noise level at the most affected noise sensitive receivers while being secure and accessible.

Continuous 5-minute samples of the L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels were undertaken at the measurement location.

The weather during the survey period was generally dry with light winds. The background noise data is not considered to have been compromised by these conditions.

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*.

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

Manufacturer	Model Type	Serial No	Calibration	
			Certificate No.	Date
NTi Class 1 Integrating SLM	XL2	A2A-11586-E0	42530-A2A-11586-E0	9/6/16
Larson Davis calibrator	CAL200	13069	42530-13069	9/6/16

Table 4.1 – Equipment used for the tests

The calibration of the sound level meters was verified before and after use with no significant calibration drift observed.

4.2 Results

The measured sound levels are shown as time-history plots on the attached charts VA1575/TH1-4.

The background noise level is determined by road traffic noise on Cricklewood Broadway and building services plant associated with neighbouring commercial premises.

The minimum background noise levels measured were:

Monitoring Period	Minimum $L_{A90,5min}$
07:00 – 23:00 hours	44 dB 28/08/2016 07:10-07:15
23:00 – 07:00 hours	43 dB 29/08/2016 05:00-05:10

Table 4.2 – Minimum background noise levels

Although it is expected that the extract system will only operate during the opening hours of the proposed business, the lowest noise level over the entire survey period has been considered in order to provide a robust assessment.

4.3 Plant Noise Emission Limits

On the basis of the measured noise levels and the planning requirements of the Local Authority, and considering that it is not expected that tonal noise will be generated by the proposed plant units, the following plant specific sound levels should not be exceeded at the most affected noise sensitive receivers:

Monitoring Period	Design Criterion (L_{Aeq})
07:00 – 23:00 hours	39 dB
23:00 – 07:00 hours	38 dB

Table 4.3 – Specific sound pressure levels not to be exceeded at most affected noise sensitive receivers

Table 4.4 shows the spectral design criteria to not be exceeded at the most affected receiver.

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Spectral Criterion	43	43	44	43	39	33	26	19

Table 4.4 – Spectral plant noise design criterion

5. Predicted Noise Impact

5.1 Proposed plant

The kitchen extract system is proposed for installation against the rear wall of the building block with the fan located within the kitchen and the discharge at roof level. The location of the system is indicated on site plan VA1575/SP1.

Plant Item	Quantity	Proposed Model	Notes
4 pole 450mm Fan	1	Generic	Noise level of 68dB(A) specified in product literature. Spectral shape of fan with equivilant size, speed and duty used for calculations.

Table 5.1 – Indicative plant selections assumed for this assessment.

Consulting the manufacturer's datasheets, the octave band frequency data of an equivalent sized fan operating at the same speed has been assumed for the purposes of this assessment.

Plant Item	Octave Band Centre Frequency (Hz) Power Level, L_W (dB)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Equivalent fan (Flakt Woods 35JM/16/4/5/30)	72	70	68	68	62	58	54	49	68

Table 5.2 – Advised plant noise data used for the assessment.

5.2 Recommended Mitigation Measures

Inital calculations have determined that in order to comply with Camden Council's planning criteria an attenuator located after the extract fan having the following acoustic performance is required:

Attenuation Component	Octave Band Centre Frequency (Hz), Attenuator Insertion Loss (dB)							
	63	125	250	500	1k	2k	4k	8k
Noise Attenuator	2	3	6	12	13	11	10	6

Table 5.3 – Recommended attenuation performance.

This performance is expected to be provided by a circular attenuator 450mm in diameter and length (a 1D attenuator). This attenuator is to be mounted after the fan on the discharge side of the system, paying attention to the suppliers instructions regarding mounting direction.

It is assumed that the fan is located internally and so breakout from the fan is not considered. Breakout through the duct work is considered after the attenuator.

The fan, attenuator and ductwork should be mounted to the structure via suitable anti-vibration mounts to minimise vibration transfer to the attached dwellings.

Please note that the above recommendations relate to acoustic issues only. It is recommended that professional advice confirming the suitability of these measures be sought from others with regards to issues such as airflow, hygine and pressure loss.

5.3 Predicted noise levels

The cumulative noise level at the most affected noise sensitive receiver, some 2 meters away from the extract discharge point and 1m away from the ductwork, has been calculated on the basis of the above information and assuming the recommended mitigation measures, with reference to the guidelines set out in ISO 9613-2:1996 *Attenuation of sound during propagation outdoors - Part 2: General method of calculation.*

A summary of the calculations are shown in Appendix B.

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k	dB(A)
Plant noise criterion	43	43	44	43	39	33	26	19	38
L_p 1m from receiver	**42**	**43**	**40**	**32**	**25**	**24**	**19**	**18**	**36**

Table 5.4 – Predicted noise level and design criteria at noise sensitive location

5.4 Comparison to BS8233:2014 Criteria

BS8233 assumes a loss of approximately 15dB for a partially open window. The external noise level shown in Table 5.4 would result in internal noise levels that achieve the guidelines shown in Table 2.1.

6. Conclusion

A baseline noise survey has been undertaken by Venta Acoustics to establish the background noise climate in the locality of 44 Cricklewood Broadway in support of a planning application for the proposed introduction of new building services plant.

This has enabled noise emission limits to be set at the most affected noise sensitive receiver such that the proposed installation meets the requirements of Camden Council.

The cumulative noise emission levels from the proposed plant have been assessed to be compliant with the plant noise emission limits, with necessary mitigation measures specified.

The proposed scheme is not expected to have a significant adverse noise impact and the relevant Planning Conditions have been shown to be met.

Steven Liddell MIOA


Noise Monitoring Location
Most Affected Receptor
Proposed location of extract system
Under
44 Cri

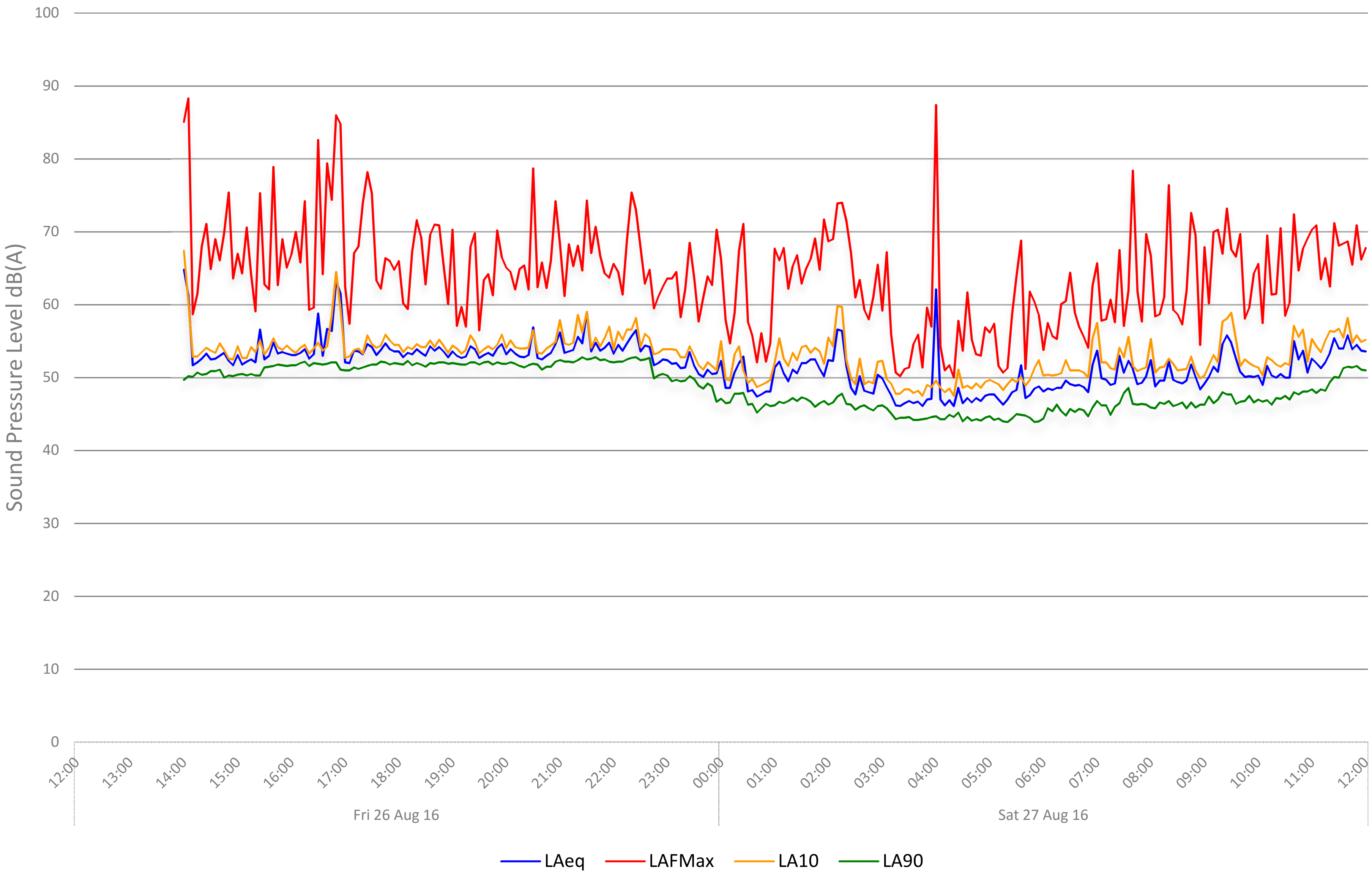
44 Cricklewood Broadway

Environmental Noise Time History: 1

Rear of Property

Venta Acoustics

Figure VA1575/TH1

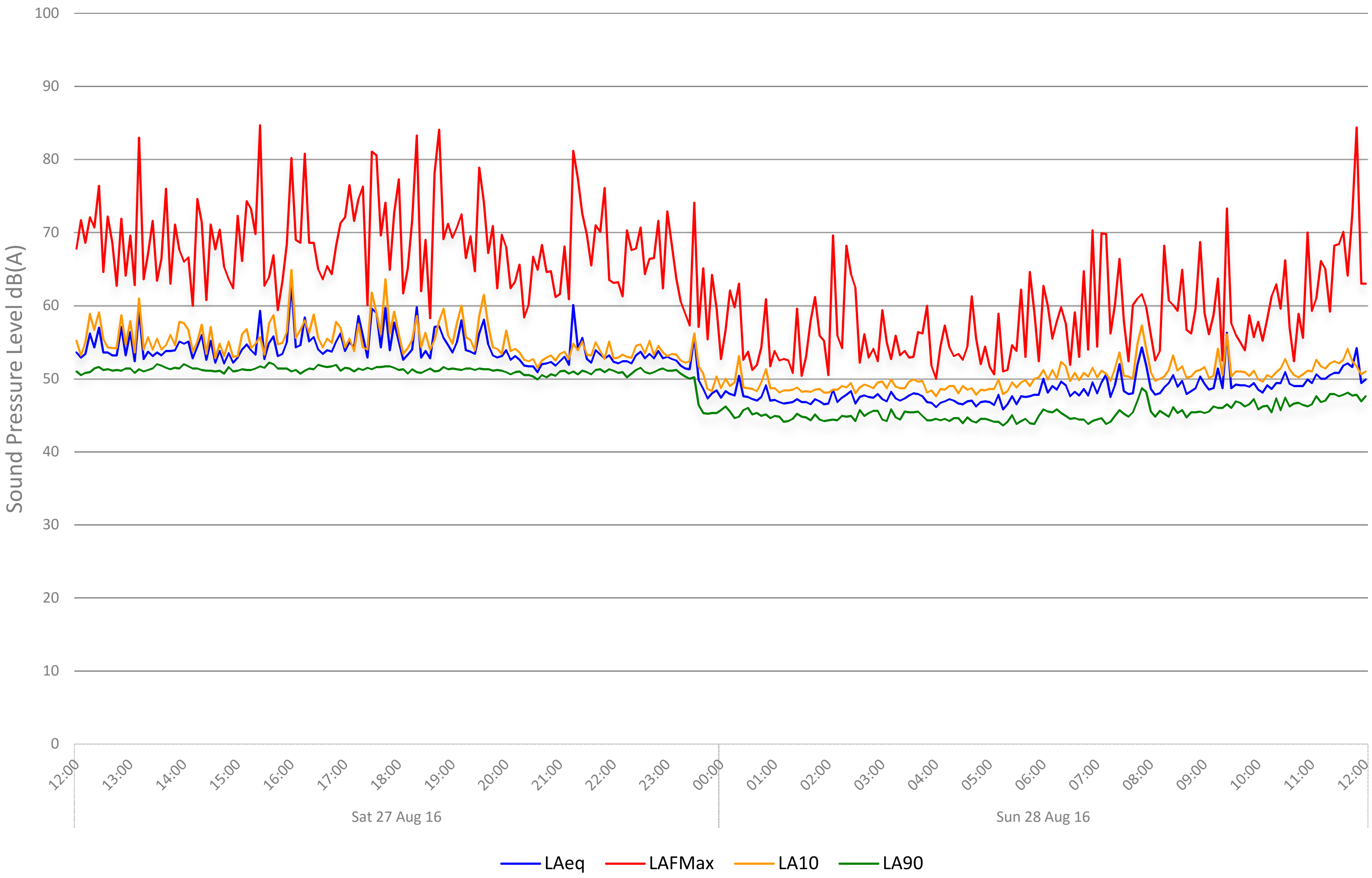


44 Cricklewood Broadway

Environmental Noise Time History: 2

Rear of Property

Figure VA1575/TH2



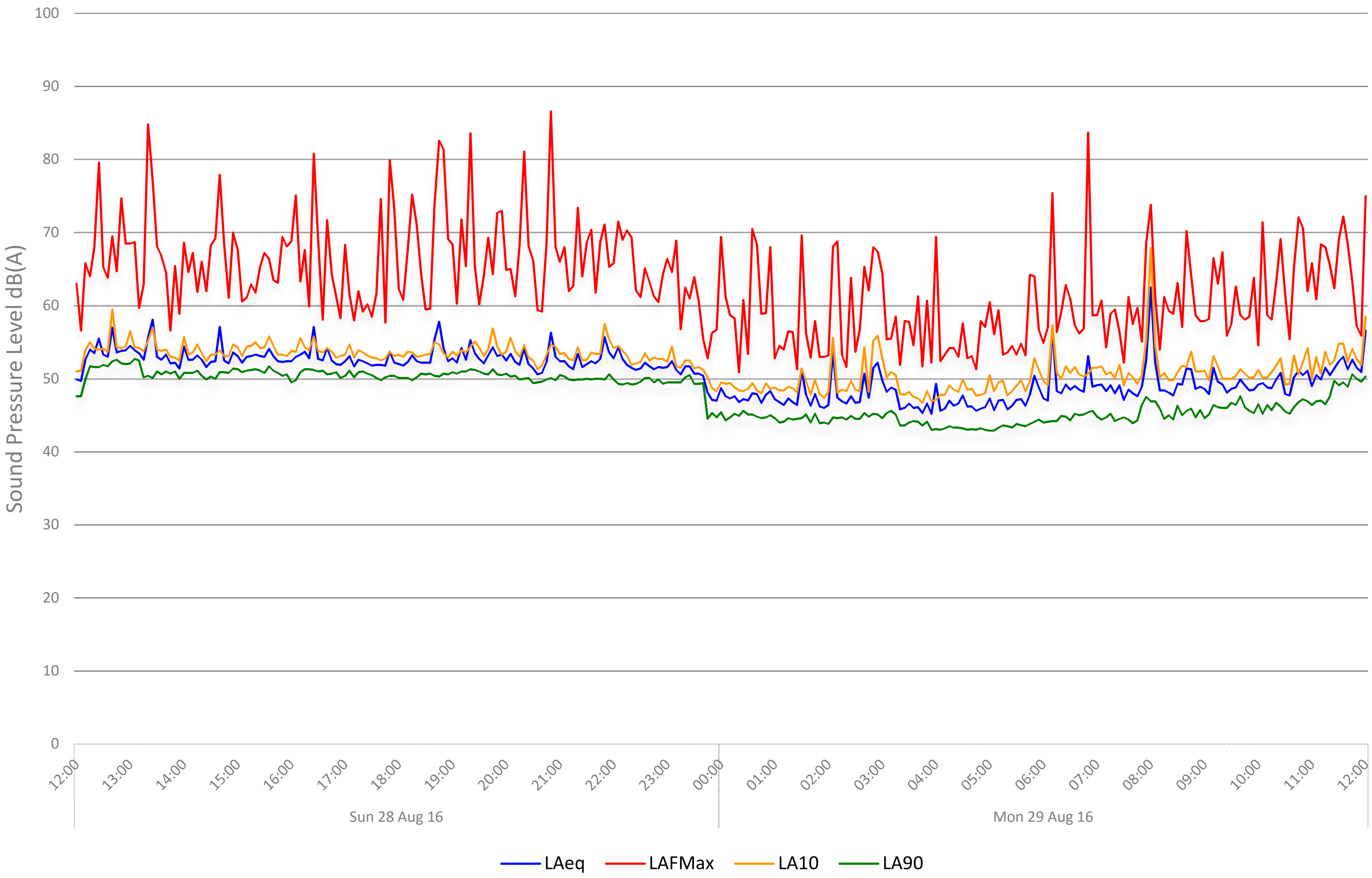
44 Cricklewood Broadway

Environmental Noise Time History: 3

Rear of Property

Venta Acoustics

Figure VA1575/TH3



44 Cricklewood Broadway

Environmental Noise Time History: 4

Rear of Property

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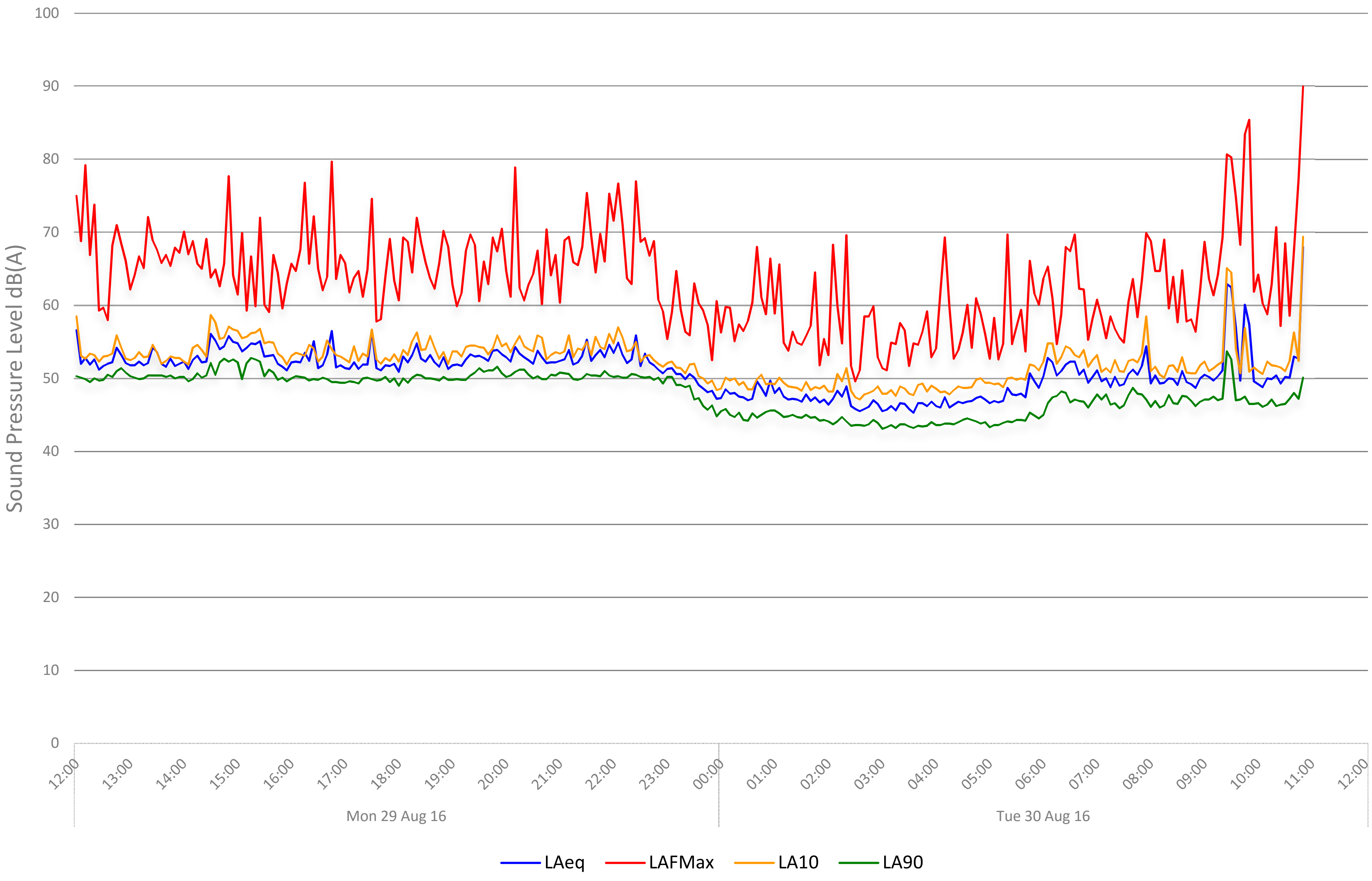
Figure VA1575/TH4



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.
L_{max} :	The maximum sound pressure level recorded over a given period. L_{max} is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged L_{eq} value.

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.

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

APPENDIX B
VA1575 - Cricklewood Broadway
Noise Impact Assessment

Calculated to nearest residential window

At Discharge		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Fan extract	Lw	72	70	68	68	62	58	54	49	**68**
Indicative Attenuator 450mm (1D)		-2	-3	-6	-12	-13	-11	-10	-6	
End Reflection @ 450mm Ø		-10	-5	-2	-1	0	0	0	0	
Directivity (Hor:0,Vert:140)		-1	-2	-3	-7	-9	-8	-8	-8	
Free Field Propagation		-11	-11	-11	-11	-11	-11	-11	-11	
Distance Loss	To 2m	-6	-6	-6	-6	-6	-6	-6	-6	
Level at 1m from discharge		**42**	**43**	**40**	**31**	**23**	**22**	**19**	**18**	**35**

duct breakout		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Fan extract	Lw	72	70	68	68	62	58	54	49	**68**
Indicative Attenuator 450mm (1D)		-2	-3	-6	-12	-13	-11	-10	-6	
Skin transmission loss (spiral wound steel duct)		-50	-50	-26	-26	-25	-22	-36	-43	
To 1m (with reflection off backing wall)		-5	-5	-5	-5	-5	-5	-5	-5	
Level at 1m from duct		**15**	**12**	**31**	**25**	**19**	**20**	**3**	**-5**	**27**

	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Cumulative Level at most affected window	**42**	**43**	**40**	**32**	**25**	**24**	**19**	**18**	**36**
Octave Band Design limit	43	43	44	43	39	33	26	19	