

Report VA3341.200729.NIA

1-3 Denmark Street, Camden

Noise Impact Assessment

22 September 2020

101 Consultants

Contents

1. Introduction	1
2. Design Criterion and Assessment Methodology	1
2.1 Camden Council Requirements	1
2.2 BS8233:2014	2
3. Site Description	2
4. Environmental Noise Survey	3
4.1 Survey Procedure & Equipment	3
4.2 Results	3
4.3 Plant Noise Emission Limits	4
5. Predicted Noise Impact	4
5.1 Proposed plant	4
5.2 Recommended Mitigation Measures	5
5.3 Predicted noise levels	6
5.4 Comparison to NR35 Curve	6
5.5 Structureborne Noise	6
5.6 Comparison to BS8233:2014 Criteria	7
5.7 BS4142 Assessment	7
6. Noise Impact On Offices	7
7. Conclusion	7

Attachments

VA3341/SP1	Indicative Site Plan
VA3341/TH1-TH4	Environmental Noise Time Histories

Appendix A	Acoustic Terminology
Appendix B	Acoustic Calculations

1. Introduction

It is proposed to install a new kitchen extract fan, supply fans and a general extraction system as well as a cooling plant to service a new restaurant at ground floor level of at 1-3 Denmark Street, Camden.

Venta Acoustics has been commissioned by 101 Consultants to undertake an assessment of the potential noise impact of these 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 Camden Council Requirements

Camden Council’s Local Plan (adopted June 2017), Appendix 3, provides the following guidance regarding noise from Industrial and Commercial Noise Sources

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 (15dB if tonal components are present) should be considered as the design criterion).

Existing Noise sensitive receiver	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	‘Rating level’ 10dB* below background	‘Rating level’ between 9dB below and 5dB above background	‘Rating level’ greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	‘Rating level’ 10dB* below background and no events exceeding 57dB _{L_{Amax}}	‘Rating level’ between 9dB below and 5dB above background or noise events between 57dB and 88dB L _{Amax}	‘Rating level’ greater than 5dB above background and/or events exceeding 88dB _{L_{Amax}}

**10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required.*

In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

***levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.*

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.

There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted $L_{eq,5mins}$ noise levels in octave bands) 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area.

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 $L_{Aeq, 16\text{ hour}}$	-
Dining	Dining Room	40 dB $L_{Aeq, 16\text{ hour}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16\text{ hour}}$	30 dB $L_{Aeq, 8\text{ hour}}$

Table 2.1 - Excerpt from BS8233: 2014

[dB ref. 20µPa]

3. Site Description

As illustrated on attached site plan VA3341/SP1, the building is at the end of a terrace in a mixed commercial residential location.

The restaurant would be located at ground floor level of the building with offices on the floors above. Adjacent to the building are residential units to the south.

The proposal is to run the extract ducting up the rear of the building to discharge above roof level.

The most affected noise sensitive receivers are expected to be the offices in the building and the dwellings immediately to the south.

Existing building services plant was noted on several of the neighbouring rooftops.

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 between Thursday 23rd and Monday 27th July 2020 at the location shown in site plan VA3341/SP1. This location was chosen to be representative of the background noise level at the most affected noise sensitive receivers.

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 2:2017 *Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of sound pressure 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-12202-E0	UCRT19/1017	4/1/19
Larson Davis calibrator	CAL200	13069	UCRT20/1562	26/6/20

Table 4.1 – Equipment used for the tests

The calibration of the sound level meter 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 VA3341/TH1-4.

The background noise level is determined by traffic on surrounding roads and existing building services plant in the locality.

The typical background noise levels measured were:

Monitoring Period	Minimum LA90,5min
07:00 – 23:00 hours	46 dB 26/07/2020 07:05-07:10
23:00 – 07:00 hours	45 dB 24/07/2020 04:25-04:30

Table 4.2 – Minimum background noise levels [dB ref. 20 µPa]

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 (LAeq)
07:00 – 23:00 hours	36 dB
23:00 – 07:00 hours	35 dB

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

5. Predicted Noise Impact

5.1 Proposed plant

The following plant is proposed for installation on the at the location indicated on site plan VA3341/SP1. The kitchen extract fan will be mounted on the external wall with the condenser unit mounted in the lightwell below. The remaining supply and extract fans will be mounted within the building and ducted to louvres on the external wall.

Plant Item	Quantity	Proposed Model	Notes
Condensers	1	Mitsubishi PUMY-P200YKM2	At base of lightwell (external)
Kitchen Extract Fan	1	S&P CVAT/4-4000/400 N D PTC	At ground – first floor level (external)
Restaurant Extract Fan	1	System Air MUB/T 042 400EC	Basement level (internal)
Supply Fans	2	System Air KDRE 65 Square Duct Fan	Ground and basement level (internal)

Table 5.1 – Indicative plant selections assumed for this assessment.

Consulting the manufacturer’s datasheets, the following noise emissions levels are attributed to the proposed plant items¹:

¹ These values have had the A-weighting removed to provide a linear spectrum

Plant Item	Octave Band Centre Frequency (Hz)								dB(A)
	Sound Pressure/Power Level, $L_p@1m$, L_w (dB)								
	63	125	250	500	1k	2k	4k	8k	
Mitsubishi PUMY-P200YKM2 ($L_p @ 1m$)	65	59	54	53	52	47	41	35	56
S&P CVAT/4-4000/400 N D PTC Outlet L_w	73	79	77	69	71	63	56	50	75
S&P CVAT/4-4000/400 N D PTC Breakout L_w	64	70	64	58	54	49	42	35	61
System Air MUB/T 042 400EC Outlet L_w	82	74	71	67	63	59	54	49	69
System Air KDRE 65 Square Duct Fan Inlet L_w	96	82	77	73	67	63	57	51	76

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

5.2 Recommended Mitigation Measures

It is recommended that the condenser unit be placed within an acoustic enclosure providing the following minimum insertion loss:

Attenuation Component	Octave Band Centre Frequency (Hz)							
	Acoustic Enclosure Insertion Loss (dB)							
	63	125	250	500	1k	2k	4k	8k
Condenser Enclosure	5	4	5	6	9	13	14	13

Table 5.3 – Recommended attenuation performance of condenser enclosure.

It is recommended that the supply and extract fans have atmosphere side attenuators with the following minimum insertion losses:

Attenuation Component	Octave Band Centre Frequency (Hz)							
	Duct Attenuator Insertion Loss (dB)							
	63	125	250	500	1k	2k	4k	8k
Kitchen Extract Fan	2	6	11	20	23	19	12	9
Kitchen Supply Fan	8	18	31	49	50	50	38	24
Restaurant Extract Fan	1	2	7	10	11	9	8	7
Restaurant Supply Fan	5	10	19	33	38	31	20	12

Table 5.4 – Recommended attenuation performance for fan attenuators (atmospheric side).

Should the above insertion loss be achieved using multiple silencers, these should be separated from each other by a distance of minimum 3-4 x D, where D is the largest internal dimension of the duct work (e.g. D is 0.5m, so a minimum of 1.5-2m apart).

To control breakout noise, the kitchen extract fan should be enclosed within an enclosure providing the following losses:

Attenuation Component	Octave Band Centre Frequency (Hz)							
	Extract fan enclosure Insertion Loss (dB)							
	63	125	250	500	1k	2k	4k	8k
Kitchen Extract Fan Enclosure	7	13	20	25	32	36	40	40

Table 5.5 – Recommended attenuation performance of condenser enclosure.

The enclosure or lagging should include the ductwork up to and including the attenuators either side of the fan.

All plant and ductwork should be fitted with anti-vibration mounts in accordance with the manufacturer guidelines. This is expected to control structureborne noise to the building to acceptable levels.

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, structural stability and visual impact.

5.3 Predicted noise levels

The cumulative noise level at the most affected residential noise sensitive receiver, some 2 meters away, 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.

Description	dB(A)
Plant noise criterion	35 dB
L _p 1m from receiver	35 dB

Table 1.1 – Predicted noise level and design criteria at noise sensitive location

5.4 Comparison to NR35 Curve

As can be seen from the following comparison in Table 1.2, the predicted noise levels at 1m from the most affected receiver are comfortably below the NR35 curve.

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
NR35	63	52	45	39	35	35	30	28
Predicted noise level	57	46	36	30	24	16	12	9

Table 1.2 – Comparison of predicted noise levels against the NR35 criterion

5.5 Structureborne Noise

All plant and ductwork should be fitted with anti-vibration mounts in accordance with the manufacturer guidelines.

The extract fan will have a dominant case frequency of 50-60Hz. To mitigate this, the fan motor should be mounted on rubber or neoprene mounts with a minimum deflection of 5mm, which would provide 95% isolation efficiency, considerably more than the recommended minimum of 90% isolation.

The fan should be attached to the ductwork on either side using flexible coupling to minimise vibration transfer to the ductwork. Ductwork should be attached to the building using isolated fixings, with either a rubber or neoprene isolator with a minimum deflection of 1mm, which would

provide 90% isolation, considerably more than would be required considering the reduced energy transmitted to the ductwork.

The above measures are to control structureborne noise and re-radiated noise to other areas of the building to considerably below current internal noise levels and hence would be considered acceptable.

5.6 Comparison to BS8233:2014 Criteria

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

5.7 BS4142 Assessment

The context of the site is off a busy road in a commercial area with a number of plant on the roofs of the surrounding buildings. The introduction of new of plant, with a specific noise level at least 10dB below the existing background, is not expected to change the local acoustic or draw attention to be perceived as characterful within this context.

As no acoustic character penalties are considered appropriate, the rating level is L_{Aeq} 35dB, being 10dB below the background noise levels at all times. The BS4142 assessment would therefore indicate a low impact.

6. Noise Impact On Offices

The noise levels at the office windows at first and third floor above the premises have been calculated as follows:

Description	dB(A)
1 st Floor Office (1m outside window)	41 dB
3 rd floor Office (1m outside window)	43 dB

Table 1.3 – Predicted noise levels outside office windows.

These noise levels are below the minimum background noise levels measured at the site.

It is not confirmed whether the offices windows are openable and so open windows are assumed. Based on a 10dB loss through an open window, internal noise levels in the offices due to the plant would be expected to be up to L_{Aeq} 33dB. This is below the BS8233:2014 recommended limit of L_{Aeq} 35dB for executive offices. The impact on the offices is therefore expected to be low.

7. Conclusion

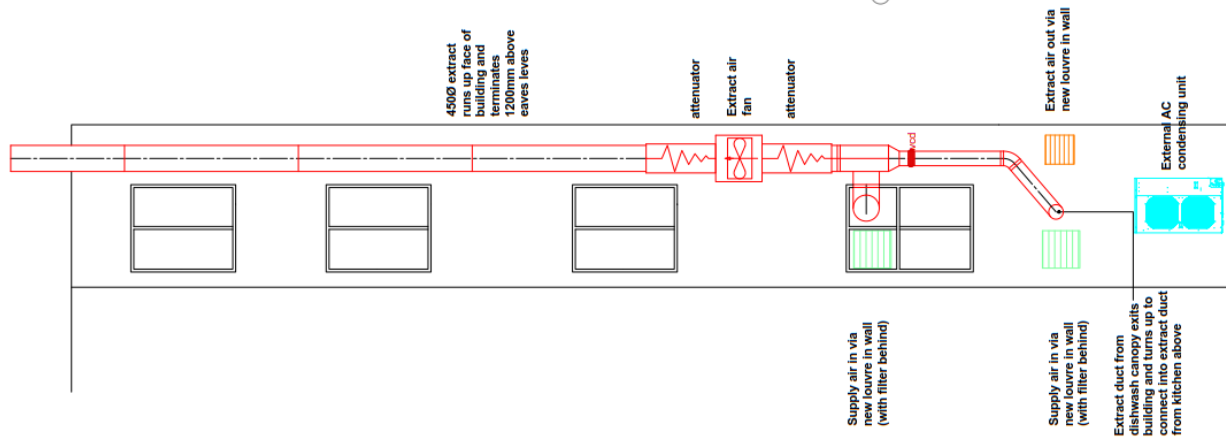
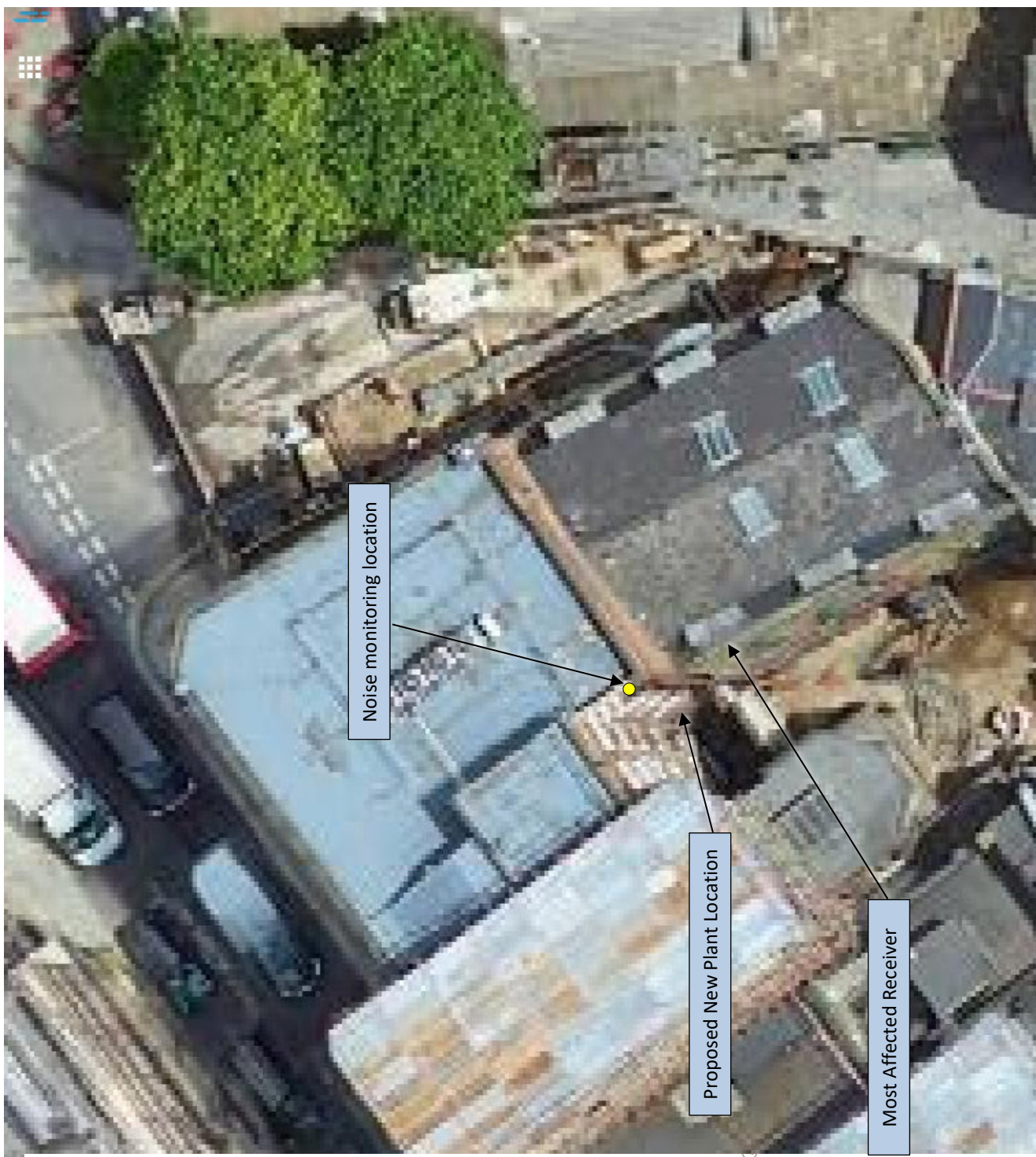
A baseline noise survey has been undertaken by Venta Acoustics to establish the background noise climate in the locality of 1-3 Denmark Street, Camden in support of a planning application for the proposed introduction of new building services plant.

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 requirements have been shown to be met.

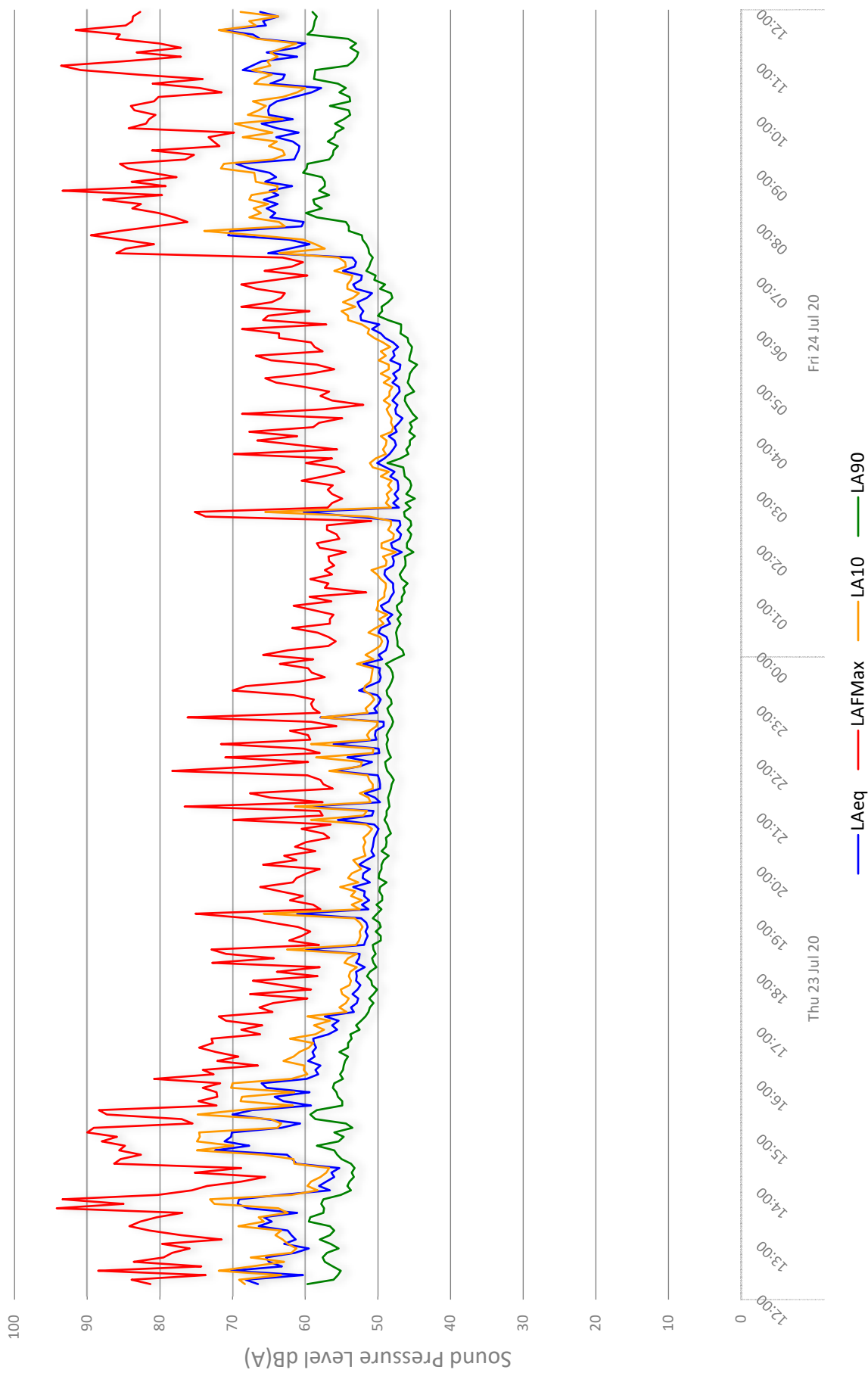
Steven Liddell MIOA



1-3 Denmark Street, Camden
Environmental Noise Time History: 1



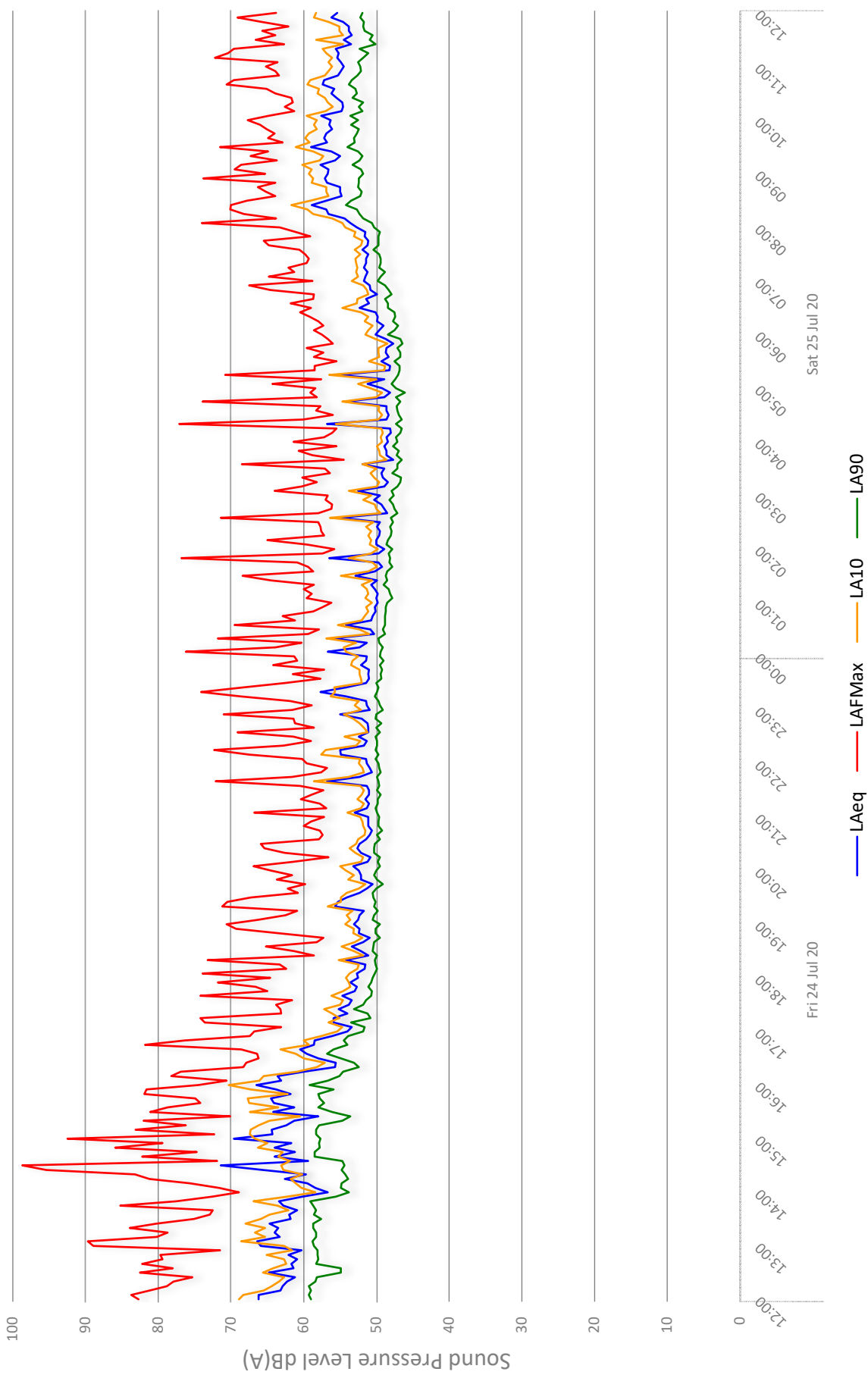
Figure VA3341/TH1



1-3 Denmark Street, Camden
Environmental Noise Time History: 2



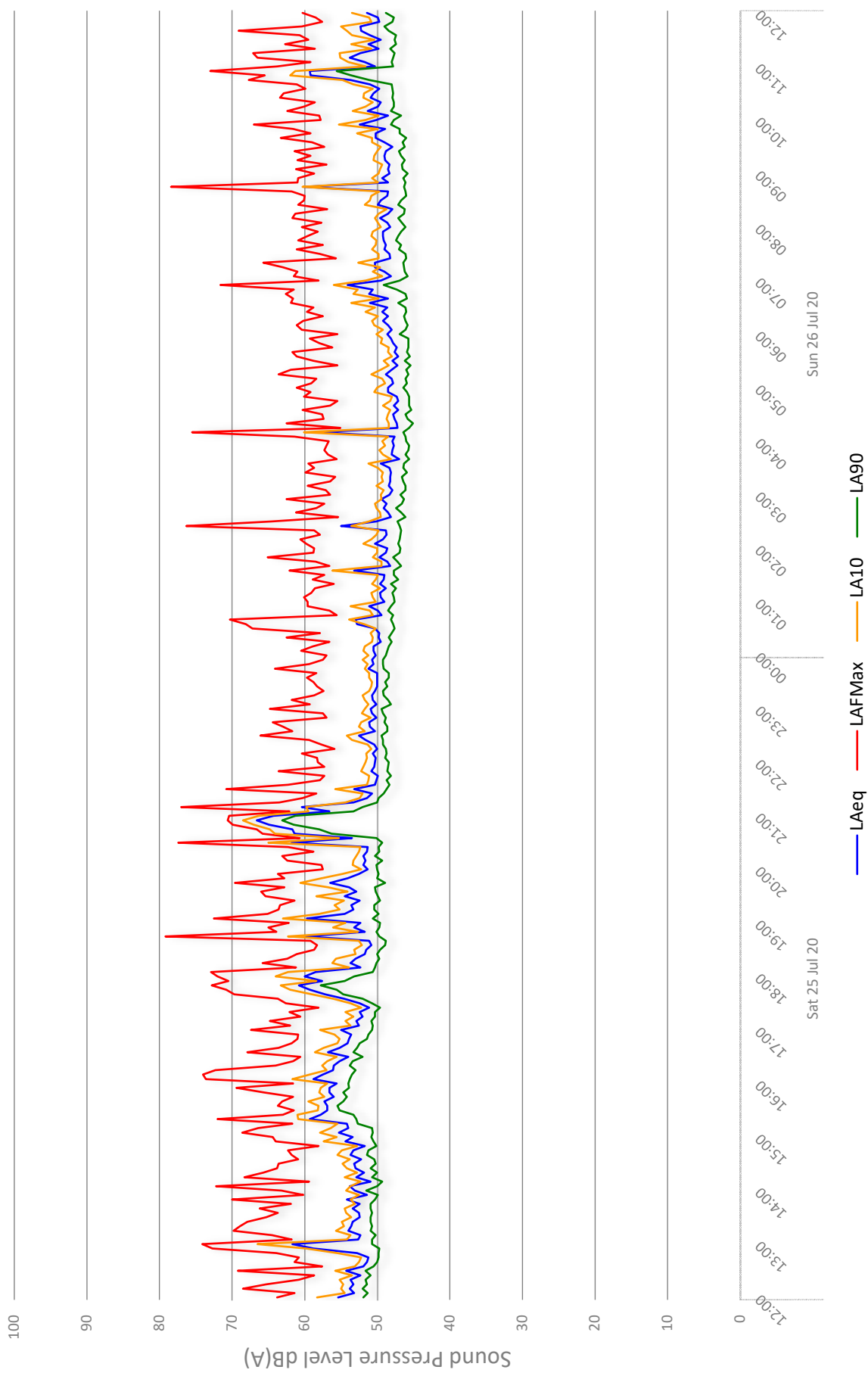
Figure VA3341/TH2



1-3 Denmark Street, Camden
Environmental Noise Time History: 3



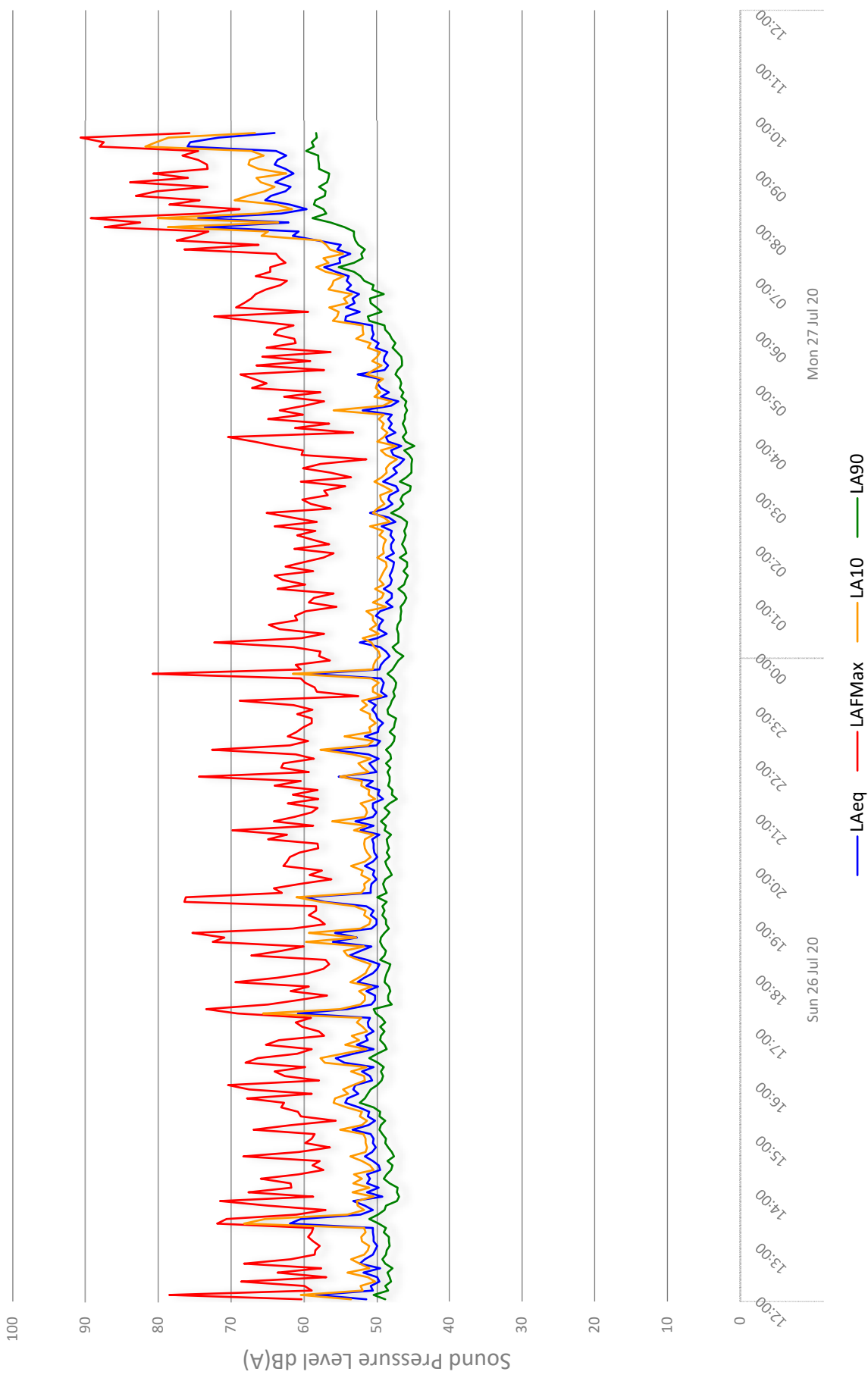
Figure VA3341/TH3



1-3 Denmark Street, Camden
Environmental Noise Time History: 4



Figure VA3341/TH4



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

1.4 Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in sound level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a tall barrier exists between a sound source and a listener, with the barrier close to the listener, the listener will perceive the sound as being louder if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the sound would seem quieter than if he were standing. This is explained by the fact that the "effective screen height" is changing with the three cases above. In general, the greater the effective screen height, the greater the perceived reduction in sound level.

Similarly, the attenuation provided by a barrier will be greater where it is aligned close to either the source or the listener than where the barrier is midway between the two.

APPENDIX B

VA3341 - 1-3 Denmark Street, Camden

Noise Impact Assessment - To Residential

Condenser Unit

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Level measured	Lp @ 1m	65	59	54	53	52	47	41	35	56
Distance Loss	To 8m	-18	-18	-18	-18	-18	-18	-18	-18	
Screening		-5	-5	-5	-5	-5	-5	-5	-5	
Enclosure		-5	-4	-5	-6	-9	-13	-14	-13	
Sound Reflection in light well		3	3	3	3	3	3	3	3	
Level at receiver		40	35	29	27	23	14	7	2	28

Kitchen Extract

In Duct		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
S&P CVAT/4-4000/400 N D PTC	Lw	73	79	77	69	71	63	56	50	75
Indicative Attenuator (1200mm)	50% F.A	-2	-6	-11	-20	-23	-19	-12	-9	
End Reflection		-10	-6	-2	-1	0	0	0	0	
Spherical propogation		-11	-11	-11	-11	-11	-11	-11	-11	
Distance Loss	To 11m	-21	-21	-21	-21	-21	-21	-21	-21	
Directivity (Hor:140,Vert:0)		-1	-2	-3	-7	-9	-8	-8	-8	
Level at receiver		28	34	28	10	7	4	4	1	22

Casing Breakout		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
S&P CVAT/4-4000/400 N D PTC	Lw	64	70	64	58	54	49	42	35	61
Fan Enclosure		-7	-13	-20	-25	-32	-36	-40	-40	
hemispherical propogation		-8	-8	-8	-8	-8	-8	-8	-8	
Distance Loss	To 2m	-6	-6	-6	-6	-6	-6	-6	-6	
Level at receiver		43	43	30	19	8	-1	-12	-19	

Kitchen Supply

In Duct		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
System Air KDRE 65 Square Duct Fan	Lw	96	82	77	73	67	63	57	51	76
Indicative Attenuator (2400mm)	40% F.A	-8	-18	-31	-49	-50	-50	-38	-24	
End Reflection		-10	-6	-2	-1	0	0	0	0	
hemispherical propogation		-8	-8	-8	-8	-8	-8	-8	-8	
Distance Loss	To 5m	-14	-14	-14	-14	-14	-14	-14	-14	
Directivity (Hor:,Vert:)		0	0	0	0	-4	-7	-7	-7	
Level at receiver		56	37	21	1	-9	-16	-10	-2	30

Restaurant Extract

In Duct		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
System Air MUB/T 042 400EC	Lw	82	74	71	67	63	59	54	49	69
Indicative Attenuator (600mm)	50% F.A	-1	-2	-7	-10	-11	-9	-8	-7	
End Reflection		-10	-6	-2	-1	0	0	0	0	
hemispherical propogation		-8	-8	-8	-8	-8	-8	-8	-8	
Distance Loss	To 8m	-18	-18	-18	-18	-18	-18	-18	-18	
Screening		-5	-5	-5	-5	-5	-5	-5	-5	
Directivity (Hor:,Vert:)		0	0	0	0	-4	-7	-7	-7	
Level at receiver		40	36	30	25	17	12	8	4	27

Restaurant Supply

In Duct		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
System Air KDRE 65 Square Duct Fan	Lw	96	82	77	73	67	63	57	51	76
Indicative Attenuator (2100mm)	50% F.A	-5	-10	-19	-33	-38	-31	-20	-12	
End Reflection		-10	-6	-2	-1	0	0	0	0	
hemispherical propogation		-8	-8	-8	-8	-8	-8	-8	-8	
Distance Loss	To 8m	-18	-18	-18	-18	-18	-18	-18	-18	
screening		-5	-5	-5	-5	-5	-5	-5	-5	
Directivity (Hor:,Vert:)		0	0	0	0	-4	-7	-7	-7	
Level at receiver		50	36	24	8	-6	-6	-1	1	26

Cumulative Level		57	46	36	30	24	16	12	9	35
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APPENDIX B

VA3341 - 1-3 Denmark Street, Camden

Noise Impact Assessment - To 1st Floor Office

Condenser Unit

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Level measured	Lp @ 1m	65	59	54	53	52	47	41	35	56
Distance Loss	To 8m	-18	-18	-18	-18	-18	-18	-18	-18	
Enclosure		-5	-4	-5	-6	-9	-13	-14	-13	
Sound Reflection in light well		3	3	3	3	3	3	3	3	
Level at receiver		45	40	34	32	28	19	12	7	

Kitchen Extract

<u>In Duct</u>		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
S&P CVAT/4-4000/400 N D PTC	Lw	73	79	77	69	71	63	56	50	75
Indicative Attenuator (600mm)	50% F.A	-1	-2	-7	-10	-11	-9	-8	-7	
End Reflection		-10	-6	-2	-1	0	0	0	0	
Spherical propogation		-11	-11	-11	-11	-11	-11	-11	-11	
Distance Loss	To 11m	-21	-21	-21	-21	-21	-21	-21	-21	
Directivity (Hor:140,Vert:0)		-1	-2	-3	-7	-9	-8	-8	-8	
Level at receiver		29	38	32	20	19	14	8	3	28

<u>Casing Breakout</u>		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
S&P CVAT/4-4000/400 N D PTC	Lw	64	70	64	58	54	49	42	35	61
Fan Enclosure		-7	-13	-20	-25	-32	-36	-40	-40	
hemispherical propogation		-8	-8	-8	-8	-8	-8	-8	-8	
Distance Loss	To 1m	0	0	0	0	0	0	0	0	
Level at receiver		49	49	36	25	14	5	-6	-13	

Kitchen Supply

<u>In Duct</u>		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
System Air KDRE 65 Square Duct Fan	Lw	96	82	77	73	67	63	57	51	76
Indicative Attenuator (2400mm)	40% F.A	-8	-18	-31	-49	-50	-50	-38	-24	
End Reflection		-10	-6	-2	-1	0	0	0	0	
hemispherical propogation		-8	-8	-8	-8	-8	-8	-8	-8	
Distance Loss	To 3m	-10	-10	-10	-10	-10	-10	-10	-10	
Directivity (Hor:,Vert:)		0	0	0	0	-4	-7	-7	-7	
Level at receiver		60	41	26	6	-5	-12	-6	3	35

Restaurant Extract

<u>In Duct</u>		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
System Air MUB/T 042 400EC	Lw	82	74	71	67	63	59	54	49	69
Indicative Attenuator (600mm)	50% F.A	-1	-2	-7	-10	-11	-9	-8	-7	
End Reflection		-10	-6	-2	-1	0	0	0	0	
hemispherical propogation		-8	-8	-8	-8	-8	-8	-8	-8	
Distance Loss	To 7m	-17	-17	-17	-17	-17	-17	-17	-17	
Directivity (Hor:,Vert:)		0	0	0	0	-4	-7	-7	-7	
Level at receiver		46	42	37	32	23	18	14	10	33

Restaurant Supply

<u>In Duct</u>		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
System Air KDRE 65 Square Duct Fan	Lw	96	82	77	73	67	63	57	51	76
Indicative Attenuator (2100mm)	50% F.A	-5	-10	-19	-33	-38	-31	-20	-12	
End Reflection		-10	-6	-2	-1	0	0	0	0	
hemispherical propogation		-8	-8	-8	-8	-8	-8	-8	-8	
Distance Loss	To 7m	-17	-17	-17	-17	-17	-17	-17	-17	
Directivity (Hor:,Vert:)		0	0	0	0	-4	-7	-7	-7	
Level at receiver		56	42	31	15	0	0	5	7	32

Cumulative Level		62	52	42	35	30	22	17	14	41
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APPENDIX B

VA3341 - 1-3 Denmark Street, Camden

Noise Impact Assessment - To 3rd Floor Office

Condenser Unit

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Level measured	Lp @ 1m	65	59	54	53	52	47	41	35	56
Distance Loss	To 16m	-24	-24	-24	-24	-24	-24	-24	-24	
Enclosure		-5	-4	-5	-6	-9	-13	-14	-13	
Sound Reflection in light well		3	3	3	3	3	3	3	3	
Level at receiver		39	34	28	26	22	13	6	1	

Kitchen Extract

In Duct		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
S&P CVAT/4-4000/400 N D PTC	Lw	73	79	77	69	71	63	56	50	75
Indicative Attenuator (600mm)	50% F.A	-1	-2	-7	-10	-11	-9	-8	-7	
End Reflection		-10	-6	-2	-1	0	0	0	0	
Spherical propagation		-11	-11	-11	-11	-11	-11	-11	-11	
Distance Loss	To 2m	-6	-6	-6	-6	-6	-6	-6	-6	
Directivity (Hor:140,Vert:0)		-1	-2	-3	-7	-9	-8	-8	-8	
Level at receiver		44	53	47	34	34	29	23	18	42

Casing Breakout		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
S&P CVAT/4-4000/400 N D PTC	Lw	64	70	64	58	54	49	42	35	61
Fan Enclosure		-7	-13	-20	-25	-32	-36	-40	-40	
hemispherical propagation		-8	-8	-8	-8	-8	-8	-8	-8	
Distance Loss	To 9m	-19	-19	-19	-19	-19	-19	-19	-19	
Level at receiver		30	30	17	6	-5	-14	-25	-32	

Kitchen Supply

In Duct		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
System Air KDRE 65 Square Duct Fan	Lw	96	82	77	73	67	63	57	51	76
Indicative Attenuator (2400mm)	40% F.A	-8	-18	-31	-49	-50	-50	-38	-24	
End Reflection		-10	-6	-2	-1	0	0	0	0	
hemispherical propagation		-8	-8	-8	-8	-8	-8	-8	-8	
Distance Loss	To 11m	-21	-21	-21	-21	-21	-21	-21	-21	
Directivity (Hor:,Vert:)		0	0	0	0	-4	-7	-7	-7	
Level at receiver		49	30	15	-5	-16	-23	-17	-9	23

Restaurant Extract

In Duct		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
System Air MUB/T 042 400EC	Lw	82	74	71	67	63	59	54	49	69
Indicative Attenuator (600mm)	50% F.A	-1	-2	-7	-10	-11	-9	-8	-7	
End Reflection		-10	-6	-2	-1	0	0	0	0	
hemispherical propagation		-8	-8	-8	-8	-8	-8	-8	-8	
Distance Loss	To 15m	-24	-24	-24	-24	-24	-24	-24	-24	
Directivity (Hor:,Vert:)		0	0	0	0	-4	-7	-7	-7	
Level at receiver		39	35	30	25	16	11	8	4	27

Restaurant Supply

In Duct		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
System Air KDRE 65 Square Duct Fan	Lw	96	82	77	73	67	63	57	51	76
Indicative Attenuator (2100mm)	50% F.A	-5	-10	-19	-33	-38	-31	-20	-12	
End Reflection		-10	-6	-2	-1	0	0	0	0	
hemispherical propagation		-8	-8	-8	-8	-8	-8	-8	-8	
Distance Loss	To 15m	-24	-24	-24	-24	-24	-24	-24	-24	
Directivity (Hor:,Vert:)		0	0	0	0	-4	-7	-7	-7	
Level at receiver		49	35	24	8	-7	-7	-1	1	25

Cumulative Level	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
	53	53	47	35	35	29	23	18	43