

Allport House, Cowley Business Park High Street Cowley Hillingdon

Noise Impact Assessment
Report 19743.NIA.01 Rev. B

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1.0 INTRODUCTION

KP Acoustics Ltd has been commissioned by Kings Oak Brunel LLP, Kings Oak Brunel LLP, 52 High Street, Harrow, London, HA1 3LL, to assess the suitability of the site at Allport House, Cowley Business Park, High Street Cowley, Hillingdon, UB8 2AD for a residential development in accordance with Permitted Development rights as outlined in Class O (offices to dwelling/houses) of The Town and Country Planning (General Permitted Development) (England) Order 2015.

This report presents the results of internal noise surveys undertaken in order to measure the current internal noise climate for compliance with current guidance, and presents the results of the external environmental surveys undertaken in order to measure the prevailing background noise levels.

2.0 SITE SURVEYS

2.1 Site Description

The site is bounded by Cowley Business Park and offices premises to the north, Cowley Road and High Street to the east, Fray's River and office premises to the west and residential buildings and a car park to the south. Entrance to the site is located at Park Road. At the time of the survey, the background noise climate was dominated by road traffic noise from Park Road and an existing neighbouring mechanical plant unit serving the Land Rover premises.

2.2 Internal Noise Survey Procedure

Noise surveys were undertaken within internal rooms of the building in order to assess worst-case levels with the current external building fabric configuration.

Continuous automated monitoring was undertaken for the duration of the survey between 16:27 on 22/10/2019 and 11:57 on 25/10/2019 for monitoring position 1 and 16:40 on 22/10/2019 and 12:00 on 25/10/2019 for monitoring position 2.

Microphones installed internally were positioned within the diffuse field of the room, ensuring the microphone was at least 1.5m from any reflective surface. Noise measurements position are detailed in Table 2.1 and shown in Figure 2.1.

2.3 Environmental Noise Survey Procedure

External noise surveys were undertaken on the proposed site as shown in Figure 2.1. The locations were chosen in order to collect data representative of the worst-case levels expected on the site due to all nearby sources, including those from nearby commercial/office premises.

Continuous automated monitoring was undertaken for the duration of the survey between 16:27 on 22/10/2019 and 11:12 on 25/10/2019 for monitoring position 1 and 17:04 on 22/10/2019 and 11:24 on 25/10/2019 for monitoring position 2.

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise. The measurement procedure complied with ISO 1996-2:2007 Acoustics '*Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels*'.

2.4 Measurement Positions

Measurement positions are as described within Table 2.1 and shown within Figure 2.1.

Icon	Descriptor	Location Description
	Internal Noise Measurement Position 1	Internal measurement position 1 was on the first floor of the building within a room on the north façade overlooking Cowley Business Park and the High Street. The microphone was installed on a tripod at a distance of 1.5m from the window on the external façade and positioned at 1.5m above the floor.
	Internal Noise Measurement Position 2	Internal measurement position 2 was on the first floor of the building within a room on the south façade overlooking Fray's River and residential properties to the south of the proposed development. The microphone was installed on a tripod at a distance of 1.5m from the window on the external façade and positioned at 1.5m above floor.
	External Noise Measurement Position 1	The meter was installed on a window on the First floor of the east elevation, overlooking Cowley Business Park and the High Street, as shown in Figure 2.1. A correction of 3dB has been applied to account for non-free field conditions.
	External Measurement Position 2	The meter was installed on a pole at approximately 3.5 metres from ground floor level and located on the South elevation, as shown in Figure 2.1.

Table 2.1 Measurement positions and descriptions

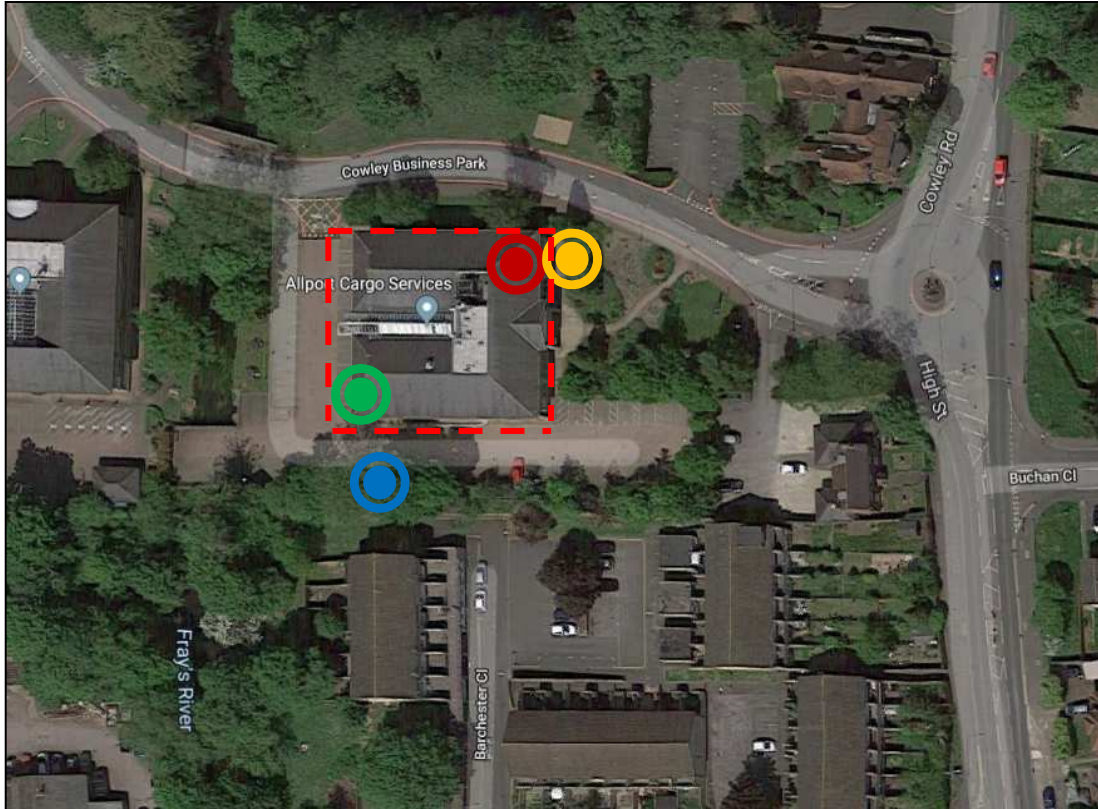


Figure 2.1 Site measurement positions (Image Source: Google Maps)

2.5 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed. The equipment used is described within Table 2.2.

	Measurement instrumentation	Serial no.	Date	Cert no.
Kit 2	Svantek Type 977 Class 1 Sound Level Meter	34104	14/02/2018	14008638
	Free-field microphone Aco Pacific 7052E	66830		
	Preamp Svantek 2v12L	17293		
	Svantek External windshield	-	-	-
Kit 5	Svantek Type 958A Class 1 Sound Level Meter	45579	20/08/2018	14010338
	Free-field microphone MTG MK255	11697		
	Preamp Svantek 2v12L	41535		
	Svantek External windshield	-	-	-
Kit 8	Svantek Type 977B Class 1 Sound Level Meter	36453	22/02/2018	14008790
	Free-field microphone Aco Pacific 7052E	54143		
	Preamp Svantek 2v12L	41508		

Measurement instrumentation		Serial no.	Date	Cert no.
	Svantek External windshield	-	-	-
Kit 12	Svantek Type 977A Class 1 Sound Level Meter	59632	26/09/2019	14012956
	Free-field microphone Aco Pacific 7052E	67603		
	Preamp Svantek 2v12L	64847		
	Svantek External windshield	-	-	-
Rion NC-74 Class 1 Calibrator		34904938	05/03/2019	04174/1

Table 2.2 Measurement instrumentation

3.0 RESULTS

3.1 Internal Noise Survey

The $L_{Aeq: 5min}$ and $L_{Amax: 5min}$ acoustic parameters was measured throughout the duration of the internal noise survey. Measured levels are shown as time history in Figure 19743.TH3 for internal monitoring position 1 and Figure 19743.TH4 for internal monitoring position 2.

Time Period	Internal Noise Measurement Position 1 (Measured Noise level – dBA)	Internal Noise Measurement Position 2 (Measured Noise level – dBA)
Daytime $L_{Aeq,16hour}$	31	30
Night-time $L_{Aeq,8hour}$	27	28

Table 3.1 Current internal average noise levels for daytime and night time

3.2 External Noise Surveys

The $L_{Aeq: 5min}$, $L_{Amax: 5min}$, $L_{A10: 5min}$ and $L_{A90: 5min}$ acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as time histories in Figures 19743.TH1-2 for external monitoring positions 1 and 2 respectively.

Measured noise levels are representative of noise exposure levels expected to be experienced by the North and South façades of the proposed development, and are shown in Table 3.2.

Time Period	External Noise Measurement Position 1 (Measured Noise level – dBA)	External Noise Measurement Position 2 (Measured Noise level – dBA)
Daytime $L_{Aeq,16\text{hour}}$	54	52
Night-time $L_{Aeq,8\text{hour}}$	48	50

Table 3.2 Site average noise levels for daytime and night time

4.0 NOISE ASSESSMENT GUIDANCE

4.1 Permitted Development Rights

It is understood that the office development would be converted into residential units under the Permitted Development Rights. Therefore, this assessment would be targeted to demonstrate the noise requirement as per Citation 7.1.c “*Amendments in relation to change of use of offices to dwelling houses*” of The Town and Country Planning (General Permitted Development) (England) (Amendment) Order 2016:

“Development under Class O is permitted subject to the condition that before beginning the development, the developer must apply to the local planning authority for a determination as to whether the prior approval of the authority will be required as to—

(a) transport and highways impacts of the development,

(b) contamination risks on the site,

(c) flooding risks on the site, and

(d) impacts of noise from commercial premises on the intended occupiers of the development”

The measurements undertaken on site would not only encompass noise generated by any nearby commercial units, but it would also encompass the full spectrum of noise sources in the area affecting the premises.

In order to demonstrate if the current external building fabric of the site would be sufficient to protect the future residents, the measured internal noise levels would be assessed against the recommendations of the British Standard BS8233:2014 “*Sound insulation and noise reduction for buildings*”.

4.2 BS8233:2014

BS8233:2014 '*Sound insulation and noise reduction for buildings*' describes recommended internal noise levels for residential spaces. These levels are shown in Table 4.1.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB(A)	-
Dining	Dining Room/area	40 dB(A)	-
Sleeping (daytime resting)	Bedrooms	35 dB(A)	30 dB(A)

Table 4.1 BS8233 recommended internal background noise levels

It should be noted that the recommended internal noise levels outlined above are not applicable under "purge ventilation" conditions as defined by Approved Document F of the Building Regulations, as this should only occur occasionally (E.G. to remove odour from painting or burnt food). However, the levels above should be achieved whilst providing sufficient background ventilation, either via passive or mechanical methods.

4.3 WHO Guidelines for Community Noise (1999)

WHO Guidelines for Community Noise (1999) recommends that internal noise levels for individual events should not exceed 45dB L_{Amax} more than 10-15 times per night.

It should be noted that this impact is increasingly being regarded as 'LOAEL' for this number of exceedances, as described in Section 4.1.

The external building fabric would need to be carefully designed to ensure that the above guidance is achieved.

4.4 ANC Residential Design Guide to Acoustics, Ventilation

The ANC guide to acoustics, ventilation and overheating provides an integrated approach to achieving good acoustic design with the ventilation requirements of Approved Document F of the Building Regulations and consideration for overheating control. This good practice document recognises the interdependence of ventilation and overheating when assessing noise, and provides a methodology for assessing the noise implications surrounding ventilation and overheating control.

Ventilation

The ANC Guide to Acoustics, Ventilation and Overheating states the following with regards to ventilation:

'It is important to differentiate between the need to provide 'purge ventilation' as required occasionally under Part F, which applies to all building types, in all locations and throughout the year; against the need to provide ventilation for the 'overheating condition' which is influenced by the location, orientation, type and design of the building and may be required for sustained periods of time, or not at all, depending on the overheating risk...

Approved Document F outlines the three main types of ventilation as whole house ventilation (continuous ventilation of rooms or spaces at a relatively low rate to dilute and remove pollutants and water vapour), extract ventilation (typically for kitchens or bathrooms), and purge ventilation (manually controlled ventilation of rooms or spaces at a relatively high rate to rapidly dilute pollutants and / or water vapour, provided by natural or mechanical means).

It also provides four template systems which can be adopted to demonstrate compliance with the Building Regulations, which are outlined in Table 4.2 below.

Ventilation System	Provision with ADF System / Purpose		
	Whole Dwelling Ventilation	Extract Ventilation	Purge Ventilation
System 1 – Trickle vents & intermittent extract fans	Trickle vents	Intermittent extract fans	Typically provided by opening windows
System 2 – Passive stack	Trickle vents and passive stack ventilation	Continuous via passive stack	Typically provided by opening windows
System 3 – Cont. mechanical extract (MEV)	Continuous mechanical extract – min. low rate Trickle vents for inlet air	Continuous mechanical extract – min. high rate Trickle vents for inlet air	Typically provided by opening windows
System 4 – Cont. mechanical supply & extract with heat recovery (MEV)	Continuous mechanical supply and extract – min. low rate	Continuous mechanical supply and extract – min. high rate	Typically provided by opening windows

Table 4.2 ADF template systems

Please note that the ANC guide to acoustics, ventilation is currently a draft document, and is therefore used as a good practice document and not formal policy.

5.0 VENTILATION AND OVERHEATING

5.1 Ventilation Strategy

Based on the noise levels measured on site, appropriate ventilation systems are outlined in Table 5.1 below in order to ensure the internal noise environment is not compromised.

Ventilation System	Whole Dwelling Ventilation	Extract Ventilation
ADF System 1	Trickle vents providing a minimum performance of 27dB $D_{n,e,w}$ for all elevations	Intermittent extract fans
ADF System 3	Continuous mechanical extract (low rate) and trickle vents for supply providing a minimum performance of 27dB $D_{n,e,w}$ for all elevations	Continuous mechanical extract (high rate) with trickle vents providing inlet air
ADF System 4	Continuous mechanical supply and extract (low rate)	Continuous mechanical supply and extract (high rate)

Table 5.1 Ventilation systems

In the case of mechanical ventilation, systems should be designed to meet the internal noise levels as defined in CIBSE Guide A (2015), as shown in Table 5.2.

Room Type	LAeq, dB	NR
Bedrooms	30	25
Living Rooms	35	30
Kitchen	45-50	40-45

Table 5.2 CIBSE Guide A 2015 guidance levels for mechanical building services

In all cases, purge ventilation would be provided by openable windows. As outlined in Section 4.2, the internal noise level requirement would not be applicable during purge conditions as this would only occur occasionally.

5.2 Overheating Control Strategy

In order to provide commentary with regards to the noise implications of the overheating strategy, thermal modelling calculations should be undertaken to inform the design team on the type of overheating strategy which will be adopted. The internal noise level would be dependent on the open area required to manage overheating, and the time that the element would be required to be open.

Various solutions to control overheating and noise passively are outlined in Table 6.2. Please note that the preferable solution would need to be assessed in full by KP Acoustics in order to confirm the viability to provide a compliant internal noise level.

Mitigation Type	Description and References	Approximate Level Difference*	Improvement Relative to a Window Providing the Same Amount of Ventilation
1. Standard opening windows	Window(s) open sufficiently to provide a ventilation free-area equivalent to 2% of the floor area	12dB	0dB
2. Open windows with sound attenuating balconies	1. plus balconies with solid balustrade or enclosed to a further degree (maintaining an open area for ventilation). Absorption may be provided to the balcony soffit or potentially to other surfaces	16-22dB	4-10dB
3. Attenuated or plenum windows	Dual windows (spaced by around 200mm) with staggered openings and absorptive linings to the cavity reveals. Various other configurations also possible in principle	16-23dB	4-11dB
4. Attenuated vents/ louvres	Ventilation openings with means of attenuating sound. Typically acoustic louvres or acoustically lined ducts/ plena	16-28dB	4-16dB
Combination of 2, 3 and 4	Combined use of options 2, 3 and 4. Refer to descriptions above	20-38dB	8-26dB

Table 6.1 Examples of passive ventilation systems (Ref: AVO Guide)

***External free field level to internal reverberant level**

6.0 DISCUSSION

As shown in Table 3.1, internally measured noise levels would be generally commensurate with the design criteria of BS8233:2014, as measured internally within the room facing the north façade of the building (monitoring position 1) and south façade of the building (monitoring position 2).

The external noise levels measured at monitoring position 1 and 2 are 54 dB(A) and 52 dB(A), respectively. With the window open this would give internal noise levels of 39 dB(A) and 37 dB(A) respectively, which does not comply with the BS8233 recommended internal

noise levels. Therefore, it is recommended that appropriate ventilation systems as outlined in Table 5.1, is installed within the proposed development so that windows do not have to be opened.

It should be noted that in a worst-case scenario of the windows system be comprised of a 3mm single pane with an overall performance of 29dB R_w , it is expected that the BS8233 recommended internal noise levels would still be achieved.

If the surrounding area were to remain unchanged, the existing external building fabric would be sufficient in controlling noise break-in from commercial sources and would provide a suitable residential environment.

7.0 CONCLUSION

Internal noise surveys and external environmental noise surveys have been undertaken at Allport House, Cowley Business Park, High Street Cowley, Hillingdon, UB8 2AD allowing the assessment of daytime and night-time levels likely to be experienced by the proposed development.

Noise levels measured internally demonstrate that the existing external building fabric would be sufficient in providing a suitable residential environment, with the existing noise levels meeting the design criteria of BS8233:2014.

The noise implications of the ventilation strategy have been considered, with options being provided to ensure that the ventilation requirements of Approved Document F are achieved.

No further mitigation measures should be required in order to protect the proposed habitable spaces from external noise intrusion.

Allport House, Cowley Business Park, High Street Cowley, UB8 2AD
Environmental Noise Time History
From 22 October 2019 To 25 October 2019

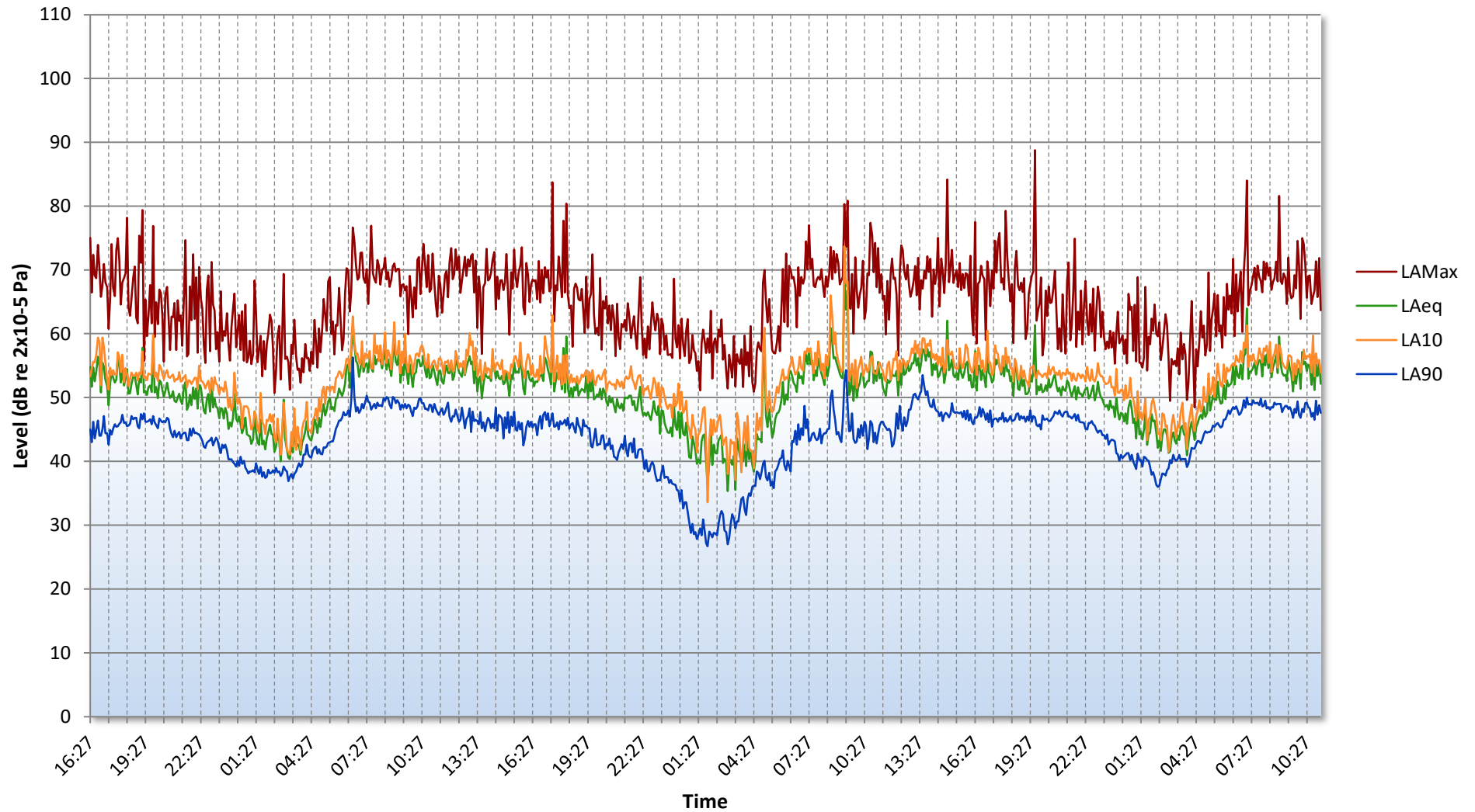


Figure 19743.TH1

Allport House, Cowley Business Park, High Street Cowley, Hillingdon, UB8 2AL
Environmental Noise Time History
From 22 October 2019 To 25 October 2019

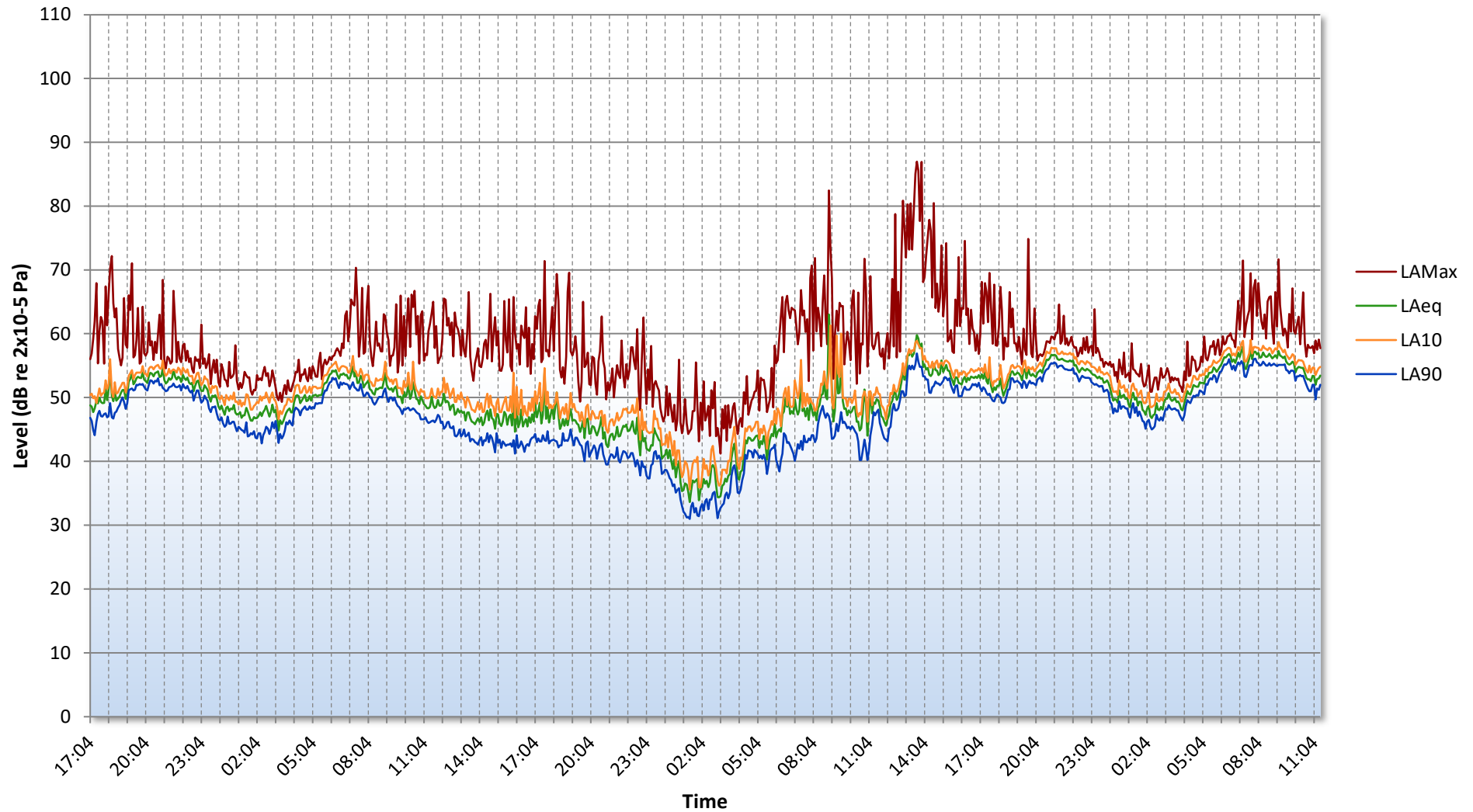


Figure 19743.TH2

Allport House, Cowley Business Park, High Street Cowley, UB8 2AD
Internal Environmental Noise Time History
From 22 October 2019 To 25 October 2019

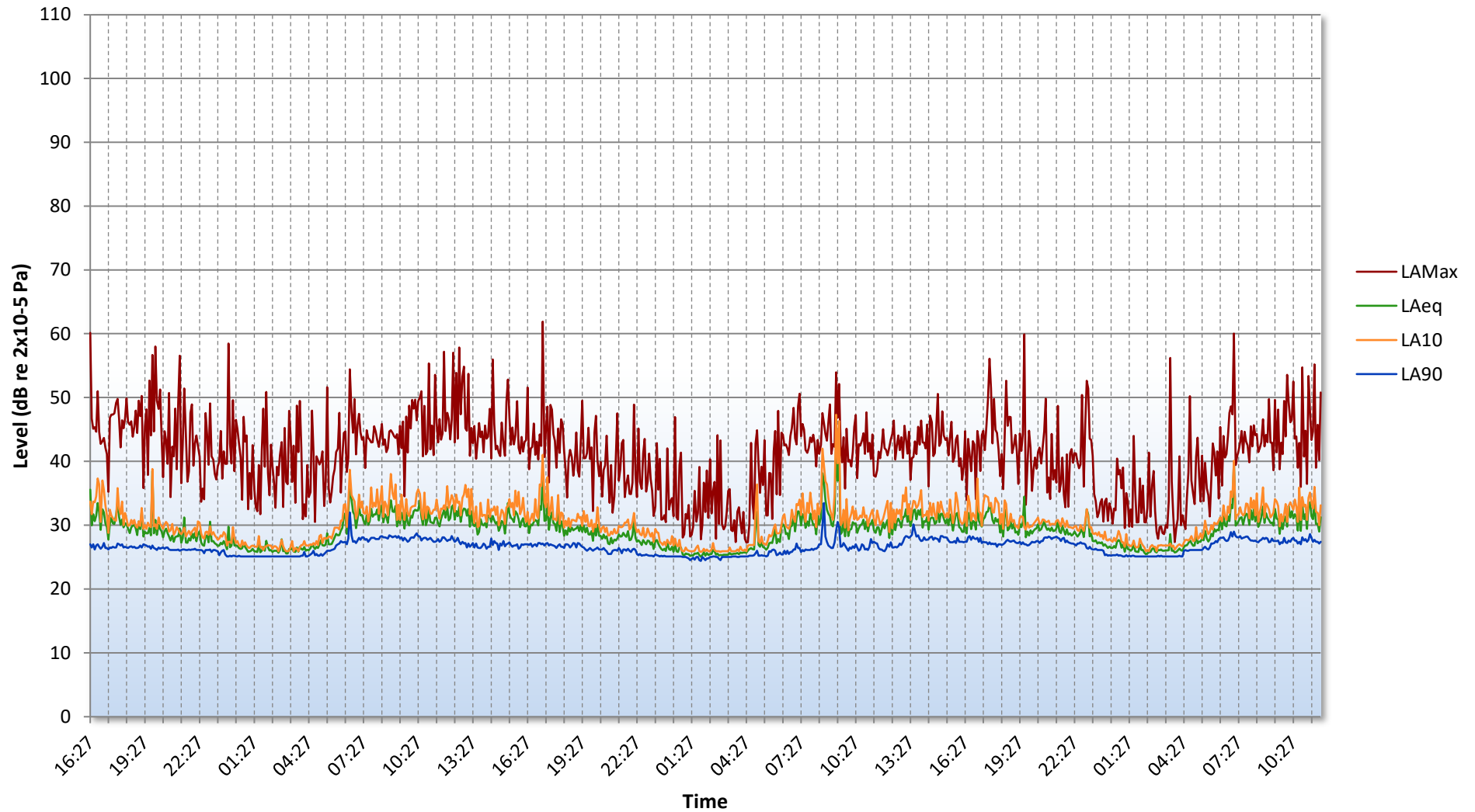


Figure 19743.TH3

Allport House, Cowley Business Park, High Street Cowley, UB8 2AD
Internal Environmental Noise Time History
From 22 October 2019 To 25 October 2019

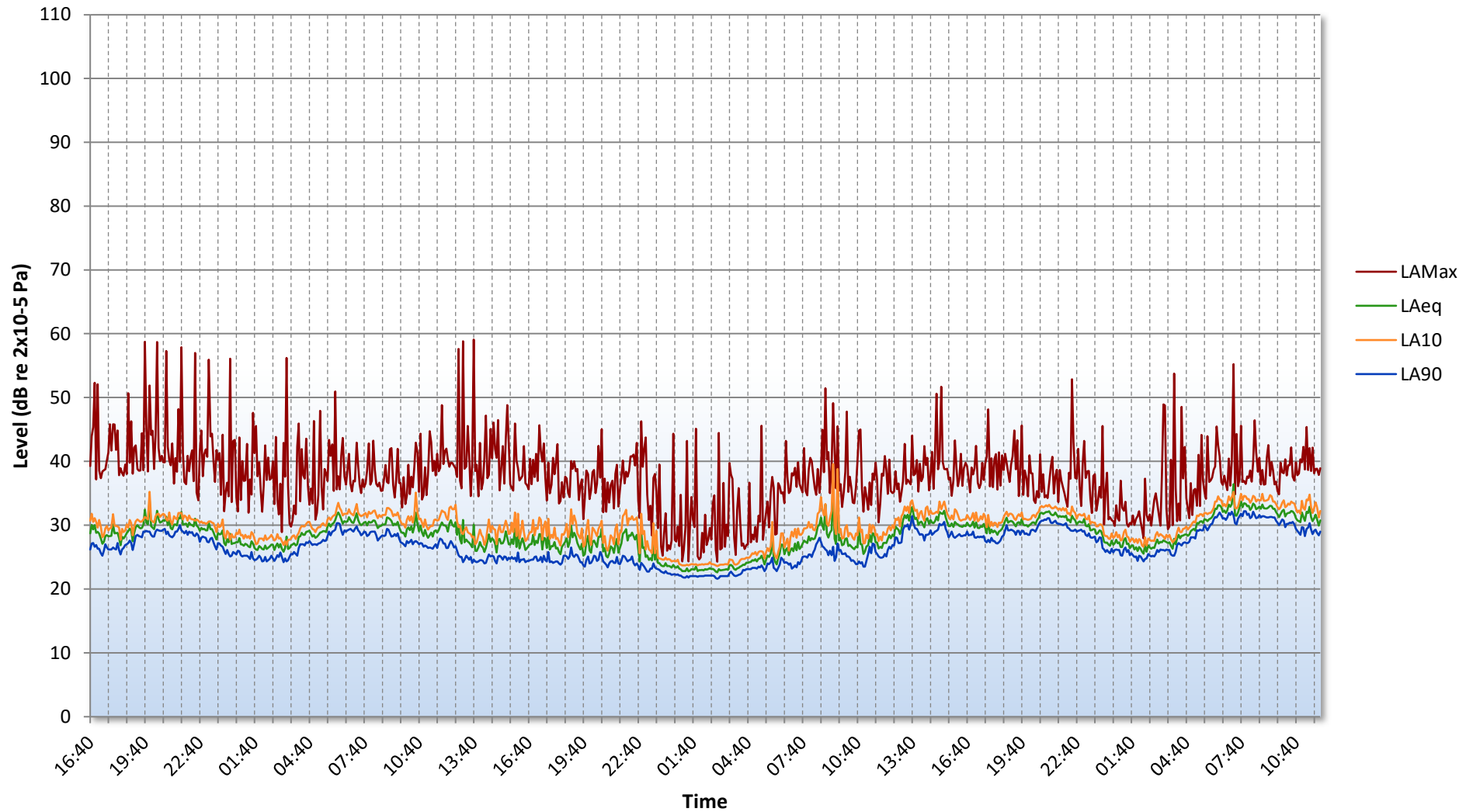


Figure 19743.TH4

GENERAL ACOUSTIC TERMINOLOGY

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq} . The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

L_{90}

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

APPLIED ACOUSTIC TERMINOLOGY

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.