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27-29 WHITFIELD STREET, LONDON

NOISE AND VIBRATION ASSESSMENT

Report 14907.NVA.01 Rev.B

Prepared on 27 October 2017

For:

27-29 Whitfield Property Ltd.

80-83 Long Lane

London

EC1A 9ET

Address	Report Date	Revision History
27-29 Whitfield Street, London, W1T 2SE	20/10/2016	Rev A – 22/11/2016 Rev B – 27/10/2017

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1.0 INTRODUCTION

KP Acoustics has been commissioned by 27-29 Whitfield Property Ltd, 80-83 Long Lane, London, EC1A 9ET to assess the suitability of the site at 27-29 Whitfield Street, London for a mixed use development in accordance with the provisions of the National Planning Policy Framework and the Noise Policy Statement for England (NPSE).

This report presents the results of the environmental survey undertaken in order to measure prevailing background noise and vibration levels and outlines any necessary mitigation measures.

2.0 ENVIRONMENTAL NOISE SURVEY

2.1 Procedure

A noise survey was undertaken on the proposed site as shown in Figure 14907.SP1. The location was chosen in order to collect data representative of the worst-case levels expected on the site due to all nearby sources.

Continuous automated monitoring was undertaken for the duration of the survey between 11:00 on 18th October and 17:00 on 19th October 2016. It is the professional opinion of KP Acoustics that this noise survey remains a true representation of the noise climate at the aforementioned site address.

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”.

In addition to the noise survey, an assessment of vibration was carried out. This survey addressed ambient road traffic from Whitfield Street.

The vibration monitoring position is indicated on the site plan 14907.SP1. Measurements were made of vertical (z-axis) and horizontal (x - y axes) vibration levels of the ambient road traffic vibration from vehicles passing in each direction.

2.2 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed. The equipment used was as follows.

- 1 No. Svantek Type 957 Class 1 Sound Level Meter
- 1 No. Svantek Type 957 Class 1 Sound Level Meter

- B&K Type 4231 Class 1 Calibrator
- PCB 356B18 Tri-axial accelerometer

3.0 RESULTS

3.1 Noise Survey

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 a time history in Figures 14907.TH1-2.

Average daytime and night time noise levels are shown in Table 4.1.

3.2 Vibration Survey

The results of the road traffic vibration measurements are shown in Figures 14907.VS1-3 as acceleration levels over the 1Hz to 80Hz frequency range.

4.0 DISCUSSION

The site is bounded by Whitfield Street to the East, and Goodge Street to the North. At the time of the survey, the background noise climate at the automated monitoring positions was dominated by road traffic noise from Goodge Street.

Table 4.1 shows the average noise levels ($L_{Aeq,}$ 5 minutes) measured for the duration of the survey throughout both daytime and night-time.

	Level dB (A) at Measurement position 1	Level dB (A) at Measurement position 2
Daytime $L_{Aeq,5min}$	67	49
Night-time $L_{Aeq,5min}$	62	42

Table 4.1 Site average noise levels for daytime and night time

5.0 NOISE ASSESSMENT

BS8233:2014 *"Sound insulation and noise reduction for buildings"* describes recommended internal noise levels for shops (A1), offices (B1), and non-residential institutions (D1) during daytime and night-time. These levels are shown in Table 5.1.

Criterion	Typical Situations	Design range $L_{Aeq,T}$ dB	
		07:00-23:00	23:00-07:00
Reasonable internal conditions	Shops Offices Non-residential institutions	45-50	--

Table 5.1 BS8233 recommended internal background noise levels

The external building fabric would need to be carefully designed to achieve these recommended internal levels. It is currently understood that the non-glazed external building fabric elements of the existing development are comprised of brickwork with the roof extension being constructed from a Lightweight steel/timber structure. This would contribute towards a significant reduction of ambient noise levels in combination with a good quality double-glazed window configuration, as shown in Section 6.

5.1 Vibration Assessment

BS6472-1:2008 '*Guide to evaluation of human exposure to vibration in buildings*' defines the vibration magnitudes at which complaints are likely to occur. These are defined by a series of standardised curves against which measured vibration values are compared.

Curve 1 may be considered as the threshold of human perception of vibration, so any levels below Curve 1 would not be tactile. In mixed-use buildings, the minimum vibration thresholds equating to a "low probability of complaints" is Curve 1.4 during night-time and Curve 2 for daytime.

Figures 14907.VS1-3 compare vibration acceleration magnitudes for road traffic pass-bys to the BS6472 curve family. The z-axis vibration level, which is the most important when annoyance is considered, is below the threshold of perception and would, consequently, not constitute a significant concern for this development.

With regards to structural or cosmetic damage to the building, this is considered significant in the frequency range above 4Hz. The small increase at the very low frequency end which is seen in the attached Figures would not be considered to present any danger to the shell of the building.

6.0 EXTERNAL BUILDING FABRIC SPECIFICATION

Sound reduction performance calculations have been undertaken in order to specify the minimum performance required from glazed and non-glazed elements in order to achieve the internal noise levels shown in Table 5.1, taking into account average and maximum noise levels monitored during the environmental noise survey.

6.1 Non-Glazed Elements

All non-glazed elements of the building façade have been assumed to provide a sound reduction performance of at least the figures shown in Table 6.1 when tested in accordance with BS EN ISO, 140-3:1995.

Element	Octave band centre frequency SRI, dB					
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Non glazed element SRI	41	43	48	50	55	55

Table 6.1 Assumed sound reduction performance for non-glazed elements

6.2 Glazed Elements

Minimum octave band sound reduction index (SRI) values required for all glazed elements to be installed are shown in Table 6.2.The performance is specified for the whole window unit, including the frame and other design features such as the inclusion of trickle vents. Sole glass performance data would not demonstrate compliance with this specification.

Glazing performance calculations have been based both on average measured night-time noise levels as well as verified against the L_{Amax} spectrum of individual events in order to comply with a maximum internal noise level of 45dB(A). The combined most robust results of these calculations are shown in Table 6.2.

Glazing Type	Octave band centre frequency SRI, dB					
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Glazing type 1 as shown by ▬ in SP2.	18	23	25	27	26	26
Glazing type 2 as shown by ▬ In SP2.	10	12	13	14	9	5

Table 6.2 Required glazing performance

All major building elements should be tested in accordance with BS EN ISO 140-3:1995.

Independent testing at a UKAS accredited laboratory will be required in order to confirm the performance of the chosen system for an "actual" configuration.

No further mitigation measures would be required to achieve good internal noise levels.

7.0 CONCLUSION

An environmental noise and vibration survey has been undertaken at the proposed development site on Whitfield Street, London allowing the assessment of daytime and night-time levels likely to be experienced by the proposed development.

Measured noise levels allowed a robust glazing specification to be proposed which would provide internal noise levels for all mixed use environments of the development commensurate to the recommendations of BS8233:2014.

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

Measurement of vibration from road traffic activity indicates that vibration levels are below the threshold of human perception in the z-axis, in accordance with BS6472: 2008.

Report by:	Checked by:
Kyri Demetriou	**Kyriakos Papanagiotou MIOA**
KP Acoustics Ltd.	**KP Acoustics Ltd.**

27-29 Whitfield Street, London
Environmental Noise Time History
18th October to 19th October 2016

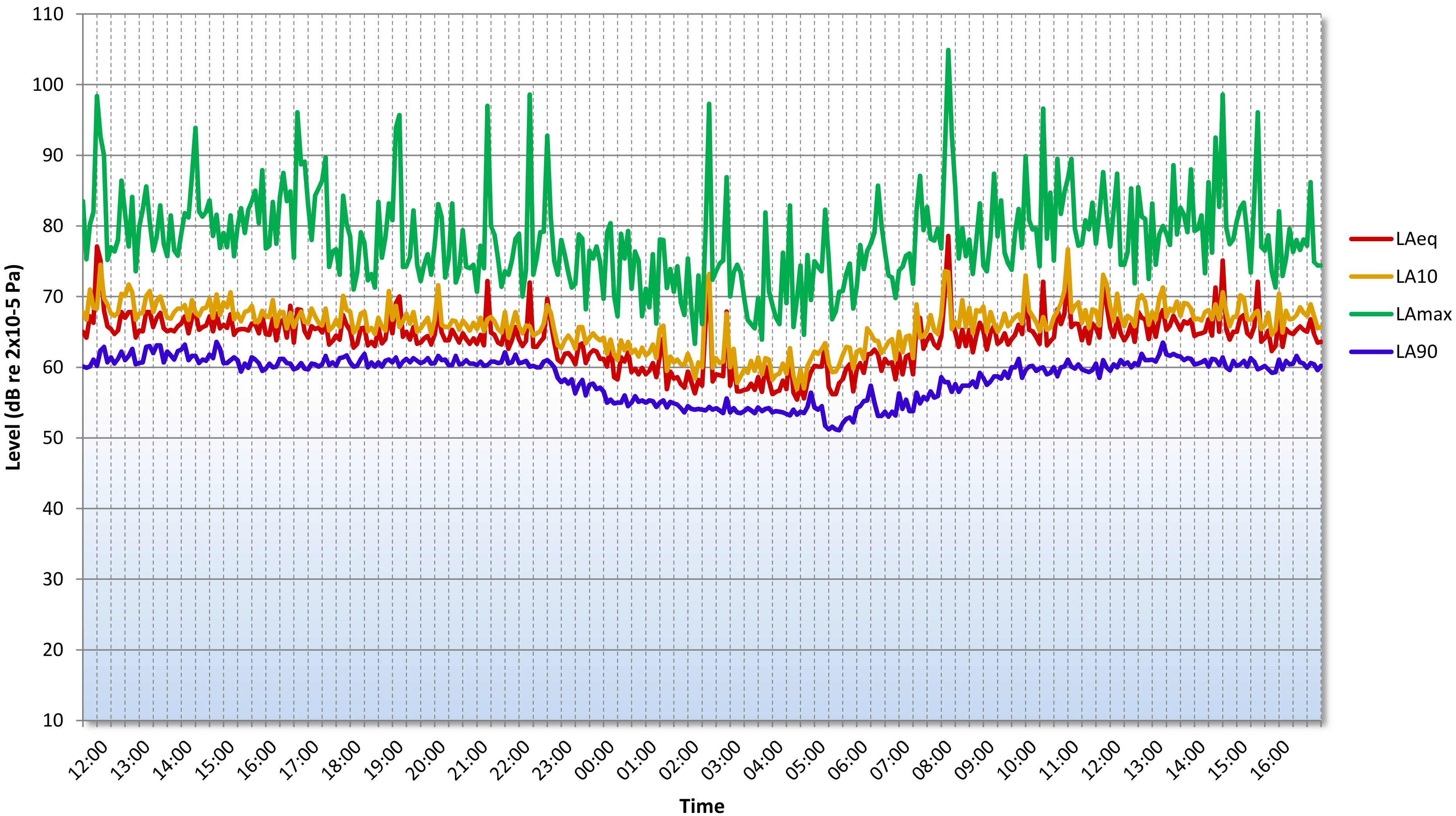


Figure 14907.TH1

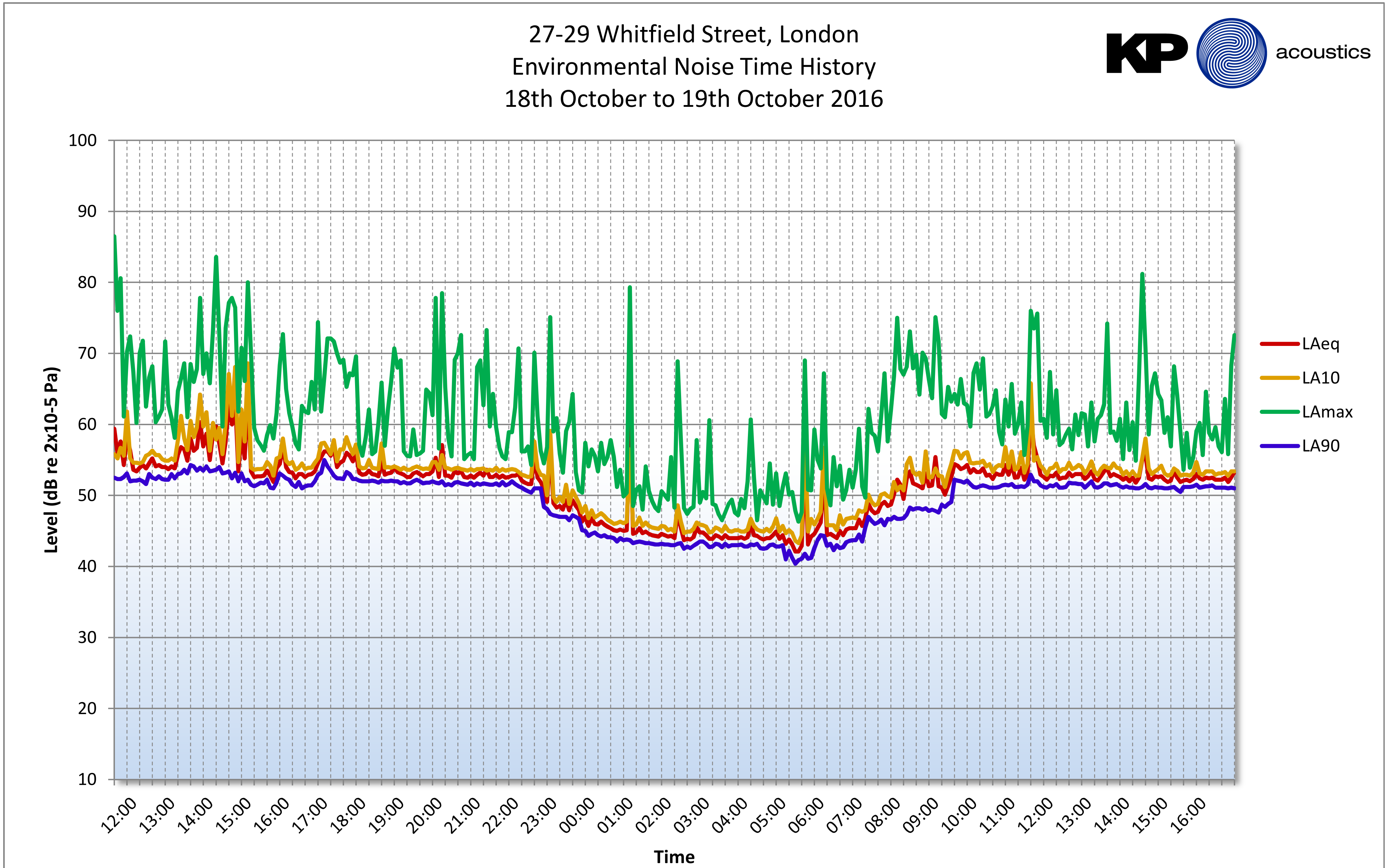


Figure 14907.TH2

27-29 Whitfield Street, London

MAXIMUM HORIZONTAL VIBRATION LEVELS

X-AXIS

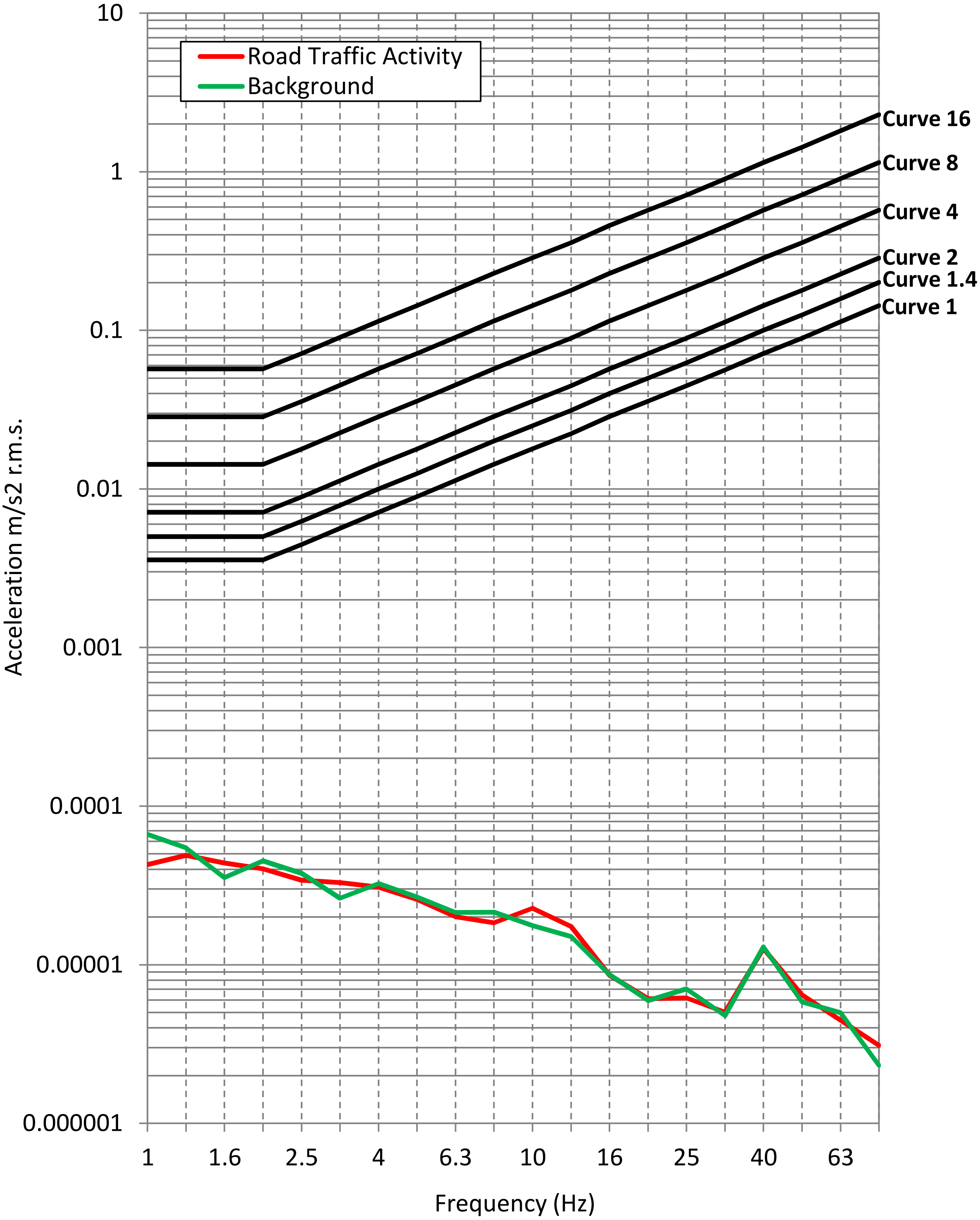


Figure 14907.VS1

27-29 Whitfield Street, London

MAXIMUM HORIZONTAL VIBRATION LEVELS

Y-AXIS

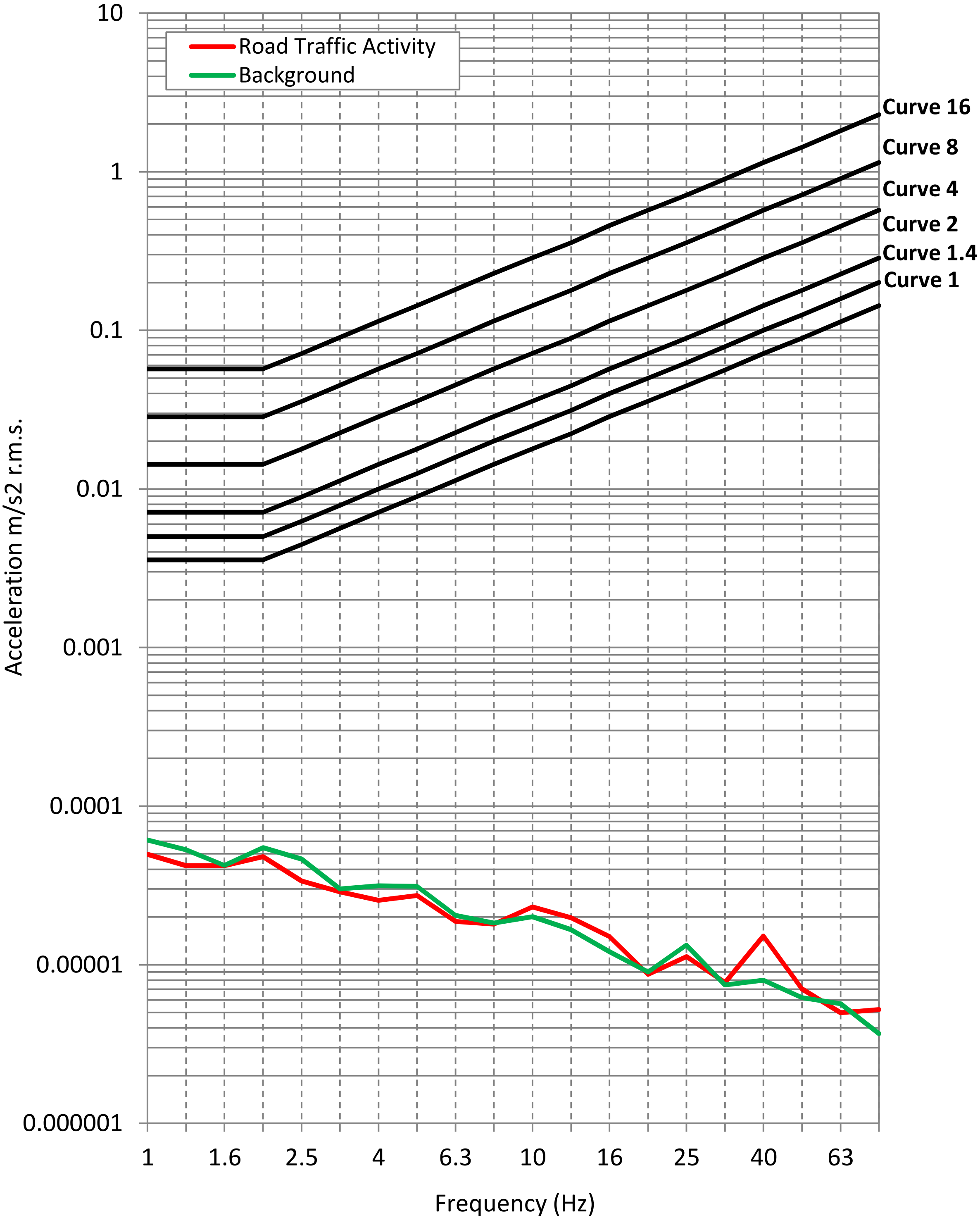


Figure 14907.VS2

27-29 Whitfield Street, London

MAXIMUM VERTICAL VIBRATION LEVELS

Z-AXIS

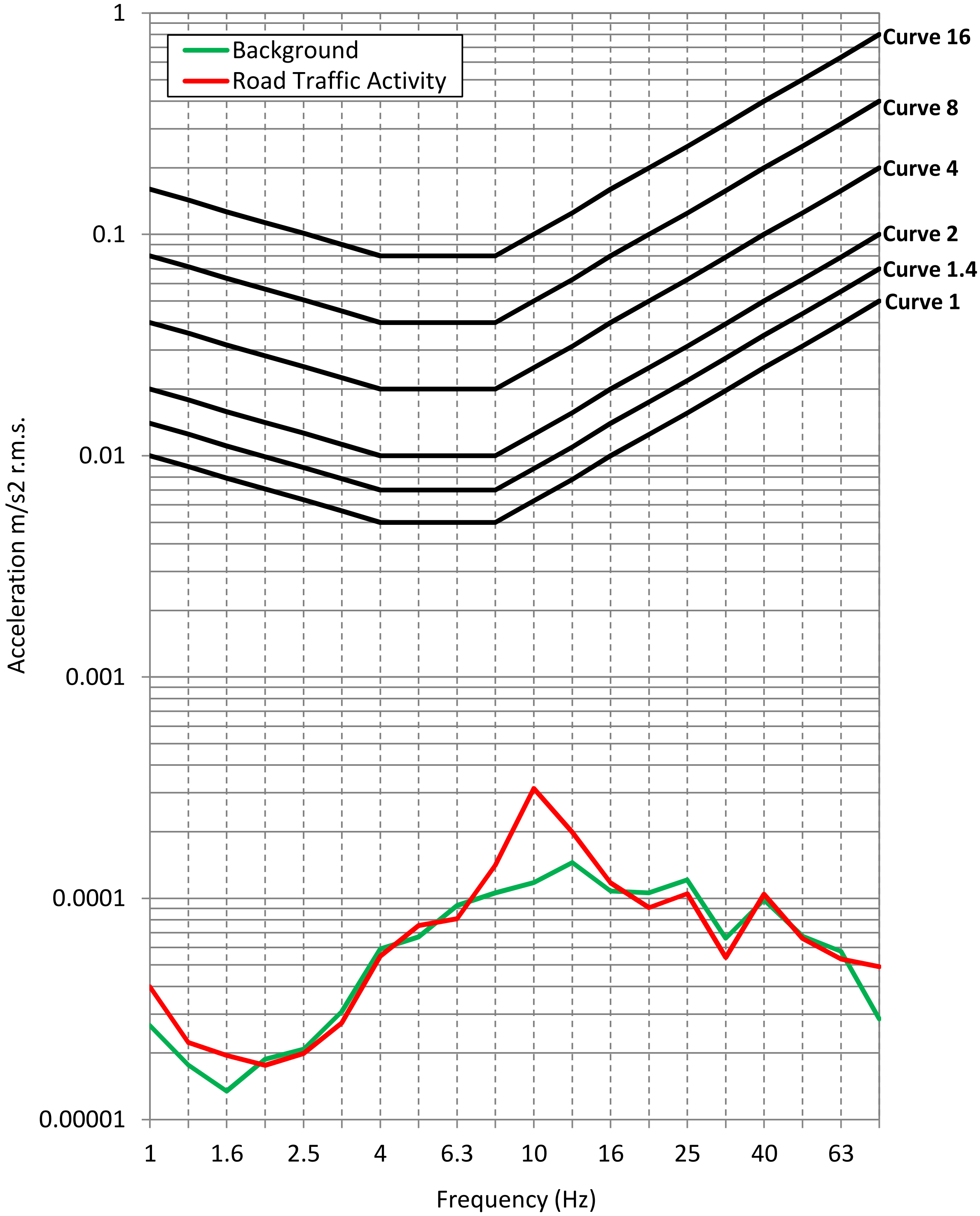
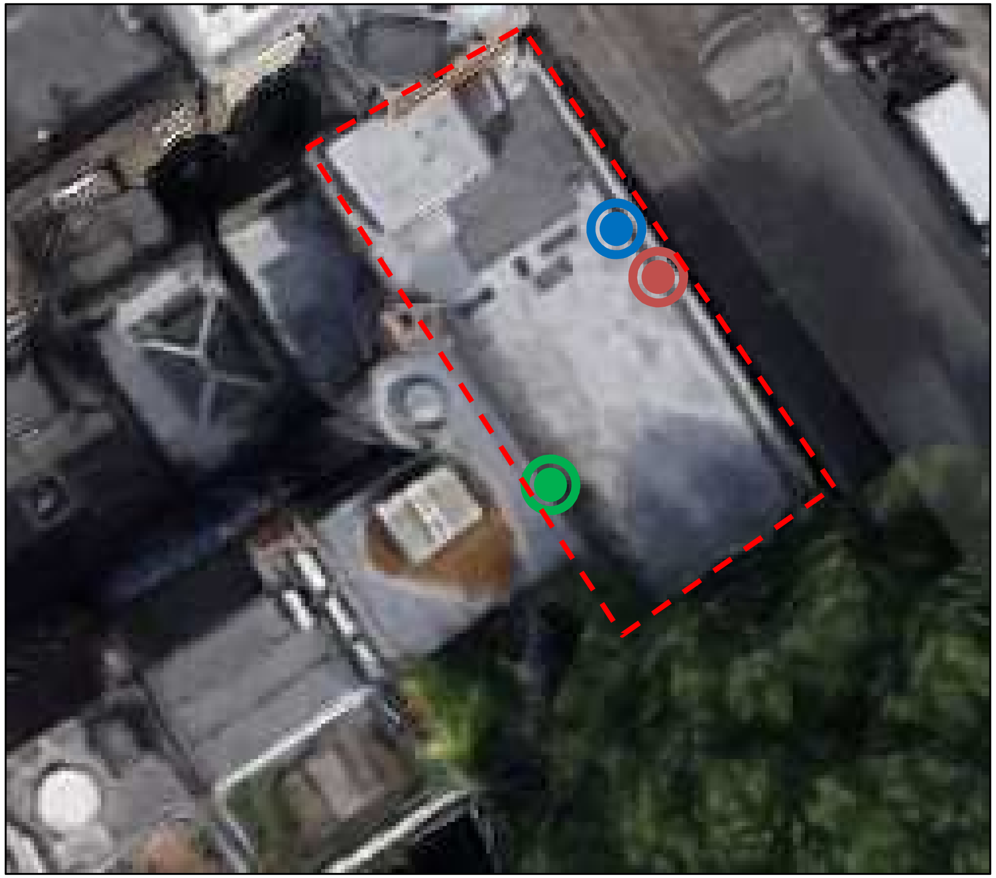


Figure 14907.VS3



Title:

Indicative site plan showing noise monitoring positions

(Image Source: Google Maps)

Date: 27 October 2017

FIGURE 14907.SP1 Rev B

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Title:

Indicative site plan showing different glazing types

(Image Source: Google Maps)

Date: 27 October 2017

FIGURE 14907.SP2 Rev B

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APPENDIX A

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*.

APPENDIX A

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.