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11 WARREN STREET, LONDON

PLANNING COMPLIANCE REPORT

Report 14055.PCR.01

Prepared on 28 April 2016

For:

Commercial Kitchen Design

Windsor House

Cornwall Road

Harrogate

HG1 2PW

Site Address	Report Date	Revision History
11 Warren Street, London, W1T 5LG	28/04/2016	-

CONTENTS

List of Attachments

1.0 INTRODUCTION

KP Acoustics Ltd, Britannia House, 11 Glenthorne Road, London, W6 0LH, has been commissioned by Commercial Kitchen Design, Windsor House, Cornwall Road, Harrogate, HG1 2PW to undertake a noise impact assessment of the proposed kitchen extraction system at 11 Warren Street, London, W1T 5LG. The background noise levels measured will be used to determine daytime and night-time noise emission criteria for the kitchen extraction system installation in agreement with the planning requirements of the London Borough of Camden.

This report presents the overall methodology and results from the environmental survey followed by calculations to demonstrate the feasibility of the proposed kitchen extraction system to satisfy the emissions criterion at the closest noise-sensitive receivers and outline mitigation measures as appropriate.

2.0 ENVIRONMENTAL NOISE SURVEY AND EQUIPMENT

2.1 Procedure

Automated noise monitoring was undertaken by KP Acoustics Ltd at the position shown in Site Plan 14055.SP1. This location was chosen in order to collect representative noise data in relation to the nearest noise sensitive receivers relative to the proposed kitchen extraction system installation. Continuous automated monitoring was undertaken for the duration of the survey to the rear of 11 Warren Street between 11:00 on 14 April 2016 and 12:00 on 15 April 2016.

Initial inspection of the site revealed that the background noise profile at the monitoring location was typical of an urban cityscape environment with existing plant units dominating the current noise footprint.

The weather during the course of the survey was generally dry with wind speeds within acceptable tolerances 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"*.

2.2 Equipment

The equipment calibration was verified before and after the survey and no calibration irregularities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 957 Class 1 Sound Level Meter
- B&K Type 4231 Class 1 Calibrator

3.0 RESULTS

The results from the continuous noise monitoring are shown as a time history of L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} averaged over 5 minute sample periods shown in Figure 14055.TH1.

Minimum background noise levels are shown in Table 3.1.

	Minimum background noise level $L_{A90: 5min}$ dB(A)
	Rear Facade
Daytime (07:00-23:00)	49
Night-time (23:00-07:00)	45

Table 3.1: Minimum measured background noise levels

The criterion of the London Borough of Camden, for noise emissions of new plant in this instance is as follows:

The Council considers that for new/current developments involving noisy plant/equipment or other uses, design measures should be taken to ensure noise levels predicted at a point 1 metre external to sensitive facades are at least 5 dB (A) less than the existing background measurement (LA90) when the equipment is in operation.

We therefore propose to set the noise criteria as shown in Table 4.1 in order to comply with the above requirement.

	Daytime (07:00 to 23:00)	**Night-time (07:00 to 23:00)**
Noise criterion at nearest residential receiver (5dB below minimum L_{A90})	45 dB(A)	40 dB(A)

Table 3.2: Proposed Noise Emissions Criteria

As the proposed extraction system could be used inside the night-time criterion hours, we would suggest adopting the night-time criterion in order to render the noise impact assessment more robust.

4.0 DISCUSSION

It is understood that the plant installation is comprised of the following units:

Air Extraction system 1

- CVAB/4-4000/400ND Kitchen Extract Fan
- 450mmx450mm square duct. Approximately 10m long.
- 2 No. square bends
- 450mm diameter square duct at the duct termination.

The closest noise sensitive receiver to the duct termination of the proposed air extraction system will be a residential window located approximately 2m from the duct.

The closest noise sensitive receiver to the CVAB/4-4000/400ND Fan Unit will be a residential window located approximately 2m from the fan unit.

The sound pressure levels as provided by the manufacturer for the unit are shown in Table 5.1.

	Octave Frequency Band							
Unit	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
CVAB/4-4000/400ND								
CVAB/4-4000/400ND Sound Pressure Level (dBA) (Extract)	40	55	61	64	65	60	54	42
CVAB/4-4000/400ND Sound Pressure Level (dBA) (Case Breakout)	32	50	52	55	58	58	53	35

Table 5.1 Manufacturer's Sound Pressure Levels

4.1 Objective overview

Taking all acoustic corrections into consideration, including distance corrections, the noise level expected at the closest residential receivers due to the kitchen extraction system would be as shown in Table 5.2. Detailed calculations are shown in Appendix B.

Receiver - Nearest Noise Sensitive Window	**Criterion dB(A)**	**Noise Level at Receiver dB(A)**
CVAB/4-4000/400ND		
CVAB/4-4000/400ND Sound Pressure Level (dBA) (Extract)	40 dB(A)	34 dB(A)

CVAB/4-4000/400ND Sound Pressure Level (dBA) (Case Breakout)	40 dB(A)	39 dB(A)

Table 5.2 Predicted noise level and criterion at nearest noise sensitive locations

As shown in Appendix B and Table 5.2, transmission of noise to the nearest sensitive windows due to the effects of the kitchen extraction system would satisfy the emissions criterion set. However, noise control elements should be adopted. These are shown in Section 5.2.

4.2 Noise Control Strategy

Air Extraction System

In order to render all noise emissions to within the criterion, we would recommend the installation of an inline silencer directly after the extraction fan with the following spectral attenuation envelope:

	CVAB/4-4000/400ND Required attenuation (dB) in each Frequency Band							
Mitigation Type	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
In-Line Silencer, 2100mm long, (45% Free area)	-8	-13	-13	-16	-25	-25	-18	-11

Table 5.3: Spectral attenuation required from proposed silencer

Case Breakout Noise Control

In order to render all noise emissions to within the criterion and to protect the amenity of the residential receiver that is 10m from the CVAB/4-4000/400ND, we would recommend the installation of an acoustic enclosure with louvres as specified in table 5.5.

	CVAB/4-4000/400ND Insertion Loss (dB) in each Frequency Band							
Mitigation Type	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Acoustic Louvres 300mm depth	-5	-7	-10	-12	-14	-16	-13	-12

Table 5.5 Spectral insertion loss required from proposed louvres

5.0 CONCLUSION

An environmental noise survey has been undertaken at 11 Warren Street, London by KP Acoustics Ltd between 11:00 on 14 April 2016 and 12:00 on 15 April 2016 in order to assess the current noise levels in the area of the proposed kitchen extraction system. The results of the survey have enabled criteria to be set for noise emissions for the proposed installation.

Using manufacturer noise data, noise levels have been calculated to the nearest noise sensitive receivers for compliance with current requirements.

Calculations undertaken by KP Acoustics Ltd. show that the noise emissions from the proposed kitchen extraction system would meet the criterion of the London Borough of Camden, provided that the noise control measures shown in section 4.2 are adopted.

Report by

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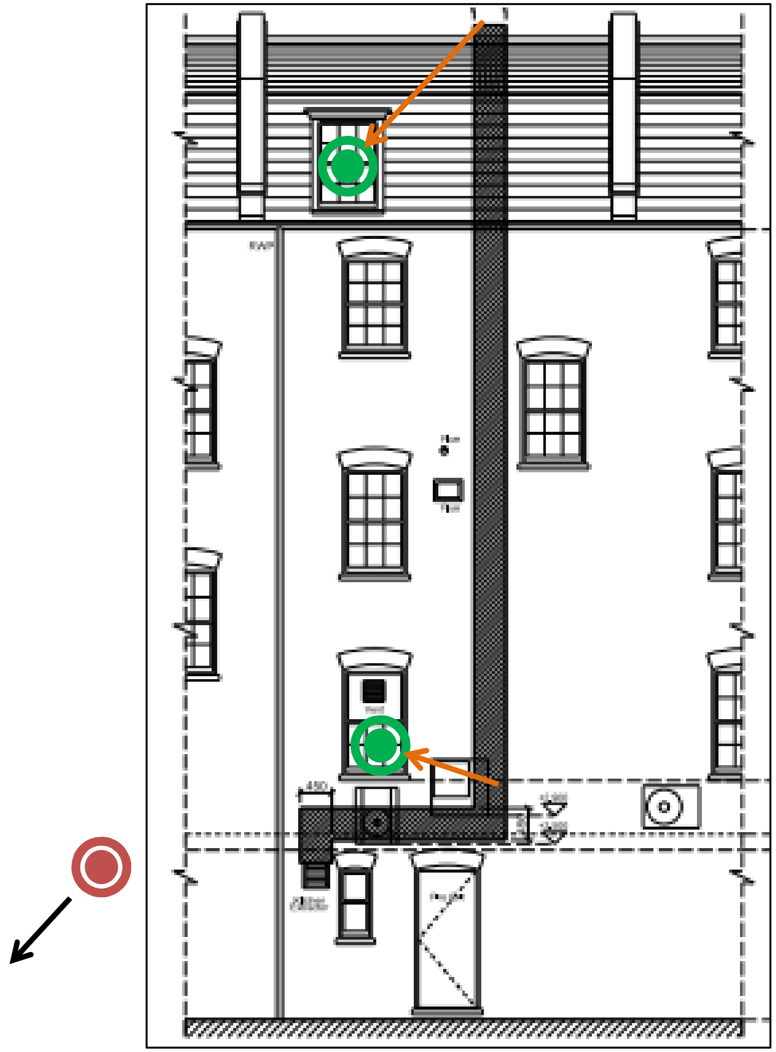

Noise Survey Monitoring Position
(Located in the South-West corner of communal courtyard due to operational plant from neighbours)

Closest noise-sensitive receivers

Distance to receiver
(Approx. 2m)

Title:
Indicative site plan showing noise monitoring position and nearest noise sensitive receivers. *(Image Source: TOOCA Architects)*

Date: 28 April 2016

FIGURE 14055.SP1

KP acoustics

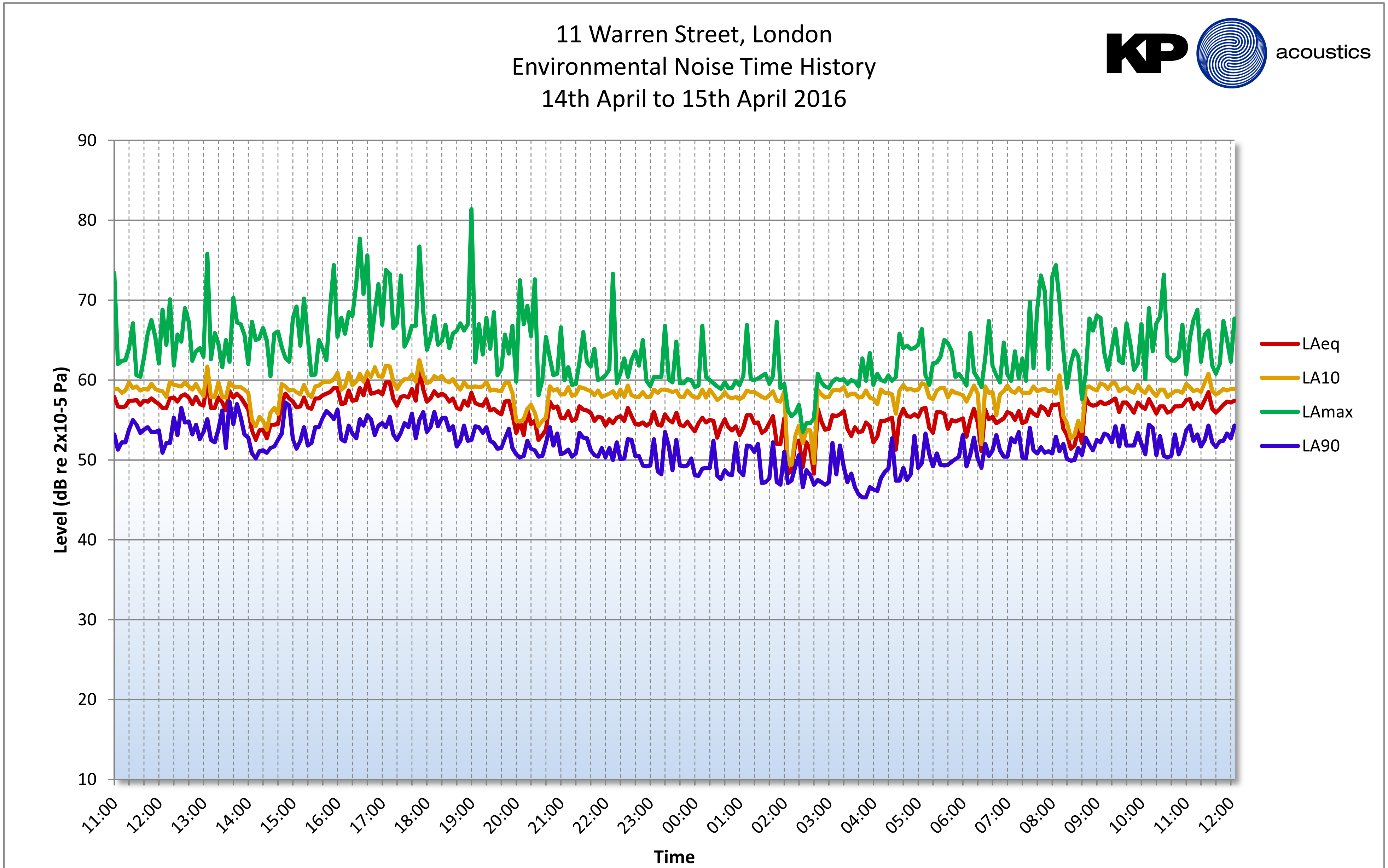

Figure 14055.TH1

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.

APPENDIX B

11 Warren Street, London

Proposed Kitchen Extraction System

Source: Proposed Kitchen Extraction System	*Frequency, Hz*								
Receiver: Nearest Residential Window	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Sound Pressure Level as provided by manufacturer									
CVAB/4-4000/400ND at 1m (Extract)									
Correction to Sound Pressure Level at 1m	40	55	61	64	65	60	54	42	
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Attenuation provided by distance to receiver (2m)	-6	-6	-6	-6	-6	-6	-6	-6	
Attenuation from Inline Silencer, dB (2100mm/45% Free Area)	-8	-13	-13	-16	-25	-25	-18	-11	
Sound Pressure level from CVAB/4-4000/400ND	**29**	**39**	**45**	**45**	**37**	**32**	**33**	**28**	**34**

Design Criterion	**40**

Source: Proposed Kitchen Extraction System	*Frequency, Hz*								
Receiver: Nearest Residential Window	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Sound Pressure Level as provided by manufacturer									
CVAB/4-4000/400ND at 1m (Case Breakout)	32	50	52	55	58	58	53	35	
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Distance correction to receiver, dB (2m)	-6	-6	-6	-6	-6	-6	-6	-6	
Predicted attenuation from proposed acoustic louvres (300mm), dB	-5	-7	-10	-12	-14	-16	-13	-12	
Sound Pressure level from CVAB/4-4000/400ND	**24**	**40**	**39**	**40**	**41**	**39**	**37**	**20**	**39**

Design Criterion	**40**