1 Stephen Street, London, Phase 3

ENVIRONMENTAL NOISE SURVEY AND
PLANT NOISE ASSESSMENT REPORT 17617/PNA5

For:

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ENVIRONMENTAL NOISE SURVEY
REPORT
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CONTENTS **Page**

1.0 INTRODUCTION

A redevelopment of the Central Cross retail areas is proposed at 1-2 Stephen Street. The development will include new items of Tenants building services plant which will emit external noise.

Hann Tucker Associates have therefore been commissioned to undertake an environmental noise survey in order to set external plant noise emissions against the requirements of the Local Authority.

This report presents our findings.

2.0 OBJECTIVES

To establish, by means of detailed 48 hour daytime and night-time fully automated environmental noise monitoring, the existing A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{max} environmental noise levels at selected accessible roof level positions.

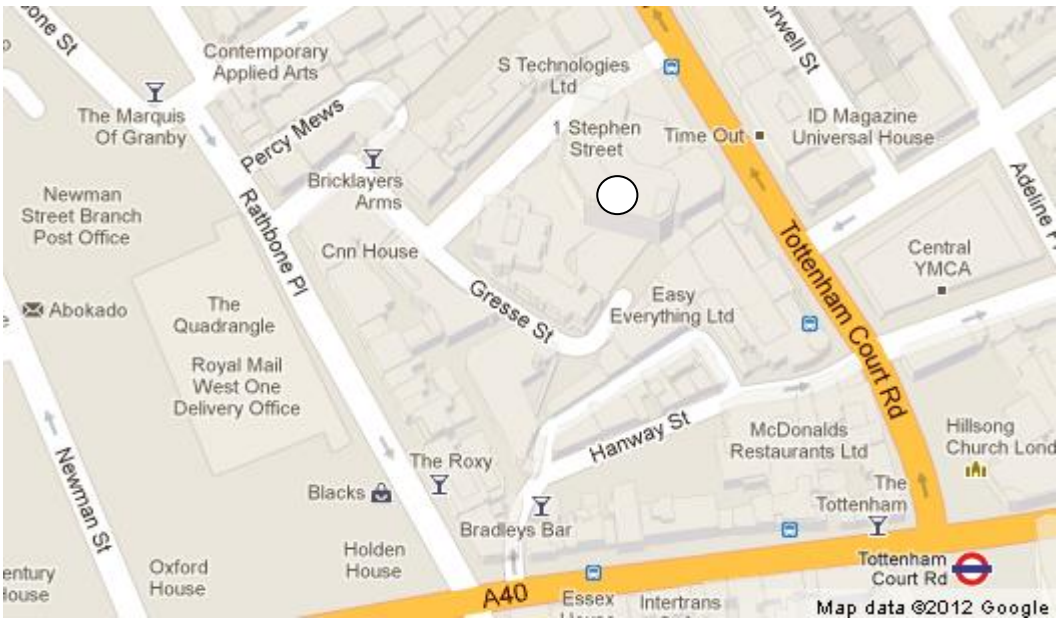
To measure L_{eq}, L_{90} and L_{max} octave band spectra noise levels for typical daytime and night-time periods at each measurement position in order to obtain a more detailed description of the noise climate.

Based on the results of the noise survey, and with reference to the requirements of the Local Authority, to recommend suitable plant noise emission criteria.

3.0 SITE DESCRIPTION

The Central Cross (Retail) scheme refers to properties on Tottenham Court Road and is part of 1-2 Stephen Street site. The site lies to the West of the Tottenham Court Road and North of Oxford Street in London. The Tottenham Court Road is a well frequented thoroughfare and provides the most influential source of noise on site. Stephen Street and Gresse Street are less frequented roads used mainly by traffic servicing the businesses to the West of the site.

The site is bounded to the South and West by residential properties.



Site Location Plan (image courtesy of maps.google.co.uk)

4.0 ACOUSTIC TERMINOLOGY

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 ACOUSTIC CRITERIA & STANDARDS

5.1 BREEAM Section Pol 8

The development is aiming to achieve a BREEAM credit under Section Pol 8 of the BREEAM Healthcare Manual 2008. This credit aims to reduce the likelihood of noise from the new development affecting nearby noise-sensitive buildings.

The credit can be obtained by ensuring:-

> *Plant noise emissions are equivalent to or less than the prevailing background noise levels at the nearest or most exposed noise sensitive development.*

Calculations should be undertaken in accordance with BS4142:1997 'Method for rating industrial noise affecting mixed residential and industrial areas'. If the above criterion is not achieved, noise mitigation measures should be specified as appropriate.

5.2 Local Authority Requirements

While the site is within the London Borough of Camden the majority of the noise sensitive residential receptors are under the jurisdiction of Westminster City Council whose plant noise emission criteria is more onerous than that of Camden Council.

Westminster's advice relating to mechanical installations within the City of Westminster is now detailed within their Noise Planning Conditions C46-C50 dated January 2007. There are two different requirements which are dependent on whether the recommended WHO Guideline noise levels are exceeded or not. These levels are: $L_{Aeq,16hrs}$ 55dB daytime (07.00-23.00hrs) and $L_{Aeq,8hrs}$ 45dB night-time (23.00-07.00hrs).

Based on the results of our unmanned survey the existing daytime and night-time external ambient levels exceed the recommended WHO guideline noise levels and hence the following plant noise emission requirement should apply: *"Show that the plant noise level is 10dBA below the lowest background level ($L_{A90\ (15minutes)}$) 1m from the nearest residential window, over the proposed operating hours. Tonality must also be taken into consideration".*

5.3 BS 4142 Assessment Methodology

The likelihood of complaints is indicated by the difference between the noise from the new development and the existing background noise. The noise from the new development is expressed in terms of a rating level, calculated from the specific noise source plus any 'acoustic feature corrections', and is given as an A-weighted (dBA) $L_{eq,T}$ noise level. The existing background noise level is expressed in terms of an A-weighted (dBA) $L_{90,T}$ noise level.

T is the assessment time interval, which is 1-hour for operations during daytime hours (07:00-23:00 hours) and 5-minutes for operations during night-time hours (23:00-07:00 hours).

The 'acoustic feature correction' (+5dB) is applied in instances where the source emits noise of a tonal, impulsive or intermittent nature.

The rating level can be subtracted from the background noise level to determine whether or not plant noise emissions are equivalent to or less than the prevailing background noise level.

6.0 ENVIRONMENTAL NOISE SURVEY

6.1 Introduction

Fully automated environmental noise monitoring was undertaken from 10:15 hours on Friday 14 September 2012 to 12:15 hours on Monday 17 September 2012 in order to obtain the daytime and night-time background noise levels for setting plant noise emission limits.

6.2 Procedure

Measurements were taken of the A-weighted (dBA) L_{eq}, L_{90} and L_{max} sound pressure levels, along with the associated octave band sound spectra, over continuous 15-minute periods.

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately comment on the weather conditions throughout the entire survey period. However at the beginning and end of the survey period the wind conditions were moderate and the sky was generally clear. We understand there were occasional brief periods of fine rainfall, although we understand road surfaces remained dry throughout the majority of the survey. These conditions were considered suitable for obtaining representative measurement results.

The equipment was located in two positions as per the following table and site plan:

Position No	Description
1	The microphone was attached to an upright scaffold at the rear of the building overlooking Gresse Street. The microphone was located in free field conditions approximately 1.5 metres from the building.
2	The microphone was attached to a steel rail at a height of approximately 1.4m on the roof of the northwest part of the site. The microphone was located in free field conditions approximately 1.2 metres from the building.

Site plan showing measurement positions (image courtesy of maps.google.co.uk)

6.3 Instrumentation

The instrumentation used during the survey is presented in the table below:

Description	Manufacturer	Type	Serial Number	Latest Verification
Position 1 Type 1 Data Logging Sound Level Meter	Larson Davis	824	3803	LD calibration on 28/08/2012
Position 1 Type 1 ½" Condenser Microphone	PCB	377B02	107427	LD calibration on 28/08/2012
Position 2 Type 1 Data Logging Sound Level Meter	Larson Davis	824	3157	LD calibration on 15/08/2012
Position 2 Type 1 ½" Condenser Microphone	PCB	2541	2470596	LD calibration on 15/08/2012
Type 1 Calibrator	Larson Davis	CAL200	3082	LD calibration on 02/03/2012

The sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable and fitted with a Larson Davis windshield. The sound level meter, including the extension cable, was calibrated prior to and on completion of the survey. No significant deviations occurred (no more than 0.1 dB).

6.4 Results & Discussion of Noise Climate

The results have been plotted on Time History Graphs 17617/TH1 to 17617/TH4 enclosed presenting the 15 minute A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{max} levels at each measurement position throughout the duration of the survey.

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period. However at the beginning and end of the survey the dominant noise source was noted to be road traffic on the surrounding road network.

6.5 Lowest Background Noise Levels

For the purpose of setting plant noise emission limits, the following table presents the lowest A-weighted daytime and night-time background L_{90} sound levels recorded during the survey.

Lowest Measured $L_{A90\ (15min)}$ (dBA)		
Position	**Daytime (07:00 – 23:00 hours)**	**Night Time (23:00 – 07:00 hours)**
1	52	51
2	53	52

7.0 PLANT NOISE EMISSION LIMITS

Based on the results of the environmental noise survey and the requirements of the Local Authority and BREEAM Section Pol 8, we propose the following plant noise emission limits to be achieved by new fixed plant at the boundary of any noise sensitive property.

Plant Noise Emission Limit (dBA)		
Position	**Daytime (07:00 – 23:00 hours)**	**Night Time (23:00 – 07:00 hours)**
1	42	41
2	43	42

Please note that the above limits are subject to the final approval of the Westminster City Council.

8.0 PLANT NOISE IMPACT ASSESSMENT

8.1 Overview

All acoustic analyses reported herein have been based on drawings and information provided by Arups.

As part of Phase 3 of the development there are three potential areas on the building for retail tenant's plant. This plant is not currently selected but preliminary selections have been made.

8.2 Plant Location and Nearest Noise Sensitive Receptors

8.2.1 Plant Area 1

Plant Area 1 is an existing plant location and is on the Ground Floor. The nearest noise sensitive receptors to these plant areas are the residential dwellings on the private road at the rear of the building. These are at a distance of approximately 20m.

8.2.2 Plant Area 2

Plant Area 2 is an existing plant location and is on Level 1. The nearest noise sensitive receptors to this plant area is the residential dwellings on the private road at the rear of the building. These are at a distance of approximately 20m.

8.2.3 Plant Area 3

Plant Area 3 is located on the Mezzanine Level of the northern part of the building overlooking Stephen Mews. The nearest noise sensitive receptors to this plant area are the residential dwellings on Percy Street. These are at a distance of approximately 18m.

8.3 Plant Noise Data

The following table details the A weighted sound pressure levels for each item of plant ducted.

Plant Area	Description	Quantity	Sound Level (dBA) at 1m per unit
1	18kW External Heat Pumps	2	51
2	50kW External Heat Pumps	14	61
3	18kW External Heat Pumps	14	51

In accordance with BS 4142, an acoustic feature correction should be applied to any plant item with tonal, irregular or impulsive characteristics. It is not possible to accurately assess plant tonality, irregularity or impulsiveness based on A weighted data alone. However, we do not normally associate these qualities with this type of plant.

8.4 Assessment

Our calculations consider distance loss, screening loss and directivity/reflections in accordance with standard acoustic theory and BS 4142: 1997.

Description	Cumulative Level of all Plant dBA	Noise Level at Receptor (dBA)	
		Private Road	Percy Street
Plant Area 1	54	28	
Plant Area 2	72	46	
Plant Area 3	62		37
Combined Total Noise Level at Receptor		**46dBA**	**37dBA**

The results above are for a worst case arrangement acoustically where all plant is operating at once. Our calculations indicate that the required plant noise emission limits set out in accordance with the Local Authority and BREEAM Section Pol 8 are likely to be exceeded without additional noise mitigation measures.

9.0 PROPOSED MITIGATION MEASURES

In order to achieve the Local Authority criteria the cumulative noise level from the plant within Plant Area 2 needs to be reduced by around 10dBA. We would expect this reduction to be achievable with the installation of either acoustic enclosures or acoustic screening. We attach a list of suitable suppliers who may be able to assist further with this.

With this reduction in noise levels the required plant noise emission limits set out in accordance with the Local Authority and BREEAM Section Pol 8 should be achieved at all noise sensitive receptors.

10.0 CONCLUSIONS

A detailed environmental noise survey has been undertaken in order to establish the currently prevailing environmental noise climate in the vicinity of the development site.

The results of this survey have been used to set plant noise emission limits in accordance with Local Authority and BREEAM Pol 8 requirements.

The design stage proposals for external plant have been assessed against the plant noise emission limits in accordance with BS 4142: 1997 and the resultant noise levels of all the plant are likely to exceed the required levels without mitigation measures.

Mitigation measures have therefore been suggested and with these we can see no reason why the required plant noise emission criteria for day and night time should not be achieved,

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APPENDIX A

The acoustic terms used in this report are as follows:

dB : Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.

dB(A) : The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level.

Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.

L_{10} & L_{90}: If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and 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 the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.

It is common practice to use the L_{10} index to describe traffic noise, as being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic noise.

L_{eq} : The concept of L_{eq} (equivalent continuous sound level) has up to recently been primarily used in assessing noise in industry but seems now to be finding use in defining many other types of noise, such as aircraft noise, environmental noise and construction noise.

L_{eq} is defined as 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. 1 hour).

The use of digital technology in sound level meters now makes the measurement of L_{eq} very straightforward.

SUITABLE SUPPLIERS

of

ACOUSTIC ENCLOSURES FOR SMALL AIR CONDITIONING UNITS

Name & Address	Telephone Number	Contact
Environ Technologies Ltd Regus House 1010 Cambourne Business Park Cambourne Cambridge CB3 6DP	0870 383 3344	Steve Cox
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