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77 AVENUE ROAD, LONDON

NOISE IMPACT ASSESSMENT

Report 3730.NIA.01

Prepared on 19 February 2010

For:

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CONTENTS

List of Attachments

1.0 INTRODUCTION

Practical Acoustics has been commissioned by Mr Giles Lovegrove, Coupdeville, Unit 1A Woodstock Studios, 36 Woodstock Grove, London, W12 8LE to measure existing background noise levels at 77 Avenue Road, London, NW8 6JD. The measured noise levels will be used to determine noise emission criteria for the proposed plant units in agreement with the planning requirements of the London Borough of Camden.

This report presents the results of the environmental survey followed by noise impact calculations and outlines any necessary mitigation measures.

2.0 ENVIRONMENTAL NOISE SURVEY

2.1 Procedure

Measurements were taken at the position shown in Site Plan 3730.SP1. The choice of this position was based both on accessibility and on collecting representative noise data in relation to the nearest noise sensitive receivers.

Continuous automated monitoring was undertaken for the duration of the survey between 13:30 on 10 February 2010 and 13:30 on 11 February 2010.

Weather conditions were dry with light winds, therefore suitable for the measurement of environmental noise.

The measurement procedure generally complied with BS7445:1991. *Description and measurement of environmental noise, Part 2- Acquisition of data pertinent to land use*.

2.2 Equipment

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

The equipment used was as follows.

- Svantek Type 957 Class 1 Sound Level Meter
- Norsonic Type 1251 Class 1 Calibrator

3.0 RESULTS

The $L_{Aeq: 15min}$, $L_{Amax: 15min}$, $L_{A10: 15min}$ and $L_{A90: 15min}$ acoustic parameters were measured and are shown as a time history in Figure 3730.TH1.

Minimum measured background levels are shown in Table 3.1.

	Minimum Background Noise Level $L_{A90: 15min}$ dB(A)
Daytime (7:00-23:00)	45
Night-time (23:00-7:00)	36

Table 3.1: Minimum background noise levels

4.0 NOISE CRITERIA

The London Borough of Camden's criteria for noise emissions of new plant installations are as follows:

"*Design measures should be taken to ensure that specific plant noise levels at a point 1 metre external to sensitive façades are at least 5dB(A) less than the existing background measurement (LA90) when the equipment is in operation. Where it is anticipated that equipment will have a noise that has distinguishable, discrete continuous note[...], special attention should be given to reducing the noise at any sensitive façade by at least 10dB(A) below the LA90 level*."

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

	Daytime	**Night-time**
Noise criterion at nearest residential receiver (10dB below minimum LA90)	35 dB(A)	26 dB(A)

Table 4.1: Proposed Noise Emissions Criteria

As the units could potentially be used at any time the night-time criterion of 26 dB(A) will be used for this assessment.

5.0 DISCUSSION

The proposed plant installation comprises twelve new Daikin Air Conditioning Condenser Units type 3MXS52E, with manufacturer sound pressure levels (at 1 metre) as shown in Table 5.1.

	Sound Pressure Level (dB) in each Frequency Band							
Air Conditioning Unit	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Daikin Air Conditioning Condenser Unit type 3MXS52E	41	53	48	43	45	42	36	33

Table 5.1 Manufacturer Sound Pressure Level at 1 Metre

The proposed location of the plant units is within a sub basement plant room at 77 Avenue Road, as shown in indicative site plant 3730.SP1. The plant room will be ventilated via ducting that goes through the basement floor above and terminates at garden level via a louvred panel. The closest noise sensitive window has been identified as a first floor window on the neighbouring premises to the north, a minimum of 12m from the ventilation termination.

As the units will be installed within an enclosed space, some reflections will be apparent, although the 2m high boundary wall to the north of the property will attenuate the noise emissions to the nearest noise sensitive window.

Due to the number of units in the proposed installation, it has been deemed necessary to specify mitigation measures in order to bring emissions from the plant within the requirements of the London Borough of Camden.

We would firstly recommend treating the floor and wall surfaces close to the plant room in order to minimise the effect of reflections. This could be achieved by using an absorptive backing formed from a 30-50mm layer of non-flammable absorbent layer, such as rock wool or glass fibre, held in place by a strong, permeable (minimum 20% open area) facing.

We would then recommend using an acoustically-treated louvred panel where the ventilation duct terminates at garden level. The louvred panel should be selected to meet minimum required attenuation levels as shown in Table 5.3.

Taking into account all necessary acoustic corrections, including proposed mitigation measures, distance corrections and screening provided by the existing boundary wall, the predicted level at the closest noise sensitive window is as shown in Table 5.2. Detailed calculations are shown in Appendix B.

Receiver	Night-time Criterion	Noise Level at Receiver (due to proposed plant)
Nearest Noise Sensitive Window	26 dB(A)	21 dB(A)

Table 5.2: Noise levels and criteria at nearest noise sensitive receivers

As shown in Appendix B and Table 5.2, transmission of noise to the nearest sensitive windows due to the proposed plant installation would be expected to meet the requirements of the London Borough of Camden.

In order to achieve the levels shown in Table 5.2, the louvred panel should be selected to meet the spectral attenuation specification as shown in Appendix B and Table 5.3.

	Attenuation (dB) in each Frequency Band							
Mitigation Type	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Louvred Panel	-4	-5	-8	-9	-12	-10	-8	-6

Table 5.3: Spectral attenuation required from louvred panel

For Indication Purposes Only:

Typically, in order to achieve the specifications shown in Table 5.3, a 300mm deep acoustically treated louvred panel would be required.

In addition to the above assessment, further calculations will aim to assess whether the noise emissions from the proposed plant unit would be expected to meet recognised British Standard recommendations in order to further ensure the amenity of nearby noise sensitive receivers.

British Standard 8233:1999 '*Sound insulation and noise reduction for buildings – Code of Practice*' gives recommendations for acceptable internal noise levels in residential properties. Assuming worst case conditions, of the closest window being for a bedroom, BS8233:1999 recommends 30dB(A) as being 'Good' internal resting/sleeping conditions.

With external levels of 21dB(A) at this window, 'good' conditions are already achieved without taking attenuation of the window itself into consideration. However, according to BS8233:1999, even a partially open window offers a minimum of 10dB attenuation.

It can therefore be predicted that, in addition to meeting the requirements of the London Borough of Camden, the emissions from the proposed plant would be expected to meet the most stringent recommendations of the relevant British Standard, even with noise sensitive windows partially open. Predicted levels are shown in Table 5.3, with detailed calculations shown in Appendix B.

Receiver	'Good' Conditions Design Range – *For resting/sleeping conditions in a bedroom, in BS8233:1999*	Maximum Noise Level at Receiver (due to plant installation)
Inside Nearest Residential Space	30 dB(A)	11 dB(A)

Table 5.3: Noise levels and criteria inside nearest residential space

6.0 SCOPE FOR FUTURE SPECIFICATIONS

In Section 6, it has been demonstrated that using a sub-basement space with louvred ventilation would be a suitable and robust way of controlling noise emissions of air conditioning units.

Once the final selection has been made for plant handling fresh air supplies, exhaust air extraction and swimming pool handling plant, we would be in a position to propose a schedule of silencers, whereby noise emissions can be effectively controlled at source. In this way, it would be possible to maintain the low level of plant noise emissions, maintaining emissions levels comfortably within the London Borough of Camden criterion of 10dB below the minimum existing background noise.

7.0 CONCLUSION

An environmental noise survey has been undertaken at 77 Avenue Road, London, NW8 6JD. The results of the survey have enabled criteria to be set for noise emissions from the proposed plant in accordance with the requirements of the London Borough of Camden.

A noise impact assessment has then been undertaken using manufacturer noise data to predict the noise levels due to the current proposals at the nearby noise sensitive receivers.

Calculations show that noise emissions from the twelve proposed air conditioning units would be within the requirements of the London Borough of Camden as well as meeting recommendations of a recognised British Standard, provided mitigation measures are put in place.

Title:
Indicative site plan showing noise monitoring position and nearest noise sensitive receiver

Date: 19 February 2010

FIGURE 3730.SP1

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Environmental Noise Time History
10 February 2010 to 11 February 2010

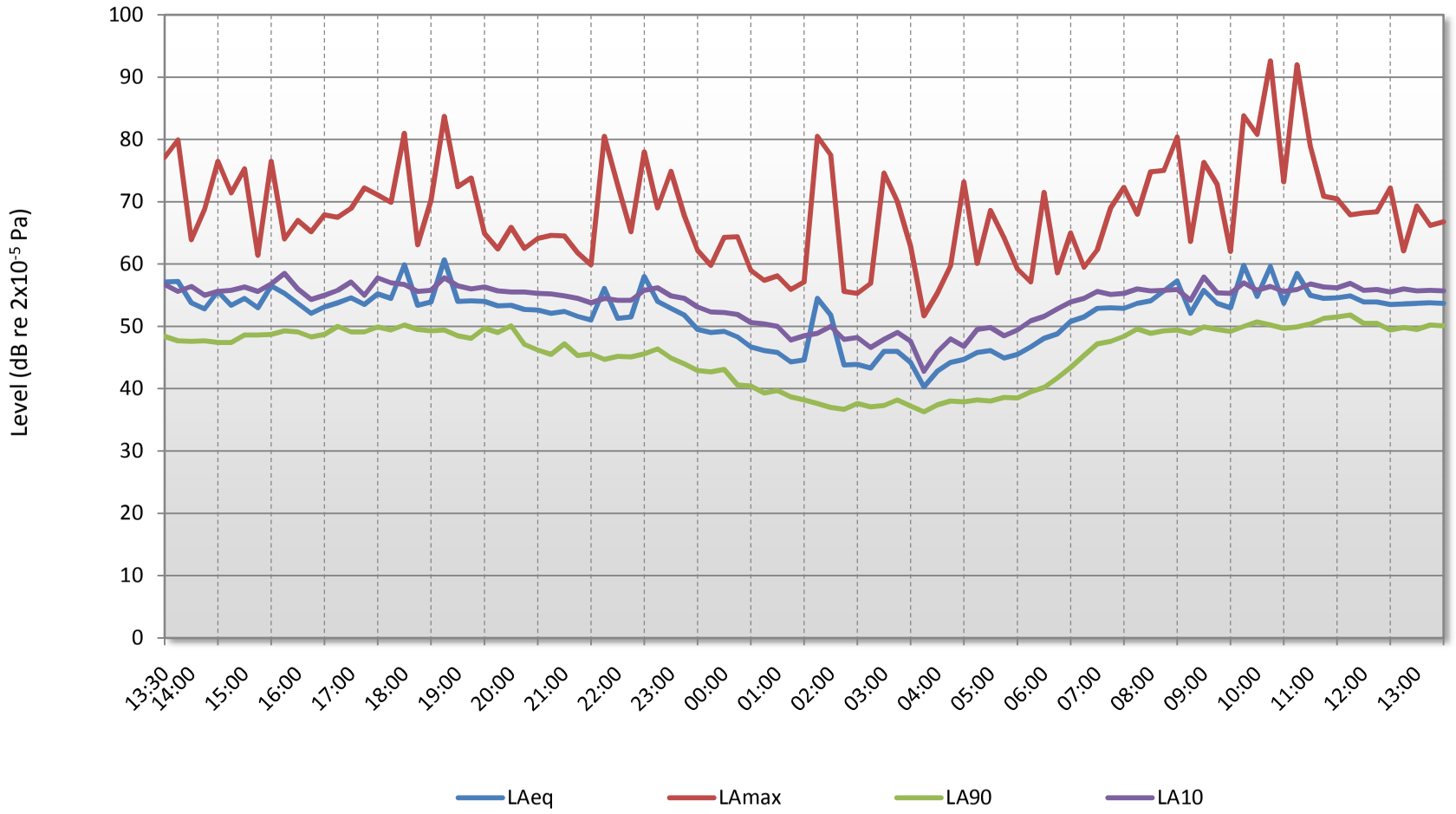

Figure 3730.TH1

APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

dB(A)

The human ear is less sensitive to low (below 125Hz) and high (above 16kHz) frequency sounds. A sound level meter duplicates the ear's variable sensitivity to sound of different frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the ear. This is called an A-weighting filter. Measurements of sound made with this filter are called A-weighted sound level measurements and 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 not 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 not 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 10 such octave bands whose centre frequencies are defined in accordance with international standards.

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 one alone and 10 sources produce a 10dB 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

Sound intensity is not perceived directly at the ear; rather it is transferred by the complex hearing mechanism to the brain where acoustic sensations can be interpreted as loudness. This makes hearing perception 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 reasonable guide to help explain increases or decreases in sound levels for many acoustic scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud
20	About 4 times as loud

Barriers

Outdoor barriers can be used to reduce environmental noises, such as traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and its construction.

Reverberation control

When sound falls on the surfaces of a room, part of its energy is absorbed and part is reflected back into the room. The amount of reflected sound defines the reverberation of a room, a characteristic that is critical for spaces of different uses as it can affect the quality of audio signals such as speech or music. Excess reverberation in a room can be controlled by the effective use of sound-absorbing treatment on the surfaces, such as fibrous ceiling boards, curtains and carpets.

APPENDIX B

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EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Source: Daikin Air Conditioning Condenser Units	*Frequency, Hz*								
	63	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Manufacturer's sound pressure level at 1m									
Daikin Air Conditioning unit, type 3MXS52E	41	53	48	43	45	42	36	33	49
Correction for number of units (12), dB	11	11	11	11	11	11	11	11	
Cumulative sound pressure level at 1m	**52**	**64**	**59**	**54**	**56**	**53**	**47**	**44**	**60**
Attenuation from acoustically treated louvres, dB	-4	-5	-8	-9	-12	-10	-8	-6	
Distance correction, dB (12m)	-22	-22	-22	-22	-22	-22	-22	-22	
Mnimum attenuation provided by boundary wall, dB	-3	-4	-6	-8	-11	-11	-11	-11	
Cumulative sound pressure level at nearest residential window	**23**	**33**	**23**	**15**	**11**	**10**	**6**	**5**	**21**

Design Criterion	**26**

Receiver: Inside Nearest Residential Window

Source: Daikin Air Conditioning Condenser Units	*Frequency, Hz*								
	63	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Sound pressure level outside window	23	33	23	15	11	10	6	5	21
Minimum attenuation from partially open window, dB	-10	-10	-10	-10	-10	-10	-10	-10	
Sound pressure level inside nearest noise sensitive window	**13**	**23**	**13**	**5**	**1**	**0**	**0**	**0**	**11**

Design Range	**30-35**