Practical Acoustics
www.practicalacoustics.com

Practical Acoustics Ltd
202 Uxbridge Road
London
W12 7JP

Tel: +44(0)2071 835 935
Fax: +44(0)2071 835 985
info@practicalacoustics.com

HAMPSTEAD PAROCHIAL CHURCH OF ENGLAND

PRIMARY SCHOOL

NOISE IMPACT ASSESSMENT

Report 3262.NIA.01

Prepared on 11 August 2009

For:

C B Swift

Swift House

Spencer Hill Road

London

SW19 4EL

CONTENTS

List of Attachments

1.0 INTRODUCTION

Practical Acoustics has been commissioned by C B Swift, Swift House, Spencer Hill Road, London, SW19 4EL to measure existing background noise levels at Hampstead Parochial Church of England Primary School, Holly Bush Vale, Heath Street, Hampstead, London, NW3 6TX. The measured noise levels will be used to determine noise emission criteria for the proposed extract flue 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 3262.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 13:00 on 28 July 2009 and 13:00 on 29 July 2009.

Weather conditions were generally dry with light winds, therefore deemed 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 3262.TH1.

Background noise levels were dominated by road traffic noise from surrounding roads.

Minimum measured background levels are shown in Table 3.1.

	Minimum Background Noise Level $L_{A90: 15min}$ dB(A)
Daytime (07:00-23:00)	35
Night-time (23:00-07:00)	30
Operating Hours (11:00-14:00)	41

Table 3.1: Minimum background noise levels

4.0 NOISE CRITERIA

The London Borough of Camden 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."

As this project is being conducted for the London Borough of Camden, we propose to set the criteria at 5dB below minimum background noise, in order to facilitate the accomplishment of the project, as shown in Table 4.1.

	Daytime	Night-time	Operating Hours
Noise criterion at nearest residential receiver (5dB below minimum L_{A90})	30 dB(A)	25 dB(A)	36 dB(A)

Table 4.1: Proposed Noise Emissions Criteria

Since the extract will only be used during school lunchtimes, this assessment will use the Operating Hours criterion of 36 dB(A) at the nearest residential window.

5.0 DISCUSSION

The proposed plant installation comprises a new kitchen extract duct, driven by a FläktWoods Cased Fan type 45JM/16/4/5/30. The manufacturer's spectral Sound Power Level of the unit is as shown in Table 5.1.

	Sound Power Level (dB) in each Frequency Band							
Unit	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
FläktWoods Cased Fan type 45JM/16/4/5/30	74	75	71	68	66	64	60	56

Table 5.1 Manufacturer's predicted Sound Power Level

The kitchen extraction duct containing the fan terminates above roof level on the School Keeper's office. In order to provide the most robust assessment we have ensured that the noise criterion is met at the nearest building facade, assuming that this building is a noise sensitive property. The closest building to the extract duct has therefore been identified as at the southern boundary of the school premises, approximately 3 meters from the flue termination, as shown in indicative site plan 3262.SP1.

Due to the close proximity of the nearest building facade it has been deemed necessary to specify mitigation measures in order to bring emissions from the plant within the set criterion

We propose that a barrier between the kitchen extract duct and the southern boundary of the school is necessary to attenuate the noise emissions from the plant to within acceptable levels.

The barrier should be constructed from timber panels at a height of 0.6 meters from the flat roof and 0.5 meters from the ductwork. The panel should run the length of the extract flue and extend beyond the termination of the flue.

We would recommend constructing the barrier from timber panels, with a minimum thickness of 10mm and 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. The panels should be arranged so that the absorptive layer is facing the flue.

Taking all acoustic corrections into consideration, including distance and reflection corrections and proposed mitigation measures, the noise levels expected at the nearest building facade to the school premises due to the proposed kitchen extract flue would be as shown in Table 5.2. Detailed calculations are shown in Appendix B.

Receiver	Operating Hours Criterion	Level at Receiver (due to proposed plant)
Nearest Building Facade	36 dB(A)	35 dB(A)

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

As shown in Table 5.2 and Appendix B, plant noise emissions at the closest building facade are expected to meet the requirements of the set criterion, provided the specified mitigation measures are put in place.

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 Practise'* gives recommendations for acceptable internal noise levels in residential properties.

Although it is not clear whether the closest building façade is that of a noise sensitive property, this assessment will assume worst case conditions, of there being a window for a bedroom in the façade. In such a scenario, BS8233:1999 recommends 30dB(A) as being 'Good' internal resting/sleeping conditions.

With external levels of 35dB(A), any residential window would only need to provide 5dB attenuation in order to bring the noise levels due to the proposed plant to 'Good' conditions. 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 proposed criteria, emissions from the proposed plant would also be expected to comfortably meet the most stringent recommendations of the relevant British Standard, even with windows being 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*	Noise Level at Receiver (due to plant installation)
Inside Nearest Residential Space	30 dB(A)	25dB(A)

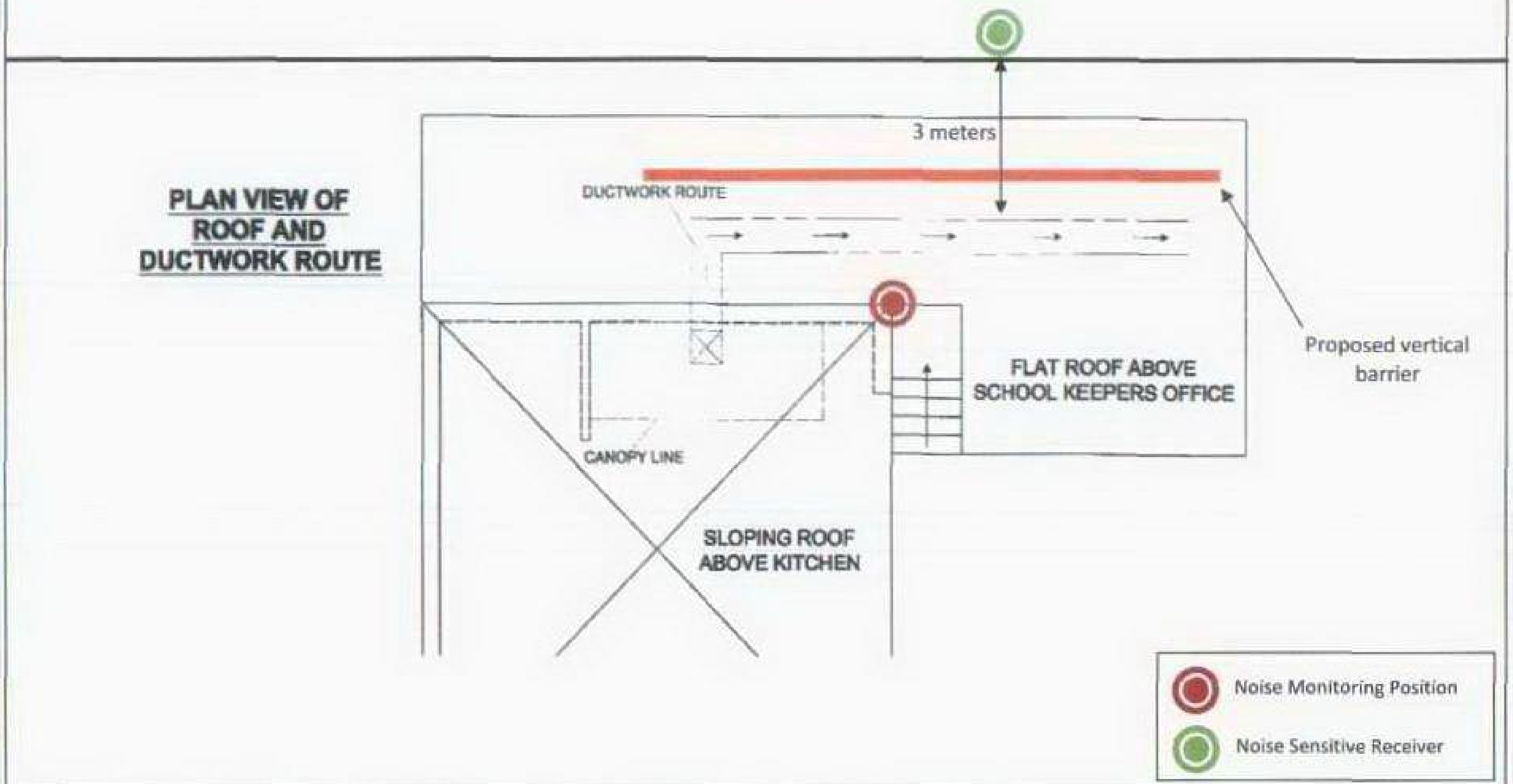
Table 5.3: Noise levels and criteria inside nearest residential space

6.0 CONCLUSION

An environmental noise survey has been undertaken at Hampstead Parochial Church of England Primary School, Holly Bush Vale, Heath Street, Hampstead, London, NW3 6TX. The results of the survey have enabled criteria to be set for noise emissions from the proposed plant in accordance with the London Borough of Camden planning conditions.

A noise impact assessment has then been undertaken using on-site measured noise data to assess noise levels at the nearest building facade due to the current proposals.

Calculations show that emissions are expected to be within set criteria, provided mitigation measures are put in place.



Title:

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

Date: 11 August 2009

FIGURE 3262.SP1

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HAMPSTEAD PAROCHIAL CHURCH OF ENGLAND PRIMARY SCHOOL

Environmental Noise Time History

28 July 2009 to 29 July 2009

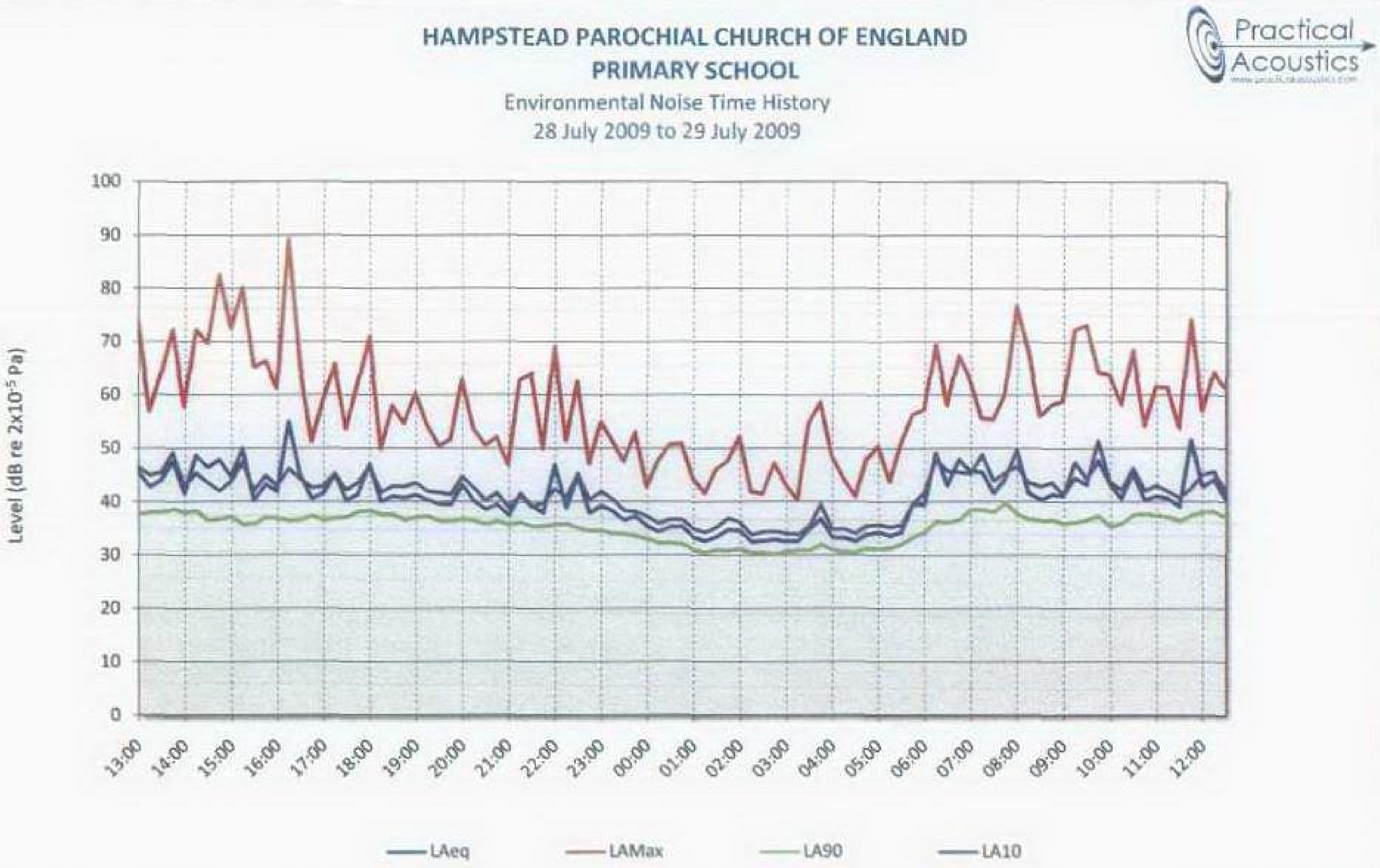

Figure 3262.TH1

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

HAMPSTEAD PAROCHIAL CHURCH OF ENGLAND PRIMARY SCHOOL, LONDON

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Receiver: Nearest Residential Window
Source: Kitchen Extract Fan

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Predicted sound power level (based on manufacturer data) FläktWoods Cased Fan type 45JM/16/4/5/30 Outlet	74	75	71	68	66	64	60	56	72
Conversion to sound pressure level at 1m	-8	-8	-8	-8	-8	-8	-8	-8	
Minimum attenuation from duct bend	0	-1	-6	-16	-18	-16	-17	-14	
Minimum attenuation from end reflections	-10	-5	-2	0	0	0	0	0	
Attenuation from proposed barrier	-3	-4	-6	-8	-11	-13	-16	-19	
Distance loss, 3m	-10	-10	-10	-10	-10	-10	-10	-10	
Sound pressure level at residential window due to exhaust	43	47	39	26	20	17	9	5	35

Design Criterion	**36**

Receiver: Inside Nearest Residential Window
Source: Kitchen Extract Fan

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Sound pressure level outside window	43	47	39	26	20	17	9	5	35
Minimum attenuation from partially open window, dB	-10	-10	-10	-10	-10	-10	-10	-10	
Sound pressure level inside nearest noise sensitive window	**33**	**37**	**29**	**16**	**10**	**7**	**-1**	**-5**	**25**

Design Range	**30-35**