www.clementacoustics.co.uk

London office
1B(c) Yukon Road
London
SW12 9PZ
Tel: 0203 475 2280

Manchester office
Suite 34 Europa House
Barcroft Street
Bury BL9 5BT
Tel: 0161 850 2280

49A Downshire Hill

London

26 April 2024

19018-NIA-01 RevB

Noise Impact Assessment

Project Number
19018

Issued For
Amir Sanei

EXECUTIVE SUMMARY

This noise impact assessment has been undertaken in order to assess a proposed plant installation for residential use at 49A Downshire Hill, London.

The proposed plant installation comprises 1 No. Warmflow AS03-R32 air source heat pump.

A background noise survey has been undertaken as detailed in the report, in order to determine an appropriate noise emission criterion, in accordance with the requirements of the London Borough of Camden.

Calculations were undertaken for the nearest receivers, identified as three rear windows belonging to the adjacent Hampstead Hill Mansions and 49 Downshire Hill and to the property to the rear of the site at 7 Hampstead Hill Gardens. It should be noted that if there are closer receivers that Clement Acoustics is not aware of, a reassessment will be necessary, and this should therefore be confirmed by the Client.

It has been demonstrated that compliance with the established criterion is feasible, dependent on the following material considerations:

- The plant could be in use at any time over a 24 hour period
- The noise emissions data for the proposed units, as obtained from available manufacturer information
- Plant and receiver locations are as established in this report and marked on the attached site plan

If there is any deviation from the above, Clement Acoustics must be informed, in order to establish whether a reassessment is necessary.

Clement Acoustics has used all reasonable skill and professional judgement when preparing this report. The report relies on the information as provided to us at the time of writing and the assumptions as made in our assessment.

This report is designed to be suitable to discharge typical plant noise planning conditions, as per our original scope of work. The report should not be relied upon for further reasons, such as the detailed design of mitigation measures.

CONTENTS

1.0 INTRODUCTION 1
2.0 SITE DESCRIPTION 1
3.0 ENVIRONMENTAL NOISE SURVEY 1
3.1 UNATTENDED NOISE SURVEY PROCEDURE 1
3.2 WEATHER CONDITIONS 2
3.3 EQUIPMENT 2
4.0 RESULTS 2
4.1 UNATTENDED NOISE SURVEY RESULTS 2
5.0 NOISE CRITERIA 3
5.1 RELEVANT LOCAL POLICY 3
5.2 LOCAL AUTHORITY CRITERIA 3
6.0 PLANT NOISE IMPACT ASSESSMENT 4
6.1 PROPOSED INSTALLATION 4
6.2 NOISE IMPACT ASSESSMENT 5
6.3 BRITISH STANDARD REQUIREMENTS 6
7.0 CONCLUSION 6

LIST OF ATTACHMENTS

19018-SP1 Indicative Site Plan
19018-TH1 Environmental Noise Time History
Appendix A Glossary of Acoustic Terminology
Appendix B Acoustic Calculations

Issue	Date of Issue	Author	Reviewed	Authorised
RevB	26/04/24			
		MD Atif Uddin Assistant Consultant BSc (Hons)	**Andy Thomas** Director BSc (Hons) MIOA	**Andy Thomas** Director BSc (Hons) MIOA

Issue	Comment
0	First Issue
RevA	Updated to reflect change in selected plant unit and position change
RevB	Plant unit position change

1.0 INTRODUCTION

Clement Acoustics has been commissioned by Amir Sanei to measure existing background noise levels at 49A Downshire Hill, London. Measured noise levels have been used to determine noise emissions criteria for a proposed plant installation 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.

An acoustic terminology glossary is provided in Appendix A.

2.0 SITE DESCRIPTION

The site is bound by Downshire Hill to the northwest and by residential dwellings to the rest of its surroundings. The area is predominantly residential in nature.

Current proposals are to install 1 No. Warmflow AS03-R32 air source heat pump in the rear garden of the property. It is understood that the unit will be used for residential purposes and could therefore be operational at any time within a 24 hour period.

A rear window belonging to the adjacent Hampstead Hill Mansions, a rear window belonging to the adjacent property at 49 Downshire Hill and a rear window belonging to the property to the rear of the site at 7 Hampstead Hill Gardens, have been identified as the nearest affected receivers. These nearest noise sensitive receivers were identified through observations on-site. If there are any receivers closer than that identified within this report then a further assessment will need to be carried out. Therefore, the closest noise sensitive receiver should be confirmed by the client before the plant is installed or any noise mitigation measures are implemented.

Locations are shown in attached site plan 19018-SP1.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Unattended Noise Survey Procedure

Measurements were undertaken at one position as shown on indicative site drawing 19018-SP1. The choice of this position was based both on accessibility and on collecting representative noise data in relation to the nearest affected receiver.

The microphone was mounted on a pole attached to a gate on the southwestern side of the building. The microphone was positioned 2.5 m from the ground.

The position was not considered to be free-field according to guidance found in BS 4142: 2014, and a correction for reflections has therefore been applied. Based on the presence of the reflective surface and the nature of surrounding noise sources, a correction for reflections of 3 dB has been applied, in line with the recommendations of the standard.

Continuous automated monitoring was undertaken for the duration of the survey between 10:35 on 27 March 2024 and 10:45 on 28 March 2024.

The measurement procedure generally complied with BS 7445: 1991: 'Description and measurement of environmental noise, Part 2- Acquisition of data pertinent to land use'.

3.2 Weather Conditions

At the time of set-up and collection of the monitoring equipment, the weather conditions were cloudy with little to no winds. It is understood that the weather conditions during the unattended survey were generally dry except a rainy spell during the night time.

It is considered that the weather conditions did not significantly adversely affect the measurements and are therefore considered suitable for the measurement of environmental noise.

3.3 Equipment

The equipment calibration was verified, by means of a field verification check, before and after use and no abnormalities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 977 Class 1 Sound Level Meter
- Rion Type NC-74 Class 1 Calibrator

4.0 RESULTS

4.1 Unattended Noise Survey Results

The $L_{Aeq: 5min}$, $L_{Amax: 5min}$, $L_{A10: 5min}$ and $L_{A90: 5min}$ acoustic parameters were measured at the location shown in site drawing 19018-SP1.

Measured noise levels are shown as a time history in Attachment 19018-TH1, with average ambient and minimum background noise levels summarised in Table 4.1.

Time Period	Average ambient noise level $L_{Aeq:\,T}$, dB	Minimum background noise level $L_{A90:\,5min}$, dB
Daytime (07:00 – 23:00)	48	35
Night-time (23:00 – 07:00)	47	30

Table 4.1 Average ambient and minimum background noise levels

5.0 NOISE CRITERIA

5.1 Relevant Local Policy

The assessment and recommendations in this report have been undertaken in accordance with Policy D14 of the London Plan 2021, which contains the following relevant sections:

"D14. In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

5) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses".

5.2 Local Authority Criteria

The London Borough of Camden's Local Plan (2017) states noise emissions criteria. The most relevant noise emissions criteria stated in the document is for Industrial and Commercial noise, which covers sources such as extract fans, air conditioning units and condensers. These types of sources are comparable to the proposed condensers at the property and therefore these requirements will be used.

The Local Plan states the following:

"The significance of noise impact varies dependent on the different noise sources, receptors and times of operation presented for consideration within a planning application. Therefore, Camden's thresholds for noise and vibration evaluate noise impact in terms of various 'effect levels' described in the National Planning Policy Framework and Planning Practice Guidance:

- *NOEL – No Observed Effect Level*
- *LOAEL – Lowest Observed Adverse Effect Level*
- *SOAEL – Significant Observed Adverse Effect Level*

Three basic design criteria have been set for proposed developments, these being aimed at guiding applicants as to the degree of detailed consideration needed to be given to noise in any planning

application. The design criteria outlined below are defined in the corresponding noise tables. The values will vary depending on the context, type of noise and sensitivity of the receptor:

- *Green – where noise is considered to be at an acceptable level.*
- *Amber – where noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development.*
- *Red – where noise is observed to have a significant adverse effect."*

The document states that plant noise emissions should be rated against the background level outside the NSR bedroom window in accordance with British Stand 4142:2014 'Methods for rating assessing industrial and commercial sound' (BS 4142).

Camden state that the following noise rating correspond to the stated NOEL, LOAEL and SOAEL:

- *LOAEL (Green) – 'Rating Level' 10 dB below background, and no events exceeding 57 dB L_{Amax}*
- *LOAEL to SOAEL (Amber) – 'Rating Level' between 9 dB below and 5 dB above background or noise events between 57 dB and 88 dB L_{Amax}*
- *SOAL (Red) – 'Rating level' greater than 5 dB above background and/or events exceeding 88 dB L_{Amax}*

Based on the results of the environmental noise survey and guidance provided by the London Borough of Camden, Table 5.1 presents the proposed plant noise emission criteria to be achieved at 1 m from the nearest noise sensitive receiver that would constitute a LOAEL.

Period	Plant Noise Emission Limit $L_{Aeq;T}$, dB	Effect Level
Night-time (23:00 - 07:00)	20	LOAEL

Table 5.1 Plant noise emission limits

6.0 PLANT NOISE IMPACT ASSESSMENT

6.1 Proposed Installation

The proposed plant installation comprises 1 No. Warmflow AS03-R32 air source heat pump.

The available data sheet only provided an overall broadband sound power level of 55 dB(A) and a nominal sound level within the range of 44 – 58 dB(A). The nominal sound level is stated as being measured in accordance with EN 12102, which is a European Standard for determining the sound power level of heat pumps. In order to conduct a robust assessment, the sound power will be assumed to be 58 dB(A).

Additionally, due to the lack of specific data from the manufacturer, spectral noise emissions for the proposed plant units have been derived from those of a similar unit (Mitsubishi Unit type PUZ-

WM50VHA) by shifting the noise emission curve. The established spectral sound pressure levels, equivalent to an overall sound power level of 58 dB(A), are shown in Table 6.1. The noise emission level equating to the highest extent of the stated range has been used in order to present a robust worst-case assessment.

Unit	Sound Pressure Level (at 1 m, dB) in each Frequency Band, Hz								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Warmflow AS03-R32	43	51	44	45	44	37	31	24	47

Table 6.1 Manufacturer provided noise emissions levels – spectral levels assumed

The proposed plant location is in the rear garden which is shown on indicative site plan 19018-SP1.

6.2 Noise Impact Assessment

The closest receivers have been identified as three windows on the rear façades of the adjacent Hampstead Hill Mansions, the adjacent property at 49 Downshire Hill and 7 Hampstead Hill Gardens to the rear of the site which are a minimum of 29 m, 32 m and 19 m from the proposed plant location respectively.

Screening of the receptors at 49 Downshire Hill and 7 Hampstead Hill Gardens is provided by the fence around the rear garden of the property.

Taking into account all necessary acoustic corrections, the resulting noise level at the identified residential windows would be as shown in Table 6.2. Detailed calculations are shown in Appendix B.

Receiver	Design Criterion	Noise Level at Receiver (due to proposed plant)	Assessment Findings
1. 49 Downshire Hill rear window	20 dB(A)	16 dB(A)	LOAEL Rating
2. Hampstead Hill Mansions rear window	20 dB(A)	20 dB(A)	LOAEL Rating
3. 7 Hampstead Hill Gardens rear window	20 dB(A)	13 dB(A)	LOAEL Rating

Table 6.2 Noise levels and project criterion at noise sensitive receivers

As presented in Table 6.2 and Appendix B, the proposed plant installation would be expected to present a receiver noise level at least 10 dB below the measured background noise level, therefore indicative of the Lowest Observable Adverse Effect Level without the need for any particular mitigation. This is in turn deemed an acceptable level, according to the requirements of Camden Council.

6.3 British Standard Requirements

Further calculations have been undertaken 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: 2014 '*Guidance on sound insulation and noise reduction for buildings*' gives recommendations for acceptable internal noise levels in residential properties. Assuming worst case conditions, of the closest window being for a bedroom, BS 8233: 2014 recommends 30 dB(A) as being acceptable internal sleeping conditions during night-time.

With loudest external levels of 20 dB(A), acceptable internal conditions would be met without taking the attenuation of the window itself into consideration. According to BS 8233: 2014, a typical building facade with a partially open window offers 15 dB attenuation.

It can therefore be predicted that, in addition to meeting the requirements of the set criteria, the emissions from the proposed plant would be expected to meet the most stringent recommendations of the relevant British Standard, with neighbouring windows partially open. Predicted levels are shown in Table 6.3.

Receiver	Recommended Target – For sleeping conditions in a bedroom, in BS 8233: 2014	Noise Level at Receiver (due to plant installation)
1. 49 Downshire Hill window	30 dB(A)	1 dB(A)
2. Hampstead Hills Mansions window	30 dB(A)	5 dB(A)
3. 7 Hampstead Hill Gardens front window	30 dB(A)	0 dB(A)

Table 6.3 Noise levels and BS 8233: 2014 criteria inside nearest residential space

7.0 CONCLUSION

An environmental noise survey has been undertaken at 49A Downshire Hill, London. 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 proposed plant, at the nearby noise sensitive receivers.

Calculations show that noise emissions from the proposed units should meet the requirements of the London Borough of Camden without the need for any particular mitigation.

clement acoustics

N

Not to scale

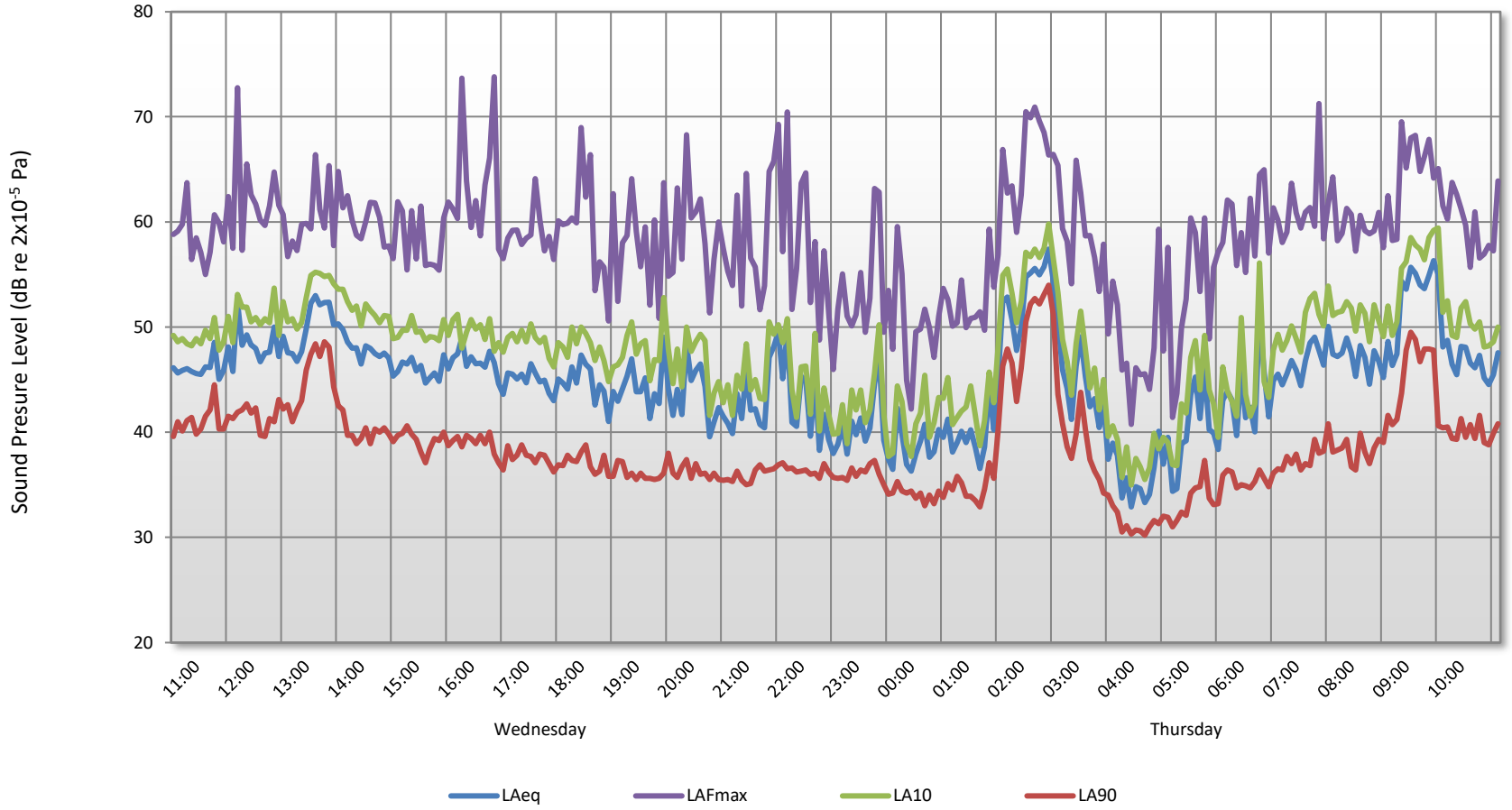
Description:
Indicative site plan showing noise monitoring position, nearest sensitive receiver and proposed plant location

Date	26 April 2024
Reference	19018-SP1
Project Name	49A Downshire Hill, London
Image ©	Google Earth

Key:	
	Unattended Noise Survey Position
	Noise Sensitive Receiver
	Proposed Plant Location

49A Downshire Hill, London

Environmental Noise Time History
27 March 2024 to 28 March 2024



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 10 dB 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 3 dB for each doubling of distance.

APPENDIX A

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

Acoustic Calculations

19018

49A Downshire Hill, London

Receiver 1: 49 Donwshire Hill rear window

External Plant Noise Emissions Calculation

Description	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Manufacturer provided sound pressure level at 1 metre									
Warmflow AS03-R32	43	51	44	45	44	37	31	24	47
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Distance correction to receiver, dB (29 m)*	-29	-29	-29	-29	-29	-29	-29	-29	
Correction due to screening from fence, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Sound pressure level at receiver	**12**	**20**	**13**	**14**	**13**	**6**	**0**	**-7**	**16**

***Distance loss calculated assuming Point Source attenuation (*typically used where distance is more than 3x the largest source dimension*)**

Design Criterion	20

BS 8233 Assessment Calculation

Description	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Sound pressure level outside window	12	20	13	14	13	6	0	-7	16
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	**-3**	**5**	**-2**	**-1**	**-2**	**-9**	**-15**	**-22**	**1**

Design Criterion	30

Appendix B

Acoustic Calculations

19018

49A Downshire Hill, London

Receiver 2: Hampstead Hill Mansions rear window

External Plant Noise Emissions Calculation

Description	Frequency, Hz								dB(A)
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	
Manufacturer provided sound pressure level at 1 metre									
Warmflow AS03-R32	43	51	44	45	44	37	31	24	47
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Distance correction to receiver, dB (32 m)*	-30	-30	-30	-30	-30	-30	-30	-30	
Sound pressure level at receiver	**16**	**24**	**17**	**18**	**17**	**10**	**4**	**-3**	**20**

***Distance loss calculated assuming Point Source attenuation (*typically used where distance is more than 3x the largest source dimension*)**

Design Criterion	20

BS 8233 Assessment Calculation

Description	Frequency, Hz								dB(A)
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	
Sound pressure level outside window	16	24	17	18	17	10	4	-3	20
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	**1**	**9**	**2**	**3**	**2**	**-5**	**-11**	**-18**	**5**

Design Criterion	30

Appendix B

Acoustic Calculations

19018

49A Downshire Hill, London

Receiver 3: 7 Hampstead Hill Gardens front window

External Plant Noise Emissions Calculation

Description	Frequency, Hz								dB(A)
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	
Manufacturer provided sound pressure level at 1 metre									
Warmflow AS03-R32	43	51	44	45	44	37	31	24	47
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Distance correction to receiver, dB (19 m)*	-26	-26	-26	-26	-26	-26	-26	-26	
Correction due to screening from fence, dB	-7	-8	-9	-11	-14	-16	-19	-23	
Sound pressure level at receiver	**14**	**21**	**12**	**11**	**8**	**-2**	**-11**	**-21**	**13**

***Distance loss calculated assuming Point Source attenuation (*typically used where distance is more than 3x the largest source dimension*)**

Design Criterion	**20**

BS 8233 Assessment Calculation

Description	Frequency, Hz								dB(A)
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	
Sound pressure level outside window	14	21	12	11	8	-2	-11	-21	13
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	**-1**	**6**	**-3**	**-4**	**-7**	**-17**	**-26**	**-36**	**-2**

Design Criterion	**30**