

13 Elsworthy Road London

Planning Compliance Report
Report 22437.PCR.01 Rev.A

EDP Environmental
Unit D1A
Fairoaks Airport
Chertsey Rd
Chobham
Surrey GU24 8HU

Report 22437.PCR.01 Rev.A					
Revision History					
First Issue Date: 29/03/2021					
A	26/05/21 Report and assessment amended to correspond to updated plant installation locations	D			
B		E			
C		F			
Written by:		Checked by:		Approved by:	
John Gray Graduate Acoustic Consultant		Kyriakos Papanagiotou MIOA Managing Director		Kyriakos Papanagiotou MIOA Managing Director	
Disclaimer KP Acoustics Ltd. has used reasonable skill and care to complete this technical document, within the terms of its brief and contract with the resources devoted to it by agreement with the client. We disclaim any responsibility to the client and others in respect of any matters outside the stated scope. This report is confidential to the client and we accept no responsibility to third parties to whom this report, or any part thereof, is made known. KP Acoustics Ltd. accepts no responsibility for data provided by other bodies and no legal liability arising from the use by other persons of data or opinions contained in this report. KP Acoustics Ltd. 2021					

Contents

1.0	INTRODUCTION	1
2.0	SITE SURVEYS	1
2.1	Site Description	1
2.2	Environmental Noise Survey Procedure	2
2.3	Equipment	4
3.0	RESULTS	4
4.0	NOISE ASSESSMENT GUIDANCE	5
4.1	BS4142: 2014 ' <i>Methods for rating and assessing industrial and commercial sound</i> '	5
4.2	Local Authority Guidance	6
5.0	NOISE IMPACT ASSESSMENT	7
5.1	Proposed Plant Installations	7
5.2	Closest Noise Sensitive Receiver	8
5.3	Calculations	8
6.0	NOISE CONTROL MEASURES	9
6.1	Anti-Vibration Mounting Strategy	10
7.0	CONCLUSION	10

List of Attachments

22437. TH1-2	Environmental Noise Time Histories
22437.TH1-2.Daytime.LA90	Statistical analysis for representative daytime L_{A90}
22437.TH1-2.Night-time.LA90	Statistical analysis for representative night-time L_{A90}
Appendix A	Glossary of Acoustics Terminology
Appendices B1-2	Acoustic Calculations
Appendix C	Anti-Vibration Mounting Specification Reference Document

1.0 INTRODUCTION

KP Acoustics Ltd has been commissioned by EDP Environmental, Unit D1A, Fair Oaks Airport, Chertsey Road, Chobham, Surrey, GU24 8HU to undertake a noise impact assessment of proposed plant unit installations serving the building at 13 Elsworthy Road, Primrose Hill, London, NW3 3DS.

Two 24-hour environmental noise surveys have been undertaken on site in order to prepare a noise impact assessment in accordance with BS4142:2014 '*Method for rating and assessing industrial and commercial sound*' as part of the planning requirements of Camden Council.

This report presents the methodology and results from the environmental surveys, followed by calculations in accordance with BS4142 to provide an indication as to the likelihood of the noise emissions from the proposed plant unit installations having an adverse impact on the closest noise sensitive receiver. Mitigation measures will be outlined as appropriate.

2.0 SITE SURVEYS

2.1 Site Description

As shown in Figure 2.1, the site is bounded by Elsworthy Road to the North, 15 Elsworthy Road to the West, Primrose Hill to the South, and 11 Elsworthy Road to the East.

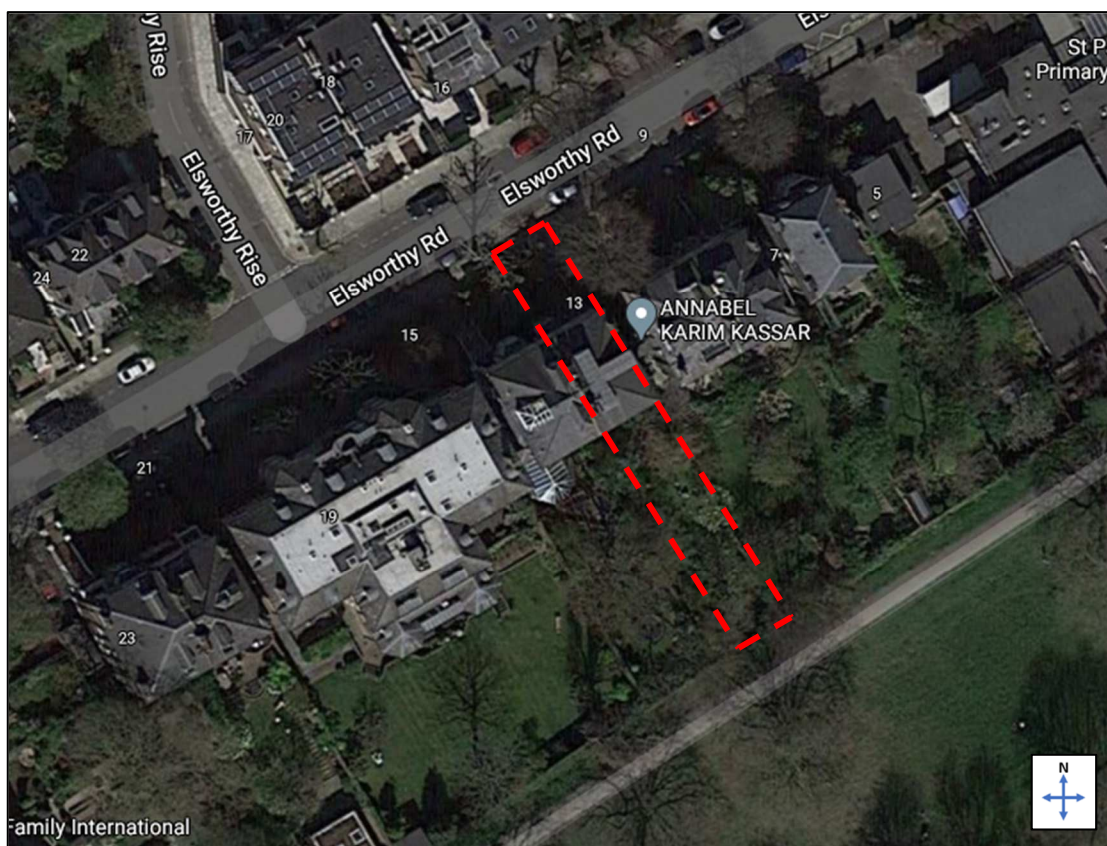


Figure 2.1 Site Location Plan (Image Source: Google Maps)

Initial inspection of the site revealed that the background noise profile at the monitoring location was typical of an urban cityscape environment, with the dominant source being road traffic noise from the surrounding roads.

2.2 Environmental Noise Survey Procedure

Continuous automated monitoring was undertaken for the duration of both noise surveys between 17:28 on 18/03/2021 and 18:03 on 19/03/2021, and 17:25 on 10/05/2021 and 17:00 on 11/05/2021.

The environmental noise measurement positions, proposed plant installation locations, and the closest noise sensitive receivers relative to the plant installations are described within Table 2.1 and shown within Figures 2.2 and 2.3.






Icon	Descriptor	Location Description
	Noise Measurement Position 1	The meter was installed in the property rear garden, approximately 2m above ground level
	Noise Measurement Position 2	The meter was installed on the North-Easternmost upper ground floor front façade window of 13 Elsworthy Road
	Closest Noise Sensitive Receiver 1	The closest noise sensitive receiver to 3 rd floor rear terrace plant installation been identified as a rear façade 2 nd floor window of the 15 Elsworthy Road
	Closest Noise Sensitive Receiver 2	The closest noise sensitive receiver to the front façade plant installation has been identified as a front façade 1 st floor window of 11 Elsworthy Road
	Proposed Plant Installation Locations	Proposed plant installations are outlined in Section 5.1

Table 2.1 Measurement position and description

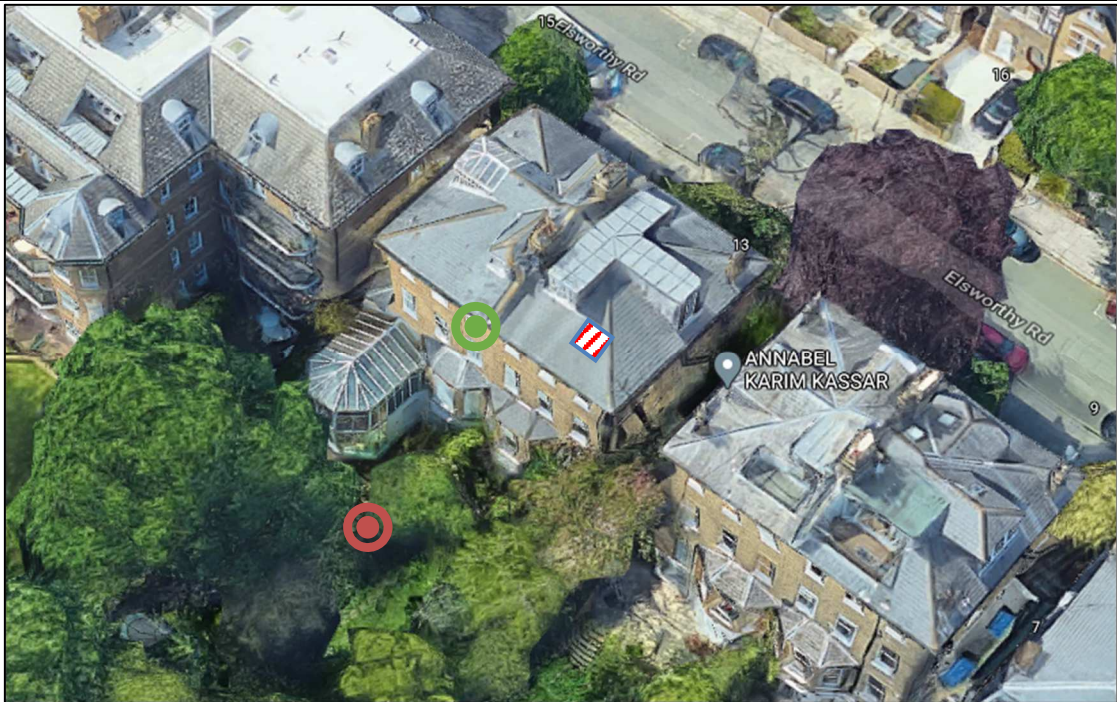


Figure 2.2 Proposed rear façade plant unit installation, with associated noise measurement position and closest noise sensitive receiver (Image Source: Google Maps)

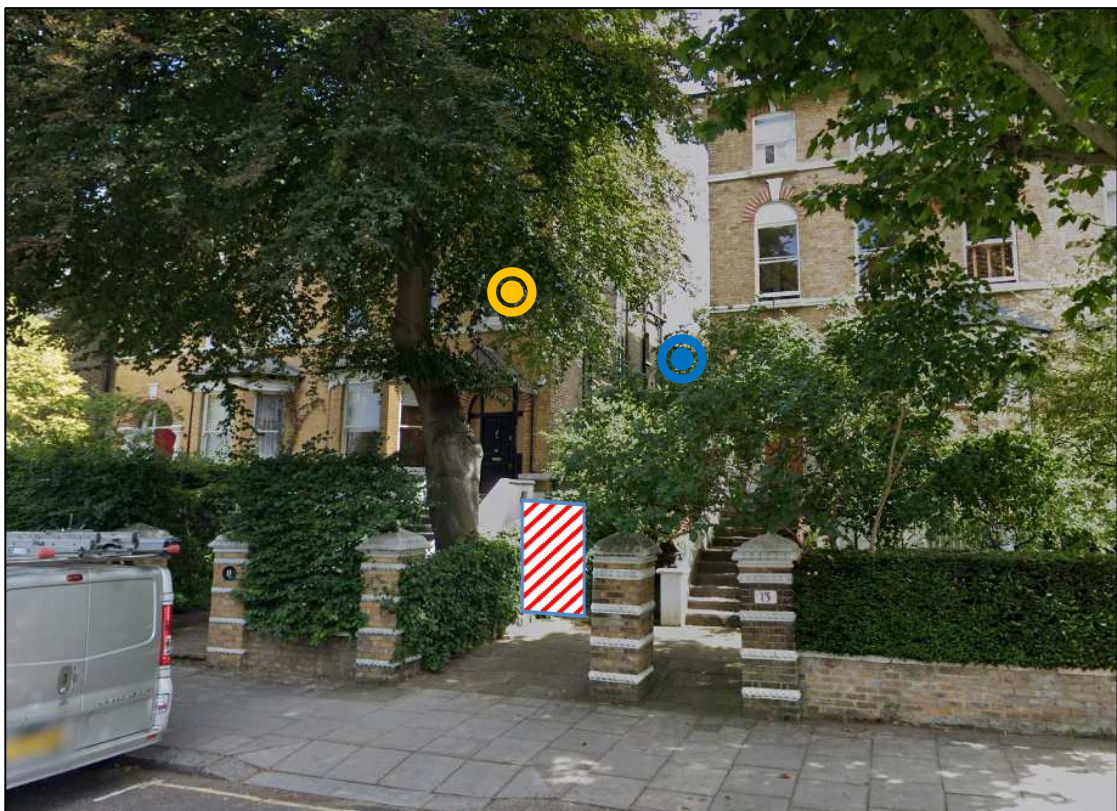


Figure 2.3 Proposed front façade plant unit installation, with associated noise measurement position and closest noise sensitive receiver as viewed from Elsworthy Road (Image Source: Google Street View)

The choice of the positions was based both on accessibility and on collecting representative noise data in relation to the nearest noise sensitive receivers relative to the proposed plant installations.

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise. The measurement procedure complied with ISO 1996-2:2017 Acoustics '*Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels*'.

2.3 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed. The equipment used is described within Table 2.3.

Measurement instrumentation		Serial no.	Date	Cert no.
Noise Kit 6	Svantek Type 977A Class 1 Sound Level Meter	59632	26/09/2019	14012956
	Free-field microphone Aco Pacific 7052E	76533		
	Preamp Svantek 2v12L	64847		
	Svantek External windshield	-	-	-
Noise Kit 8	Svantek Type 958A Class 1 Sound Level Meter	59559	26/09/2019	14012947
	MTG MK250 Free-field microphone	10904		
	Preamp Svantek SV12L	33619		
	Svantek External windshield	-	-	-
Larson Davis CAL200 Class 1 Calibrator		17148	27/04/2021	05223/1

Table 2.2 Measurement instrumentation

3.0 RESULTS

The $L_{Aeq: 5min}$, $L_{Amax: 5min}$, $L_{A10: 5min}$ and $L_{A90: 5min}$ acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as a time history in Figure 22437.TH1-2.

Representative background noise levels are shown in Table 3.1 for daytime and night-time.

It should be noted that the representative background noise level has been derived from the most commonly occurring $L_{A90,5 min}$ levels measured during the environmental noise survey undertaken on site, as shown in 22437.Daytime.LA90 and 22437.Night-time.LA90 attached.

Time Period	Noise Measurement Position 1 Representative background noise level L_{A90} dB(A)	Noise Measurement Position 2 Representative background noise level L_{A90} dB(A)
Daytime (07:00-23:00)	46	44
Night-time (23:00-07:00)	39	35

Table 3.1 Representative background noise levels

4.0 NOISE ASSESSMENT GUIDANCE

4.1 BS4142: 2014 'Methods for rating and assessing industrial and commercial sound'

British Standard BS4142:2014 'Methods for rating and assessing industrial and commercial sound' describes a method for rating and assessing sound of an industrial and/or commercial nature, which includes:

- Sound from industrial and manufacturing processes
- Sound from fixed installations which comprise mechanical and electrical plant and equipment
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises, and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes.

This Standard compares the Rating Level due to the noise source/s under assessment for a one-hour period during the daytime (07:00 – 23:00 hours) and a fifteen-minute period during the night-time (23:00 – 07:00 hours) with the existing background noise level in terms of an L_{A90} when the noise source is not operating.

It should be noted that the Rating Level is the Specific Sound Level in question (L_{Aeq, T_r}), including any relevant acoustic feature corrections, as follows:

- **Tonality** – 'For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0dB and +6dB for tonality. Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible'
- **Impulsivity** – 'A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3dB for

impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible'

- **Intermittency** – *'If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied'*
- **Other sound characteristics** – *'Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied'*

Once the Rating Level has been obtained, the representative background sound level is subtracted from the Rating Level to obtain an initial estimate of the impact, as follows:

- Typically, the greater this difference, the greater the magnitude of the impact
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context
- A difference of around +5 dB could be an indication of an adverse impact, depending on the context
- The lower the rating level is relative to the measured background sound level, the less likely it is that there will be an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context

NOTE: Adverse impacts may include but not be limited to annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

The initial estimate of the impact may then be modified by taking consideration of the context in which the sound occurs.

4.2 Local Authority Guidance

The guidance provided by The London Borough of Camden for noise emissions of new plant in this instance is as follows:

The noise criteria, as per the Local Plan 2017 of London Borough of Camden, British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' should be considered as the main reference document for the assessment. The resultant 'Rating Level' would be considered as follows:

Period	Assessment Location	Rating Level Acceptability Range		
		Green: noise is considered to be at an acceptable level	Amber: 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: noise is observed to have a significant adverse effect.
Daytime (7:00-23:00)	Garden used for main amenity (free field) and Outside living or dining or Bedroom window (façade)	10dB below background	9 dB below and 5dB above background	5dB above background
Night-time (23:00-7:00)	Outside bedroom window (façade)	10dB below background and no events exceeding 57dB L_{Amax}	9db below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	5dB above background and/or events exceeding 88dB L_{Amax}

Table 4.1 Camden noise criteria for plant and machinery

5.0 NOISE IMPACT ASSESSMENT

5.1 Proposed Plant Installations

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

- 1 No. Daikin RXM50N9 Air Condenser Unit
- 1 No. Panasonic WH-MDC07H3E5 Air Source Heat Pump Unit

The proposed installation location for the Daikin air condenser unit will be in an enclosure on the 3rd floor rear property terrace, as shown in Figure 2.2 above. The proposed installation location for the Panasonic air source heat pump unit will be outside at ground level in an ASHP room at the front of the property, adjacent to the dividing wall between 11 and 13 Elsworthy Road.

The noise emission levels as provided by the manufacturer for the unit are shown in Table 5.1.

Unit	Descriptor	Octave Frequency Band (Hz)								Overall (dBA)
		63	125	250	500	1k	2k	4k	8k	
Daikin RXM50N9	SPL@1m (dB)	49	53	50	48	43	37	31	24	49
Panasonic WH-MDC07H3E5	SWL	No spectral noise levels available								68

Table 5.1 Plant Units Noise Emission Levels as provided by the manufacturer

It should be noted that for the purpose of the calculations of noise emissions from the proposed Panasonic unit, spectral data from a similar plant has been used, and normalised to the same overall sound power level as the plant. When spectral data for the proposed plant is made available, this report can be revised with updated calculations specific to the Panasonic unit.

5.2 Closest Noise Sensitive Receiver

The closest noise sensitive receivers to the proposed installation location has been identified as being a 2nd floor rear residential window of 15 Elsworthy Road, located approximately 6 metres from the 3rd floor terrace proposed plant installation location, and a 1st floor front façade window of 11 Elsworthy Road, located approximately 7 metres from the proposed front façade plant installation, as shown in Figures 2.2 and 2.3.

It should be noted that both plant units would be out of line of site of their associated receiving windows due to screening from the building envelope.

5.3 Calculations

The 'Rating Level' of each plant unit installation has been calculated at 1m from their closest receivers using the noise levels shown in Table 5.1, and corrected due to different acoustic propagation features such as distance, reflective surfaces, screening elements, etc.

These values are presented in Table 5.2 alongside the noise criteria, below which plant noise emissions would be considered to be at an acceptable level based on the guidance provided by the London Borough of Camden. Night-time noise levels have been considered when establishing this criterion as it is understood that the plant units could be in operation at any time of the day or night.

It should be noted that acoustic feature corrections as per BS4142 have been applied for intermittency and that detailed calculations for both plant unit installations are shown in Appendices B1-2.

Receiver	Criterion	Rating Level at 1m From the Closest Noise Sensitive Window
Rear 2 nd floor window of 15 Elsworthy Road	29dB(A)	27dB(A)
Front 1 st floor window of 11 Elsworthy Road	25dB(A)	25dB(A)

Table 5.2 Predicted noise levels and criteria at nearest noise sensitive locations

As shown in Appendices B1 and B2 and Table 5.2, transmission of noise to the nearest sensitive windows due to the effects of the air condenser unit installations satisfies the emissions criterion of The London Borough of Camden, providing that the mitigation measures outlined in Section 6 are implemented.

6.0 NOISE CONTROL MEASURES

In order to protect nearby receivers from plant noise and vibration emissions, the following control strategy should be adopted.

6.1 Plant Enclosure Louvre

To control noise emissions from the Panasonic WH-MDC07H3E5 Air Source Heat Pump Unit installed in the plant enclosure at the front of the property, we would recommend that the louvre leading into the enclosure should provide the minimum insertion loss levels shown in Table 6.2.

Attenuating Element	Insertion Loss Levels (dB) in each Octave Frequency Band							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Louvres of proposed acoustic enclosure at front of 13 Elsworthy Road	8	10	13	19	19	17	13	5

Table 6.2 Insertion loss figures to be provided by louvres of acoustic enclosure

We would recommend the following suppliers of the aforementioned enclosure:

- Environmental Equipment Corporation
- Noico Ltd
- Waterloo Acoustics
- Allaway Acoustics
- Wakefield Acoustics
- Caice

It should be noted that any louvre installed as part of the proposed plant installation on the 13 Elsworthy Road 3rd floor terrace, would not need to provide any acoustic attenuation for the plant installation to adhere to the rating level criterion.

6.2 Anti-Vibration Mounting Strategy

In the case of all plant units, appropriate anti-vibration mounts should be installed in order to ensure that vibrations do not give rise to structure-borne noise. Appendix C outlines detailed advice in order to ensure that the system installer selects the appropriate anti-vibration mount for the installation.

It is the supplier's responsibility to ensure that all mountings offered are suitable for the loads, operating and environmental conditions which will prevail.

7.0 CONCLUSION

Two environmental noise surveys have been undertaken at 13 Elsworthy Road, Primrose Hill, London, NW3 3DS, by KP Acoustics Ltd between 17:28 on 18/03/2021 and 18:03 on 19/03/2021, and between 17:25 on 10/05/2021 and 17:00 on 11/05/2021. The results of the surveys have enabled representative background noise levels to be set.

Manufacturer's noise data of proposed plant units has been used to obtain Specific and Rated Noise Level at the nearest noise sensitive receivers in accordance with British Standard BS4142:2014 for compliance with the London Borough of Camden requirements.

The plant rating levels were compared with the representative background noise levels to assess the likelihood of impact considering the environmental noise context of the area as per the requirements of BS4142:2014.

It has been concluded that noise emissions from the proposed plant units would not have an adverse impact on the nearest residential receivers provided that the noise control strategy presented in Section 6 is followed.

13 Elsworthy Road, Primrose Hill, London
Environmental Noise Time History
From 18 March 2021 To 19 March 2021

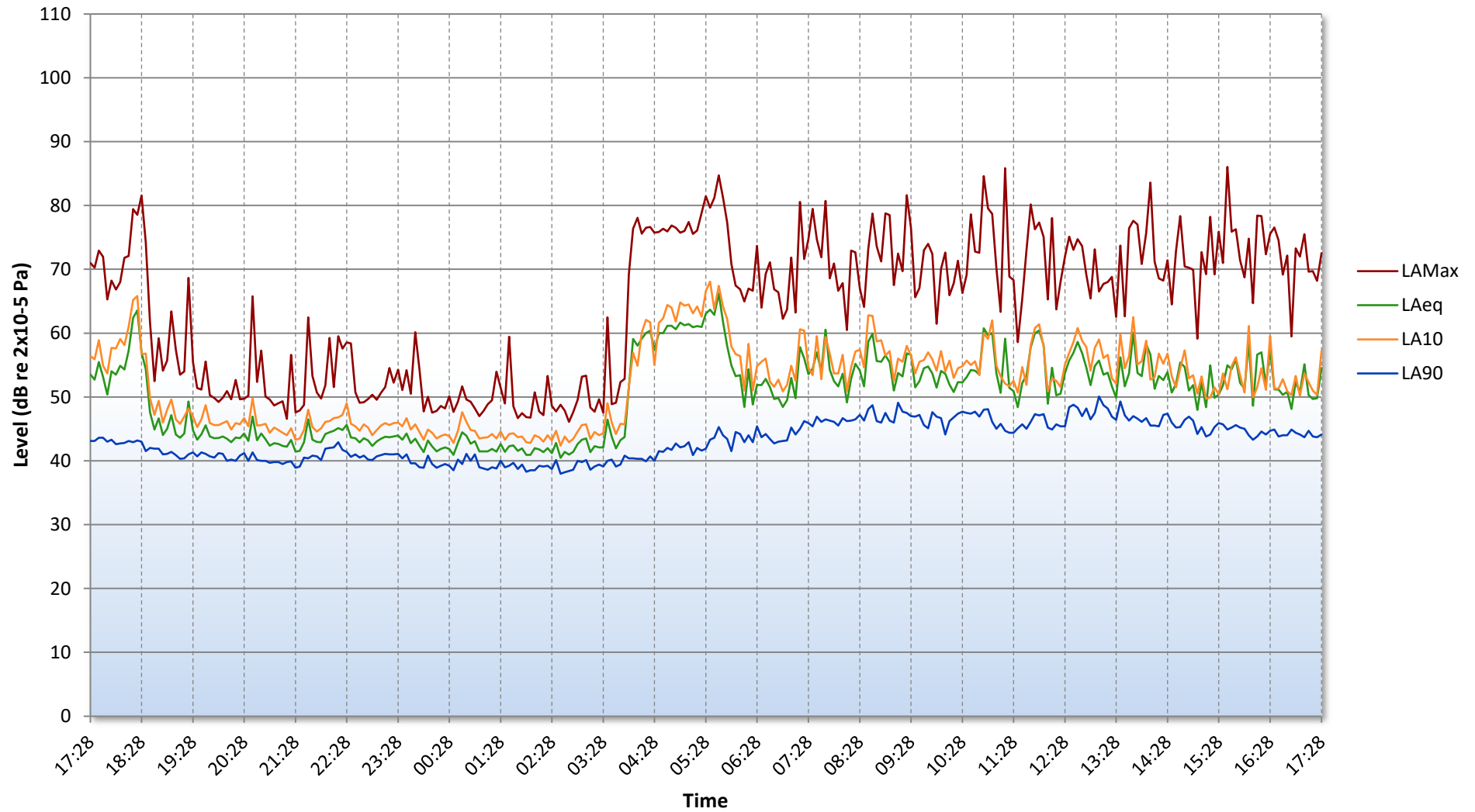


Figure 22437.TH1 - Rear Facade

13 Elsworthy Road, London
Environmental Noise Time History
From 10 May 2021 To 11 May 2021

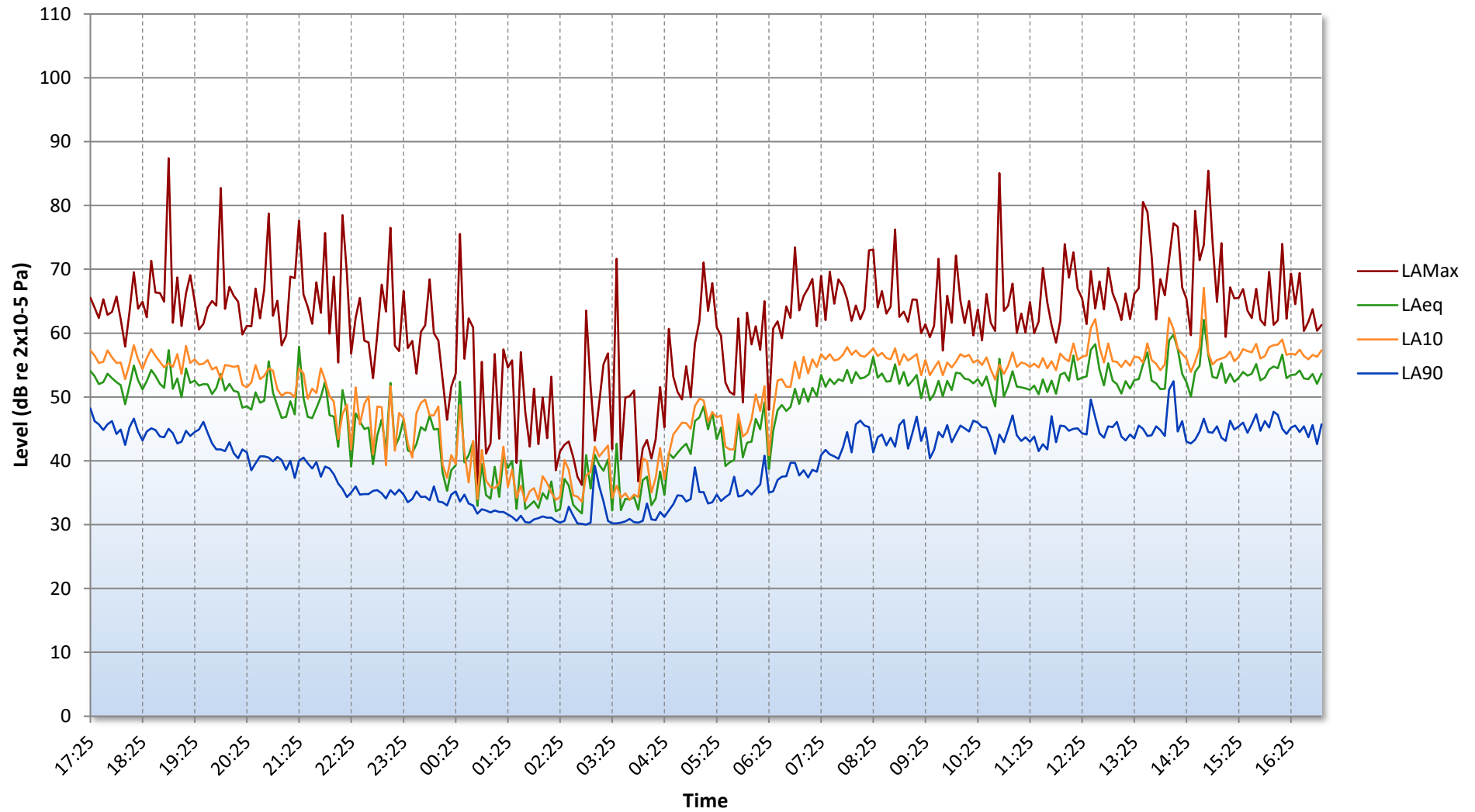


Figure 22437.TH2 - Front Façade

13 Elsworthy Road, Primrose Hill, London
Representative Daytime Background Noise Level
From 18 March 2021 To 19 March 2021

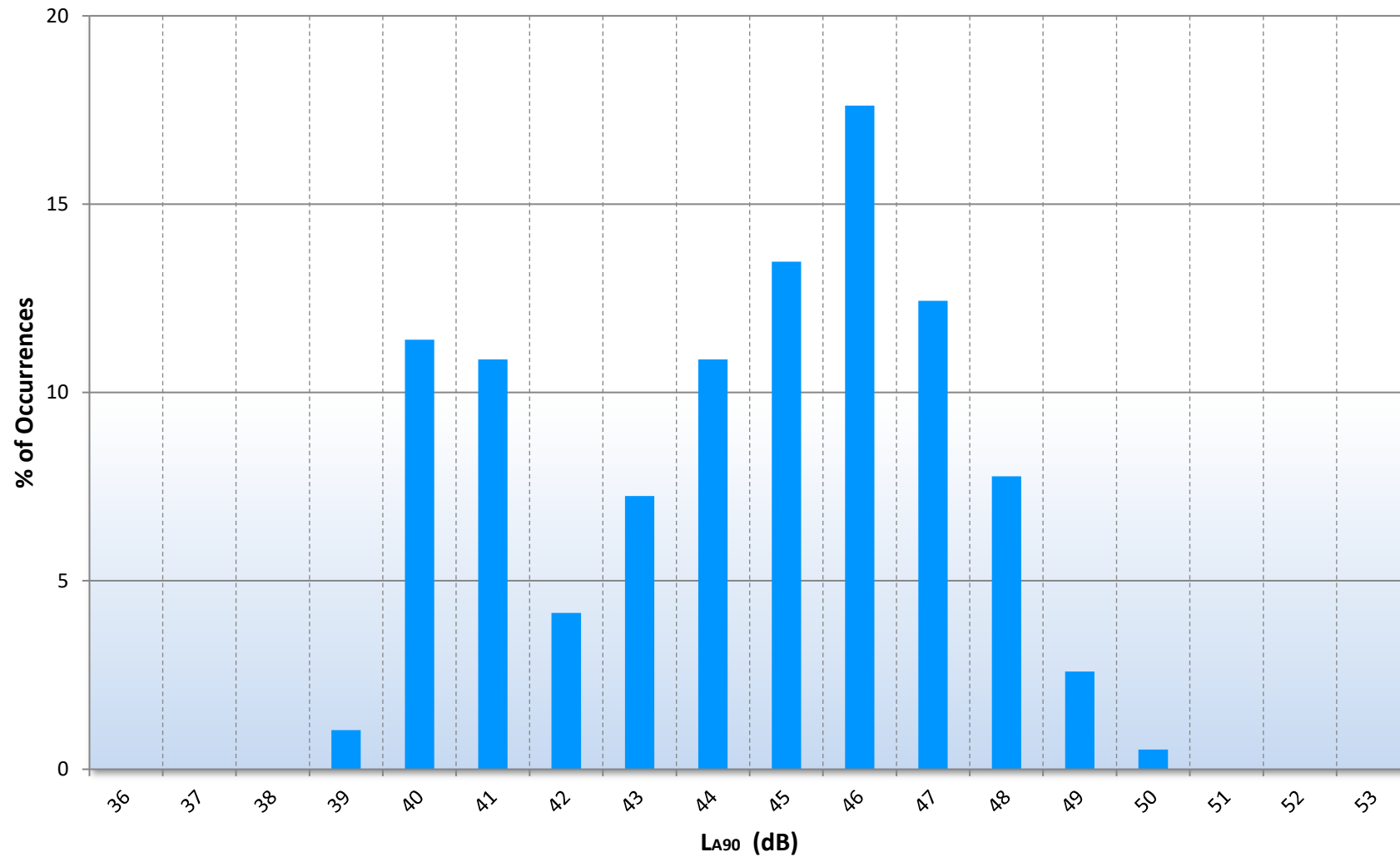


Figure 22437.TH1.L90 - Rear Facade

13 Elsworthy Road, London
Representative Daytime Background Noise Level
From 10 May 2021 To 11 May 2021

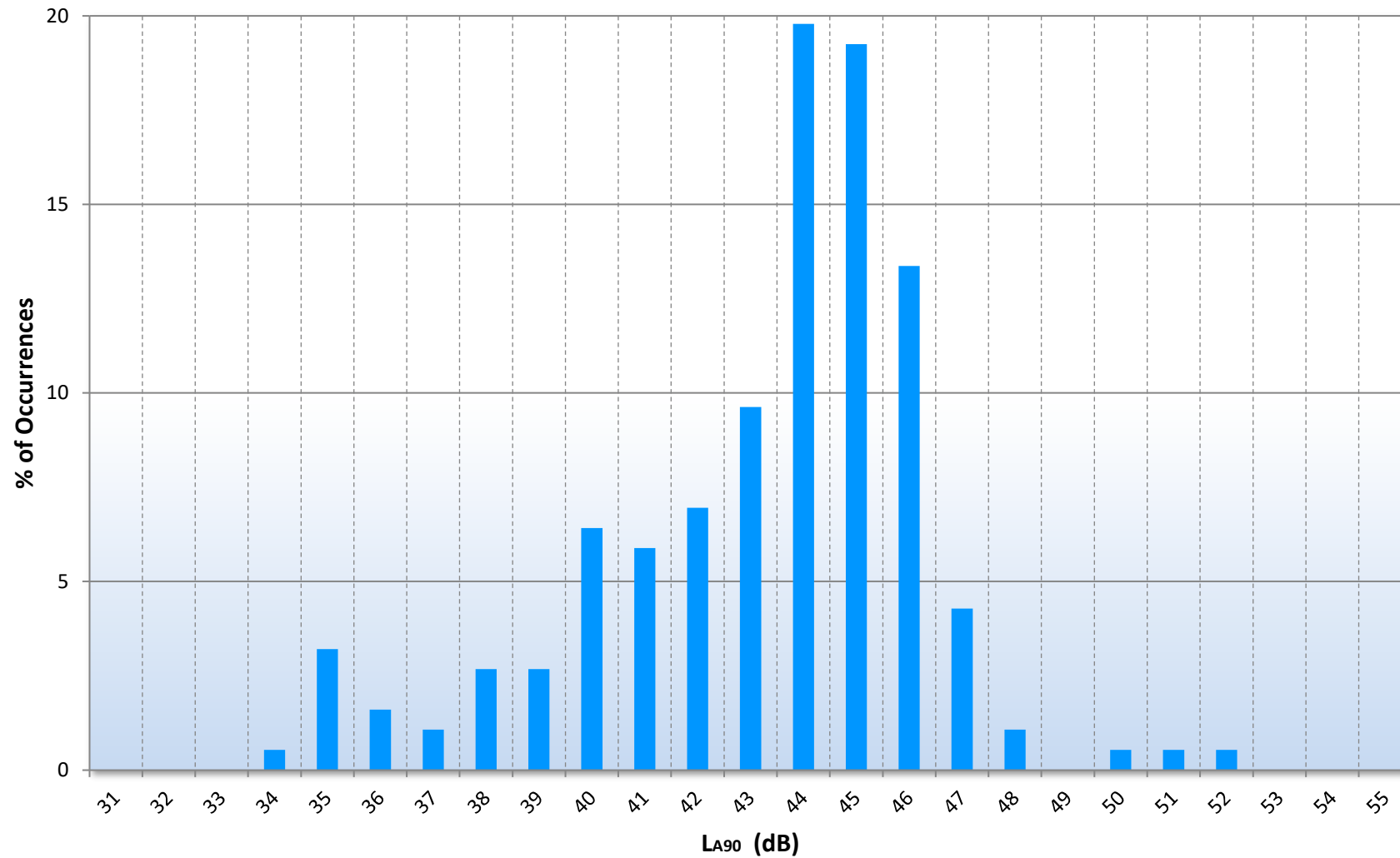


Figure 22437.TH2.L90 - Front Facade

13 Elsworthy Road, Primrose Hill, London
Representative Night-time Background Noise Level
From 18 March 2021 To 19 March 2021

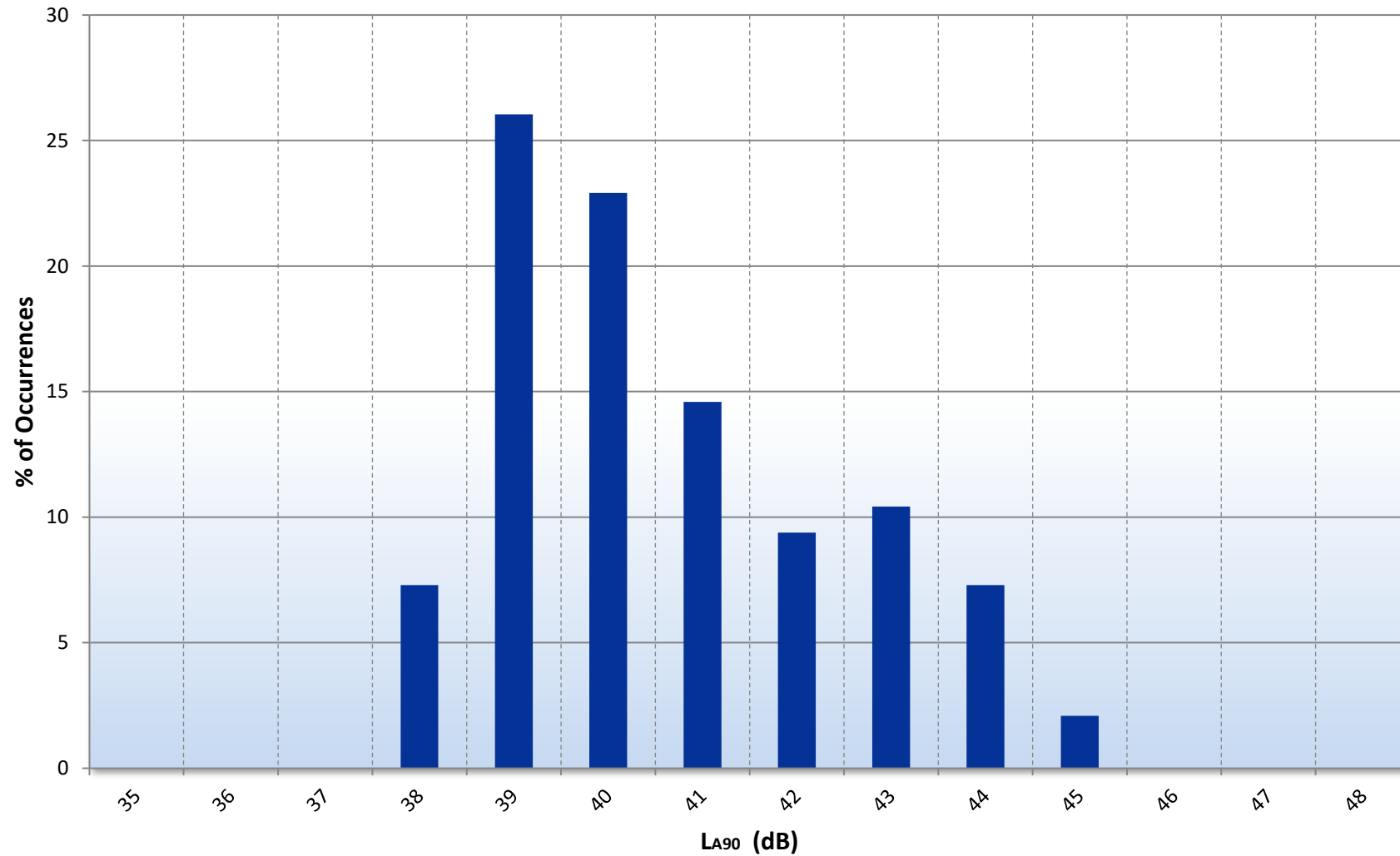


Figure 22437.TH1.L90 - Rear Facade

13 Elsworthy Road, London
Representative Night-time Background Noise Level
From 10 May 2021 To 11 May 2021

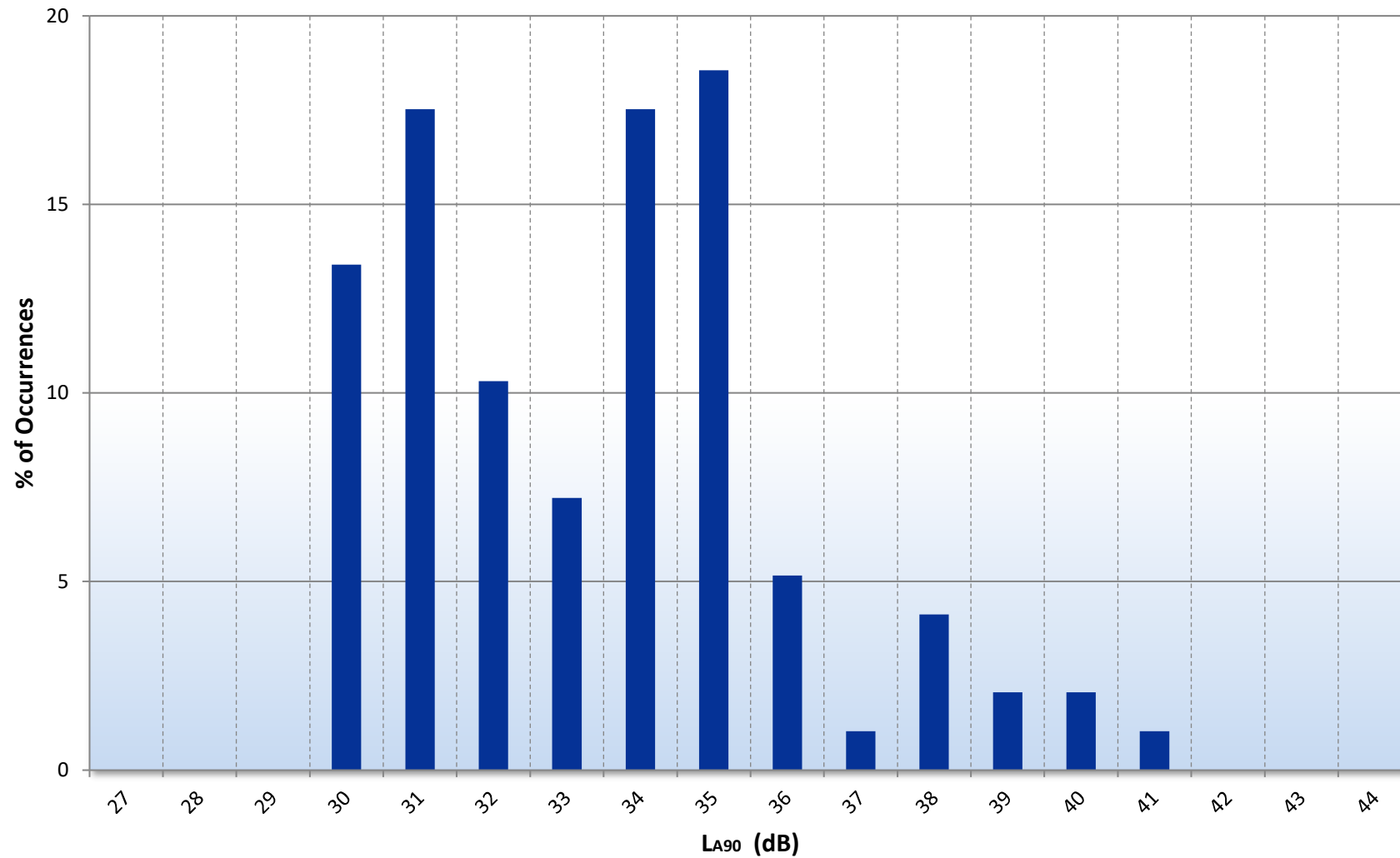


Figure 22437.TH2.L90 - Front Facade

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*.

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 B1 Rev.A

13 Elsworthy Road, London - Rear Terrace Plant Installation

PLANT NOISE EMISSIONS CALCULATIONS

Source: Air Condenser on 13 Elsworthy Road 3rd floor terrace Receiver: 2nd floor rear window of 15 Elsworthy Road	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Daikin RXM50N9 (Sound Power Level)	60	64	61	59	54	48	42	35	60
Reverberation time (1s), dB	0	0	0	0	0	0	0	0	
Room volume (12m ³), dB	3	3	3	3	3	3	3	3	
Reverberant Sound Pressure Level in Plant Room	63	67	64	62	57	51	45	38	63
Area of louvre/opening (5m ²), dB	1	1	1	1	1	1	1	1	
Minimum attenuation provided by acoustic louvre, dB	0	0	0	0	0	0	0	0	
Sound Power Level at Louvre	64	68	65	63	58	52	46	39	64
Directivity correction, dB	2	1	-11	-11	-11	-11	-11	-11	
Minimum attenuation due to building envelope, dB	-8	-10	-13	-15	-15	-15	-15	-15	
Minimum attenuation provided by distance (6m), dB*	-21	-21	-21	-21	-21	-21	-21	-21	
Total Specific Level of all Plant Unit Installations at Receiver	37	38	21	17	12	6	0	-7	24
BS4142 Acoustic Feature Corrections									
Intermittency	3	3	3	3	3	3	3	3	
Total Rating Noise Level of all Plant Unit Installations at Receiver	40	41	24	20	15	9	3	-4	27

Design Criterion	29
------------------	----

APPENDIX B2

13 Elsworthy Road, London - Front Plant Installation

PLANT NOISE EMISSIONS CALCULATIONS

Source: Heat Pump installed in enclosure at front of property Receiver: Front 1st Floor Window of 11 Elsworthy Road	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Panasonic WH-MDC07H3E5 (spectral data from similar unit) (SWL)	74	71	69	66	62	59	55	46	68
Reverberation time (0.25s), dB	-6	-6	-6	-6	-6	-6	-6	-6	
Room volume (4.5m ³), dB	7	7	7	7	7	7	7	7	
Reverberant Sound Pressure Level in Plant Room	75	72	70	67	63	60	56	47	70
Area of louvre (4m ²), dB	0	0	0	0	0	0	0	0	
Minimum attenuation provided by acoustic louvre, dB	-8	-10	-13	-19	-19	-17	-13	-5	
Sound Power Level at Louvre	67	62	57	48	44	43	43	42	54
Directivity correction, dB	2	-1	-8	-11	-11	-11	-11	-11	
Minimum attenuation due to building envelope, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Minimum attenuation provided by distance (7m), dB	-22	-22	-22	-22	-22	-22	-22	-22	
Total Specific Level of Plant Unit Installation at Receiver	43	35	23	11	7	6	6	5	22
BS4142 Acoustic Feature Corrections									
Intermittency	3	3	3	3	3	3	3	3	
Total Rating Noise Level of Plant Unit Installation at Receiver	46	38	26	14	10	9	9	8	25

Design Criterion	25
------------------	----

ANTI-VIBRATION MOUNTING SPECIFICATION REFERENCE DOCUMENT

1.0 General

- 1.1 All mountings shall provide the static deflection, under the equipment weight, shown in the schedules. Mounting selection should allow for any eccentric load distribution or torque reaction, so that the design deflection is achieved on all mountings under the equipment, under operating conditions.
- 1.2 It is the supplier's responsibility to ensure that all mountings offered are suitable for the loads, operating and environmental conditions which will prevail. Particular attention should be paid to mountings which will be exposed to atmospheric conditions to prevent corrosion.
- 1.3 All mountings shall be colour coded, or otherwise marked, to indicate their load capacity, to facilitate identification during installation.

Where use of resilient supports allows omission of pipe flexible connections for vibration/noise isolation, it shall be the Mechanical Service Consultant's or Contractor's responsibility to decide whether such devices are required to compensate for misalignment or thermal strain.

2.1 Type A Mounting (Caged Spring Type)

- 2.1.1 Each mounting shall consist of cast or fabricated telescopic top and bottom housings enclosing one or more helical steel springs as the principle isolation elements, and shall incorporate a built-in levelling device. The housing should be designed to permit visual inspection of the springs after installation, i.e. the spring must not be totally enclosed.
- 2.1.2 The springs shall have an outside diameter of not less than 75% of the operating height, and be selected to have at least 50% overload capacity before becoming coil-bound.
- 2.1.3 The bottom plate of each mounting shall have bonded to it a rubber/neoprene pad designed to attenuate any high frequency energy transmitted by the springs.
- 2.1.4 Mountings incorporating snubbers or restraining devices shall be designed so that the snubbing, damping or restraining mechanism is capable of being adjusted to have no significant effect during the normal running of the isolated machine.
- 2.1.5 All nuts, bolts or other elements used for adjustment of a mounting shall incorporate locking mechanisms to prevent the isolator going out of adjustment as a result of vibration or accidental or unauthorised tampering.

2.2 Type B Mounting (Open Spring Type)

- 2.2.1 Each mounting shall consist of one or more helical steel springs as the principal isolation elements, and shall incorporate a built-in levelling device.
- 2.2.2 The springs shall be fixed or otherwise securely located to cast or fabricated top and bottom plates, shall have an outside diameter of not less than 75% of the operating height, and shall be selected to have at least 50% overload capacity before becoming coil-bound.
- 2.2.3 The bottom plate shall have bonded to it a rubber/ neoprene pad designed to attenuate any high frequency energy transmitted by the springs.

2.3 Type C Mounting (Rubber/Neoprene Type)

Each mounting shall consist of a steel top plate and base plate completely embedded in oil resistant rubber/neoprene. Each mounting shall be capable of being fitted with a levelling device, and should have bolt holes in the base plate and a threaded metal insert in the top plate so that they can be bolted to the floor and equipment where required.

3.0 Plant Bases

3.1 Type A Bases (A.V. Rails)

An A.V. Rail shall comprise a steel beam with two or more height-saving brackets. The steel sections must be sufficiently rigid to prevent undue strain in the equipment and if necessary should be checked by the Structural Engineer.

3.2 Type B Bases (Steel Plant Bases)

Steel plant bases shall comprise an all-welded steel framework of sufficient rigidity to provide adequate support for the equipment, and fitted with isolator height saving brackets. The frame depth shall be approximately 1/10 of the longest dimension of the equipment with a minimum of 150 mm. This form of base may be used as a composite A.V. rail system.

3.3 Type C Bases (Concrete Inertia Base: for use with steel springs)

These shall consist of an all-welded steel pouring frame-work with height saving brackets, and a frame depth of approximately 1/12 of the longest dimension of the equipment, with a minimum of 100 mm. The bottom of the pouring frame should be blanked off, and concrete (2300 kg/m³) poured in over steel reinforcing rods positioned 35 mm above the bottom. The inertia base should be sufficiently large to provide support for all parts of the equipment, including any components which over-hang the equipment base, such as suction and discharge elbows on centrifugal pumps.