SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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Evergreen House, 160 Euston Road, London

Noise survey and plant noise egress assessment report

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Summary

Sandy Brown has been commissioned by Evergreen Marine (UK) Limited to provide acoustic advice in relation to the proposed development at 160 Euston Road, London NW1 2DX.

An environmental noise survey has been carried out to determine the existing sound levels in the area. The noise survey was performed between 09:49 on 9 July 2021 and 09:49 on 16 June 2021.

The representative background sound levels measured during the survey were $L_{A90,15min}$ 56 dB during the daytime, $L_{A90,15min}$ 53 dB in the evening, and $L_{A90,15min}$ 48 dB at night.

It is proposed that the two existing roof top chillers are replaced with new units. Three options, as listed below, have been reviewed:

- Daikin (6 units)
- Carrier (8 units)
- Klima-Therm (2 units).

In relation to new building services plant, the London Borough of Camden (LBC) requires that noise egress be designed to be 10 dB below the existing background noise levels (or 15 dB if the noise contains attention-catching features) when measured at the nearest noise sensitive premises.

Based on the results of the noise survey and the requirements of LBC, noise limits for the new plant have been derived. An acoustic assessment of the proposed Daikin, Carrier and Klima-Therm chiller proposals has also been conducted. All assessments have been completed using the design duty noise levels and subsequently reductions in cooling demand would result in reduced noise emissions.

Both the Daikin and Carrier chillers meet the LBC daytime requirement without any mitigation measures.

Only the Carrier chillers meet the LBC evening requirement and no option meets the LBC night-time requirement, with the Klima-Therm being the loudest.

Both the Daikin and Carrier chillers would be capable of meeting the night-time requirement provided they are installed behind a sufficiently specified screen. A screen would not be required for the Carrier chillers if three or fewer units operate during the night-time hours.

For the Klima-Therm chillers, to meet the LBC requirements, they would need to be placed in proprietary acoustic enclosures capable of reducing the noise level by at least L_{Aeq} 13 dB.

Contents

1 Introduction

Sandy Brown has been commissioned by Evergreen Marine (UK) Limited to provide acoustic advice in relation to the proposed development at 160 Euston Road, London NW1 2DX.

As part of this, an environmental noise survey is required, the purpose of which is to establish the existing background sound levels in the vicinity of nearby noise sensitive premises and to set appropriate limits for noise egress from building services plant.

This report presents the survey method and results, a discussion of acceptable limits for noise emissions from building services plant and an assessment of the proposed plant options.

2 Site description

2.1 The site and its surrounding

The site location in relation to its surroundings is shown in Figure 1.

The site is accessed via Grafton to the northwest, Churchway to the northeast, and Euston Road to the southeast.

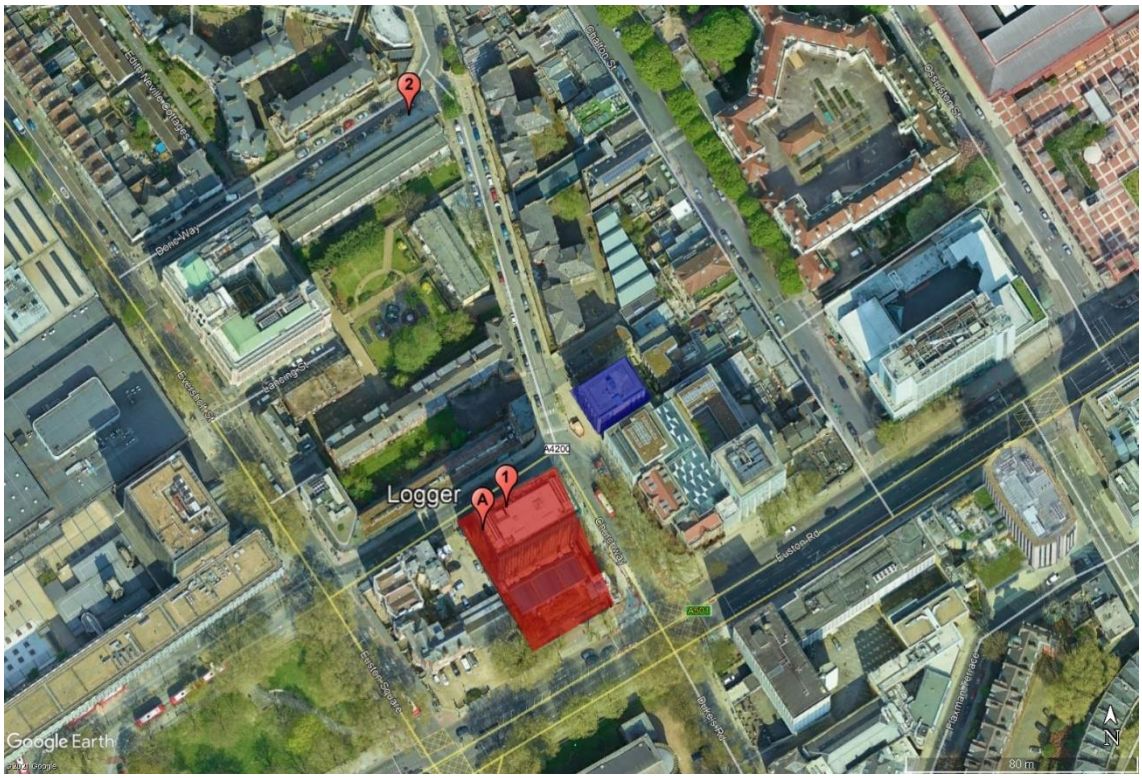


Figure 1 Aerial view of the site. The site location is highlighted in red. The nearest noise sensitive receiver is highlighted in blue (courtesy of Google Earth Pro)

2.2 Adjacent premises

There are residential properties and offices around the site on Grafton Place and Churchway. A Travelodge hotel is also located to the northwest of the site on Grafton Place. When the heights of the buildings are taken into consideration, the nearest noise sensitive receiver is the upper floor residential flats at 36 Churchway.

3 Development proposals

The proposal includes the replacement of two chillers located on the roof of the building. The existing roof level mechanical services layout is shown in Figure 2.

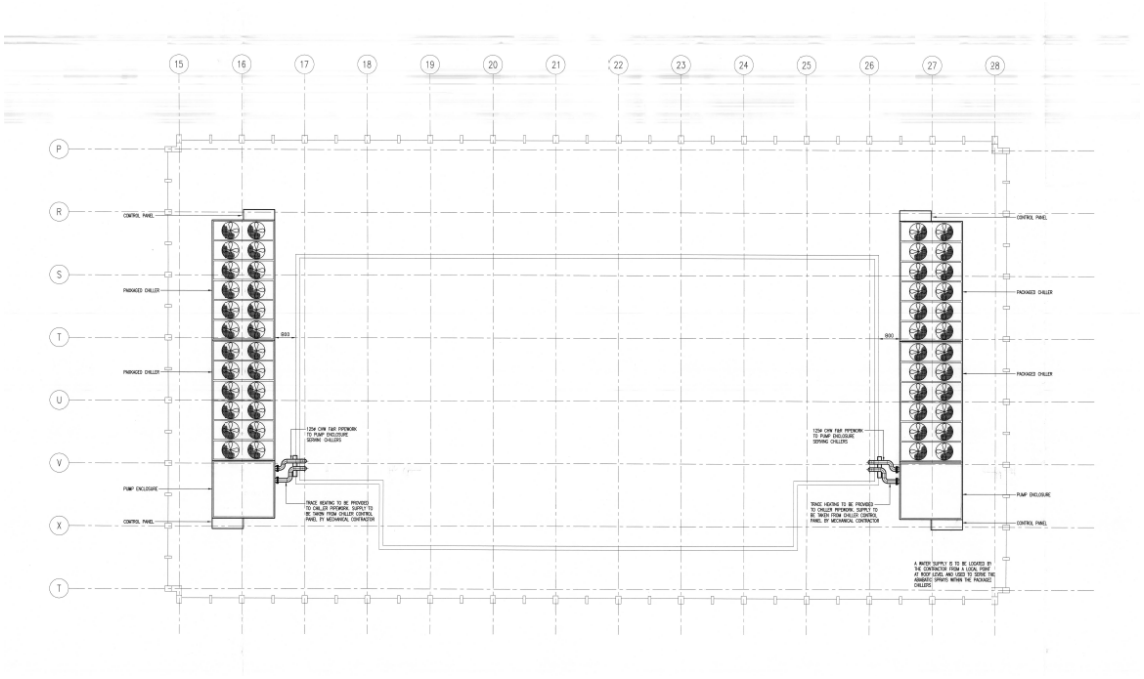


Figure 2 Roof level mechanical services layout

4 Building services noise egress criteria

4.1 Standard guidance

BS 4142:2014:+A1:2019 *Methods for rating and assessing industrial and commercial sound* (BS 4142) provides a method for assessing noise from items such as building services plant against the existing background sound levels at nearby noise sensitive premises.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains 'attention-catching features' such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

4.2 Local Authority criteria

In relation to noise egress from industrial and commercial noise sources, London Borough of Camden's local plan (June 2017) states:

"*Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases, a 'Rating Level' of 10 dB below background (15 dB if tonal components are present) should be considered as design criterion."*

Based on the extract from Camden Local Plan, all external plant must be such that the cumulative noise 1 m away from the windows of the nearest noise sensitive receptors is 10 dB below the representative measured background sound level $L_{A90,\ 15\ min}$ (15 dB if tonal components are present).

5 Noise survey method

A noise survey has been carried out which included unattended and attended noise measurements.

5.1 Unattended noise measurements

Unattended noise monitoring was undertaken at the site over eight days.

Details of the equipment used and the noise indices measured are provided in Appendix A.

The unattended measurements were taken over 15-minute periods between 09:49 on 9 July 2021 and 09:49 on 16 June 2021. The equipment was installed and collected by Matthew Elliott.

The measurement position used during the survey is indicated in Figure 1, denoted by the letter 'A'. A photograph showing the measurement location is provided in Figure 3. This location was chosen to be reasonably representative of noise levels at the site and outside the nearest noise sensitive premises.

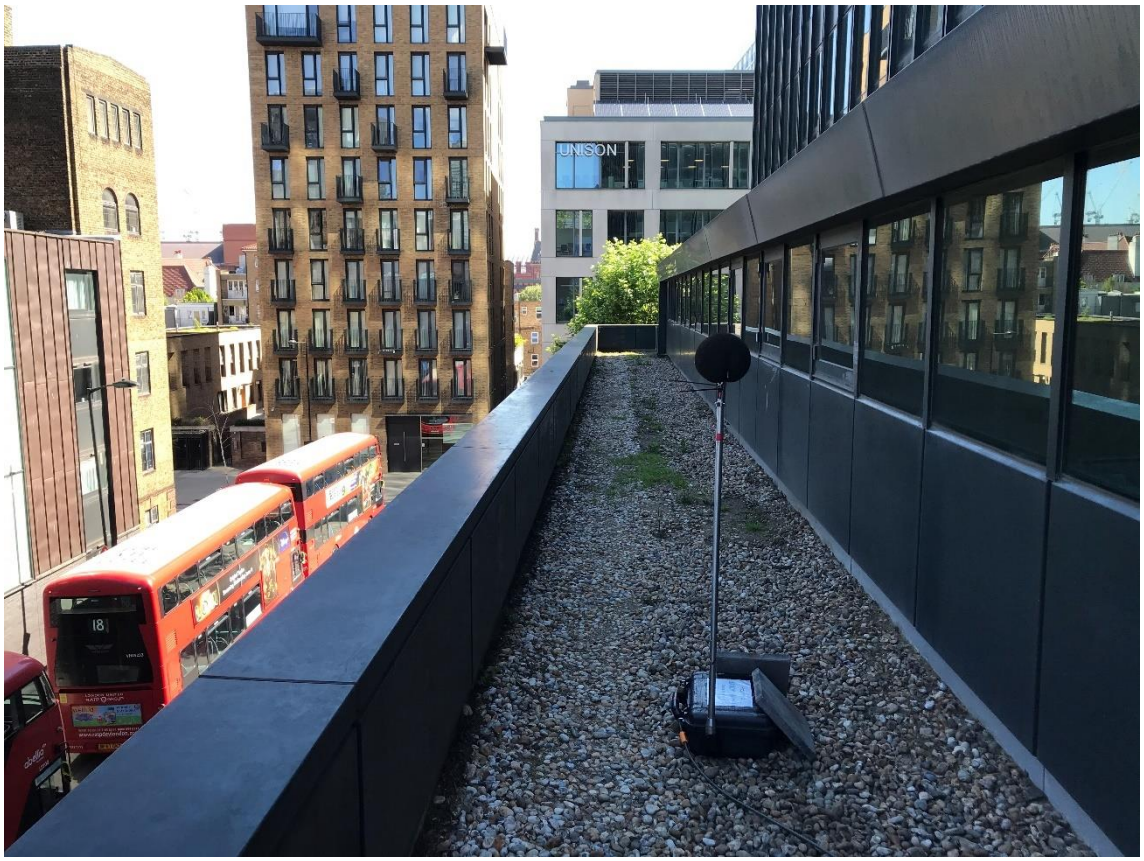


Figure 3 A photograph of the unattended measurement location

5.2 Attended measurements

Attended sample measurements were taken by Matthew Elliott at two locations around the site. These are indicated in Figure 1 as positions 1 and 2. The attended measurements were carried out on 16 June 2021, over 15-minute periods.

At position 1, the microphone was mounted on a tripod approximately 1.2 m above the ground level and at least 5 m from any other reflective surfaces.

At position 2, the microphone was mounted on a tripod approximately 1.2 m above the ground level and less than 2 m from a building facade.

Details of the equipment used and the noise indices measured are provided in Appendix A.

Dominant noise sources occurring during the measurements were noted.

5.3 Weather conditions

Weather conditions during the survey are described in Appendix A.

6 Noise survey results

6.1 Observations

The dominant noise sources observed at the site during the survey were from road traffic, particularly buses, and idling traffic queuing for traffic lights.

Less significant noise sources included people outside nearby public houses, distant building services plant, construction activity, and church bells.

6.2 Noise measurement results

6.2.1 Unattended measurement results

A graph showing the results of the unattended measurements is provided in Appendix B.

Day, evening and night-time ambient noise levels measured during the unattended survey are presented in Table 1. These are facade noise levels.

Table 1 Ambient noise levels measured during the unattended survey

Date	Daytime (07:00-19:00) $L_{Aeq,12h}$ (dB)	Evening (19:00-23:00) $L_{Aeq,4h}$ (dB)	Night (23:00-07:00) $L_{Aeq,8h}$ (dB)
Wednesday 9 June 2021	-	60	57
Thursday 10 June 2021	63	61	57
Friday 11 June 2021	63	61	57
Saturday 12 June 2021	63	61	60
Sunday 13 June 2021	60	62	57
Monday 14 June 2021	64	61	58
Tuesday 15 June 2021	64	61	56
Average	63	61	57

In line with BS 4142:2014+A1:2019, representative background sound levels have been determined using statistical analysis of the continuous measurements.

Daytime, evening and night-time statistical analysis of representative values for the site are given in Figure 4, Figure 5 and Figure 6 respectively.

From this analysis, the representative background sound levels measured during the survey were $L_{A90,15min}$ 56 dB during the daytime, $L_{A90,15min}$ 53 dB in the evening, and $L_{A90,15min}$ 48 dB at night.

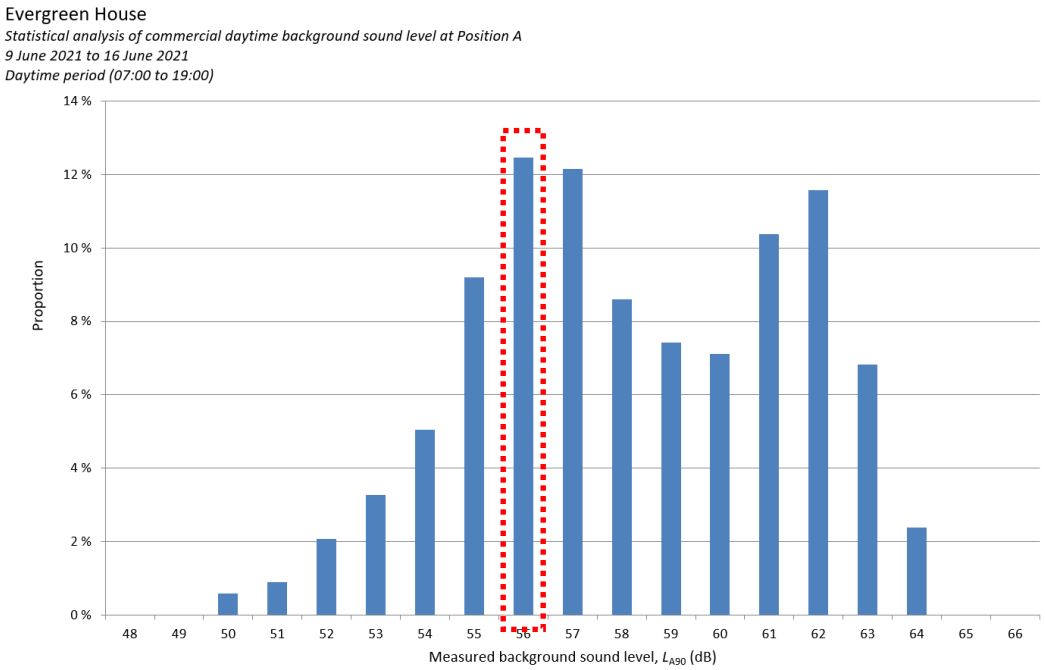


Figure 4 Statistical analysis of daytime background noise level

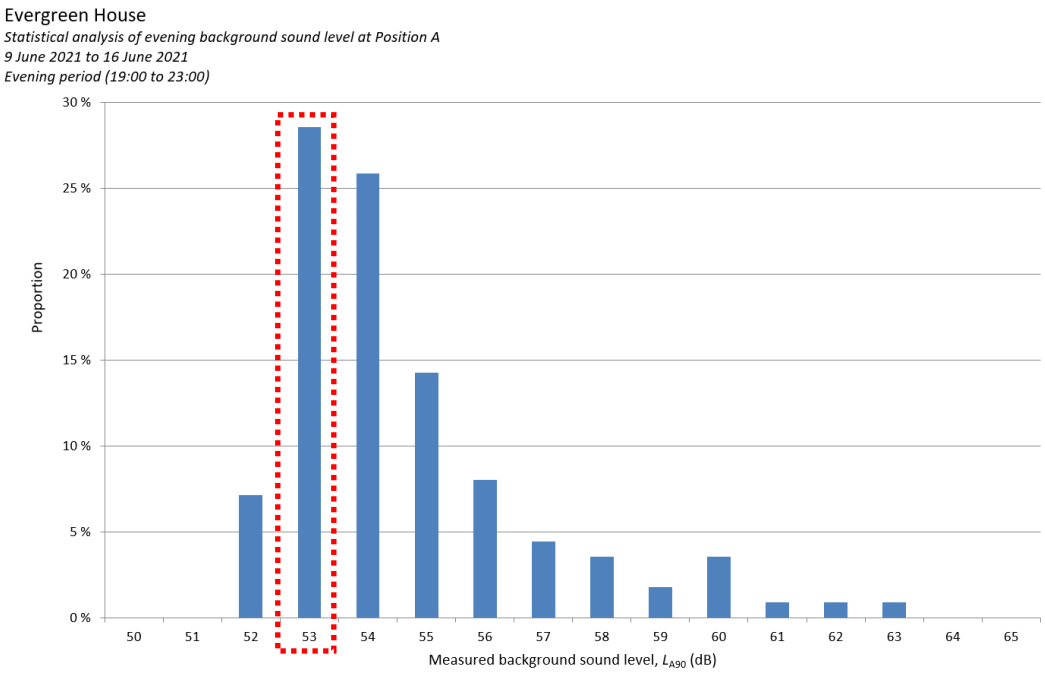


Figure 5 Statistical analysis of evening background noise level

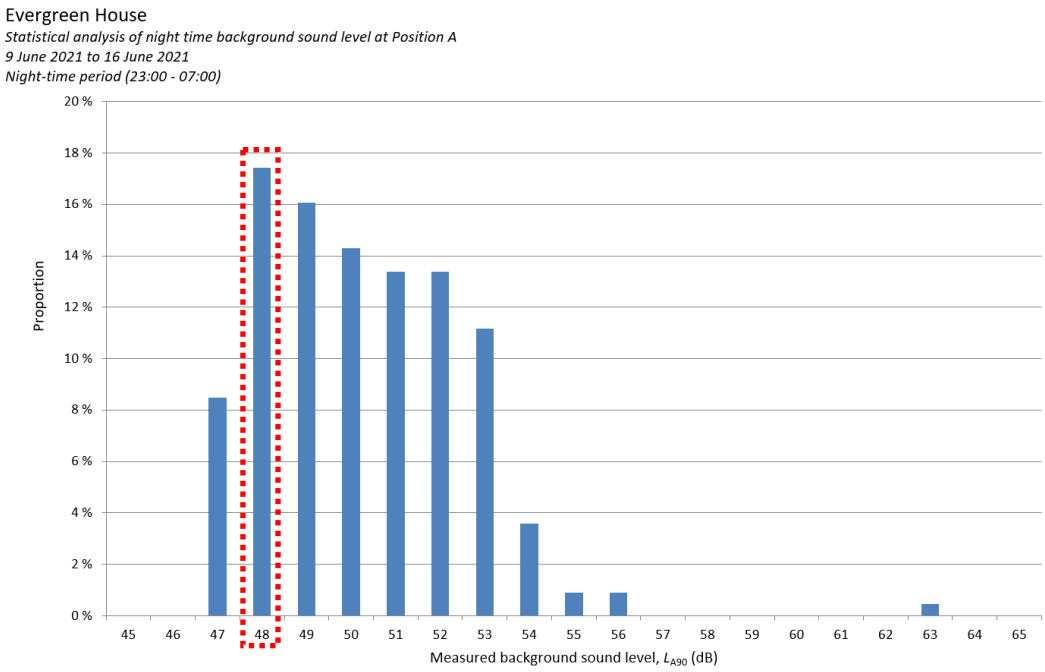


Figure 6 Statistical analysis of night-time background noise level

6.2.2 Attended measurement results

Noise levels and key sources recorded during the attended measurements are summarised in Table 2.

Table 2 Noise levels and key noise sources from attended measurements

Pos.	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
1	08:59	69	90	61	Busses, idling traffic queuing for traffic lights, church bells
1	09:14	69	91	59	Busses, idling traffic queuing for traffic lights
2	09:32	52	72	45	Light traffic, distant plant and construction
2	09:47	48	72	45	Light traffic, distant plant and construction, pedestrians, plane flyovers, birds

6.3 Basic limits

Based on the above criteria and the measurement results, the cumulative noise level from the operation of all new plant should not exceed the limits set out in Table 3.

The limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises and are presented as facade levels.

LBC considers housing, schools, and hospitals, as well as offices, workshops and open spaces.

In this case, these limits would apply to the upper floor flats at 36 Churchway. All other noise-sensitive receivers are located at greater distances when the height of the Evergreen House building and the locations of the chillers are taken into consideration.

Table 3 Plant noise limits at 1 m from the nearest noise sensitive premises

Time of day	Maximum sound pressure level at 1 m from noise-sensitive premises, $L_{Aeq,15min}$ (dB)
Daytime (07:00-19:00)	46
Evening (19:00-23:00)	43
Night-time (23:00-07:00)	38

[1] The limits set out in Table 3 do not include any attention-catching features. The limits would need to be reduced by 5 dB if the plant noise contains attention-catching features, in line with London Borough of Camden's local plan

7 Plant noise assessment

7.1 Proposed plant

The three following options are currently being considered and have therefore been reviewed:

- Daikin (6 units)
- Carrier (8 units)
- Klima-Therm (2 units).

The current locations of the existing chillers are shown in Figure 7. The proposed chillers will occupy the same locations as the existing chillers.

Figure 7 The existing chiller locations on the roof of the building. Proposed chillers will occupy the same locations (courtesy of Google Earth Pro)

7.2 Manufacturers' noise data

The sound power levels of the proposed chillers are presented in Table 4. The manufacturers have proposed different number of chillers to be used to achieve the cooling load required. The proposed number of units are also presented in Table 4.

Table 4 Sound power level of the proposed chillers, and the proposed number of units

Manufacturer	Model	Sound power level (dBA)	Proposed number of units
Daikin	IC3000AS/LE/LH	88	6
Carrier	30RB-160R	83	8
Klima-Therm	VHA2145A EC-01 6V	98	2

7.3 Assessment and recommendations

The predicted plant noise levels from the proposed chillers outside the facade of 36 Churchway are summarised in Table 5. The prediction assumes that all proposed units run simultaneously at their design duty.

The resultant noise levels have then been compared to the LBC criteria for new plant (see Table 3). Acoustic mitigation measures are also discussed.

Table 5 Predicted plant noise levels at 1m from the facade of 36 Churchway

Chillers	Predicted noise level at 1 m from facade	Does it meet the criteria?		
		Daytime	Evening	Night-time
Daikin	46	Yes	No	No
Carrier	42	Yes	Yes	No
Klima-Therm	51	No	No	No

The predicted noise level from the Daikin chillers meets the daytime criterion but exceeds the evening and night-time criteria by 3 dB and 8 dB, respectively.

The predicted noise level from the Carrier chillers meets the daytime and evening criteria but exceeds the night-time criterion by 4 dB.

The predicted noise level from the Klima-Therm chillers exceeds the criteria by the following margins:

- Daytime: 5 dB exceedance
- Evening: 8 dB exceedance
- Night-time: 13 dB exceedance.

Mitigation measures are therefore necessary, which are outlined in the following sections for each chiller manufacturer.

7.3.1 Daikin chillers

To meet the evening and night-time requirements, the chillers would need to be placed behind a screen.

The screens would need to have a minimum superficial weight of 10 kg/m^2, imperforate and sealed at roof level. The height of the barrier would need to exceed the combined height of the chiller and any supporting structures on which the chillers are placed so that there is no direct line of sight between the upper floor windows of 36 Churchway and the chillers.

Alternatively, the chiller fans could be fitted with suitable attenuators capable of reducing their noise level by a minimum of 8 dB.

7.3.2 Carrier chillers

Amongst the three proposed chiller manufacturers, the Carrier chillers result in the lowest noise level at the closest receptor. The predicted noise level meets the daytime and evening criteria without any mitigation measures.

At night, although eight units are proposed to meet the daytime cooling load, it is likely the cooling load would be lower, and ultimately, a fewer number of chillers would be needed to meet the night-time demand. As such, if up to three units are scheduled to run at night, the night-time criterion would be met without any mitigation measures being required. Should more than three units run at night, they would need to be placed behind a screen. The requirement of the screen is given in Section 7.3.1.

7.3.3 Klima-Therm chillers

The Klima-Therm chillers are louder than the Daikin and Carrier chillers. Although only two units are proposed to meet the cooling load, the predicted noise level is significantly above the daytime, evening and night-time requirements.

To meet LBC's requirements, the units would need to be placed in proprietary acoustic enclosures capable of reducing the noise level by a minimum of L_{Aeq} 13 dB.

8 Conclusion

In relation to new building services plant, London Borough of Camden (LBC) requires that noise egress be designed to be 10 dB below the existing background noise levels when measured at the nearest noise sensitive premises (or 15 dB if the noise contains attention-catching features).

A noise survey has been carried out to determine the existing background noise levels in the area. The survey included unattended and attended noise measurements.

The unattended measurements were taken over 15-minute periods between 09:49 on 9 July 2021 and 09:49 on 16 June 2021.

Attended sample measurements were taken on 16 June 2021 at two locations around the site, over 15-minute periods.

Based on the results of the noise survey and the requirements of LBC, noise limits for the new plant have been derived. An acoustic assessment of the proposed options comprising Daikin, Carrier and Klima-Therm chillers has been conducted.

Both Daikin and Carrier chillers meet the LBC daytime requirement without any mitigation measures.

Only the Carrier chillers meet the LBC evening requirement and neither of the proposed chillers meets the LBC night-time requirement, with the Klima-Therm being the loudest.

Both the Daikin and Carrier chillers would be capable of meeting the night-time requirement provided they are installed behind a sufficiently specified screen. A screen would not be required for the Carrier chillers if the night time demand were less and only required up to three units being operational.

For the Klima-Therm chillers, to meet the LBC requirements, they would need to be placed in proprietary acoustic enclosures capable of reducing the noise level by at least L_{Aeq} 13 dB.

Appendix A

Survey details

Equipment

The unattended and attended noise measurements were taken using a Rion NL-32 (D) sound level meter and a Rion NL-52 (J) sound level meter, respectively.

Calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
NL-32 (D)				
Sound level meter	NL-32/00423756	Rion	22 Jan 23	TCRT21/1054
Microphone	UC-53A/319228	Rion	22 Jan 23	TCRT21/1054
Pre-amp	NH-21/36631	Rion	22 Jan 23	TCRT21/1054
Calibrator	NC-74/34625670	Rion	22 Jan 23	TCRT21/1046
NL-52 (J)				
Sound level meter	NL-52/00375679	Rion	9 Jul 21	TCRT19/1541
Microphone	UC-59/11168	Rion	9 Jul 21	TCRT19/1541
Pre-amp	NH-25/65806	Rion	9 Jul 21	TCRT19/1541
Calibrator	SV30A/10576	Svan	9 Jul 21	TCRT19/1539

[1] Calibration of the meters used for the measurements is traceable to national standards. Calibration certificates for the sound level meters used in this survey are available upon request.

Calibration checks were carried out on the meters and their measurement chains at the beginning and end of the survey. No significant calibration deviation occurred.

Noise indices

Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a fast time weighting.
- $L_{A1,T}$ The A-weighted sound pressure level exceeded for 1% of the measurement period. Indicative of the representative maximum sound level.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures.*

Weather conditions

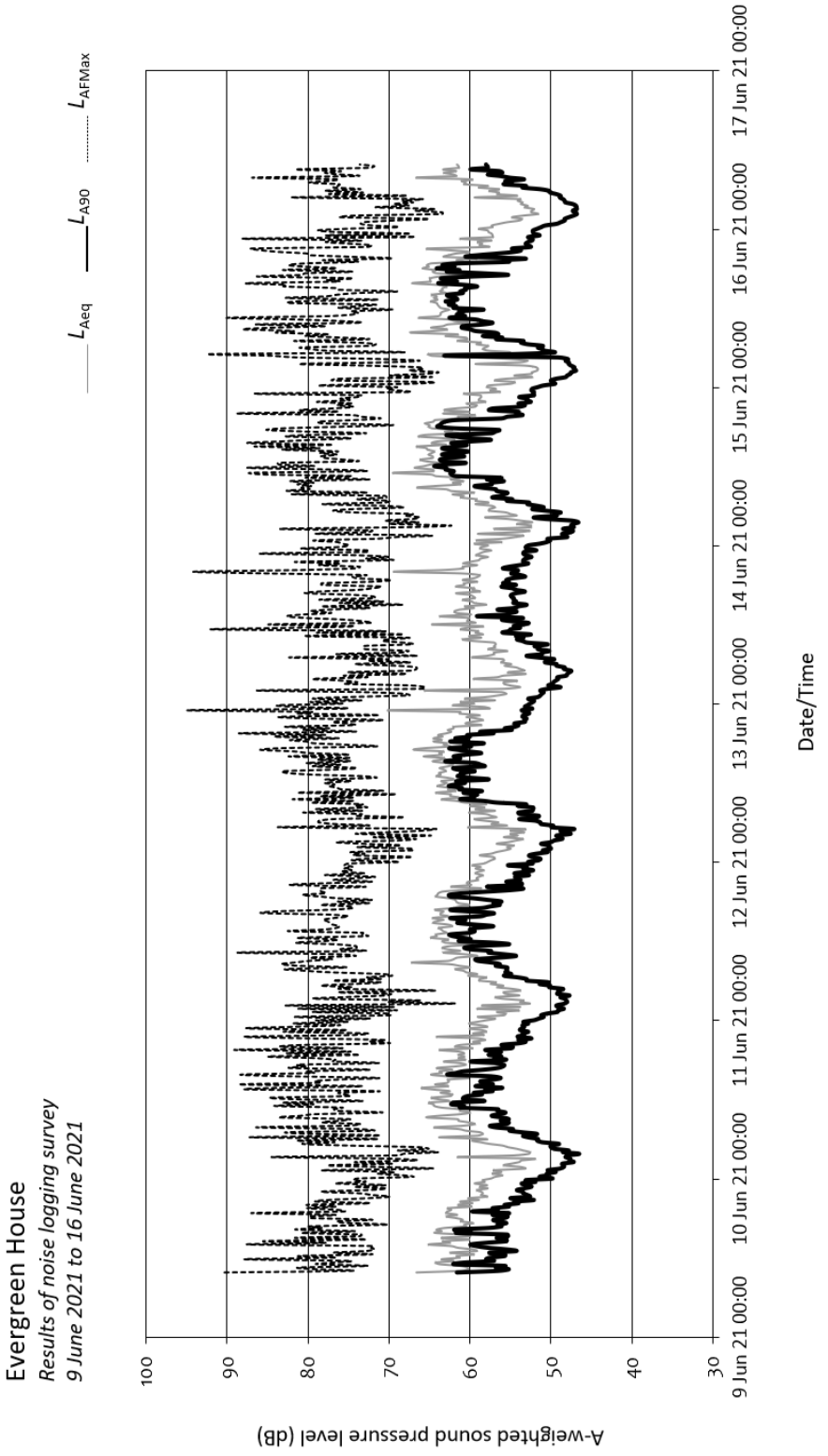
During the attended noise measurements, the weather was generally clear and dry and no rain occurred. Wind speeds were measured at each position and varied between 3.1 m/s and 4.0 m/s.

During the unattended noise measurements, weather reports for the area indicated that temperatures varied between 13°C at night and 28°C during the day, and the wind speed was less than 6.2 m/s.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

Results of unattended measurements at Location A


Evergreen House
Results of noise logging survey
9 June 2021 to 16 June 2021
L_{Aeq}
L_{A90}
L_{AFMax}
A-weighted sound pressure level (dB)
100
90
80
70
60
50
40
30
9 Jun 21 00:00
10 Jun 21 00:00
11 Jun 21 00:00
12 Jun 21 00:00
13 Jun 21 00:00
14 Jun 21 00:00
15 Jun 21 00:00
16 Jun 21 00:00
17 Jun 21 00:00
Date/Time