

Project:	22 Endell Street London WC2H 9AD	Date:	05/06/20
Client:	Flatt Consulting Ltd	Ref:	4657



Project:	22 Endell Street London WC2H 9AD			
Client:	Flatt Consulting Ltd			
Report Title:	Environmental Noise Assessment			
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Revision:	0			
Report Status:	First Issue			
Reference:	4657_ENA_0			

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1.0 Introduction

As part of refurbishment works to the property of address 22 Endell Street London WC2H 9AD, it is proposed that a number of items of air-conditioning plant be installed within the site demise.

Paragon Acoustic Consultants Ltd has been commissioned to conduct an environmental noise survey to obtain statistical noise data to characterise the existing local background and ambient noise climate at the site and to derive noise limits to atmosphere based on Local Authority Noise Policy and other relevant guideline documents. This information shall be used at the appropriate stage of the project to determine if the proposed new mechanical plant selections will meet with the derived noise limits.

This practice has been advised that the operational period of the proposed mechanical plant will be office daytime hours only taken as 08:00-18:00

2.0 Site Description and Proposed Plant Location

2.1 Site Description

The site under consideration is situated at 22 Endell Street London WC2H 9AD, within The London Borough of Camden.

The site under consideration is a five-storey office building located on the north east elevation of Endell Street. On the south west side of Endell Street lie 4/5 story properties with various retail ground level and residential properties above. The Crosskeys public house is also located opposite the site.

To the south east lies Betterton Street, on the west side of which lie 5 storey residential properties. To the north west lies Short's Gardens. Covent Garden Medical Centre is located on the north side of the street opposite the site, extending to 5 stories in height. On the east side of Endell Street, beyond Short's Gardens lies Dudley Court comprising retail at ground floor with residential above and extending to five storeys in height. To the north east lie the roof areas of adjacent office buildings.

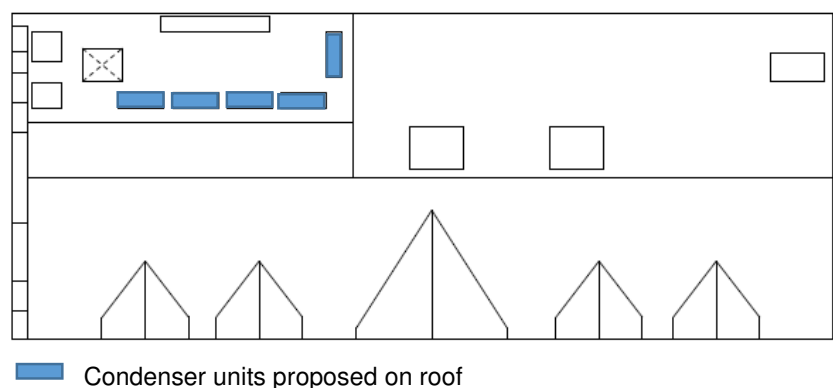
The area where mechanical plant is proposed generally benefits from screening to surrounding areas due to the building roof structures.

The site is illustrated by plan in Appendix A.

2.2 Proposed Plant Location

An extract of drawing indicating the proposed plant location is shown below

Figure 1: Proposed Plant Location



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3.0 Existing Noise Climate

It is stressed that the survey was undertaken during the COVID19 lockdown period and as such it is probable that the noise climate measured was significantly lower than would normally be expected. Transportation noise such as road and rail movement and aircraft overflights were not operating at normal capacity and footfall was considered to be significantly less than normal. Nonetheless the following comments re provided:

3.1 Road Traffic

Noise emanating from vehicular road traffic was deemed to provide a contribution to the ambient noise climate proximal to the nearest affected residential premises. The overall noise comprises both individual "event" type emissions from vehicles passing along local roads, and also continuous low frequency "rumble" due to middle distance traffic flows.

3.2 Rail Traffic

Rail traffic noise events were not observed during the survey period.

3.3 Aircraft

Aircraft over flights were not observed during the survey. However, if any overflights were out of view their contribution to the background noise climate will have been included within the measurements taken.

3.4 Mechanical Noise Sources

Numerous items of mechanical plant items were observed that were associated with third party properties such as retail outlets. The measurement locations were chosen to minimise any impact that these items of plant would have to the background noise level.

3.5 Construction Noise

Distant construction noise was audible during the periods at the site. The contribution to the background noise climate will have been included within the measurements taken.

4.0 Environmental Noise Survey

4.1 Measurements

The noise monitoring took place on 04/06/2020 between 10:00 and 13:00 hours.

The noise monitoring was manned and was undertaken at the location as described below.

- **MP1:** On Betterton street
- **MP2:** On Short's Gardens

The measurement location is illustrated on the site layout drawing in Appendix A.

Various statistical broad-band and spectral sound pressure level measurements were obtained during the survey. A sampling measurement time interval $T_m = 15$ minutes was used. This comprised disaggregated measurements at MP1 and MP2.

Measurements of the percentile level $L_{A90,T}$ were made using time weighting F as per clause 3.4 of BS 4142:2014.

The quantities recorded included:

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- **L_{Aeq}**: the equivalent continuous A-weighted sound pressure level over the measurement period
- **L_{Amax}**: the maximum A-weighted sound pressure level for the measurement period
- **L_{A10}**: the A-weighted sound pressure level exceeded for 10% of the measurement period
- **L_{A90}**: the A-weighted sound pressure level exceeded for 90% of the measurement period

4.2 Weather during survey period

The weather conditions were mild and dry with a slight breeze.

4.3 Instrumentation

Sound pressure level measurements were obtained using the following instrumentation complying with the Type 1 specification of BS EN 60804, BS EN 60651, BS EN 60942, BS EN 61260, and BS EN 61672-1:

- Norsonic Type 118 Sound level analyser, serial number 31322
- Norsonic Type 1225 ½" microphone

Calibration checks were made prior to and after completion of measurements using a Norsonic Type 1251 acoustical calibrator complying with Class 1 of BS EN 60942, calibration level 114.0 dB $\pm$ 0.3 dB, @ 1.0 kHz. All instrumentation carries a current manufacturer's certificate of conformance a copy of which is available upon request.

4.4 Results

The recorded survey data is shown as follows:

File	Date	Measuring position	L _{Aeq}	L _{Afmax}	L _{A10}	L _{A90}
NOR118_6212828_200604_0001.NBF	10:00-11:00	MP1	54.8	68.6	58	47.5
NOR118_6212828_200604_0002.NBF	10:00-11:00	MP2	61.8	78.6	63.8	50.4
NOR118_6212828_200604_0003.NBF	11:00-12:00	MP1	61.8	80.2	65.1	46.3
NOR118_6212828_200604_0004.NBF	11:00-12:00	MP2	56.7	69	61.5	49.3
NOR118_6212828_200604_0005.NBF	12:00-13:00	MP1	59.1	81.5	53.5	47.2
NOR118_6212828_200604_0006.NBF	12:00-13:00	MP2	68.2	88	71.6	50.4

The L_{A90} background noise levels for MP 1 and MP2 are taken as follows:

MP1: 46 dB LA90

MP2: 49 dB LA90

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5.0 Evaluation of External Noise Criteria

The local vicinity contains properties of mixed usage, which must be given due consideration in terms of acceptable levels of noise exposure from the new plant.

5.1 Noise Sensitive Properties

It is necessary to consider the requirements of the Local Authority. Recent correspondence from the London Borough of Camden advised the following:

“For the correct criterion, reference should be made the Noise Thresholds in Appendix 3 of the Local Plan 2017, specifically Table C/ the “Design Criterion of 10dB below background which increases to 15 dB if the noise source requires acoustic correction.

Table C of the Appendix 3 of the Local Plan 2017 *advises the following:*

Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL _{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L _{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL _{Amax}

*10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

**levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.

The document confirms that the 'Rating Level' shall be required to be 10 dB below the background and this should be increased to 15dB if the noise contains audible tonal elements.

The above document confirms that *“levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises”*. As such, the proposed noise limits for commercial premises are confirmed as follows:

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5.2 Commercial Properties

The methods described in BS4142:2014 use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident. It is considered reasonable that commercial properties not used for residential purposes be assessed in line with the guidelines provided in BS 8233:2014. BS 8233:2014 provides guideline noise levels for internal areas of buildings, reproduced as follows:

Figure 2: BS8233:2014 table of typical noise levels in non-domestic buildings

Table 6 Typical noise levels in non-domestic buildings

Activity	Location	Design range dB $L_{Aeq, T}$
Speech or telephone communications	Department store	50 – 55
	Cafeteria, canteen, kitchen	
	Concourse	45 – 55
Study and work requiring concentration	Corridor, circulation space	
	Library, gallery, museum	40 – 50
	Staff/meeting room, training room	35 – 45
	Executive office	35 – 40
Listening	Place of worship, counselling, meditation, relaxation	30 – 35

Figure 3: BS8233:2014 table of indoor ambient noise levels

Table 2 Indoor ambient noise levels in spaces when they are unoccupied and privacy is also important

Objective	Typical situations	Design range $L_{Aeq, T}$ dB
Typical noise levels for acoustic privacy in shared spaces	Restaurant	40 – 55
	Open plan office	45 – 50
	Night club, public house	40 – 45
	Ballroom, banqueting hall	35 – 40
	Living room	35 – 40

NOTE See Noise control in building services [28] and BS EN ISO 3382.

In view of the details presented above it is considered reasonable to adopt a noise criterion of 40 dB $L_{Aeq, T}$ for commercial office space in the proximity of the site.

It is also reasonable to consider a noise criterion external to commercial property windows that takes account of the internal design range, plus the loss expected through an openable window. In a research study conducted for DEFRA NANR116: "Open/Closed Window Research", numerous references are provided which quantify losses through open and partially open windows:

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Figure 4: DEFRA NANR16 Summary of findings

Information Source	Summary of Findings
PPG 24 (1994) ^[2]	A reduction of 13 dB(A) from the facade level is assumed for an open window
WHO (1999) ^[4]	A reduction of 15 dB from the facade level is assumed for a partially open window. (no reference)
BS 8233 (1999) ^[5]	Windows providing rapid ventilation and summer cooling are assumed to provide 10 - 15 dB attenuation (no specific reference)
BRE Digest 338 (1988) ^[6]	A partly open window has an averaged level difference, $D_{1m;av100-3150}$ of 15 dB
DoE Design Bulletin 26 (1972) ^[7]	A reduction of 5 dB(A) with a window wide open
Nelson - Transportation Noise (1987) ^[8]	Sound insulation of an open single window is 5 – 15 dB. (theoretical)
Mackenzie & Williamson DoE Report (1972-73) ^{[9],[10]}	A vertical sliding sash window open 0.027 m ² (summer night-time ventilation) and 0.36 m ² (daytime summer ventilation) provided a sound level reduction of 16 and 11 dB(A) respectively. (Lab Study)
Kerry and Ford (1973 – 74) ^{[11],[12]}	A horizontal sliding sash window open 25 mm and 200 mm provided averaged sound reduction indices, R_{av} of 14 and 9 dB respectively. (Field Study)
Lawrence and Burgess (1982 – 83) ^{[13],[14]}	A vertical sliding sash open 9% of the total façade provided a sound reduction index R_w 10 dB. (Field study)
Hopkins (2004) ^[15]	Road traffic noise reductions through window openings resulted in reductions of between $D_{2m,n,T}$ 8 and 14 dB. (Field Study)

Table 1.1 Summary of open-window acoustic transmission literature

The findings of the study are referenced in this report to substantiate the use of a 13dB(A) loss through a partially open window.

5.3 External Noise Criteria

The derived external noise criteria which the new building services plant shall be required to achieve are shown below:

Table 1: Limiting Noise Criteria applicable at the affected premises

Plant Location	Receptor	Daytime Office Hours 08:00-18:00 $L_{Art,(15\ min)}$
Proposed roof location	Properties on east side of Betterton Street and west side of Endell Street Outside residential living or dining or bedroom window	36 dB
	Properties to the north of Short's Gardens Outside residential living or dining or bedroom window	39 dB
	Commercial premises	53 dB L_{Aeq}

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6.0 Review of Proposed Plant

6.1 Introduction

The new plant will comprise 5 Number Daikin condensers model RXTQ60TAVJUA

Detailed calculations have been carried out in order to determine the likely level of airborne noise transmission outside the identified assessment locations due to the operation of the proposed new plant to be installed.

Section 2.2 details the plant location/s used in the assessment.

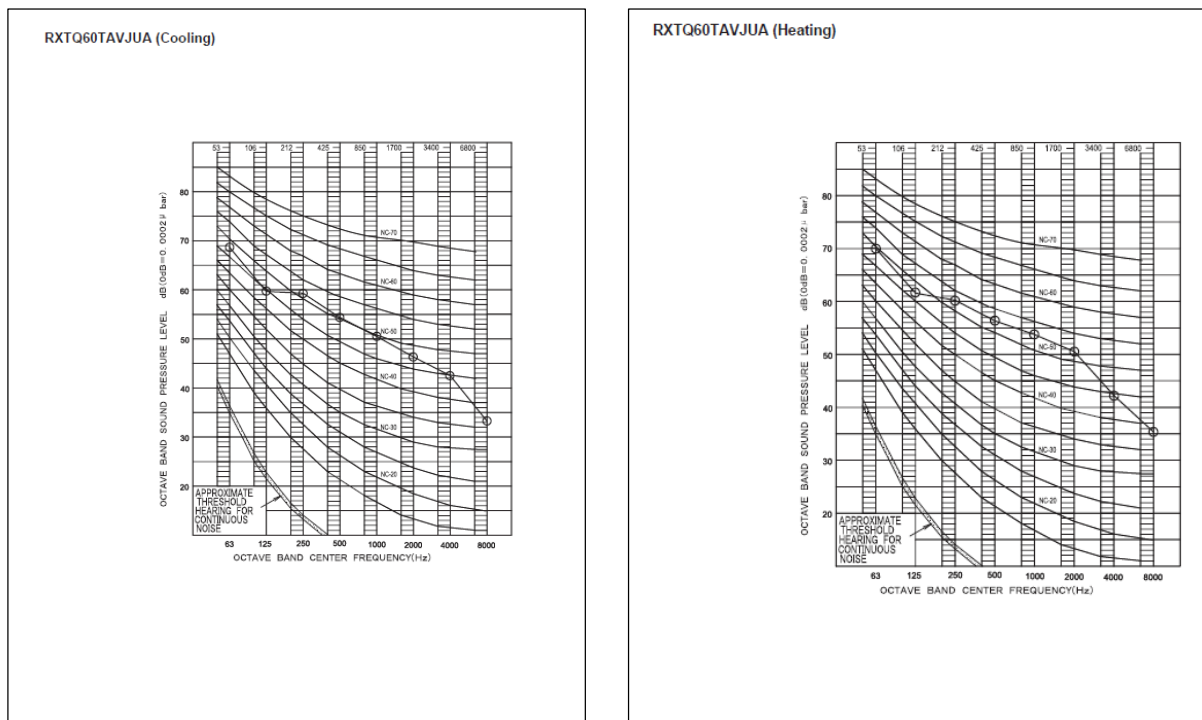
The following sections provide a record of the proposed new plant, the operational sound levels used as the basis for this assessment, and a specification for noise mitigation treatments.

At this stage, the scope of work herein is limited to the consideration of mechanical plant noise emissions to atmosphere and does not include evaluation of the transmission of noise via building envelopes to internal areas of the clients building. It is recommended that the client employ acoustic consultants to assess this aspect at the appropriate stage of the project.

6.2 Plant Noise Data

The noise levels / acoustic data for the proposed new plant items are shown below:

Figure 5: Noise data for Daikin condensers model RXTQ60TAVJUA



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6.3 Predicted Plant Noise Levels

Calculations have been carried out using the data presented earlier within this report to predict the resultant sound pressure levels due to airborne transmitted noise outside the nearest exposed noise assessment position and corresponding to the quietest period of plant operation. The predicted results are summarised below:

Table 2: Predicted Noise Levels at nearest affected premises

Plant under consideration	Worst case assessment location	Approx. distance to receiver	Direct line of sight?	Predicted Lp	Derived noise limit
Proposed new five number Daikin condensers model RXTQ60TAVJUA	Worts case Residential property on east side of Betterton Street	25 m	No	36 dB	36 dB
	Residential properties on north side of Short's Gardens	26 m	No	27 dB	36 dB
	Commercial property to west	17 m	Yes / No	37 dB	53 dB

Predictions are based on the plant operating normally at the noise levels detailed herein, and it is considered that the noise emitted from the proposed plant will not contain audible tonal elements at the receiver.

It can be seen that:

- For affected third party noise sensitive properties, the proposed plant will maintain the derived noise limit.
- For affected third party commercial properties, the proposed plant will maintain the derived noise limit.

Example Calculations are provided in Appendix B

6.4 Vibration

It is recommended that the client provisions for appropriate vibration isolation mountings for the proposed mechanical plant items. It is recommended that the plant be installed on vibration isolation mounts providing a minimum of 98% isolation efficiency at all forcing frequencies using an isolation mount system approved by the plant supplier. In addition, all pipework should be suitably isolated from the building structure.

7.0 Conclusions

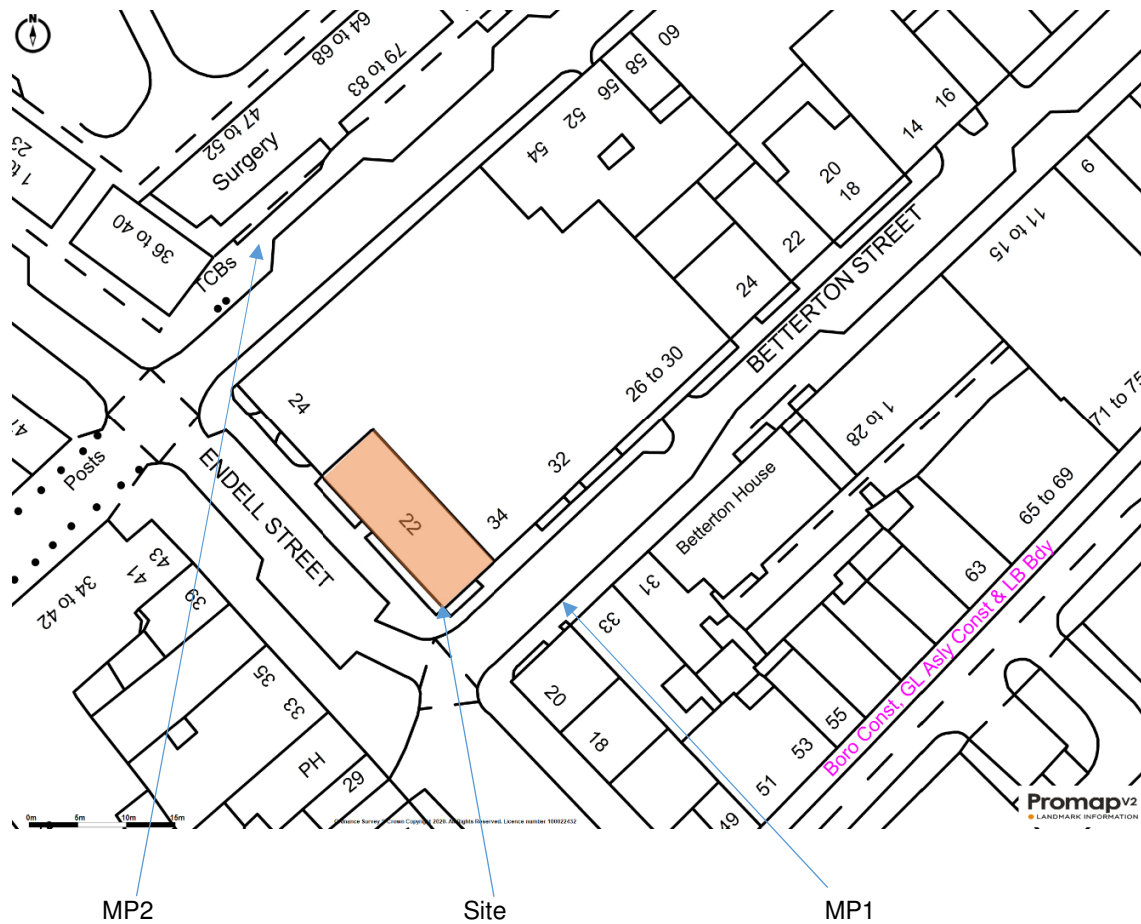
A background noise survey has been undertaken to determine the noise climate likely to exist in the vicinity of 22 Endell Street London WC2H 9AD, where the positioning of new mechanical plant is proposed.

Appropriate external criteria have been identified on the basis of Local Authority noise policy, and predictions of the proposed mechanical plant noise emissions have been undertaken. Predictions indicate that the plant noise emissions will meet with the derived noise limits.

On this basis, reservations are not expected from the planning authority on the grounds of noise.

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Appendix A: Site Plan



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Appendix B: Example Calculation sheets

Calculation to residential on east side of Betterton Street

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date	43987
Plant	5 Number Daikin condensers model RXTQ60TAVJUA

		Predicted noise levels WITHOUT additional attenuation								
		63	125	250	500	1000	2000	4000	8000	dB(A)
Plant Group 1:Plant A sound pressure level at	1 m	70	62	60	57	54	50	47	35	59
correction for propagation of noise into the space		3	3	3	3	3	3	3	3	
correction due to distance to receiver at	25 m	-28	-28	-28	-28	-28	-28	-28	-28	
Source situation correction		3	3	3	3	3	3	3	3	
Number of units of same noise level if not added above	5 unit/s	7	7	7	7	7	7	7	7	
allowance for acoustic barrier loss due screening / other structures to other buildings		-5	-6	-6	-7	-9	-11	-13	-16	
Predicted noise level at receiver plus feature corrections		49	41	38	34	30	24	18	4	36

SUMMARY - ALL PLANT										
UN-ATTENUATED PLANT (but including barrier losses and noise through barriers where applicable)										

		63	125	250	500	1000	2000	4000	8000	dB(A)
Plant Group 1:Plant A		49	41	38	34	30	24	18	4	36

Calculation to residential to North of Short's Gardens

project	22 Endell Street London WC2H 9AD
date	43987
Plant	5 Number Daikin condensers model RXTQ60TAVJUA

		Predicted noise levels WITHOUT additional attenuation								
		63	125	250	500	1000	2000	4000	8000	dB(A)
Plant Group 1:Plant A sound pressure level at	1 m	70	62	60	57	54	50	47	35	59
correction for propagation of noise into the space		3	3	3	3	3	3	3	3	
correction due to distance to receiver at	25 m	-28	-28	-28	-28	-28	-28	-28	-28	
Source situation correction		3	3	3	3	3	3	3	3	
Number of units of same noise level if not added above	5 unit/s	7	7	7	7	7	7	7	7	
allowance for acoustic barrier loss due screening / other structures to other buildings		-9	-12	-14	-17	-20	-23	-26	-29	
Predicted noise level at receiver plus feature corrections		45	35	31	25	19	12	6	-9	27

SUMMARY - ALL PLANT										
UN-ATTENUATED PLANT (but including barrier losses and noise through barriers where applicable)										

		63	125	250	500	1000	2000	4000	8000	dB(A)
Plant Group 1:Plant A		45	35	31	25	19	12	6	-9	27

Calculation to commercial property to the west

project	22 Endell Street London WC2H 9AD
date	43987
Plant	5 Number Daikin condensers model RXTQ60TAVJUA

		Predicted noise levels WITHOUT additional attenuation								
		63	125	250	500	1000	2000	4000	8000	dB(A)
Plant Group 1:Plant A sound pressure level at	1 m	70	62	60	57	54	50	47	35	59
correction for propagation of noise into the space		3	3	3	3	3	3	3	3	
correction due to distance to receiver at	17 m	-25	-25	-25	-25	-25	-25	-25	-25	
Source situation correction		3	3	3	3	3	3	3	3	
Number of units of same noise level if not added above	5 unit/s	7	7	7	7	7	7	7	7	
allowance for acoustic barrier loss due screening / other structures to other buildings		-6	-7	-8	-10	-12	-15	-18	-21	
Predicted noise level at receiver plus feature corrections		52	43	40	35	30	23	17	2	37

SUMMARY - ALL PLANT										
UN-ATTENUATED PLANT (but including barrier losses and noise through barriers where applicable)										

		63	125	250	500	1000	2000	4000	8000	dB(A)
Plant Group 1:Plant A		52	43	40	35	30	23	17	2	37