cass allen

NOISE IMPACT ASSESSMENT

21 PARK SQUARE EAST, NW1 4LH

MRS J UMAROVA

RP01-14521

NOISE IMPACT ASSESSMENT

PROJECT: 21 PARK SQUARE EAST, NW1 4LH

CLIENT: MRS J UMAROVA

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1. INTRODUCTION

1.1 Cass Allen has been instructed by Mrs J Umarova to assess the noise impact of proposed new external condenser units at 21 Park Square East, NW1 4LH in Marylebone, London.

1.2 The assessment has been carried out in accordance with relevant local and national planning guidance.

1.3 The aim of this report is to assess the potential noise impact of the proposed plant installation and to provide sufficient information to satisfy the local authorities planning requirements.

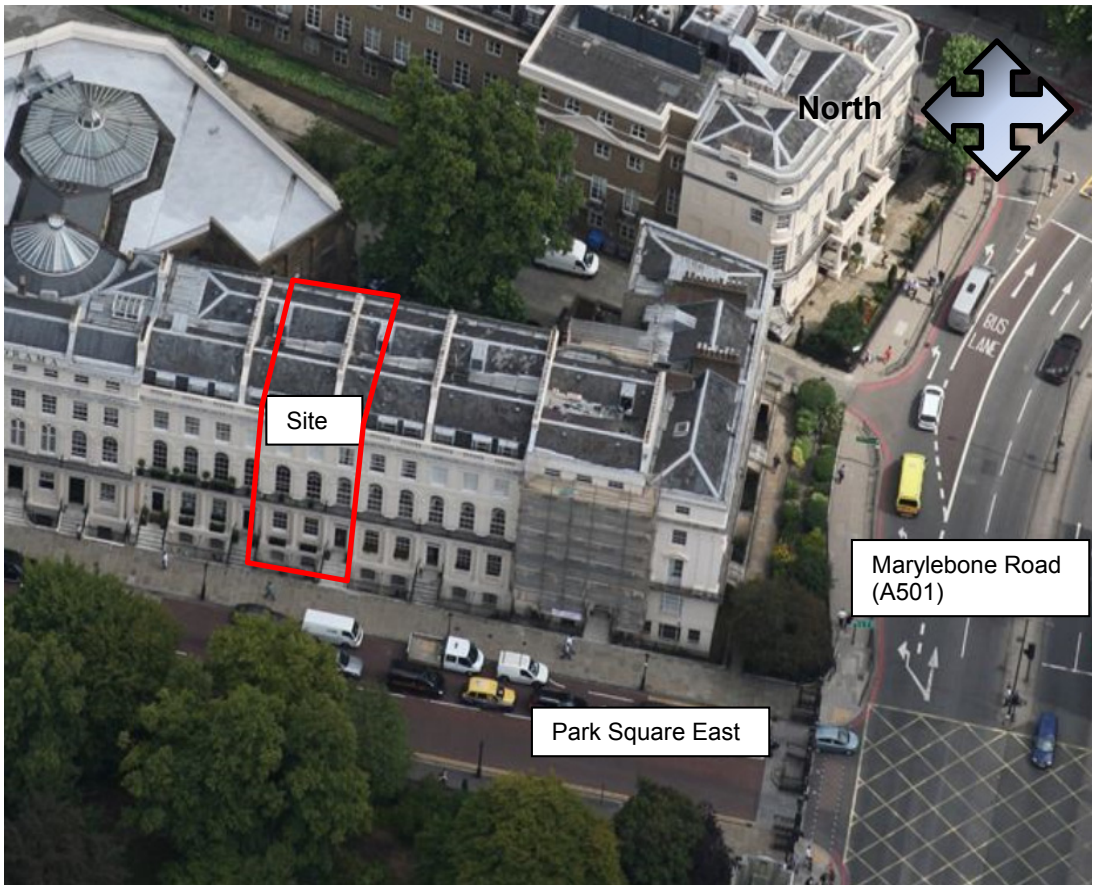
1.4 This report contains technical terminology; a glossary can be found in Appendix 1.

2. PROJECT DESCRIPTION

2.1 21 Park Square East is a 5 storey terraced residential dwelling. It is located in a mixed-use area, consisting of residential dwellings and offices. It is bounded to the east by Park Square East and to the west by an access road. Marylebone Road (the A501) is approximately 40 m due south of the site. The nearest noise-sensitive properties are numbers 20 and 22 Park Square East either side of the site.

2.2 An annotated aerial photo of the site is shown in Figure 1 below.

Figure 1 Annotated Aerial Photo



2.3 The proposal is to install 2 external condenser units at rooftop level which will serve the property's air conditioning system. A current drawing of the proposed development layout is shown in Appendix 2.

3. PLANNING POLICY

3.1 The local planning authority, the London Borough of Camden (LBC), typically require that assessments of this nature are carried out according to the methodology described in British Standard 4142:1997 *'Rating industrial noise affecting mixed residential and industrial areas'* (BS4142).

3.2 BS4142 provides an assessment methodology that indicates the likelihood of complaints arising following the introduction of a new noise source in an area containing existing noise sensitive properties. It is commonly used as a tool in the planning process and can be used in this case to assess the likely impact of the new plant on nearby noise-sensitive uses (i.e. the external balcony of the neighbouring residential unit.).

3.3 The BS4142 assessment methodology can be summarised as follows:

1. Measure the existing background noise levels ($L_{A90,T}$) at the locations of nearby noise sensitive receptors during the quietest periods when the new noise source(s) will operate;
2. Predict the noise emissions ($L_{Aeq,T}$) from the new development at the locations of the nearby sensitive receptors, including corrections for any distinguishable features (e.g. tones, whines, screeches, hisses etc); and
3. Determine whether the noise requires a decibel penalty for certain noise characteristics likely to increase annoyance or attract attention. The rated noise level is referred to as the 'rating level', dB $L_{Ar,Tr}$.
4. Compare the measured background noise levels (item 1 above) with the measured or predicted rating noise levels (item 3 above) at each sensitive receptor.

3.4 BS4142:1997 states that:

- A rating noise level around 10 dB (or more) higher than the background noise level indicates that complaints are likely;
- A rating noise level around 5 dB higher that the background noise level is *"of marginal significance"*; and,
- If the rating noise level is more than 10 dB below the background noise level then it is a positive indication that complaints are unlikely.

3.5 LBC's typical requirements for assessing the acceptability of noise impact from mechanical plant relating to developments of this nature are contained in Table E of Policy DP 28 – Noise and Vibration within the adopted local policy document *Camden Development Policies* 2010. This is reproduced in Table 1 for reference.

Table 1 Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise Level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <L_{A90}
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	10dB(A) <L_{A90}
Noise that has distinct impulses (bangs clicks, clatters, thumps) at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	10dB(A) <L_{A90}
Noise at 1 metre external to a sensitive façade where LA90 > 60dB	Day, evening and night	0000-2400	55dB L_{Aeq}

4. SITE NOISE SURVEY

4.1 A noise survey was carried out at the site between Friday 6th and Monday 9th June 2014, in order to quantify existing background noise levels representative of the nearby noise-sensitive receptors over a suitable time period. Weekend measurements were undertaken specifically to avoid on-site construction noise which would otherwise impact the ambient and background noise measurements. Background noise levels are likely to be lower during the weekend than during the week, due to less road traffic activity. This approach is therefore considered to represent a worst-case scenario. The full methodology and results of the noise survey are provided in Appendix 2 for reference.

4.2 Measurements were carried out in two locations. Both were at basement level, with one in the proposed internal light well (L1) and the other in the rear courtyard (L2). These locations were chosen as representative of a previous iteration of the proposed plant installation. This consisted of the condensing units being situated in one of these locations. The survey was carried out prior to the proposed location of the plant (and subsequently the 'worst-case' noise-sensitive receptor) being changed. However, measurements carried out in these locations are still considered to be appropriate for use in this assessment, as background noise levels measured at basement level are likely to lower than those at high level, due to being acoustically screened from road traffic noise and other local noise sources.

4.3 Background noise levels across the site were generally dictated by noise emissions from road traffic on Park Square East and the A501.

4.4 A summary of the noise data is provided in Table 2. We consider that the application of a single noise limit throughout the daytime, evening and night-time periods to be inappropriate, particularly when both of the proposed condensing units will not operate simultaneously, with one only operating during the day-time and one during the night. Subsequently, we have nominated two assessment scenarios; daytime (0700 – 2300 hours) and night-time (2300 – 0700 hours).

Table 2 Summary of Unattended Noise Logging Results – Façade Levels

Measurement Position	Approximate Distance to nearest noise sensitive receptor (m)	Lowest Measured Background Noise Levels dB, LA90,5mins	
		Daytime (0700-2300hrs)	Night-time (2300-0700hrs)
L1 – 1m external to window in proposed front lightwell at basement level	3	48	38
L2 – 1m external to window in rear courtyard at basement level	3	43	40

4.5 The noise survey results summarised in Table 2 and Appendix 2 have been used to inform a noise impact assessment of the proposed plant. This is discussed further in Section 5 of this report.

5. ASSESSMENT

5.1 The plant installation consists of 2 units to be placed at rooftop level. Unit 1 (a Daikin RXYSQ6P8V1) would only operate during daytime hours (i.e. 0700 to 2300 hours) and serve habitable areas from the basement to first floor level. Unit 2 (a Daikin RXYSQ4P8V1) would only operate during the night-time hours (i.e. 2300 to 0700 hours) and serve habitable areas on the second and third floors. A plan showing the proposed location of the unit is shown in Appendix 3 (Location A1).

5.2 The worst-case noise-sensitive locations in relation to the new plant are approximately 6 m away (i.e. the windows of numbers 20 and 22 Park Square East respectively).

5.3 It is understood that the installed units will be for occasional use only, primarily to control thermal comfort during periods of hot weather.

5.4 Subsequently, in order to meet the LBC assessment criteria, overall plant noise emission levels should not exceed the limits shown in Table 3, when measured at any noise-sensitive receptor, with all plant running at typical maximum duty. This corresponds to a rating level of 10dBA below the lowest measured background noise level at the 'worst-case' (nearest) assessment position.

Table 3 Noise Limits for External Plant Emissions

Location	Daytime (0700-2300hrs)	Night-time (2300-0700hrs)
Any noise sensitive receptor	33	28

5.5 Data provided by the manufacturer of the proposed units confirms that the Unit 1 operates with a sound power level of 72 dB(A) at typical maximum duty, whereas Unit 2 operates with a sound power level of 69 dB(A) at typical maximum duty

5.6 BS4142 states that *"Certain acoustic features can increase the likelihood of complaint"*. This refers to distinct features such as a continuous tones, impulses (e.g. bangs) and irregular bursts of noise. In such instances it is recommended that a +5dB penalty should be added to obtain the rating level.

5.7 It is possible that noise emissions from the proposed units might contain tonal, impulsive or otherwise distinctive characteristics. Subsequently, the 5dB penalty recommended in BS4142 has been incorporated into the assessment as this represents a worst-case assessment.

5.8 Based on the manufacturers' sound power level data (see Appendix 4), the propagation of noise emitted by the plant has been predicted; taking into account the distance from the source to the assessment location and the level of screening likely to be provided by the building structure (see Appendix 5). A summary of the noise emission calculations (see Appendix 6) are shown in Table 4.

Table 4 Predicted noise emissions from proposed plant at noise-sensitive locations

Noise sensitive location at which limits apply	Calculated predicted cumulative noise emissions from proposed plant	
	Daytime (0700-2300hrs)	Night-time (2300-0700hrs)
Location A1	31 dBA	28 dBA

5.9 It can be seen that noise emissions from the proposed plant, when operating at maximum duty, are predicted to meet LBC's requirements for the 'worst-case' noise-sensitive location. It follows that this would also be the case at all other noise-sensitive locations in relation to the proposed plant.

5.10 Subsequently, it is our view that the information above provides sufficient evidence that noise emissions from the proposed plant will meet the criteria set out in Section 3, thereby satisfying the Council's requirements.

6. CONCLUSIONS

6.1 An assessment of the potential noise impact due to the siting of proposed mechanical plant at 21 Park Square East, NW1 4LH in Marylebone, London has been carried out in accordance with relevant local and national planning policy and guidance.

6.2 The London Borough of Camden have four separate sets of criteria when assessing the noise impact of mechanical plant on residential properties In this case, a rating level of 10dBA below the lowest existing background noise level should be achieved. This applies to plant that is considered to be tonal or intermittent in nature.

6.3 BS4142 recommends that distinct features such as a continuous tones, impulses (e.g. bangs) and irregular bursts of noise should result in a +5dB penalty being added to obtain the rating level. In order to assess a potential 'worst-case' it has been assumed that that noise generated by the proposed plant will necessitate this penalty.

6.4 A noise survey has been carried out at the site to measure existing background noise levels. The lowest background noise levels at the nearest noise-sensitive receptors to the proposed plant have subsequently been determined. From this information, appropriate noise emissions criteria have been established for the assessment location.

6.5 Cumulative noise emissions from the proposed plant are predicted to comply with the individual noise limits for the 'worst-case' noise-sensitive locations. It follows that this would also be the case at all other noise-sensitive locations in relation to the proposed plant.

6.6 Consequently, it is our belief that the noise impact of the proposed plant will be acceptable and subsequently, that this report contains sufficient information to satisfy the local authorities' planning requirements in relation to noise from the proposed plant.

Appendix 1 Glossary

<table>
<tr><th>Term</th><th>Explanation</th></tr>
<tr><td>Noise</td><td>Sound that is unpleasant or that causes (or could cause) disturbance or annoyance. Noise is assessed in terms of sound pressure levels.</td></tr>
<tr><td>Ground-borne Vibration</td><td>Vibration transmitted through the ground. Can cause disturbance or annoyance if at sufficient levels. Usually measured as Vibration Dose Values (VDVs).</td></tr>
<tr><td>Reradiated Noise (or ‘Ground-borne Noise’)</td><td>Ground-borne vibration can cause room walls, floors and ceilings to radiate noise in the audible frequencies. This type of noise is often referred to as ground-borne noise. Mechanical plant may also generate structure-borne vibration that is reradiated as noise.</td></tr>
<tr><td>dB (decibel)</td><td>The standard unit for defining sound pressure levels. The lower threshold of normal hearing is in the region of 0dB. 130dB is the upper threshold of pain.

A change of 1dB in sound pressure levels is only perceptible under controlled conditions. The minimum perceptible change under normal conditions is 3dB. A change of 5dB would be clearly noticeable to the average listener. A change of 10dB roughly corresponds to a subjective ‘halving’ or ‘doubling’ of loudness.

The decibel is a logarithmic quantity, meaning the normal arithmetic rules of mathematics cannot be directly applied. For example:
• 30dB + 30dB ≈ 33dB;
• 3 x 20dB ≈ 25dB, and;
• 40dB – 25dB ≈ 40dB</td></tr>
<tr><td>dBA (A-weighted decibel)</td><td>A-weighted decibels have been corrected using a frequency weighting (A-weighting) that broadly corresponds with the hearing response of the human ear. Measurements of noise in dBA are generally used for assessing people’s perception of noise.

The table on the right shows indicative A-weighted noise levels (sound pressure levels) from a variety of sources.

<table><tr><th>Source, distance</th><th>Level (dBA)</th></tr><tr><td>Jet aircraft, 50m away</td><td>140</td></tr><tr><td>Threshold of pain</td><td>130</td></tr><tr><td>Threshold of discomfort</td><td>120</td></tr><tr><td>Chainsaw, 1m distance</td><td>110</td></tr><tr><td>Disco, 1m from speaker</td><td>100</td></tr><tr><td>Diesel truck, 10m away</td><td>90</td></tr><tr><td>Kerbside of busy road, 5m</td><td>80</td></tr><tr><td>Vacuum cleaner, distance 1m</td><td>70</td></tr><tr><td>Conversational speech, 1m</td><td>60</td></tr><tr><td>Average home</td><td>50</td></tr><tr><td>Quiet library</td><td>40</td></tr><tr><td>Quiet bedroom at night</td><td>30</td></tr><tr><td>Background in TV studio</td><td>20</td></tr><tr><td>Rustling leaves in the distance</td><td>10</td></tr><tr><td>Threshold of human hearing</td><td>0</td></tr></table></td></tr>
<tr><td>$L_{Aeq,T}$ (equivalent continuous noise level)</td><td>The sound level of a notionally steady sound having the same energy as the A-weighted fluctuating sound over the measurement period (T). The A-weighted equivalent continuous noise level (LAeq) is commonly used to describe the “average” or “ambient” noise level in a given environment over the measurement period.</td></tr>
</table>

Term	Explanation
$L_{A10,T}$	The A-weighted level of noise exceeded for 10% of the specified measurement period (T). It gives an indication of the upper limit of fluctuating noise and is commonly used to describe road traffic noise levels. $L_{A10,18h}$ is the arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06.00 to 24.00 (defined in CRTN).
$L_{A90,T}$	The A weighted noise level exceeded for 90% of the specified measurement period (T). It is commonly used to define "background" noise level, i.e. the underlying noise level in the absence of intermittent or short-duration noises.
L_{Amax} (maximum noise level)	The highest A-weighted noise level recorded during the measurement period. Unless described otherwise, it is generally measured using the 'fast' sound level meter response.
Hz (Hertz)	Hz are the unit of frequency, equal to one cycle per second. Frequency of sound waves refers to the number of pressure fluctuations per second. Frequency is related to the pitch of a sound.
Octave-band or third-octave band (1/1 or 1/3)	The spectrum of audible frequencies can be separated into proportional 'bands' to facilitate ease of computation and analysis (the bandwidth being proportional to the band centre-frequency). Third-octave bands (1/3-octave) split each octave into 3 bands, which allows greater accuracy.
Free-field	A sound field determined at a point away from reflective surfaces other than ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Facade-level	A measurement taken in close proximity (e.g. 1m) to a reflective surface (other than ground) such as a building facade. It is generally accepted that reflections from the surface will increase the measured noise levels by around 3 dB compared to free-field levels, i.e. free-field levels = facade levels – 3 dB.
Reverberation	The sound in a room or enclosed space that results from reflections from the room boundaries. The reverberation time (RT) is the time required for the steady sound pressure level in an enclosed space to decay by 60dB.
Sound absorption	The process whereby sound energy is converted into heat, leading to a reduction in the sound pressure level. Directly related to reverberation in an enclosed space, i.e. more absorption = lower reverberant level and shorter reverberation time.
Sound insulation	A general term referring to the degree by which a material or separating construction reduces sound energy passing through it.
D_w (weighted sound level difference)	Describes the weighted sound level difference between a source room and receiving room when noise is being generated in the source room. Used to assess and describe the sound insulation between the two rooms. DnTw is the sound level difference normalised to a reference reverberation time (0.5 seconds unless stated otherwise).
L_w (weighted sound level difference)	Describes the weighted impact sound insulation of a floor. Impact sound is sound caused by physical impacts (such as footfall) on the floor. Impact sound insulation is quantified by placing a 'tapping machine' on top of the floor and measuring the resultant noise levels in rooms below. LnTw is the sound level difference normalised to a reference reverberation time (0.5 seconds unless stated otherwise).
R_w (Weighted sound reduction index)	The weighted sound reduction index (see SRI entry below) is a single number laboratory-measured rating used to describe the sound insulation performance of building elements. The R'w is the apparent sound reduction index measured onsite (normally tends to lower than the laboratory rated Rw level due to onsite conditions).
SRI (Sound Reduction Index)	A laboratory-measured rating of the airborne sound insulation properties of building elements across various frequencies.

Term	Explanation
NR (Noise Rating)	Noise rating is a method for assigning a single number level to a noise spectrum. It is typically used to specify allowable noise emissions from mechanical ventilation systems in buildings. For a typical noise spectrum the NR level is approximately equivalent to the dBA level minus 6, i.e. NR ≈ dBA – 6.

Appendix 2 Survey Results

Survey Summary:

The survey comprised of two unattended noise logging positions located on the basement level at the site. One was positioned 1m external to the nearest window of the proposed front lightwell The other was positions 1m external to the nearest window within the rear courtyard. Noise levels at the site were generally dictated by road traffic on Park Square East and the A501.

Survey Period:

06/06/2014 to 09/06/2014

Survey Objectives:

- To identify existing noise sources that contribute to background noise levels at the site;
- To measure existing background noise levels around the site over a typical day and night-time period, free from on-site construction noise.

Equipment Used:

Type	Manufacturer	Model	Serial Number
Sound level meter[1] (noise logger)	Rion	NL-32	01182950
Sound level meter[1] (noise logger)	Rion	NL-32	00623765

Note 1: All sound level meters were calibrated before and after measurement periods and no significant drift in calibration was found to have occurred. The results of the measurements are therefore considered to be representative.

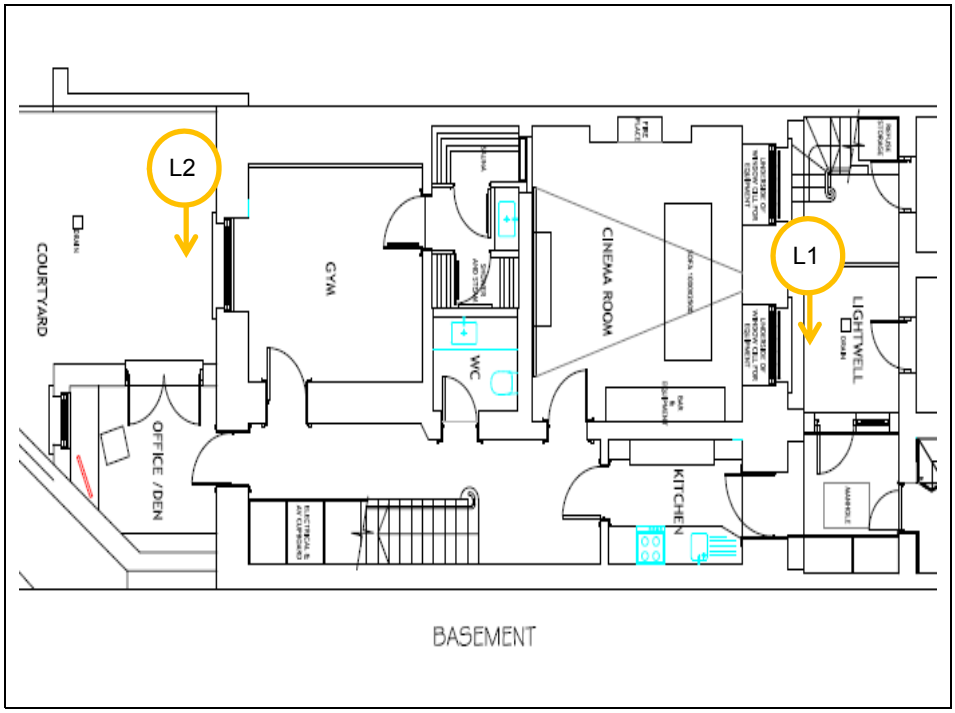
Weather Conditions:

Weather records for the area confirmed that weather conditions were generally acceptable for acoustic measurement during the unattended monitoring. Any periods of unattended monitoring that may have been adversely affected by weather conditions or on-site construction have been excluded from the data analysis.

Measurement Positions:

Position (refer plan below)	Description
L1	Unattended noise logging position. 1.5 m above ground level. Façade measurement. Screened from road traffic noise by existing building layout.
L2	Unattended noise logging position. 1.5 m above ground level. Façade measurement. Screened from road traffic noise by existing walls surrounding courtyard.

Site Plan showing Measurement Positions:



Unattended Noise Monitoring Summary:

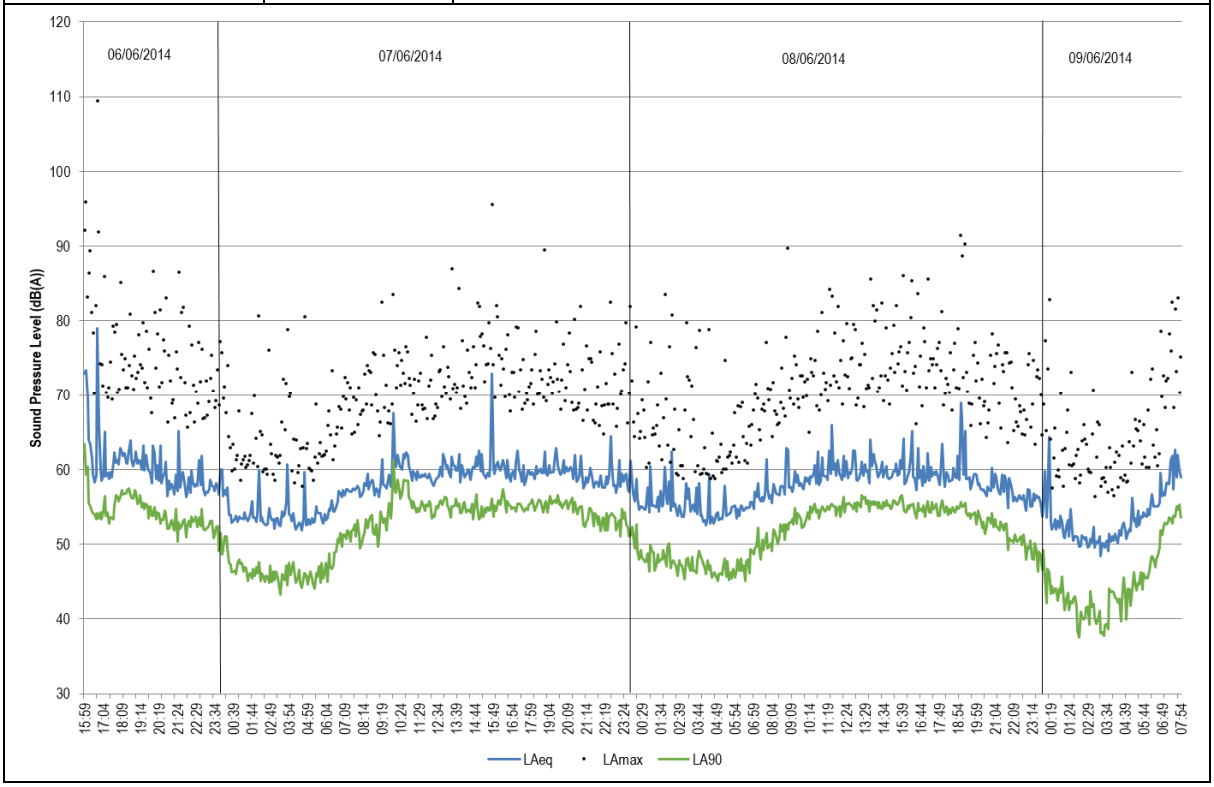
Meas. Period	Position	Daytime (0700-2300hrs)	Night-time (2300-0700hrs)
		LA90,5mins dB[1]	LA90,5mins, dB[1]
06.06.14	L1	Affected by construction noise	43
	L2		43
07.06.14	L1	49	45
	L2	44	42
08.06.14	L1	48	38
	L2	43	40

Note 1: Lowest measured during the period shown.

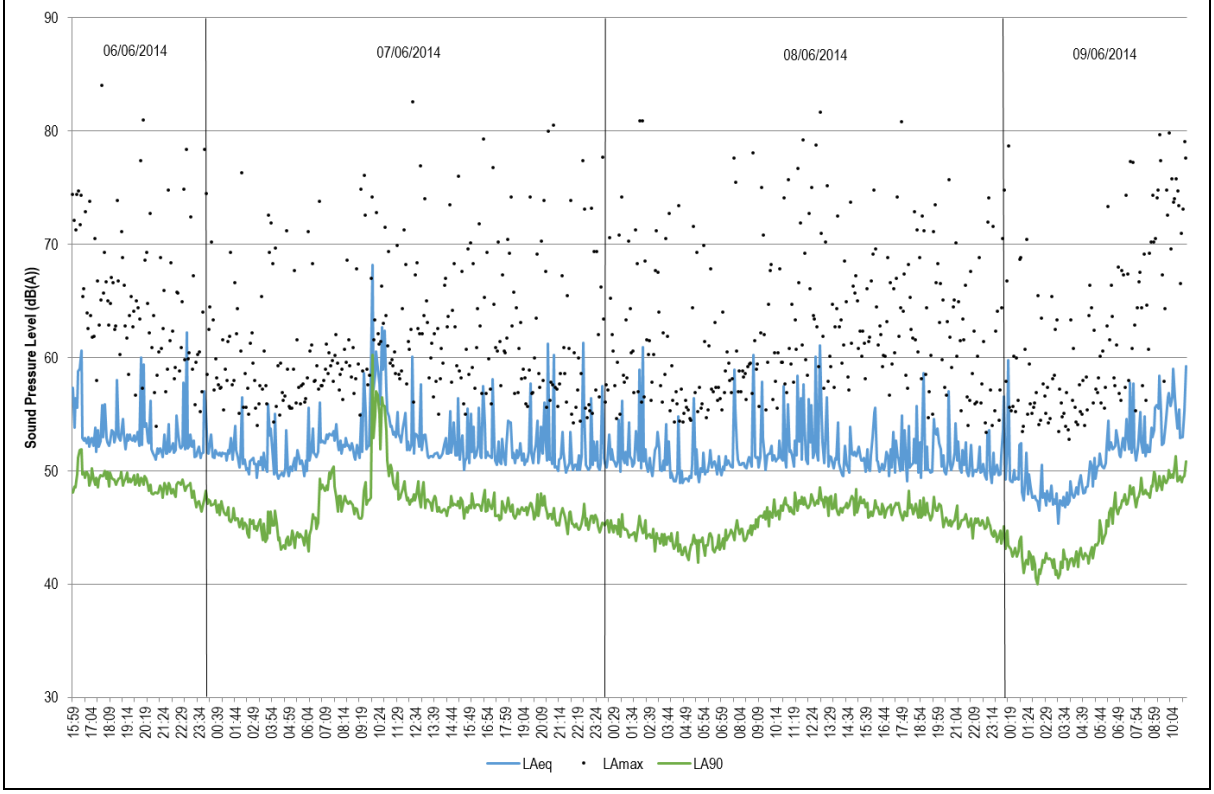
Unattended Noise

Monitoring Graphs:

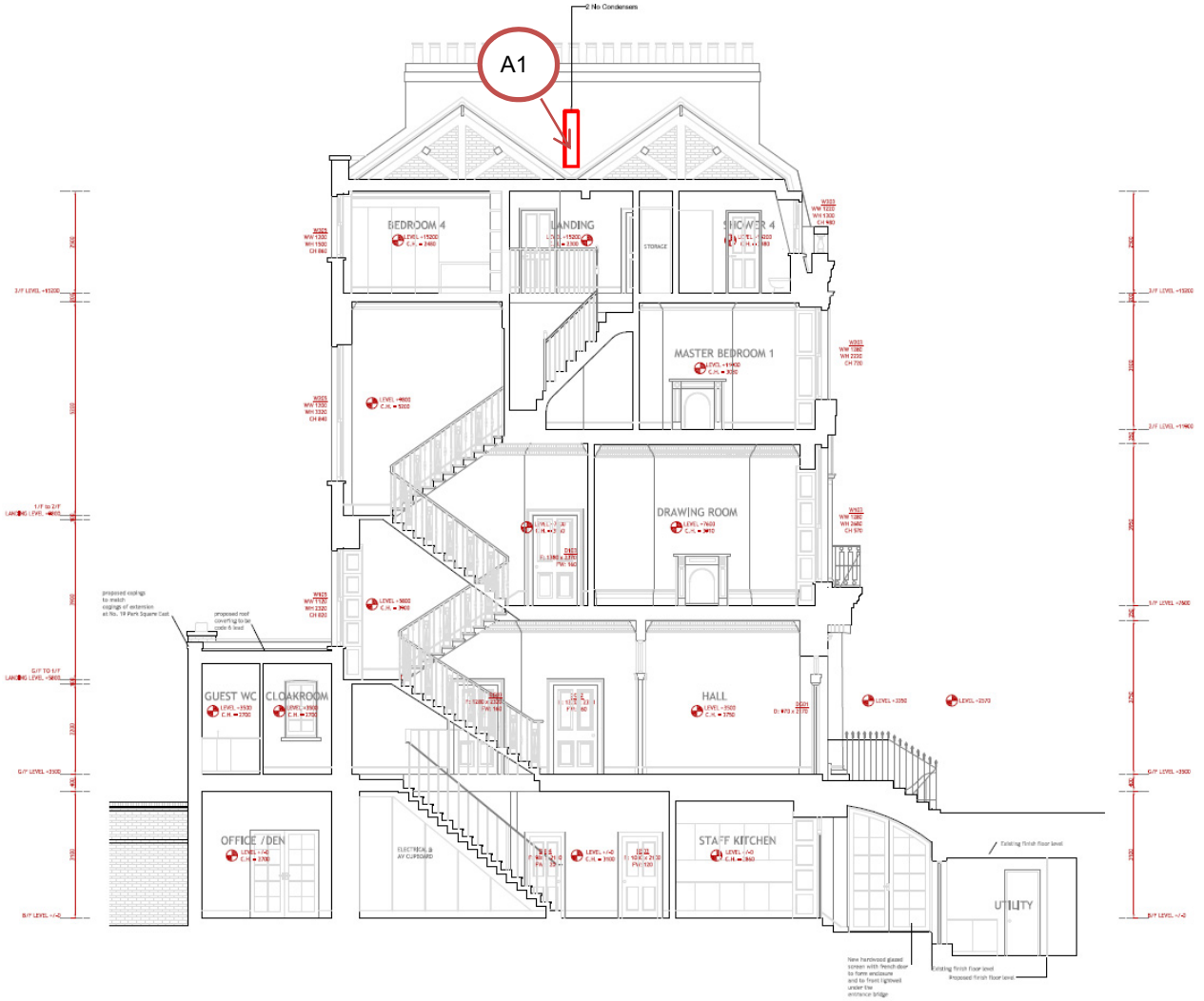
Meas. Period	Position
06.06.14 to 09.06.14	L1



Meas. Period	Position
06.06.14 to 09.06.14	L2



Appendix 3 Proposed Plant Locations

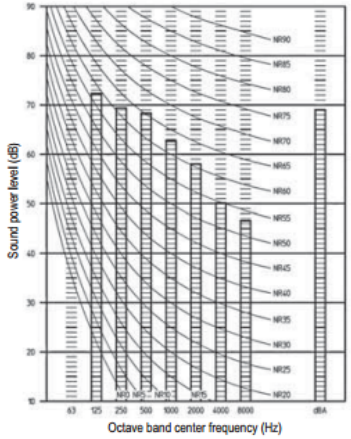


Appendix 4 Manufacturers' Data

10 Sound data

10 - 1 Sound Power Spectrum

RXYSQ6P8V1



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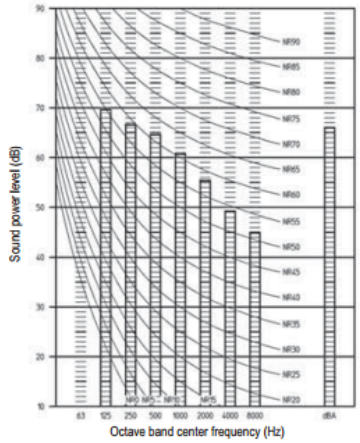
NOTES

1 dBA = A-weighted sound power level. (A-scale according to IEC)
2 Reference acoustic intensity 0dB = 10E-6μW/m²
3 Measured according to ISO 3744

RXYSQ4P8V1



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NOTES

1 dBA = A-weighted sound power level. (A-scale according to IEC)
2 Reference acoustic intensity 0dB = 10E-6μW/m²
3 Measured according to ISO 3744

Unit 1 Unit 2

Appendix 5 Barrier (Screening) Attenuation

CLIENT:	Mrs J Umarova
PROJECT:	21 Park Square East, London

Screening provided by roof structure

Source height (m)	0.5
Receiver height (m)	0.25
Barrier height (m)	2
Horizontal distance from source to barrier (m)	2.5
Horizontal distance from barrier to receiver (m)	3

Frequency (Hz)	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Barrier Attenuation	8	11	14	17	20	23	26	29

Appendix 6 Cumulative Plant Noise Emissions Calculation Summary

Daytime Operation

Assessment Position A1

Daikin RXYSQ6P8V1 (Unit 1)	
Distance from Source (m)	6

	Octave Band Centre Frequency (Hz)							
	125	250	500	1000	2000	4000	Total	
Sound Power Level (Cooling), L_{WA}	59	63	68	66	62	54	72	dBA
Screening from building orientation and roof	11	14	17	20	23	26		
Resultant Sound Pressure Level at Receiver, L_{pA}	**24**	**25**	**27**	**22**	**15**	**4**	**31**	**dBA**

Assumptions

Plant running at maximum duty
Point source attenuation over hard ground
Design criterion includes tonal penalty
Façade corrections included
Design Criterion, L_{pA} = 33 dB

Night-time Operation

Assessment Position A1

Daikin RXYSQ4P8V1 (Unit 2)	
Distance from Source (m)	6

	Octave Band Centre Frequency (Hz)							
	125	250	500	1000	2000	4000	Total	
Sound Power Level (Cooling), L_{WA}	56	60	65	63	59	51	69	dBA
Screening from building orientation and roof	11	14	17	20	23	26		
Resultant Sound Pressure Level at Receiver, L_{pA}	**21**	**22**	**24**	**19**	**12**	**1**	**28**	**dBA**

Assumptions

Plant running at maximum duty
Point source attenuation over hard ground
Design criterion includes tonal penalty
Façade corrections included
Design Criterion, L_{pA} = 28 dB

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