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PRIYESH PATEL

**100 ALEXANDRA
PARK ROAD**

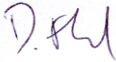
**PLANT NOISE
ASSESSMENT**

4 JANUARY 2023

1838-AF-00001-03

**PRIYESH PATEL
100 ALEXANDRA PARK ROAD
PLANT NOISE ASSESSMENT**

DOCUMENT REFERENCE: 1838-AF-00001-03

REVIEW AND AUTHORISATION			
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Approved by Adrian Finn	Position Director	Signature 	Date 12/12/2022

AMENDMENT HISTORY			
Issue	Status	Description	Date
01	Draft	Report issued as draft	12/12/2022
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1. INTRODUCTION

- 1.1.1 Priyesh Patel has commissioned AF Acoustics Ltd. to undertake a plant noise assessment for 2No. existing condensing units on-site located towards the rear of the property, on a first-floor flat roof area.
- 1.1.2 These plant items serve refrigeration units associated with the retail business, positioned at the front of the property
- 1.1.3 It is understood that these units were previously located at first-floor level, however, due to building works, have been repositioned on the flat roof of the building extension.
- 1.1.4 Consequently, the plant items have moved closer to the closest residential windows.
- 1.1.5 AF Acoustics have undertaken measurements of the prevailing background noise conditions on site, spot measurements of the existing plant, and undertaken the plant noise assessment in accordance with BS4142 and the requirements of the London Borough of Haringey.

1.2 Brief and Scope

- 1.2.1 Undertake a noise survey, over a 24-hour period, at one location on-site to obtain typical and worse case ambient and background noise levels.
- 1.2.2 Additional spot measurements will be undertaken of each individual condensing unit, at a distance of 1m. This data will be used to calculate the specific plant noise levels at the closest residential receptor, in accordance with the criteria set out in BS4142:2014 and local authority guidelines. Mitigation measures will be proposed if local authority requirements are exceeded.

2. SITE DESCRIPTION

2.1 Location

- 2.1.1 100 Alexandra Park Road is located within the administrative district of the London Borough of Haringey. The area is a mixture of commercial and residential properties.
- 2.1.2 The adjoining properties are commercial on ground floor level, with residential units above. The wider area is predominantly residential in character.
- 2.1.3 The existing plant on site consists of 2No. condensing units, located towards the rear of site, a first-floor flat roof area. These units serve refrigeration units associated with the retail unit at the front of the property.
- 2.1.4 It is understood that these units were previously located at first-floor level, however, due to building works, have been repositioned on the flat roof of the extension.
- 2.1.5 Consequently, the plant items have moved closer to the nearest residential windows.
- 2.1.6 The ambient noise profile at the site was generally quiet, due to being screened from Alexandra Park Road. The plant associated with 100 Alexandra Park Road cycled on/off in regular intervals. When these units were inactive, the noise environment was determined by plant from adjoining premises and distant road traffic.
- 2.1.7 The site layout is shown in **Error! Reference source not found..**

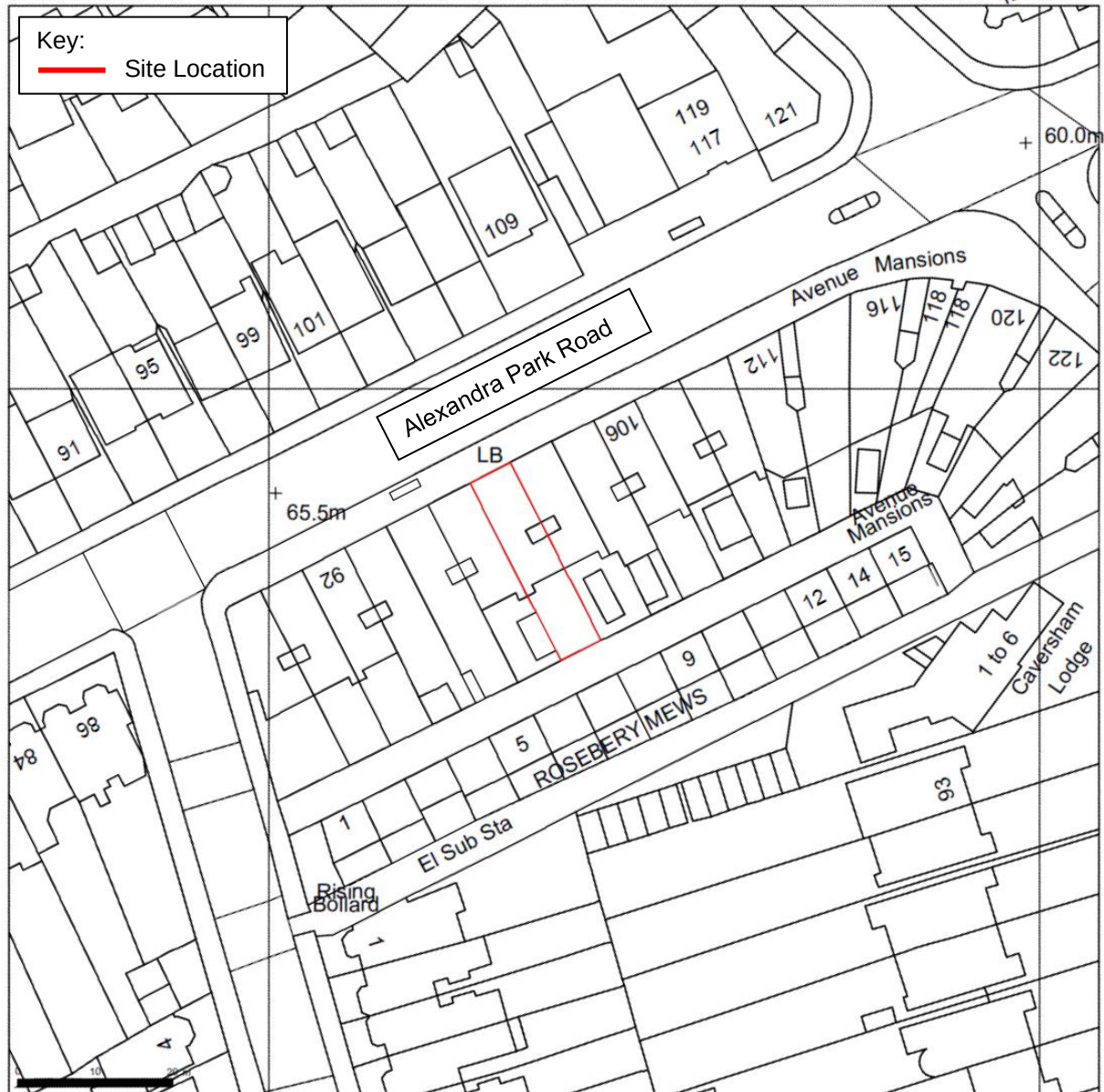


FIGURE 2.1 LOCATION MAP

3. GUIDANCE

3.1 British Standard 4142:2014

3.1.1 BS 4142:2014 'Methods for rating and assessing industrial and commercial sound' describes methods for rating and assessing sound from "fixed installations which comprise mechanical and electrical plant and equipment", amongst other sources of noise.

3.1.2 The methodology contained within BS 4142:2014 uses 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.

3.1.3 A summary of the approach set out within BS 4142:2014 is set out below:

- establish the specific sound level of the source(s);
- measure the representative background sound level, typically by measurement close to the receptor location;
- rate the specific sound level to account for any distinguishing characteristics;
- estimate the impact by subtracting the background sound level from the rating level; and
- consider the initial estimate of impact, in the context of the noise and its environment.

3.1.4 An initial estimate of the impact of the specific sound is obtained by subtracting the background sound level from the rating level. Using this approach, BS 4142 states:

"Typically, the greater this difference, the greater the magnitude of 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 is likely to 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 the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

3.1.5 Certain acoustic features can increase the significance of the impact over that expected from a basic comparison between specific sound level and the background sound level. These features include tonality and impulsivity, as well as additional characteristics and intermittency of the sound.

3.1.6 If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor.

3.1.7 The specific sound level is rated to account for distinguishing characteristics by using the penalties below:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible

3.1.8 Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor.

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible

3.1.9 For noise which is equally both impulsive and tonal, then both features can be taken into account by linearly summing the corrections for both characteristics.

3.1.10 If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

3.1.11 If a subjective assessment is not appropriate then an objective assessment can be made. A noise source is deemed to be tonal if the time averaged sound pressure level in a one-third octave band exceeds the level in adjacent one-third octave bands by the level differences given below:

- 15 dB in the low frequency one-third octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency one-third octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency one-third octave bands (500 Hz to 10000 Hz)

3.1.12 If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.

3.1.13 Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

3.1.14 The standard states, '*Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.*'

3.2 Local Authority Guidance – London Borough of Haringey

3.2.1 It is understood that the London Borough of Haringey's requirements are as follows: noise from the new items of plant shall be designed to 10dBA below the prevailing background level at 1m outside windows of the nearest affected noise-sensitive properties. The assessment shall be carried out in accordance with BS4142.

4. NOISE SURVEY AND MEASUREMENTS

4.1 Unattended Noise Survey

- 4.1.1 An unattended noise survey was undertaken by Daniel Flood of AF Acoustics.
- 4.1.2 The duration of the survey was between 12:40 on Tuesday 6 December to 12:45 on Wednesday 7 December 2022.
- 4.1.3 Measurements were undertaken at the rear of site, on a first floor balcony. This position was fully screened from the roof mounted condensers. The microphone was mounted on a tripod at a height of 1.5m. The ambient noise environment in this location was determined by plant from adjoining premises and distant road traffic.
- 4.1.4 The measurement position is shown below in in Figure 4.1.



FIGURE 4.1: MEASUREMENT LOCATION

- 4.1.5 Measurements were carried out in accordance with the requirements of BS 7445-2:1991 and ISO 1996-2:1987.
- 4.1.6 The sound level meter was calibrated both prior to and on completion of the survey, with no calibration drift observed. The microphone was fitted with a windshield.
- 4.1.7 The equipment used is shown in Table 4.1.

Name	Serial Number	Last Calibrated
Norsonic 118 Class 1 Sound Level Meter	31382	March 2022
Norsonic 1206 Pre-amplifier	30416	March 2022
Gras 40AF Microphone	150690	March 2022
Norsonic 1251 Calibrator	30900	February 2022

TABLE 4.1: MEASUREMENT EQUIPMENT

4.2 Measurement Weather Conditions

4.2.1 The weather during the measurements was dry and clear. The temperature ranged from 2 to 7°C. Average wind speeds remained below 3 ms⁻¹. The weather is deemed to have caused no significant effect during the measurement period.

4.3 Results

4.3.1 The results of the continuous noise monitoring survey are presented in graphical form in Figure A1 of Appendix A and summarised in Table 4.2.

4.3.2 The period averaged L_{Aeq} noise levels are presented below. The L_{A90} background noise level has been derived considering the most commonly occurring 15 minute sample. The $L_{Amax,F}$ is the maximum noise level measured.

Time period	Measured Noise Levels (dB re 2.0 x 10 ⁻⁵ Pa)		
	$L_{Amax,F}$	$L_{Aeq,T}$	Typical $L_{A90,T}$
Daytime (07:00 – 23:00)	91	61	39
Nighttime (23:00 – 07:00)	68	43	28

TABLE 4.2: SUMMARY OF UNATTENDED NOISE MEASUREMENTS

4.4 Attended Noise Measurements

4.4.1 In addition to the above, short-term source measurements of the existing items of plant was undertaken on Tuesday 6 December 2022.

4.4.2 Measurements were taken at a distance of 1m from each item, for a duration of 30 seconds.

4.4.3 The results are presented below in Table 4.3.

Unit	Measured Noise Levels (dB re 2.0 x 10 ⁻⁵ Pa)
	L _{Aeq,T}
Condenser 1	67
Condenser 2	72

TABLE 4.3: SUMMARY OF ATTENDED NOISE MEASUREMENTS

5. PLANT NOISE ASSESSMENT

5.1 Operating Hours

5.1.1 It is understood the condensers operate 24 hours a day.

5.2 Noise Rating Limit

5.2.1 As presented in Table 4.2, measured background noise levels during the night-time period are very low. If following the London Borough of Haringey guidance, a plant rating level of 18dB would be targeted, which is extremely low.

5.2.2 BS4142:2014+A1-2019 states that “Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night”.

5.2.3 On that basis, AF Acoustics proposes an absolute noise rating level of 30dB, which must not be exceeded at the noise sensitive receptor.

Measurement Period	Assessed Background Noise Level dB L _{A90}	Noise Level Design Criteria	Plant Noise Level Limit dB L _{Aeq,T}
24 hours	28	Absolute plant noise rating	30

TABLE 5.1: TARGET BACKGROUND NOISE LEVEL

5.3 Plant Noise Levels

5.3.1 The measured octave band noise levels of the existing plant, which are used in the subsequent assessment, are presented in Table 5.2.

Plant	Parameter	Sound Level at Octave band Centre Frequency, dB								dBA
		63	125	250	500	1000	2000	4000	8000	
Condenser 1	L _p at 1m	71	75	71	70	67	63	55	46	67
Condenser 2	L _p at 1m	74	74	69	66	61	52	48	46	72

TABLE 5.2: PLANT NOISE LEVEL

5.4 Noise Sensitive Receptors

- 5.4.1 The closest residential windows have been identified as belonging to the rear of 98 Alexandra Park Road, on the second and third-floor levels. These are located at a distance of 4m from the existing condensing units.

5.5 Calculated Noise Levels

- 5.5.1 Based on the information above Table 5.3 provides a summary of the calculated plant noise at the nearest residential receptor. Our calculation method has included: 20LogR distance correction. The calculation sheets are presented in Appendix B.

Property	Assessment Period	Target Plant Noise Level dB $L_{Aeq,T}$	Calculated Plant Sound Level dB $L_{Aeq,T}$
98 Alexandra Park Road	24 hours	30	64

TABLE 5.3: PREDICTED NOISE AT NEAREST RESIDENTIAL RECEPTOR

- 5.5.2 Without mitigation, the calculated noise level from the existing plant is 34dB above the target plant noise level.

5.6 Mitigation

- 5.6.1 In order to ensure that the target plant noise level can be achieved, the following mitigation measures are proposed:

Acoustic Enclosure

- 5.6.2 It is recommended to house the condensing units within a louvred enclosure. A suitable louvred enclosure would typically be formed from 300mm deep acoustic louvres, such as Caice's SH300 or equivalent. The minimum required losses are presented below::

	Minimum Insertion Loss (dB) at Octave band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Acoustic louvre 300mm (Caice SH300)	7	7	10	17	29	30	27	21

Screen

- 5.6.3 The plant enclosure should be surrounded on three sides, along the north/east/west elevations by a screen 1.4m in height. The barrier should be solid, imperforate and have a minimum surface density of 15kg/m². This can be seen in Figure 5.1.
- 5.6.4 Examples of material which can achieve this are as follows:
- 22mm plywood (density of 690kg/m³)
 - 2mm sheet steel (density of 7850kg/m³)

Relocation

- 5.6.5 It is understood the distance to which the units can be moved is limited. That being the case, the units should be moved further away from the closest windows, so they are at a distance of 8m. The proposed location is shown below in Figure 5.1.

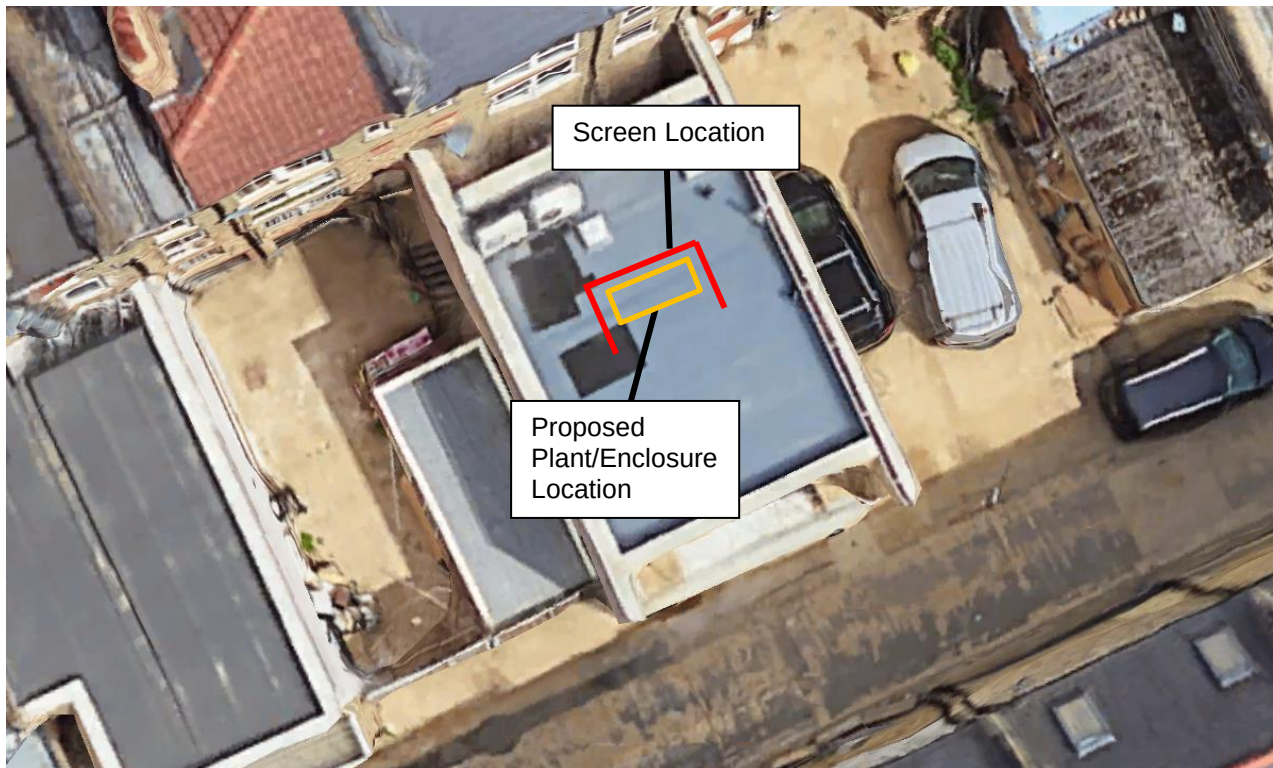


FIGURE 5.1: UNIT RELOCATION AND MITIGATION

- 5.6.6 Table 5.4 provides a summary of the predicted noise levels at the closest residential receptor with the adoption of proposed mitigation.

Property	Assessment Period	Target Plant Noise Level dB $L_{Aeq,T}$	Calculated Plant Sound Level dB $L_{Aeq,T}$
98 Alexandra Park Road	24 hours	30	30

TABLE 5.4: PREDICTED NOISE AT NEAREST RESIDENTIAL RECEPTOR – WITH MITIGATION

- 5.6.7 The results of the assessment indicate that the atmospheric noise emissions from the proposed plant installation will meet the target plant noise level, providing suitable mitigation measures are employed.
- 5.6.8 On that basis, and as per the semantics of BS4142:2014, the assessment indicates little likelihood of adverse impact.

6. VIBRATION CONTROL

- 6.1.1 In order to limit the transfer of structure-borne noise we recommend that all plant is isolated from the supporting structure by either steel spring isolators or rubber footings. For particularly sensitive location, or when on lightweight structures, the mounts should ideally be caged and be of the restrained type.
- 6.1.2 It is important that the isolation is not “short-circuited” by associated pipework or conduits. To this end, any conduits should be looped and flexible connectors should be introduced between the condenser and any associated pipework. Pipework should be supported by brackets containing neoprene inserts.

7. CONCLUSION

- 7.1.1 Priyesh Patel has commissioned AF Acoustics Ltd. to undertake a plant noise assessment for 2No. existing condensing units on-site located towards the rear of the property, on a first-floor flat roof area.
- 7.1.2 These plant items serve refrigeration units associated with the retail business, positioned at the front of the property.
- 7.1.3 AF Acoustics have undertaken measurements of the prevailing ambient noise conditions on site and undertaken the plant noise assessment in accordance with BS4142 and the requirements of the London Borough of Haringey.
- 7.1.4 The results of the measurements have been used to determine the required criteria for atmospheric noise emissions from the condensing units.
- 7.1.5 The results of the assessment indicate that the proposed plant can meet the proposed target plant noise level, providing that suitable mitigation measures are adopted.
- 7.1.6 On that basis, and as per the semantics of BS4142:2014, the assessment indicates little likelihood of adverse impact.

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APPENDIX A: FIGURES

1838 - 100 Alexandra Park Road, London

Rear balcony

Time History - 6 December to 7 December 2022

Graph 1

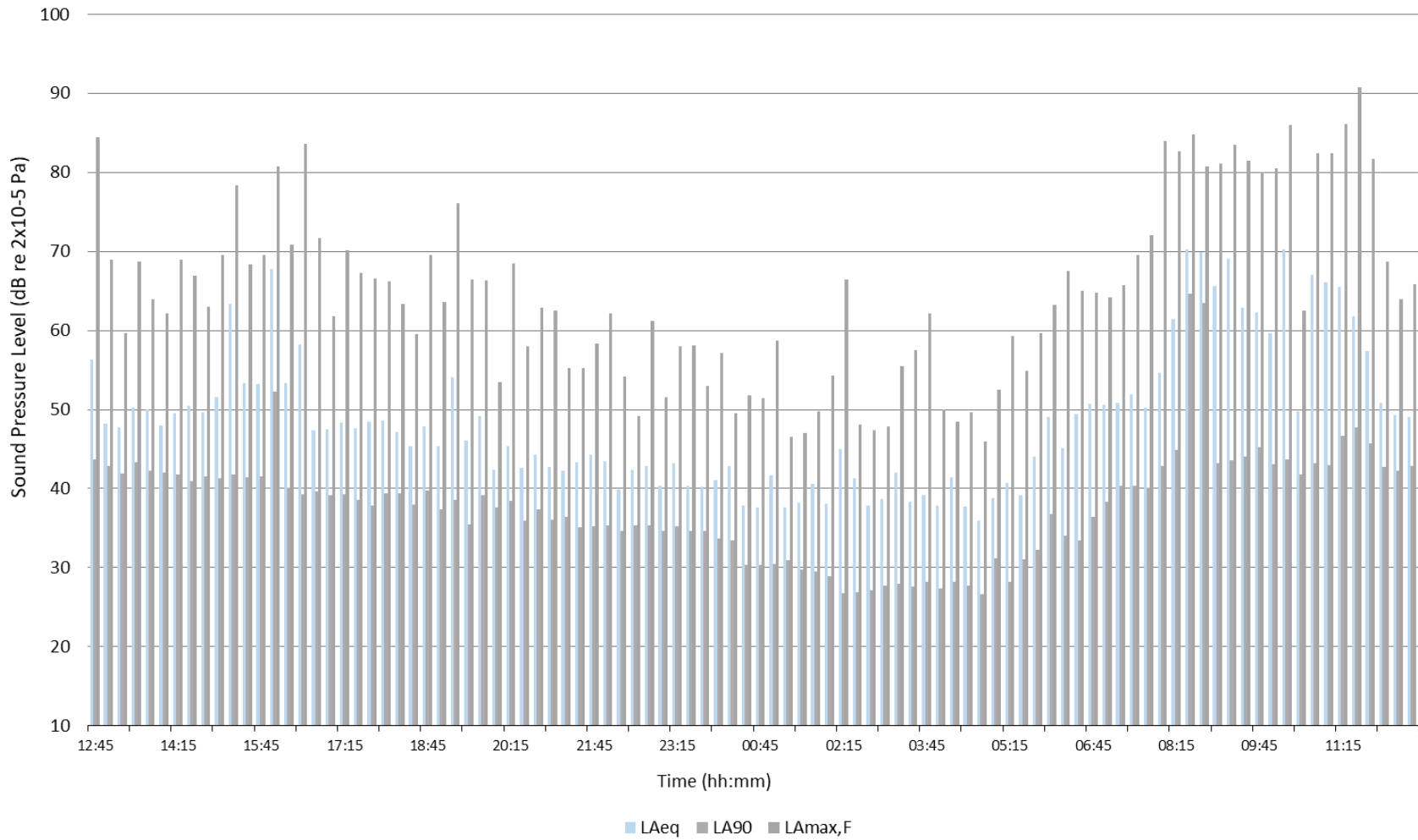


FIGURE A1: NOISE MEASUREMENT RESULTS – REAR OF 100 ALEXANDRA PARK ROAD

APPENDIX B: TABLES



Job No.	Job Title				
1838	100 Alexandra Park Road				
Date Created	By	Date Revised	Rev	Sheet	
12 Dec 2022	DF	12 Dec 2022	2	3	
Date Reviewed	By	Review Type	Review Status		

Calculation to rear of 98 Alexandra Park Road

Item / Description		Rating/Broadband/Input			31.5	Octave Band Centre Frequency, Hz							
		Rating	dB	dB(A)		63	125	250	500	1k	2k	4k	8k
Condenser 1	Lp at 1m			67.0 (A)		74.0	74.4	68.7	65.6	60.9	52.3	48.0	45.7
Condenser 2	Lp at 1m			71.9 (A)		70.7	74.6	70.8	69.9	67.4	62.7	54.9	46.0
Accumulative				73.1 (A)		75.7	77.5	72.9	71.3	68.3	63.1	55.7	48.9
Distance Loss	4m					12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
At Receptor				61.1 (A)		63.6	65.5	60.8	59.2	56.2	51.0	43.7	36.8

TABLE B1: CALCULATIONS – NO MITIGATION

Calculation to rear of 98 Alexandra Park Road

Item / Description		Rating/Broadband/Input			31.5	Octave Band Centre Frequency, Hz							
		Rating	dB	dB(A)		63	125	250	500	1k	2k	4k	8k
Condenser 1	Lp at 1m			67.0 (A)		74.0	74.4	68.7	65.6	60.9	52.3	48.0	45.7
Condenser 2	Lp at 1m			71.9 (A)		70.7	74.6	70.8	69.9	67.4	62.7	54.9	46.0
Accumulative				73.1 (A)		75.7	77.5	72.9	71.3	68.3	63.1	55.7	48.9
Distance Loss	8m					18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
Enclosure	300mm - SH300					7.0	7.0	10.0	17.0	29.0	30.0	27.0	21.0
Barrier Attenuation - Theory: Maekawa, Source Height: 0.3 m, Receiver Height: 3.5 m		1.4 m	0.3 m	5.6 m		-7.3	-8.9	-11.1	-13.8	-16.8	-19.8	-22.8	-25.0
At Receptor				30.1 (A)		43.3	43.5	33.7	22.4	4.4	-4.8	-12.2	-15.2

TABLE B2: CALCULATIONS – MITIGATION

APPENDIX C: TERMINOLOGY RELATING TO NOISE

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level	The sound level is the sound pressure relative to a standard reference pressure of $20\mu\text{Pa}$ (20×10^{-6} Pascals) on a decibel scale.
Sound Power Level (L_w)	is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1 / s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
$L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound
$L_{90,T}$	L_{90} is the noise level exceeded for 90% of the period T (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
Specific Noise	The noise source under investigation for assessing the likelihood of complaints.
Rating Level	The specific noise level plus any adjustment for the characteristic features of the noise.
Free field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
Façade	At a distance of 1m in front of a large sound reflecting object such as a building façade.

APPENDIX D: LIMITATIONS TO THE REPORT

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The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. Opinions included therein are based on information gathered during the study and from our experience. If additional information becomes available which may affect our comments, conclusions or recommendations AF Acoustics Ltd reserves the right to review the information, reassess any new potential concerns and modify our opinions accordingly.