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BAILEY GARNER

13 – 29 BELMONT ST, LONDON

PLANT NOISE ASSESSMENT

17 DECEMBER 2024

3092-AF-00001-01

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PLANT NOISE ASSESSMENT

DOCUMENT REFERENCE: 3092-AF-00001-01

REVIEW AND AUTHORISATION			
Authored and approved by Adrian Finn	**Position** Director	**Signature**	**Date** 17/12/2024
Reviewed by Daniel Flood	**Position** Senior Consultant	**Signature**	**Date** 17/12/2024

AMENDMENT HISTORY			
Issue	**Status**	**Description**	**Date**
01	Draft	Report issued	17/12/2024

CONTENTS **PAGE NO.**

1. INTRODUCTION

1.1.1 Bailey Garner has commissioned AF Acoustics Ltd. to undertake a plant noise assessment for the proposed installation of 9 No. Air Source Heat Pumps (ASHP) to be installed at 13-29 Belmont St, London NW1.

1.2 Brief and Scope

1.2.1 The brief is to undertake a plant noise assessment for the proposed plant to be installed at 13-29 Belmont St., to calculate the atmospheric noise emissions at the nearest residential receptors, in accordance with the requirements of Camden Council. If the proposed plant exceeds the local authority criteria, recommendations will be provided such that this can be achieved.

2. SITE DESCRIPTION

2.1 Location

2.1.1 13-29 Belmont St is a residential block of flats in a mainly residential street, located near Chalk Farm, within the administrative jurisdiction of Camden Council.

2.1.2 Six ASHP units are to be located on the first floor flat roof at the south of the building. The remaining three ASHPs are to be located at the rear of flats on the ground floor. The layout and plant locations are shown in Appendix A.

2.1.3 The site layout is shown in Figure 2.1.

2.1.4 The noise profile at the measurement locations consisted mainly of noise from traffic on the surrounding road network.

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.

3.2 Local Authority Guidance – Camden Council - Policy A4 Noise and vibration

3.2.1 The Camden Local plan seeks to ensure that noise and vibration is controlled and managed. Noise and Vibration thresholds are provided, appended to the local plan documentation. The noise limits relating to industrial and commercial noise sources are reproduced below in Table 3.1.

3.2.2 The local plan states that planning permission will not be granted for A) development likely to generate unacceptable noise and vibration impacts or B) development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.

3.2.3 It is also stated that Camden will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity.

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 57 dB L_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57 dB and 88dB L_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88 dB L_{Amax}

TABLE 3.1: CAMDEN LOCAL PLAN INDUSTRIAL AND COMMERCIAL NOISE THRESHOLDS

4. NOISE SURVEY AND MEASUREMENTS

4.1 Unattended Noise Survey

4.1.1 An unattended noise survey was undertaken by Adrian Finn of AF Acoustics.

4.1.2 The duration of the survey was between 11:10 on Monday 28 November to 11:40 on Tuesday 29 November 2024.

4.1.3 The sound level meter was located on the first floor flat roof overlooking the neighbouring 13 Belmont Street. The sound level meter was mounted on a tripod at a height of 1.5m above the first floor flat roof level.

4.1.4 The noise profile at the measurement location consisted mainly of local traffic noise from the local road network.

4.1.5 The measurement and plant locations are shown below in Figure 4.1.

4.1.6 Measurements were carried out in accordance with the requirements of BS 7445-2:1991 and ISO 1996-2:1987.

4.1.7 The sound level meter was calibrated both before and on completion of the survey, with no calibration drift observed. The microphones were fitted with windshields.

FIGURE 4.1: MEASUREMENT LOCATION
Note: Plant location is illustrative. Appendix A shows the actual location.

4.1.8 The equipment used is shown in Table 4.1.

Name	Serial Number	Last Calibrated
NTI Audio XL2-TA Class 1 Sound Level Meter	A2A-18530-E0	January 2023
NTI Audio MA220 Pre-amplifier	9566	January 2023
NTI Audio MC230A Microphone	A19842	January 2023
Larson Davis Calibrator	18295	January 2024

TABLE 4.1: MEASUREMENT EQUIPMENT

4.2 Measurement Weather Conditions

4.2.1 The weather during the measurements was mainly dry and clear. The temperature ranged from -3 to 8°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 period, whilst 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)	83	50	43
Nighttime (23:00 – 07:00)	75	46	40

TABLE 4.2: SUMMARY OF UNATTENDED NOISE MEASUREMENTS

5. PLANT NOISE ASSESSMENT

5.1 Noise Rating Limit

5.1.1 The table below presents the maximum noise rating level which must not be exceeded at the noise sensitive receptor.

Location	Measurement Period	Assessed Background Noise Level dB L_{A90}	Noise Rating Level Design Criteria	Plant Noise Rating Level Limit dB $L_{Ar,Tr}$
Properties on Belmont St	24 hour	40	-10dB below the typical background noise level – at night	30

TABLE 5.1: TARGET BACKGROUND NOISE LEVEL

5.2 Plant Noise Levels

5.2.1 It is proposed to install nine Mistubishi PUZ-WM50VHA ASHPs. The manufacturer's noise levels are presented in Table 5.2.

Plant		Sound Power Level, dB							
	Frequency Hz	63	125	250	500	1000	2000	4000	8000
Mistubishi PUZ-WM50VHA	L_p	57	56	49	49	48	42	36	28

TABLE 5.2: PLANT NOISE LEVEL

5.3 Mitigation

5.3.1 To meet the criteria from the London Borough of Camden, that noise from the plant is 10dB below the background noise level, AF Acoustics recommends that four of the ASHP units are housed within acoustic enclosures. The ASHP units which require an enclosure are shown in Figure 5.1.

5.3.2 The recommended manufacturer is Enclosures UK, model no. DE-L-024. The insertion losses are presented in Table 5.3.

Name	Model	Insertion Loss (dB) at Octave band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Enclosures Uk	DE-L-024	4	5	7	12	18	16	14	13

TABLE 5.3: ACOUSTIC ENCLOSURE SPECIFICATION

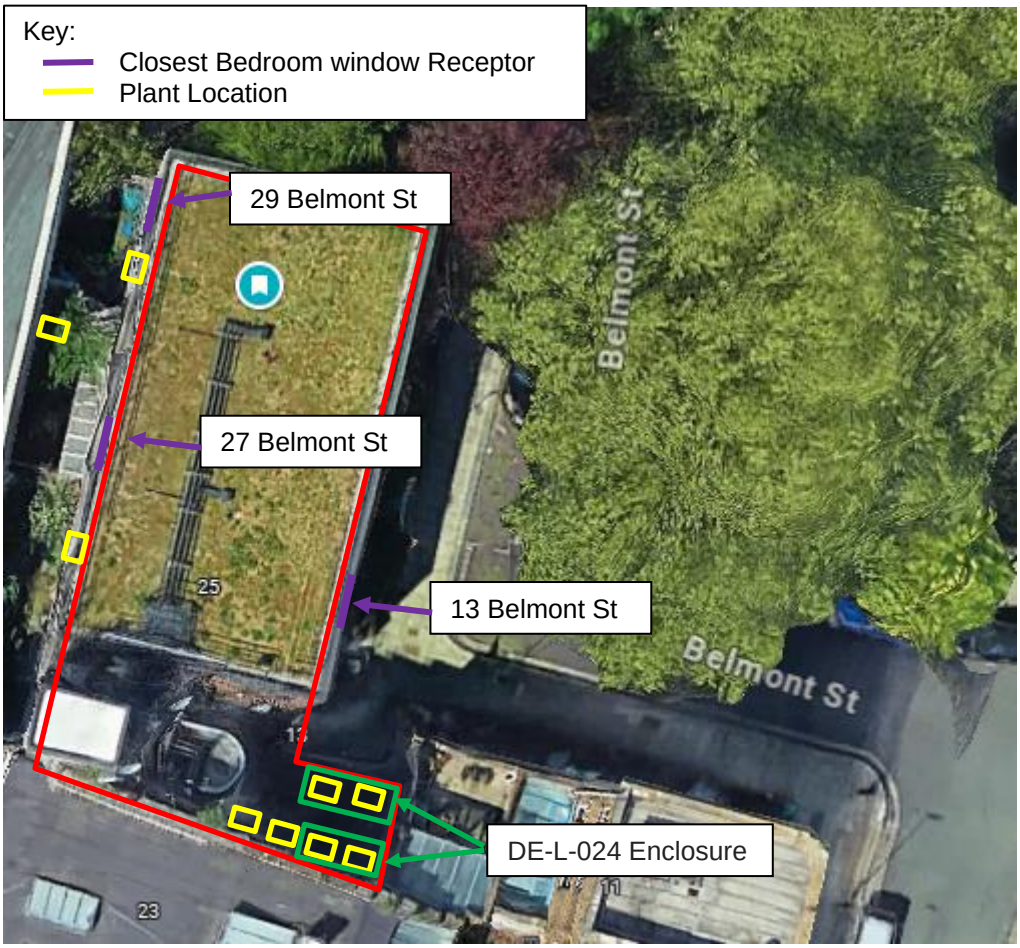

FIGURE 5.1: PLANT LOCATION WITH ENCLOSURES

5.4 Location of Nearest Sensitive Receptors

Receptor 1 – 13 Belmont St

The closest residential bedroom windows with the potential to be affected by noise from the plant installation, have been identified as belonging to the first floor flats and are marked out in Figure 5.1. These are located at an approximate distance of 7.5m from the nearest two items of the roof plant and 10m from the other four items of roof plant.

Receptor 2 - 29 Belmont St

The closest living room windows with the potential to be affected by noise from the ground floor plant installation at the neighbouring 27 Belmont St, have been identified as belonging to the ground floor flats of 29 Belmont St and are marked out in Figure 5.1. The living room is located at an approximate distance of 5.7 m from the proposed plant and does not have direct line of sight to the plant due to the neighbouring fence.

Receptor 3 – 27 Belmont St

The closest bedroom window with the potential to be affected by noise from the ground floor plant installation at the neighbouring 29 Belmont St, has been identified as belonging to the ground floor flats of 27 Belmont St are marked out in Figure 5.1. The bedroom is located at an approximate distance of 7.3 m from the proposed plant at 29 Belmont St and does not have direct line of sight to the plant due to the neighbouring fence.

27 Belmont St also has the potential to be affected by the ASHP to be installed at 25 Belmont St. The plant at 25 Belmont St is 4.9m from the bedroom window and does not have line of sight to the bedroom window.

5.5 Calculated Noise Levels

5.5.1 Table 5.4 provides a summary of the calculated plant noise levels at the nearest noise sensitive receptors. The calculation sheets are presented in Appendix B.

Location	Assessment Period	Target Plant Noise Rating Level dB $L_{Ar,Tr}$	Calculated Plant Noise Rating Level dB $L_{Ar,Tr}$
Receptor 1 – 13 Belmont St	24 hour	30	28
Receptor 2 - 29 Belmont St			25
Receptor 3 – 27 Belmont St			19

TABLE 5.4: PREDICTED NOISE LEVEL AT THE NEAREST RESIDENTIAL RECEPTOR

5.5.2 No correction factors have been added in accordance with BS4142:2014. There are no tones or other acoustic characteristics present from the proposed plant.

5.5.3 The results of the analysis indicate that the plant installation meets the proposed plant criteria. As per the semantics of BS4142:2014, the assessment indicates little likelihood of adverse impact.

5.5.4 The adoption of the above mitigation proposals is expected to see the plant noise levels achieve the requirements of Camden Council at the closest residential receptor, and should therefore be considered acceptable.

6. CONCLUSION

6.1.1 Bailey Garner has commissioned AF Acoustics Ltd. to undertake a plant noise assessment for the proposed installation of 9 No. Air Source Heat Pumps (ASHP) to be installed at 13-29 Belmont St.

6.1.2 The sound level meter was located on the first floor flat roof overlooking the neighbouring 13 Belmont Street in November 2024. The measurement position is considered representative of the noise levels affecting the nearest noise sensitive receptor. The representative noise levels measured at this location have been used to establish the prevailing environmental noise climate.

6.1.3 Plant noise emission criteria have been set at the nearest receptor based on the results of the noise survey and in conjunction with the national and local guidance.

6.1.4 Noise calculations based on the plant data have been undertaken to the nearest noise sensitive receptors.

6.1.5 The results of the assessment have been used to assess the impact of noise from the proposed plant at the nearest noise-sensitive receptors. The calculations show that additional noise mitigation is required.

6.1.6 It is recommended that four of the rooftop ASHP units are housed within acoustic enclosures.

6.1.7 The adoption of the above mitigation will ensure that the predicted plant noise levels meet the requirements of Camden Council at the closest residential receptors, and should therefore be considered acceptable.

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APPENDIX A: FIGURES

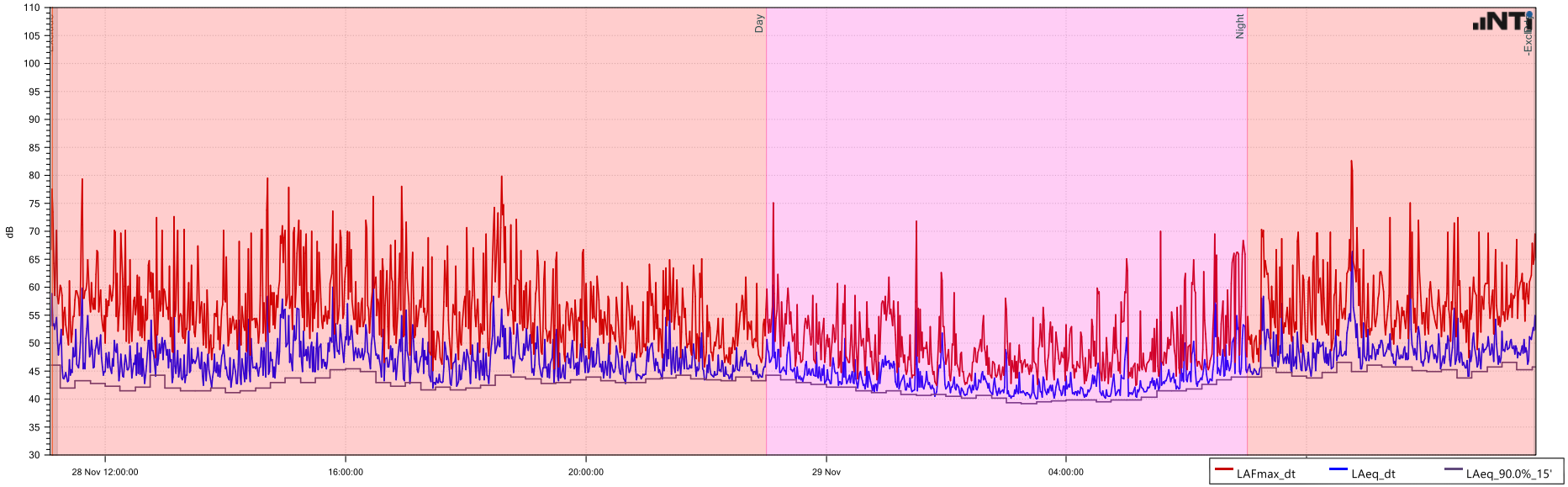

FIGURE A1: NOISE MEASUREMENT RESULTS – BELMONT ST

FIGURE A2: GROUND AND FIRST FLOOR PLAN

APPENDIX B: TABLES

Job No.	Job Title			
3092	Belmont St			
Date Created	By	Date Revised	Rev	Sheet
09 Dec 2024	AF	12 Dec 2024	9	2
Date Reviewed	By	Review Type	Review Status	
12/12/2024	AF	Self Check	No Comments	

Plant Calculation - 1st floor flat roof

	Item / Description		Rating/Broadband/Input Rating	dB	dB(A)	Octave Band Centre Frequency, Hz 31.5	63	125	250	500	1k	2k	4k	8k
	To Flat 13													
	Closet ASHP													
	Mistubishi PUZ-WM50VHA	Lp			51.7 (A)		57.0	56.0	49.0	49.0	48.0	42.0	36.0	28.0
	Ratio of Distances - Point Source		1.0 m	7.5 m		-17.5	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5
	Enclosures UK DE-L-024						-4.0	-5.0	-7.0	-12.0	-18.0	-16.0	-14.0	-13.0
	Number of Sources Correction		2 x			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
‡	Level at receiver				25.5 (A)		38.5	36.5	27.5	22.5	15.5	11.5	7.5	0.5
‡	Right rear ASHP													
‡	Mistubishi PUZ-WM50VHA	Lp			51.7 (A)		57.0	56.0	49.0	49.0	48.0	42.0	36.0	28.0
‡	Ratio of Distances - Point Source		1.0 m	10.0 m		-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0
	Number of Sources Correction		2 x			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
	Enclosures UK DE-L-024						-4.0	-5.0	-7.0	-12.0	-18.0	-16.0	-14.0	-13.0
	Level at receiver				23.0 (A)		36.0	34.0	25.0	20.0	13.0	9.0	5.0	-2.0
	Left rear ASHP													
	Mistubishi PUZ-WM50VHA	Lp			51.7 (A)		57.0	56.0	49.0	49.0	48.0	42.0	36.0	28.0
	Ratio of Distances - Point Source		1.0 m	10.0 m		-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0
	Number of Sources Correction		2 x			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
	Path Length Difference						-7.7	-9.4	-11.8	-14.7	-17.6	-20.6	-23.6	-26.7
	Level at receiver				19.7 (A)		32.4	29.6	20.2	17.4	13.4	4.4	-4.6	-15.6
=	**Sum of all plant**				**28 (A)**		**41.1**	**39.0**	**29.9**	**25.2**	**18.9**	**14.0**	**9.6**	**2.5**

TABLE B1: PLANT CALCULATIONS – 1ST FLOOR ROOF

Job No.	Job Title			
3092	Belmont St			
Date Created	By	Date Revised	Rev	Sheet
09 Dec 2024	AF	12 Dec 2024	5	4
Date Reviewed	By	Review Type	Review Status	
12/12/2024	AF	Self Check	No Comments	

Plant Calculation - 27 Belmont St

Item / Description		Rating/Broadband/Input Rating	dB	dB(A)	Octave Band Centre Frequency, Hz 31.5	63	125	250	500	1k	2k	4k	8k
From No. 29													
Mistubishi PUZ-WM50VHA	Lp			51.7 (A)		57.0	56.0	49.0	49.0	48.0	42.0	36.0	28.0
Ratio of Distances - Point Source		1.0 m	7.3 m		-17.3	-17.3	-17.3	-17.3	-17.3	-17.3	-17.3	-17.3	-17.3
Number of Sources Correction		1 x			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Path Length Difference						-7.7	-9.4	-11.8	-14.7	-17.6	-20.6	-23.6	-26.7
Level at receiver				19 (A)		32.1	29.3	19.9	17.1	13.1	4.1	-4.9	-15.9

TABLE B2: PLANT CALCULATIONS TO 27 BELMONT ST

Job No.	Job Title			
3092	Belmont St			
Date Created	By	Date Revised	Rev	Sheet
09 Dec 2024	AF	12 Dec 2024	7	5
Date Reviewed	By	Review Type	Review Status	
12/12/2024	AF	Self Check	No Comments	

Plant Calculation - 29 Belmont St

	Item / Description		Rating/Broadband/Input Rating	dB	dB(A)	Octave Band Centre Frequency, Hz 31.5	63	125	250	500	1k	2k	4k	8k
	From No. 27													
	Mistubishi PUZ-WM50VHA	Lp			51.7 (A)		57.0	56.0	49.0	49.0	48.0	42.0	36.0	28.0
	Ratio of Distances - Point Source		1.0 m	5.7 m		-15.1	-15.1	-15.1	-15.1	-15.1	-15.1	-15.1	-15.1	-15.1
	Number of Sources Correction		1 x			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Path Length Difference						-7.7	-9.4	-11.8	-14.7	-17.6	-20.6	-23.6	-26.7
	Level at receiver				21.5 (A)		34.2	31.4	22.0	19.2	15.3	6.2	-2.8	-13.8
	From No. 25													
	Mistubishi PUZ-WM50VHA	Lp			51.7 (A)		57.0	56.0	49.0	49.0	48.0	42.0	36.0	28.0
	Ratio of Distances - Point Source		1.0 m	4.9 m		-13.8	-13.8	-13.8	-13.8	-13.8	-13.8	-13.8	-13.8	-13.8
	Number of Sources Correction		1 x			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
‡	Path Length Difference						-7.7	-9.4	-11.8	-14.7	-17.6	-20.6	-23.6	-26.7
‡	Level at receiver				22.8 (A)		35.5	32.8	23.3	20.5	16.6	7.6	-1.5	-12.5
=	Logarithmic Sum				25 (A)		37.9	35.2	25.8	22.9	19.0	10.0	0.9	-10.1

TABLE B3: PLANT CALCULATIONS TO 29 BELMONT ST

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_{μ}Pa ($20x10^{-6}$ Pascals) on a decibel scale.
Sound Power Level (Lw)	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_{μ}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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