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12 EARLHAM STREET, LONDON, WC2

Technical Note

Acoustic Assessment Report – Revision A

22nd November 2017 Peter Clark

1. INTRODUCTION

1.1 A noise survey has been carried out adjacent to the residential property at 12 Earlham Street, London, WC2. The property is to be refurnished and a part of the proposed work includes the installation of an air conditioning system which will serve a number of the rooms at the property. The noise survey and assessment report is required to accompany a Planning Application for the installation of the external air conditioning unit at the property. A single outdoor unit is proposed. The unit is to be positioned on the first floor flat roof at the rear of the property, close to and partially shielded by the existing ventilation ductwork which serves a neighbouring property. 12 Earlham Street lies close to the corner of Tower Street and Earlham Street itself. The property is a single dwelling over five floors with a small extension and flat roof at the rear. Many of the neighbouring properties are commercial/restaurant spaces with some residential above. The nearest neighbouring areas for assessment purposes are the upper floor windows of the neighbouring properties at 14 Earlham Street, 4-10 Tower Street and the rear of the flats in 19-22 Tower Street[1].

[1] The rear windows in 10 Earlham Street are not considered in the assessment as they serve "non-habitable" rooms (i.e. stairwell/toilets etc). 10 Earlham Street is commercial/office space.

1.2 The measurements have shown that the proposed installation meets with the requirements of the London Borough of Camden (LBC) Environmental Noise Policy (Policy A4) without the need for additional noise attenuation measures.

1.3 The site location and surroundings are given in Figure 1 below:

Figure 1: Site Location (© Google Maps) – 12 Earlham Street (from rear)

1.4 The noise survey and assessment has been completed by Dr Peter Clark who is a Chartered Engineer and a Member of the Institute of Acoustics with 25 years professional experience.

2.0 NOISE MEASUREMENTS

2.1 Environmental noise measurements were carried out from Friday 15th September to Wednesday 20th September 2017. Sound level measurement equipment was installed on the flat roof at the rear of the property close to the nearest neighbouring windows and used to log noise levels over the four day period. The measurement equipment is listed below in Table 1.

Table 1 Environmental Noise Measurement Instrumentation

No.	Description
1.	Larson Davis Model 812 Sound Level Meter.
2.	Larson Davis Model 2541 1/2" Diameter Condenser Microphone.
3.	Larson Davis Model CAL200 Sound Level Meter Calibrator.

2.2 All acoustic equipment conforms to the relevant parts of BS EN 60651:1994 (equivalent to BS 5969:1981) for the requirements of Type 1 acoustic accuracy. Additionally, the relevant equipment conforms to the specifications contained within BS EN 60804:1994 (equivalent to BS 6698:1976) for integrating sound level meters.

2.3 In order to verify the correct operation of the equipment on site, an acoustic calibrator was applied during the course of the measurements. A maximum change of 0.1 dB(A) was noted, this can be considered as an insignificant change. The calibrator complies with the specifications of IEC

942:2003. The equipment was previously laboratory calibrated in January 2017.

2.4 Fast meter response was used for all measurements carried out during the course of the survey.

2.5 Noise levels are expressed in terms of continuous equivalent noise levels (L_{Aeq}) over an appropriate time period. The use of L_{Aeq} allows non-steady and non-continuous noise to be assessed and compared to the existing noise climate. L_{Aeq} is referred to as the ambient noise level. In addition to this background noise levels have also been measured and are expressed as L_{A90}. A full explanation of terminology commonly used in the measurement and assessment of noise levels is given in Appendix B at the end of this report.

3.0 RESULTS

3.1 Noise level measurements were carried out at 5 minute intervals during the survey period. Ambient (L_{Aeq}) and background (L_{A90}) noise levels were measured. Minimum noise levels for the day-time (07:00 to 19:00 hrs), evening time period (19:00 to 23:00 hrs) and night time period (23:00 to 07:00 hrs) have been determined.

Table 2: Summary Results

	Day	Evening	Night
L_{A90}	51.8	51.1	47.9(45.2)*
L_{Aeq}	57.8	55.1	52.3

*Note: The lowest night time background noise level measured during the survey period was 45.2 dB(A) and occurred at 4.15am on Monday 18th September 2017.

3.2 Although the survey was not attended on a full time basis, it was noted that during site visits that the Earlham Street itself was being re-surfaced and these works dominated day-time noise levels at the front of the property. The rear of the property is relatively well-sheltered although noise from an existing ventilation system (which serves other properties) could be heard. A full listing of measured noise data for the period is given in the graph at the end of this report (Figure A1). A photograph showing the noise monitor in position at the property is shown in Figure A2.

3.3 Noise level data for the unit to be installed at the property are given as 52 dB(A) at 1m (See attached data sheet shown in Figure A3 – Daikin 5MXS90E) in either heating or cooling mode. The nearest neighbouring windows for assessment are (a) the windows in the rear façade of 14 Earlham Street (b) the first floor windows of 4-10 Tower Street and (c) the rear windows of flats in 19-22 Tower Street. The location of the unit is such that the windows of 19-22 Tower Street are shielded from the unit by the rear wall of 19-22 Tower Street itself. A layout is shown in Figures A4a and b. Calculated noise levels are as follows (see also Figure A5 at the end of this report):

Rear Windows – 14 Earlham Street

- Unit S.P.L. at 1m: 52 dB(A) – see data sheet (Figure A.3)
- Distance correction (7m): - 16.9 dB(A)
- Resultant predicted noise level: 35.1 dB(A)

Rear Windows – First Floor, 4-10 Tower Street

- Unit S.P.L. at 1m: 52 dB(A) – see data sheet (Figure A.3)
- Distance correction (14m): - 22.9 dB(A)
- Resultant predicted noise level: 29.1 dB(A)

Rear Windows – First Floor Flats, 19-22 Tower Street

- Unit S.P.L. at 1m: 52 dB(A) – see data sheet (Figure A.3)
- Partial barrier/screening from wall of 19-22 Tower Street: -5 dB(A)
- Distance correction (8m): - 18.1 dB(A)
- Resultant predicted noise level: 29.0 dB(A)

3.4 The London Borough of Camden Local Plan (Adopted Version) Policy A4 "Noise and Vibration" states that *"The Council will seek to ensure that noise and vibration is controlled and managed"*. Furthermore the policy states that *"Developments should be have regard to Camden's Noise and Vibration Thresholds (Appendix 3)"*. Appendix 3; Table C "Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)" is listed below. In Table C;

- NOEL refers to "No Observed Effect Level"
- LOAEL refers to "Lowest Observed Adverse Effect Level"
- SOAEL refers to "Significant Observed Adverse Effect Level"

Each of these terms are described in greater detail in the National Planning Policy Framework and Planning Practice Guidance"

Existing Noise Sensitive Receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (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 9 dB below and 5 dB above background	"Rating level" greater than 5 dB above background
Dwellings	Outside bedroom window (façade)	Night	"Rating level" 10dB* below background and no events exceeding 57 dB L_{Amax}	"Rating level" between 9 dB below and 5 dB above background or noise events between 57 dB and 88 dB L_{Amax}	"Rating level" greater than 5 dB above background and/or events exceeding 88 dB L_{Amax}

** 10 dB should be increased to 15 dB if the noise contains audible tonal elements (day or night) …*

3.5 The proposed air conditioning equipment does not attract the + 5 dB(A) correction referred to in *"BS4142" and Table C above* (i.e. contains no distinguishable discrete continuous note or distinct impulses)

3.6 It therefore follows that the criterion to meet is 35.2 dB(A)[2] (10 dBA less than the lowest night-time background noise level measured – see Table 2 above) and installation is shown to meet with the criterion without the need for additional noise control.

3.7 London Borough of Camden Policy A4 Appendix 3 also states that in some cases *"… the Council will generally also require a NR curve specification of NR35 or below … 1 metre from the façade of the affected premises …"*. Detailed calculations (including frequency data) for each receptor is given in Figure A5 where the resulting noise levels are also plotted with reference to the NR35 spectrum.

4.0 CONCLUSION

4.1 A noise measurement survey and assessment has been carried out on the external air conditioning condensing unit which is to be installed on the flat roof at the rear of 12 Earlham Street, London WC2.

4.2 The proposed installation has been shown to meet with the London Borough of Camden's acoustic criteria. No additional noise control measures are required.

[2] These levels being below the LOAEL as referred to in Appendix 3: Noise Thresholds of Camden Policy A4 and as such fall into the "Green" category *where noise is considered to be an acceptable level.*

APPENDIX A: GRAPHS AND FIGURES.

Figure A1: Environmental Noise Measurement Data – Friday 15th to Wednesday 20th September 2017.

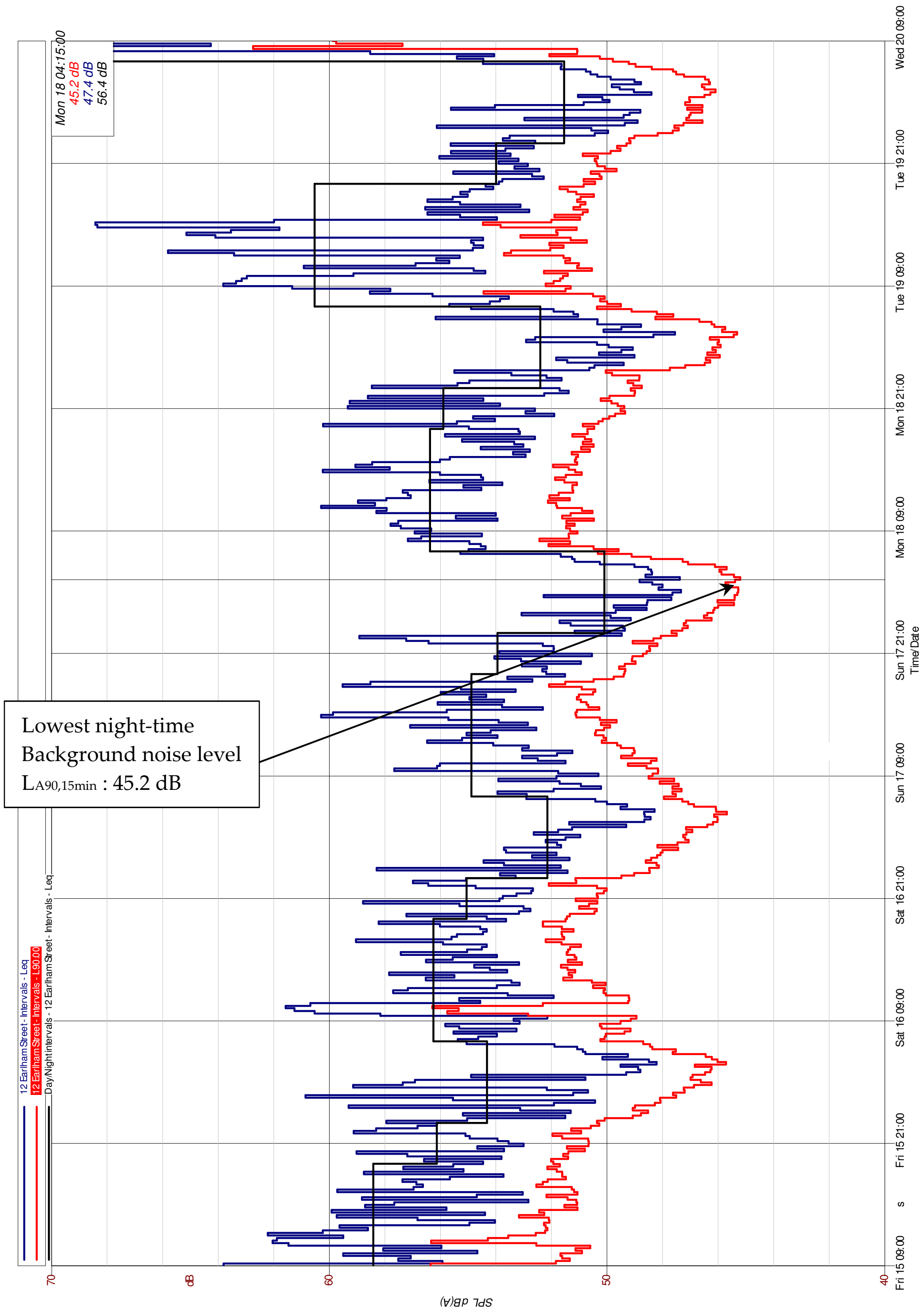
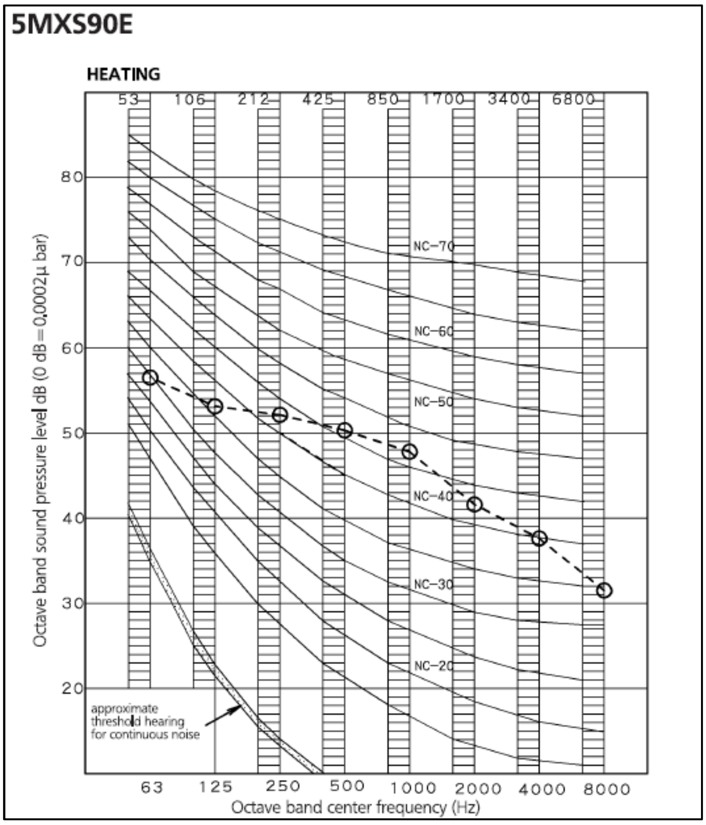


Figure A.2: Noise Monitoring Equipment at rear of 12 Earlham Street

Figure A3: Equipment Noise Data

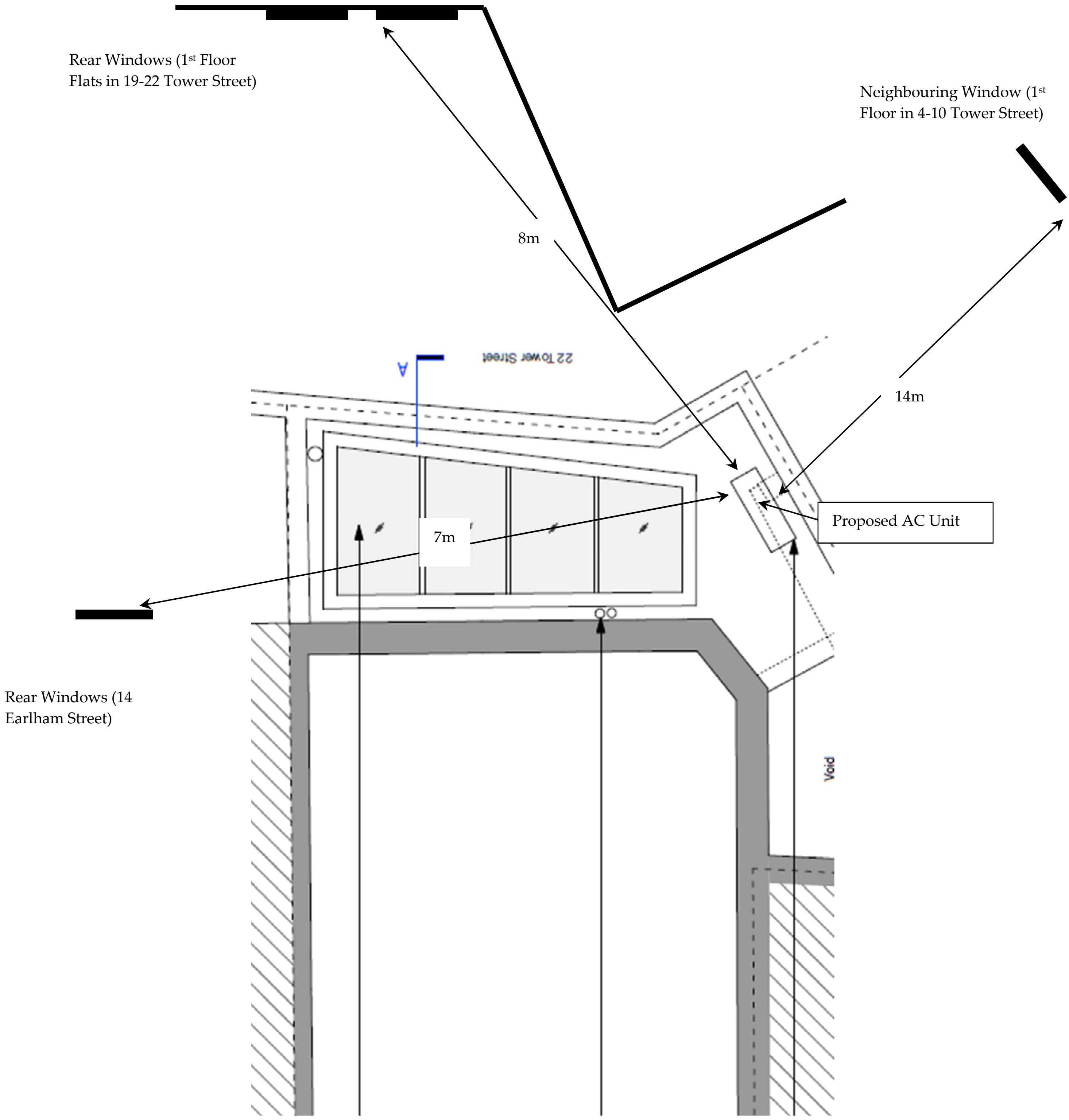
Daikin 5MXS90E

Outdoor Units			2MXS40H	2MXS50H	3MXS40K	3MXS52E	3MXS68G	4MXS68F	4MXS80E	5MXS90E
Capacity	Nominal Cooling	kW	4.00	5.00	4.00	5.20	6.80	6.80	8.00	9.00
	Nominal Heating	kW	4.40	5.70	4.60	6.80	8.60	8.60	9.60	10.40
Dimensions	Height	mm	550	550	735	735	735	735	770	770
	Width	mm	765	765	936	936	936	936	900	900
	Depth	mm	285	285	300	300	300	300	320	320
Weight		kg	38	42	49	49	58	58	72	73
Electrical Details	Power Supply	Phase	1ph							
		Hz	50							
		V	230							
	Running Current	amps	Refer to Multi Combination Tables							
	Starting Current	amps	4	4	4	4	4	4	4	4
	Fuse Rating	amps	16	16	16	20	20	20	20	20
Refrigerant Circuit	Refrigerant Type		R410a							
	Refrigerant Charge	kg	1.2	1.6	2.0	2.0	2.6	2.6	3.0	3.0
Sound Pressure	High	dBA	47	48	46	46	48	48	48	52



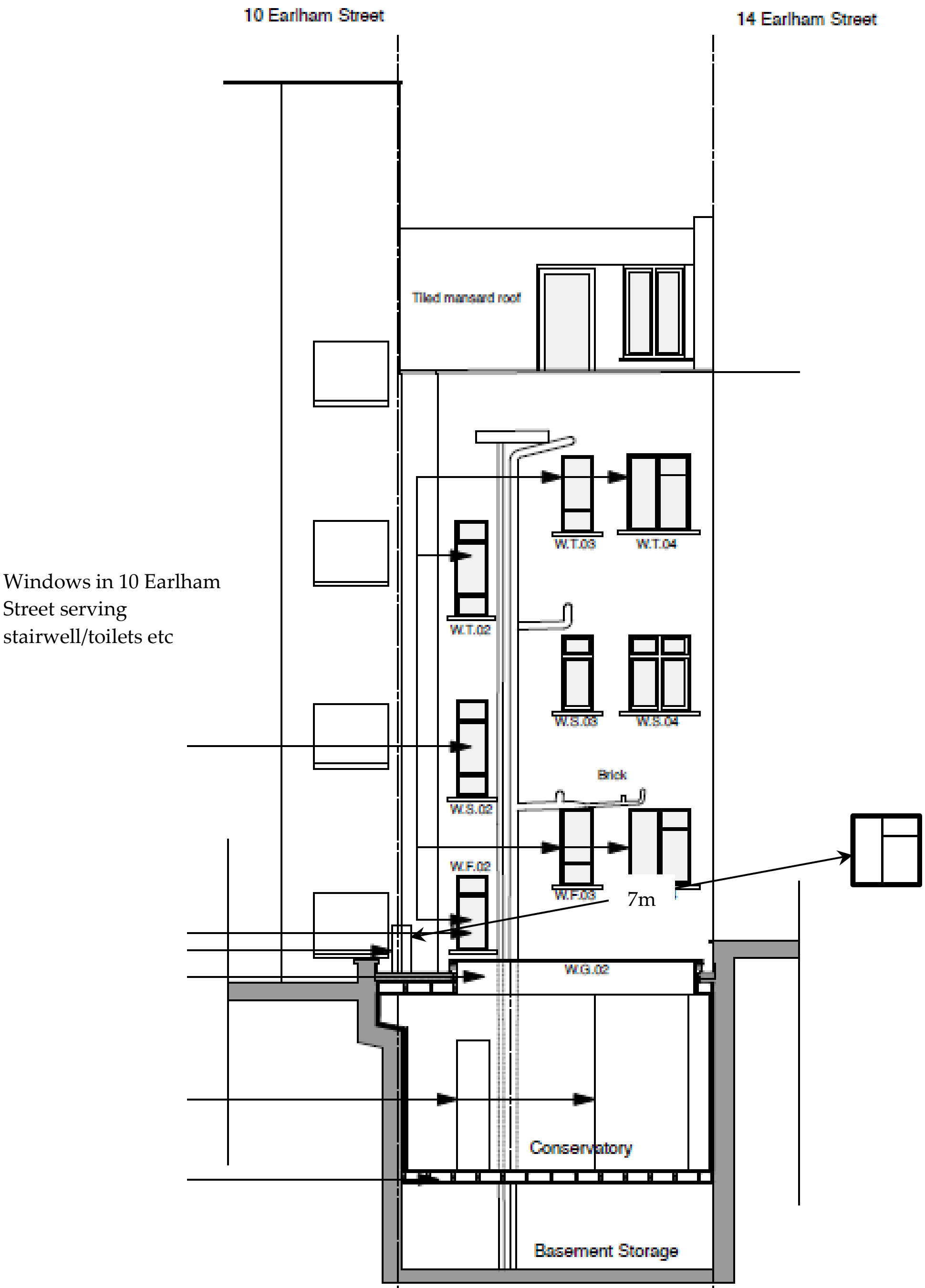
Revision A

Figure A4a: Layout Drawing (Plan View)



Extract from Johanna Molineus Architects 232 12-202 Rev B Dated July 2016

Figure A4b: Layout Drawing (Rear Elevation)



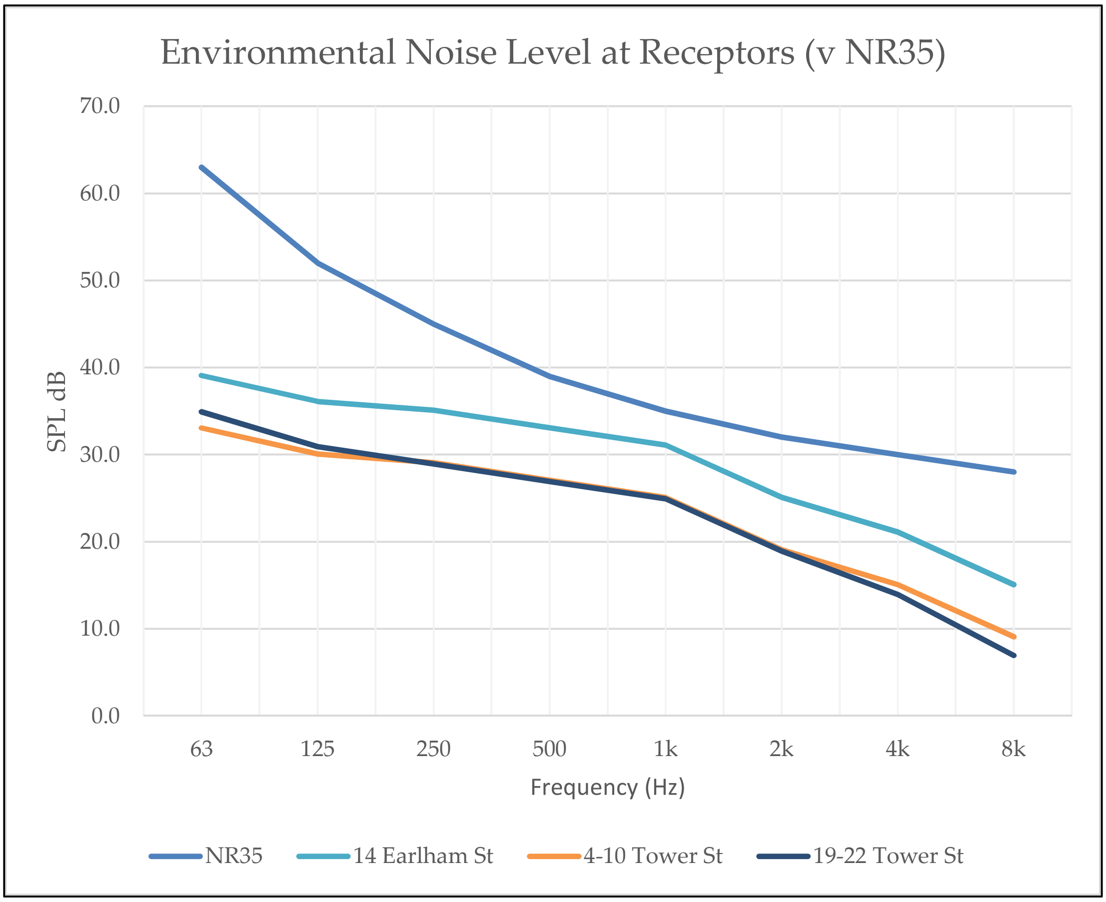
Extract from Johanna Molineus Architects 232 12-251 Rev B Dated July 2016

Figure A5: Detailed Calculations and NR curves

12 Earlham Street

Octave Band Frequency

	63	125	250	500	1k	2k	4k	8k	A
1. Daikin 5MXS90E									
1.1 SPL AT 1M	56.0	53.0	52.0	50.0	48.0	42.0	38.0	32.0	
A-weighting	-26.0	-16.0	-9.0	-3.0	0.0	1.0	1.0	-1.0	
	30.0	37.0	43.0	47.0	48.0	43.0	39.0	31.0	52
2. Distance									
14 Earlham St (7m)	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	
4-10 Tower St (14m)	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	
19-22 Tower St (8m)	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	
3. Screening etc									
14 Earlham St									
4-10 Tower St									
19-22 Tower St	-3.0	-4.0	-5.0	-5.0	-5.0	-5.0	-6.0	-7.0	
4. Receptor SPL									
14 Earlham St	13.1	20.1	26.1	30.1	31.1	26.1	22.1	14.1	35
4-10 Tower St	7.1	14.1	20.1	24.1	25.1	20.1	16.1	8.1	29
19-22 Tower St	8.9	14.9	19.9	23.9	24.9	19.9	14.9	5.9	29



APPENDIX B: GLOSSARY OF NOISE TERMS AND UNITS.

1.0 Noise

1.1 The sounds that we hear are as a result of successive air pressure changes. These air pressure changes are generated by vibrating sources, such as train engines or wheels, and they travel to a receiver, i.e. the human ear, as air pressure waves.

1.2. The human ear is capable of detecting a vast range of air pressures, from the lowest sound intensity that the normal ear can detect (about 10^{-12} watts/m^2) to the highest that can be withstood without physical pain (about 10 watts/m^2). If we were to use a linear scale to represent this range of human sensitivity it would encompass more than a billion units. Clearly this would be an unmanageable scale yielding unwieldy numbers.

1.3. The scale can be compressed by converting it to a logarithmic or Bel scale, the number of Bels being the logarithm to the base 10 of one value to another (as applied by Alexander Graham Bell to measure the intensity of electric currents). The Bel scale gives a compressed range of 0 to 12 units which in practice is a little too compressed. A more practical operating range of 0 to 120 is obtained by multiplying by 10, ie. 10 x Bel, which produces the scale units known as decibels or dB.

1.4. Examples of typical sound intensity levels within the decibel range of 0 to 120 dB are listed below:

Commercial four-engine jet aircraft at 100m	120dB
Riveting of steel plate at 10m	105dB
Pneumatic drill at 10m	90dB
Circular wood saw at 10m	80dB
Heavy road traffic at 10m	75dB

Male speech, average, at 10m	50dB
Whisper at 10m	25dB
Threshold of hearing, 1000Hz	0dB

1.5. Due to this logarithmic scale noise levels have to be combined logarithmically rather than arithmetically. For example, two equal sound sources of 70 dB each, when operated simultaneously, do not produce a combined level of 140 dB but instead result in a level of 73 dB, ie. A rise of 3dB for each doubling of sound intensity. Subjectively, a 3dB change does not represent a doubling or halving of loudness; to make a sound appear twice as loud requires an increase in sound pressure level of about 10dB.

1.6. The subjective loudness of noise can be measured by applying a filter or weighting which equates to the frequency response of the human ear. This is referred to as an A-weighting and when applied results in noise levels expressed as dB(A).

1.7. dB(A) noise levels can be measured using a variety of noise indices. The index which correlates best with human response due to machinery noise is the L_{Aeq} this is the A-weighted L_{eq} which is referred to as the 'equivalent continuous noise level' and is a measure of the total sound energy generated by a fluctuating sound signal within a given time period.