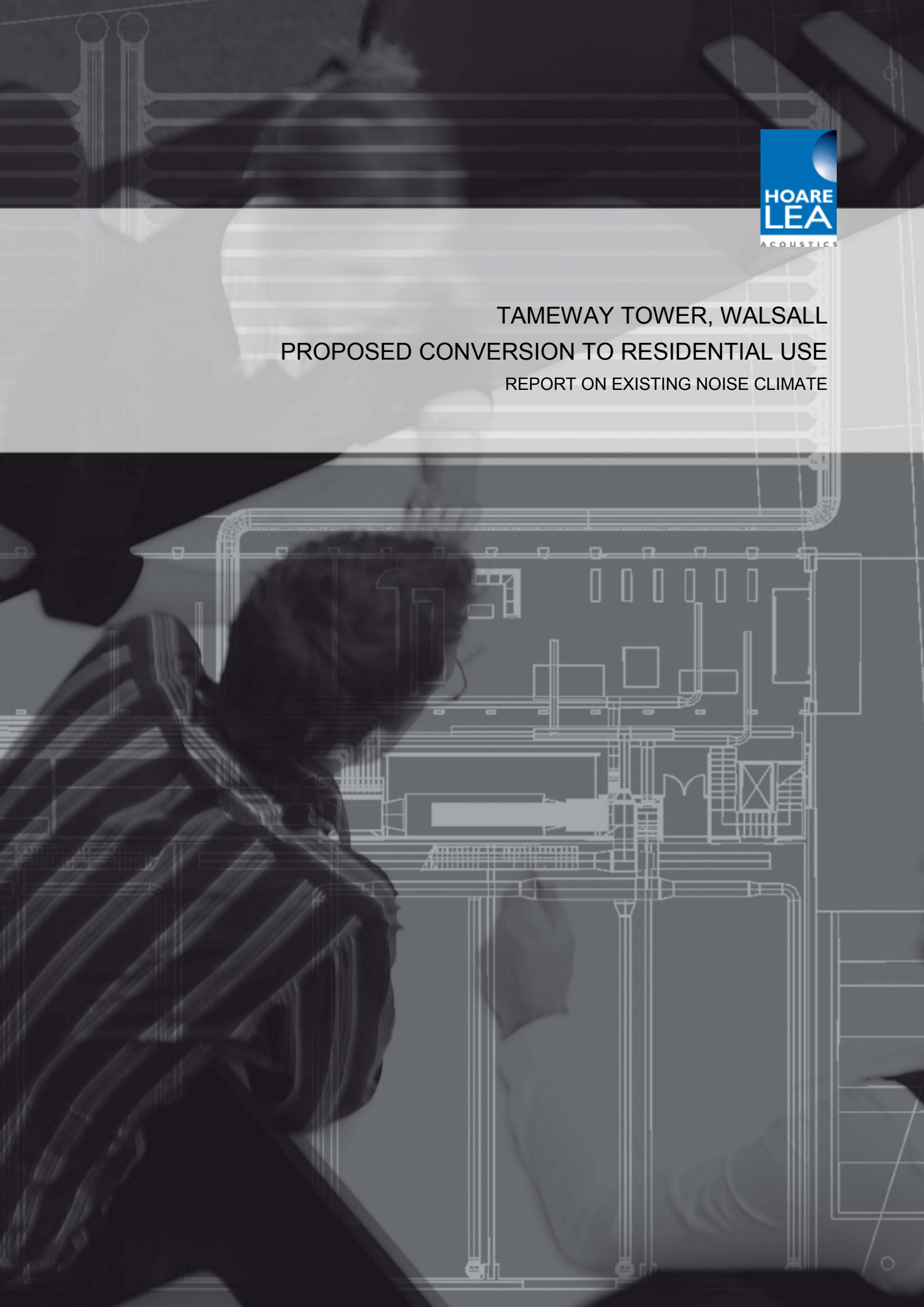

TAMEWAY TOWER, WALSALL

PROPOSED CONVERSION TO RESIDENTIAL USE

REPORT ON EXISTING NOISE CLIMATE

TAMEWAY TOWER, WALSALL

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REPORT ON EXISTING NOISE CLIMATE

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REVISION	DESCRIPTION	DATE	ISSUED BY	REVIEWED BY
R0 DFC	Survey report	4th June 2014	AMcC	
R1	Client issue	6 June 2014	AMcC	DM
R2	Updated site details and drawings	20 June 2014	AMcC	DM

CONTENTS

1. INTRODUCTION

Assessment has been made of the existing noise climate at Tameway Tower, Bridge Street, Walsall. It is proposed that the building be refurbished and converted to residential use.

This report details the results of all site measurements and reviews this data with respect to applicable guidance and standards for residential development.

2. SITE DESCRIPTION

The site is located at Tameway Tower, an existing office building at the junction of Bridge Street and Goodall Street on the eastern side of Walsall town centre. The building is currently part occupied with offices on the lower ground, ground and 1st floors of the building forming the larger pedestal area of the building with the smaller footprint of levels 2 to 12 above. The remaining floors are empty but were former offices.

At lower ground floor level is the Tameway Tower entrance hallway with access from Bridge Street. This lower ground floor also contains the plant room and an existing retail unit. An internal stairway then then steps up to concierge and a disused restaurant premises.

Bridge Street forms the northern site boundary and carries a high volume of traffic during the daytime and evening through the town centre. Traffic speeds on this section of road are limited by the close proximity of the road junctions with Goodall Street and Rushall Street both of which are controlled by traffic lights. In addition, that section of Bridge Street immediately in front of the site has restricted access with westerly movements limited to buses and service vehicles.

Across Bridge Street to the north are a number of retail and commercial premises including a restaurant and bar towards the north east.

To the south and west of Tameway Tower is a ground level car-park solely to be used by members of staff working within the building. Beyond the car park to the south is Freer Street, a one-way street providing access to the rear of local shops, the NCP Freer Street Car Park, The Lounge Public House and Goodall Street.

Beyond the car park to the west are a series of commercial and retail premises including the WS1 Nightclub at a distance of approximately 40m.

The eastern site boundary is formed by Goodall Street which provides access to the surrounding residential and commercial district. Traffic flows on this road are relatively light and intermittent. Currently, the majority of the buildings beyond Bridge Street and Goodall Street are in commercial use including offices and retail space.

An aerial view of the site is given at Figure 1.

3. DEVELOPMENT PROPOSALS

Current development proposals include for conversion of the office space to residential accommodation. There will be 19 units of accommodation on the first floor with 9 units per level within the tower, comprising a total of 118 units.

Figures 2 and 3 show the current proposed floor plans.

4. BASIS OF ASSESSMENT

4.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) 2012 sets out the Government planning policies for England and how these are expected to be applied.

Section 11, Conserving and enhancing the natural environment, para 123 of NPPF states:

'Planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put upon them because of changes in nearby land uses since they were established
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason'

Reference is made to the DEFRA Noise Policy Statement for England 2010 (NPSfE). This latter document is intended to apply to all forms of noise other than that which occurs in the workplace and includes environmental noise and neighbourhood noise in all forms.

NPSfE advises that the impact of noise should be assessed on the basis of adverse and significant adverse effect but does not provide any specific guidance on assessment methods or limit sound levels. Moreover, the document advises that it is not possible to have 'a single objective noise-based measure…that is applicable to all sources of noise in all situations'. It further advises that the sound level at which an adverse effect occurs is 'likely to be different for different noise sources, for different receptors and at different times'.

In the absence of specific guidance for assessment of environmental noise within NPPF and NPSfE it is considered appropriate to base assessment on current British Standards and appropriate local or national guidance.

4.2 BS8233: 2014

BS8233:2014 'Guidance on sound insulation and noise reduction for buildings' is the current British Standard providing guidance for acoustic requirements within buildings. The Standard advises appropriate criteria and limits for different building types including dwellings.

BS8233 provides guidance regarding acceptable internal and external noise level criteria for dwellings but does not form any statutory requirement to achieve the guidance values provided therein. The BS8233 internal design criteria for dwellings are as follows:

Table 1 – BS8233 recommended Internal ambient noise level guidelines

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living rooms	35 dB $L_{Aeq,16hour}$	-
Dining	Dining Room / Area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Section G1 of BS 8233 advises that, where windows are open for ventilation, then sound reduction is limited to 15dB.

For gardens and terraces, the Standard states that it is desirable that the steady noise level does not exceed $L_{Aeq,T}$ 50dB whilst a level of $L_{Aeq,T}$ 55dB would be acceptable in noisier environments. However, BS 8233 states that, 'it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable…In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited'.

4.3 BS 4142:1997

BS4142: 1997 *'Rating industrial noise affecting mixed residential and industrial areas'* is the current British Standard providing guidance for assessment of noise impact from industrial and commercial sites. The Standard details a procedure for assessing if noise is likely to give rise to complaints from residents within the vicinity. In general, the likelihood of complaint in response to a particular noise is dependent upon factors including the margin by which it exceeds the background noise level, the character of the noise and its occurrence. The Standard recommends the determination of the Rating Level of the specific source by a correction of +5 dB if it contains any of the following features:

- The noise contains a discreet distinguishable continuous note i.e. whine, hiss screech etc;
- The noise contains distinct impulses - i.e. bangs, clatters or thumps; and
- The noise is irregular enough to attract attention.

The likelihood of complaints is assessed by comparing the measured background level with the Rating Level. Where the rating level exceeds the background the chances of complaint increases as shown below:

+10 dB or greater above measured background	Complaints Likely
+ 5 dB	Marginal Significance
- 10 dB or more below measured background	Complaints unlikely

5. MEASUREMENTS

Monitoring was undertaken at the site over a weekday and weekend period between Thursday 15th to Tuesday 20th May 2014 as detailed below:

- Position 1 – located on the roof of the second floor level atop the pedestal section of the building at a position overlooking the Bridge Street and Goodall Street junction. The microphone was located 1.4m above local roof level and at least 8 metres from the external façade of the tower section of the building.
- Position 2 – located on the roof of the second floor level atop the pedestal section of the building at a position on the western boundary with clear view of both The Lounge public house and the WS1 nightclub. The microphone was located 1.4m above local roof level and at least 6 metres from the external façade of the tower section of the building.

The measurement positions are indicated in Figure 1.

Levels were recorded continuously in 5 minute samples to determine the equivalent continuous sound level, L_{Aeq}, the short duration level L_{Amax} and also the percentiles L_{A10} and L_{A90}. It is considered that the measurement data obtained is representative of the overall noise climate around the proposed site.

Weather conditions over the survey period were fine and dry temperatures in the range 7-24 degrees Celsius. There was little or no wind during the survey period.

All measurements were made with calibrated, precision grade sound level meters in accordance with BS EN 60651 and BS 7445:1993. Details of the equipment used are provided in Appendix 3 – List of Measurement Equipment. All equipment was calibration-checked before and after the survey with no significant drift observed.

6. RESULTS

The results of all diurnal measurements are shown in Appendix 1. Levels are shown as hourly values derived from the 5 minute data.

Position 1: Noise Measurements overlooking Bridge Street and Goodall Street

Typical sample levels at Position 1 were in the range $L_{Aeq(5min)}$ 43.0dB night time to $L_{Aeq(5min)}$ 77dB daytime. The Table below shows the extrapolated mean noise levels for both day and night-time at Position 1. All levels shown are in dB(A):

Period	Average Measured L_{Aeq}	Average measured L_{A10}	Average Measured L_{A90}
Thursday 15th (14:00 – 23:00)	61.5	62.6	52.9
Thursday 15th (23:00 – 07:00)	54.2	55.6	47.8
Friday 16th (07:00 – 23:00)	61.7	63.1	53.3
Friday 16th (23:00 – 07:00)	56.5	57.4	50.9
Saturday17th (07:00 – 23:00)	61.4	61.9	51.4
Saturday 17th (23:00 – 07:00)	57.4	56.9	50.2
Sunday 18th (07:00 – 23:00)	57.8	58.6	48.7
Sunday 18th (23:00 – 07:00)	53.1	53.0	45.5
Monday 19th (07:00 – 23:00)	60.8	62.5	52.8
Monday 19th (23:00 – 07:00)	52.1	52.9	43.6
Tuesday 20th (07:00 – 13:10)	61.0	63.7	53.6

This equates to a measured daytime average of $L_{Aeq,16hr}$ 60.8dB.

This equates to a measured night time average of $L_{Aeq,8hr}$ 55.1dB.

The lowest measured background level was L_{A90} 38.3 dB at 02:00 hours on Sunday 18th May 2014.

The survey data indicates that maximum levels during the night at the measurement position were in the range L_{Amax} 65-79dB with approximately one event per night exceeding this value.

Position 2: Noise Measurements to rear of pedestal level

Typical sample levels at Position 2 were in the range $L_{Aeq(5min)}$ 43.0dB night time to $L_{Aeq(5min)}$ 77dB daytime. The Table below shows the extrapolated mean noise levels for both day and night-time at Position 1. All levels shown are in dB(A):

Period	Average Measured L_{Aeq}	Average measured L_{A10}	Average Measured L_{A90}
Thursday 15th (14:00 – 23:00)	54.5	55.6	50.1
Thursday 15th (23:00 – 07:00)	52.7	54.1	50.4
Friday 16th (07:00 – 23:00)	55.8	56.1	50.5
Friday 16th (23:00 – 07:00)	54.2	54.8	51.5
Saturday17th (07:00 – 23:00)	53.6	55.0	49.6
Saturday 17th (23:00 – 07:00)	52.7	53.6	50.1
Sunday 18th (07:00 – 23:00)	50.9	52.3	47.3

This equates to a measured daytime average of $L_{Aeq,16hr}$ 54.1dB.

This equates to a measured night time average of $L_{Aeq,8hr}$ 53.3dB.

The lowest measured background level was L_{A90} 46 dB. This background level is reasonably constant throughout the night due to the influence of mechanical plant in the surrounding area.

The survey data indicates that maximum levels during the night at the measurement position were all in the range L_{Amax} 65-75dB.

7. DISCUSSION

7.1 Existing Noise Climate

The general noise climate around the site is attributable to traffic flows on Bridge Street and traffic in the local area. Overall flow rates during daytime along Bridge Street are high and include a significant number of bus movements. Traffic flows reduce significantly during the later evening and night time periods. Additional noise is generated by vehicles accelerating and decelerating for the road junctions.

To the rear, the site is significantly quieter due to the screening effect of the building and low traffic flows though there is a degree of additional noise from the car-park to the rear and existing mechanical plant.

From analysis of the logged data over several days, noise levels during periods when both nightclubs and the pubic house are in operation do not appear to increase above typical noise levels from road traffic activity measured throughout the rest of the day and night. In addition, noise levels during these periods are not unduly high.

7.2 BS8233 Assessment

Based upon the site measurement data, it may be extrapolated that, in order to achieve the BS 8233 internal ambient noise level standard, the building fabric to façades closest to Bridge Street and Goodall Street would need to provide a minimum temporal sound reduction of the order of 25dB(A) for night time sleeping and 26dB(A) for daytime resting and/or sleeping. For the tower facades overlooking the roads, there will be a reduction in traffic noise levels due to increased distance and the screening effect of the pedestal building.

To the rear of building for facades to the south and west, the building fabric would need to provide a minimum temporal sound reduction of the order of 23dB(A) for night time sleeping and 19dB(A) for daytime resting and/or sleeping.

In practice, the structural components of the building envelope can be expected to provide a sound reduction in excess of 45dB and will not provide a significant pathway for noise break-in. Greatest sound break-in can be expected to occur via windows.

Data given in BRE IP 12/89 and BS 8233 indicates that, for road traffic noise, standard thermal double glazing provides a typical sound reduction of the order of 33dB(A). This reduction would enable the BS 8233 internal criteria to be achieved for all habitable rooms including those directly overlooking Bridge Street.

BS 8233 notes that regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. Glazing providing a typical sound reduction of the order of 33dB(A) would reduce internal maximum levels to below L_{Amax} 46dB for the majority of the night time with approximately one event per night exceeding this value.

The sound reduction noted above applies to closed windows and BS8233 Section G1 advises that sound reduction across a partially open window will be limited to 15dB. Under these conditions the BS 8233 internal criteria may, at times, be exceeded for those habitable rooms directly overlooking the adjacent roads, and it will be necessary for these rooms to be provided with alternative means of ventilation. Background ventilation in accordance with Building Regulations requirements can be achieved with proprietary window or wall mounted trickle vents.

For units within the tower block, it is considered that the increased separation to the road and screening effect of the pedestal section of the building will enable BS 8233 internal criteria to be achieved when windows are open.

7.3 Impact of commercial and licensed premises

As noted in 7.1 above, the survey data obtained over several days including the evenings of Thursday to Monday inclusive does not indicate any significant activity attributable to surrounding commercial and licensed premises. The sound reduction requirements for the building envelope derived from the survey data are well within the typical sound reduction performance of a standard sealed double glazed unit.

It is anticipated that there will be late evening and night time pedestrian activity on Bridge Street in the vicinity of the site which is likely to generate noise. However, windows to habitable rooms adjacent the road will be required to provide adequate attenuation of general traffic noise including bus movements which will be exacerbated by the traffic signals at the junction with Goodall Street. It is considered that the sound reductions required for traffic noise would also provide adequate attenuation of any noise associated with pedestrian activity.

Where, however, windows adjacent to the road are open for ventilation, it is possible that noise from pedestrian activity (and traffic movement) would be intrusive. On this basis, it would be prudent to consider some form of mechanical ventilation for 1st floor apartments that overlook Bridge Street and Goodall Street in order to avoid the need to use open windows.

For the WS1 nightclub premises to the west, it is noted that the nearest elevation of Tameway Tower is mostly taken up by the stair core and that there are only a limited number of windows overlooking the premises which are to living rooms which also have windows on other elevations. All other windows at the site are further from the WS1 premises and do not overlook the club. It is probable that the limited number of living room windows noted on the nearest western elevation of the tower could be fixed units. This would also limit noise impact from the adjacent car park.

With regard to sound levels measured at Position 2 near to this façade location, there is a marginal increase in levels during the period 23.00hrs -02.00hrs but levels are generally below those that occur during the daytime and early evening. On the basis of the typical sound level for this period, the building fabric is required to provide a reduction of approximately 25dB which is within that available from standard windows.

For The Lounge public house to the south west of the site on Freer Street, it is noted that this building is screened from the site by an intervening office building adjacent to the pub. This screening, together with distance attenuation is expected to limit any potential noise impact upon Tameway Tower.

8. RECOMMENDATIONS

On the basis of the site measurement data, it is recommended that all habitable windows throughout the development have a minimum manufacturer's rating of R_w 33. This reduction should be from the window units as a whole, including the frame and any associated furniture.

All habitable rooms throughout the development should also be provided with proprietary wall or window mounted trickle vents to achieve background ventilation in accordance with the Building Regulations requirements. All such vents should, when open, have a minimum rated sound reduction of $D_{n,e,W}$ 33.

It is recommended that consideration be given to provision of mechanical ventilation to those residential units at 1st floor level overlooking Bridge Street and Goodall Street in order to provide an alternative to use of open windows.

9. CONCLUSIONS

Survey work carried out at this site indicates that the overall noise climate at the site is determined by traffic noise from Bridge Street and other roads in the local area.

BS 8233 requirements within dwellings can be achieved by use of appropriate acoustic rated windows and vents.

The survey data did not identify any significant increase in late evening and night time sound levels attributable to nearby commercial and licensed premises.

FIGURE 1 – SITE LOCATION

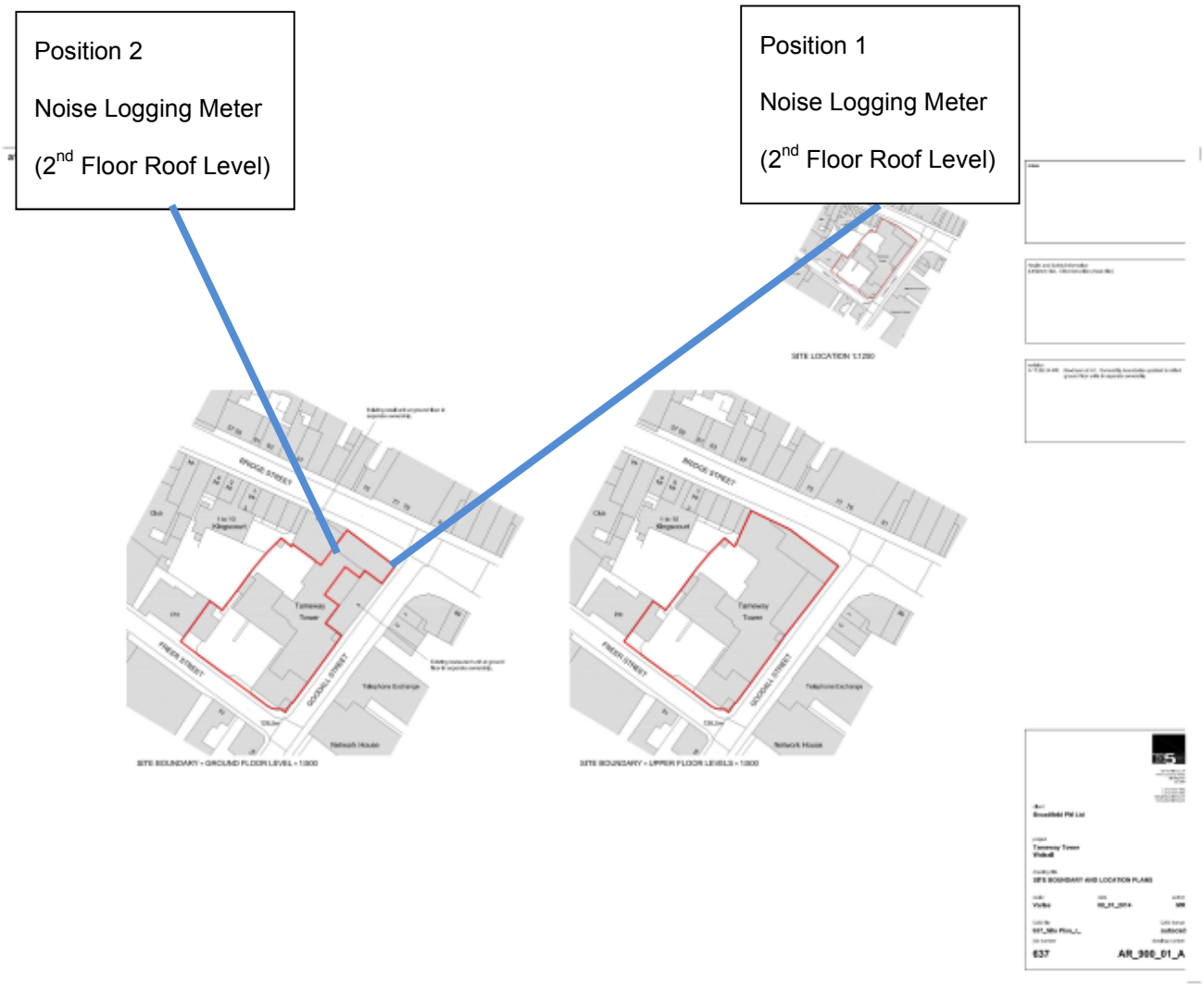

FIGURE 2 - PROPOSED LAYOUT - 1ST FLOOR

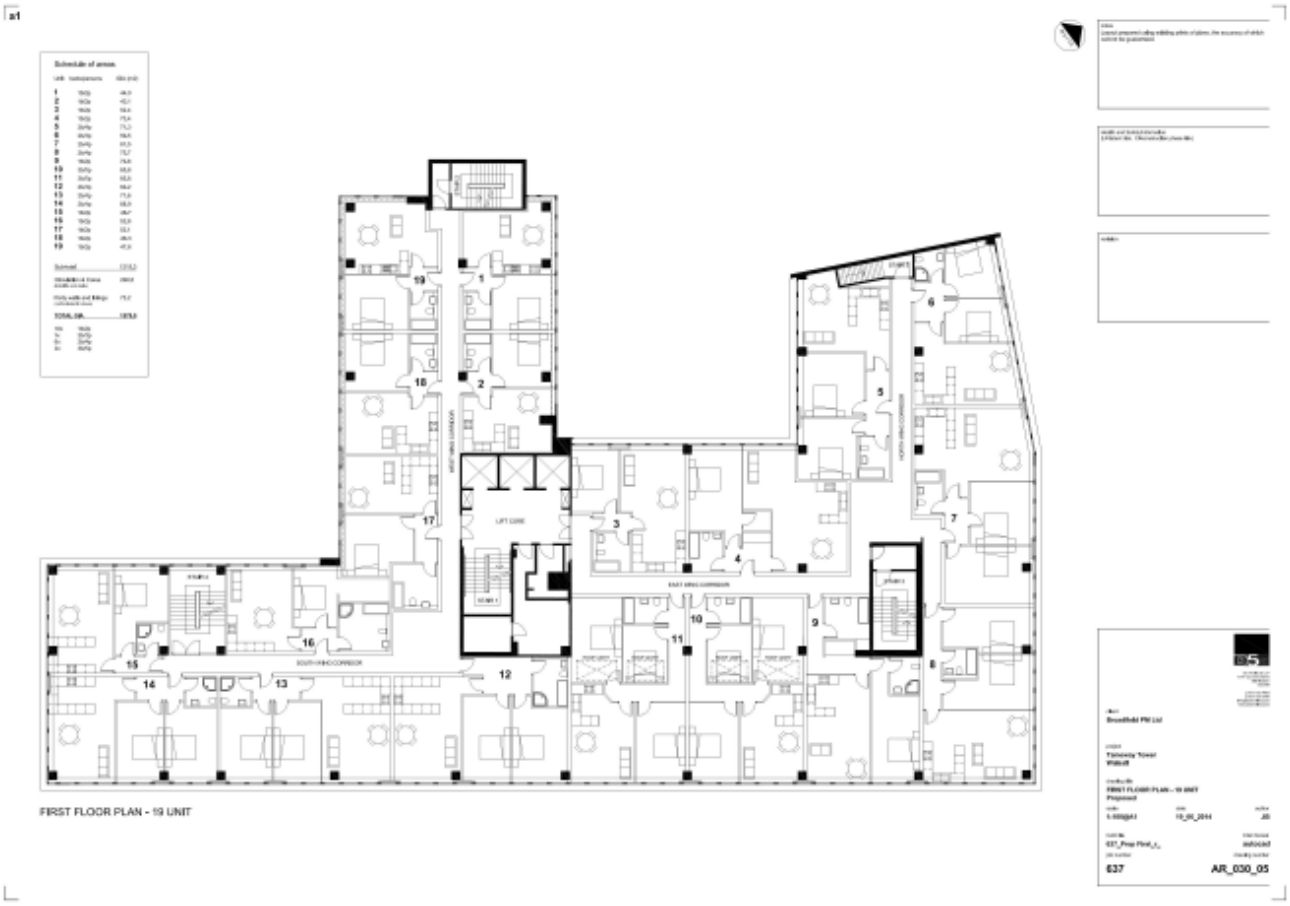

FIGURE 3 – PROPOSED LAYOUT – TYPICAL TOWER FLOOR PLAN

APPENDIX 1 – MEASURED SOUND PRESSURE LEVELS

Position 1: Noise Levels at 1st Floor Level roof adjacent junction to Bridge Street and Goodall Street

			Leq,1hr	Lmax,1hr	L10,1hr	L90,1hr
Day 1	14:00	14:59	59.2	81.2	63.0	52.9
	15:00	15:59	61.8	79.0	64.2	54.0
	16:00	16:59	63.5	91.0	64.7	55.0
	17:00	17:59	63.8	87.1	64.6	55.6
	18:00	18:59	61.7	81.3	63.7	53.4
	19:00	19:59	60.8	85.4	62.9	53.6
	20:00	20:59	62.1	89.4	61.1	50.9
	21:00	21:59	58.4	79.6	59.3	50.3
	22:00	22:59	58.2	82.5	59.7	50.0
	23:00	23:59	54.2	78.2	55.6	48.6
Day 2	00:00	00:59	54.0	73.1	56.1	49.2
	01:00	01:59	53.3	75.0	54.6	48.4
	02:00	02:59	53.5	67.4	54.6	50.2
	03:00	03:59	54.9	72.9	56.6	49.3
	04:00	04:59	52.7	76.9	54.1	43.2
	05:00	05:59	52.4	72.9	54.4	45.8
	06:00	06:59	56.7	75.3	58.7	47.6
	07:00	07:59	60.4	86.1	62.6	50.8
	08:00	08:59	62.7	83.1	64.5	54.5
	09:00	09:59	61.0	77.8	63.1	53.7
	10:00	10:59	63.3	86.7	64.9	54.1
	11:00	11:59	63.7	90.9	63.9	53.9
	12:00	12:59	60.9	78.8	63.2	53.4
	13:00	13:59	64.6	89.5	64.5	53.7
	14:00	14:59	61.4	82.1	63.0	53.5
	15:00	15:59	61.8	80.8	64.1	54.6
	16:00	16:59	62.6	84.0	64.4	55.0
	17:00	17:59	62.3	82.8	64.3	55.1
	18:00	18:59	60.3	77.0	62.6	52.6
	19:00	19:59	60.3	84.8	62.4	52.5
	20:00	20:59	59.2	81.1	61.0	53.0
	21:00	21:59	56.9	77.1	59.3	51.0
	22:00	22:59	59.8	81.1	61.1	51.9
	23:00	23:59	56.4	81.2	58.0	51.3
Day 3	00:00	00:59	58.9	73.5	59.9	55.2
	01:00	01:59	57.4	76.8	58.8	53.8
	02:00	02:59	58.1	79.5	59.4	55.4
	03:00	03:59	57.7	84.1	58.3	49.9
	04:00	04:59	52.2	72.6	54.7	47.1
	05:00	05:59	52.4	71.4	54.3	47.4

	06:00	06:59	54.3	72.8	56.1	47.2
	07:00	07:59	55.9	75.1	56.8	45.8
	08:00	08:59	61.0	78.4	61.4	49.7
	09:00	09:59	58.2	74.6	60.6	50.0
	10:00	10:59	60.5	79.3	62.5	51.4
	11:00	11:59	60.8	80.7	62.6	52.7
	12:00	12:59	61.3	79.2	63.4	53.0
	13:00	13:59	67.4	97.8	63.8	53.3
	14:00	14:59	61.3	79.8	63.2	52.7
	15:00	15:59	61.6	80.6	63.5	53.1
	16:00	16:59	62.4	84.7	63.1	52.3
	17:00	17:59	62.4	87.4	63.2	51.7
	18:00	18:59	59.8	87.1	61.9	50.9
	19:00	19:59	59.8	79.8	61.5	51.3
	20:00	20:59	59.8	86.3	61.1	50.2
	21:00	21:59	57.4	82.9	60.1	50.2
	22:00	22:59	59.7	79.3	61.4	53.7
	23:00	23:59	57.3	74.7	59.4	52.0
Day 4	00:00	00:59	57.8	83.4	58.7	53.1
	01:00	01:59	57.6	81.7	59.1	54.2
	02:00	02:59	57.7	79.1	59.3	53.9
	03:00	03:59	62.2	94.5	59.1	51.8
	04:00	04:59	52.2	69.1	54.7	45.0
	05:00	05:59	51.0	70.7	52.4	45.0
	06:00	06:59	50.7	71.1	52.3	46.1
	07:00	07:59	58.9	75.6	56.9	48.6
	08:00	08:59	53.2	73.9	54.6	43.8
	09:00	09:59	55.3	77.3	57.0	46.3
	10:00	10:59	56.3	76.0	58.8	49.3
	11:00	11:59	57.0	75.3	59.1	49.9
	12:00	12:59	57.9	77.0	60.0	50.7
	13:00	13:59	61.1	90.2	60.6	51.0
	14:00	14:59	58.2	79.6	60.2	50.4
	15:00	15:59	59.6	85.1	60.7	50.5
	16:00	16:59	57.4	79.9	59.5	49.3
	17:00	17:59	58.9	86.4	59.7	48.9
	18:00	18:59	57.6	77.9	59.1	48.5
	19:00	19:59	56.3	75.3	58.7	48.7
	20:00	20:59	59.5	87.8	58.8	48.6
	21:00	21:59	55.0	80.3	57.2	47.8
	22:00	22:59	54.1	74.3	56.6	47.1
	23:00	23:59	53.9	70.9	55.9	47.2
Day 5	00:00	00:59	52.9	76.5	54.8	45.0
	01:00	01:59	51.2	73.4	52.6	44.1

	02:00	02:59	48.0	65.6	49.0	43.8
	03:00	03:59	46.3	72.1	47.2	43.9
	04:00	04:59	49.7	70.5	51.3	45.0
	05:00	05:59	54.9	74.3	54.9	46.4
	06:00	06:59	57.4	78.4	58.1	48.6
	07:00	07:59	60.8	76.8	63.1	53.6
	08:00	08:59	62.6	80.3	64.9	55.4
	09:00	09:59	62.4	82.8	64.9	54.9
	10:00	10:59	62.2	78.9	64.0	53.9
	11:00	11:59	61.6	80.5	63.2	53.6
	12:00	12:59	61.1	81.1	63.3	53.8
	13:00	13:59	61.7	79.2	64.0	53.5
	14:00	14:59	60.9	78.5	63.4	54.0
	15:00	15:59	61.7	79.9	64.0	54.5
	16:00	16:59	61.2	78.7	63.3	55.0
	17:00	17:59	61.7	84.0	63.8	56.2
	18:00	18:59	59.3	82.1	61.7	52.3
	19:00	19:59	58.4	75.5	60.6	50.1
	20:00	20:59	56.6	83.6	58.9	48.6
	21:00	21:59	56.8	78.0	58.7	47.6
	22:00	22:59	56.5	81.5	57.8	47.7
	23:00	23:59	53.5	73.2	55.5	45.3
Day 6	00:00	00:59	54.1	79.4	55.5	44.4
	01:00	01:59	50.5	77.4	51.0	42.4
	02:00	02:59	47.8	65.7	49.0	40.4
	03:00	03:59	48.7	66.0	50.1	42.3
	04:00	04:59	50.2	72.1	52.6	42.8
	05:00	05:59	52.1	74.6	53.2	44.0
	06:00	06:59	54.9	72.9	56.7	47.0
	07:00	07:59	60.3	78.1	62.9	52.3
	08:00	08:59	62.5	89.3	64.3	54.5
	09:00	09:59	62.0	81.3	63.6	54.0
	10:00	10:59	61.1	81.8	63.2	53.1
	11:00	11:59	61.0	78.2	63.3	53.2
	12:00	12:59	61.1	77.8	63.3	53.9
	13:00	13:59	57.7	80.1	65.0	54.2

Position 2: Noise Levels at 1st Floor Level roof towards rear of Tameway Tower

			Leq,1hr	Lmax,1hr	L10,1hr	L90,1hr
Day 1	13:00	13:59	53.2	87.0	55.4	49.8
	14:00	14:59	57.0	78.7	58.2	51.1
	15:00	15:59	54.3	71.0	56.3	50.4
	16:00	16:59	54.3	71.1	56.4	50.6
	17:00	17:59	56.8	74.1	58.3	51.2
	18:00	18:59	54.6	77.0	55.9	50.4
	19:00	19:59	51.4	65.7	53.3	49.0
	20:00	20:59	55.7	73.6	54.7	49.5
	21:00	21:59	52.4	68.0	54.3	49.4
	22:00	22:59	51.5	62.9	52.9	49.7
	23:00	23:59	53.7	68.5	55.0	51.9
Day 2	00:00	00:59	53.9	67.5	55.2	52.1
	01:00	01:59	53.6	65.7	54.9	51.8
	02:00	02:59	51.9	66.7	53.3	49.6
	03:00	03:59	51.3	73.6	52.5	48.8
	04:00	04:59	52.1	67.4	53.5	50.0
	05:00	05:59	52.0	66.1	53.6	49.6
	06:00	06:59	52.7	73.4	54.9	49.8
	07:00	07:59	54.5	65.2	56.7	50.4
	08:00	08:59	54.6	75.3	56.0	50.3
	09:00	09:59	54.3	78.0	56.5	50.1
	10:00	10:59	54.5	74.9	56.4	50.4
	11:00	11:59	53.9	77.5	55.4	50.0
	12:00	12:59	55.7	83.4	56.9	49.6
	13:00	13:59	63.3	88.3	59.8	52.2
	14:00	14:59	56.7	80.4	58.1	50.8
	15:00	15:59	54.5	74.6	56.5	50.0
	16:00	16:59	54.3	70.4	56.2	50.6
	17:00	17:59	52.8	72.2	54.7	49.9
	18:00	18:59	53.0	70.7	54.8	50.0
	19:00	19:59	53.1	70.8	54.7	50.6
	20:00	20:59	52.4	72.3	54.1	50.2
	21:00	21:59	53.3	68.4	54.8	51.0
	22:00	22:59	53.9	65.5	55.3	52.2
	23:00	23:59	57.9	65.1	58.7	54.6
Day 3	00:00	00:59	55.7	65.1	57.1	54.0
	01:00	01:59	55.7	71.1	57.2	53.4
	02:00	02:59	51.8	65.4	53.1	50.2
	03:00	03:59	51.4	66.9	52.6	49.8
	04:00	04:59	51.5	65.2	52.6	49.9
	05:00	05:59	52.3	71.5	53.4	50.5

	06:00	06:59	51.6	63.2	53.4	49.4
	07:00	07:59	53.3	68.2	55.2	49.8
	08:00	08:59	51.9	68.6	53.7	48.5
	09:00	09:59	52.7	71.3	54.5	48.8
	10:00	10:59	53.0	79.7	55.1	49.6
	11:00	11:59	53.2	70.0	55.4	49.2
	12:00	12:59	55.9	81.0	56.6	50.4
	13:00	13:59	55.1	75.3	57.0	50.5
	14:00	14:59	54.2	73.5	56.3	49.9
	15:00	15:59	53.2	72.0	55.4	49.4
	16:00	16:59	53.7	75.3	55.3	49.1
	17:00	17:59	52.4	76.4	54.0	48.9
	18:00	18:59	53.5	75.8	54.6	49.2
	19:00	19:59	52.0	73.4	53.4	48.9
	20:00	20:59	54.0	69.4	54.5	49.8
	21:00	21:59	54.9	68.4	55.2	51.0
	22:00	22:59	53.0	68.1	54.4	51.3
	23:00	23:59	54.4	66.7	55.9	52.5
Day 4	00:00	00:59	54.9	65.3	56.3	53.1
	01:00	01:59	54.5	74.8	55.7	52.2
	02:00	02:59	52.6	71.3	54.2	50.0
	03:00	03:59	50.6	67.0	52.0	48.5
	04:00	04:59	49.6	61.3	50.7	48.2
	05:00	05:59	49.8	58.3	50.9	48.3
	06:00	06:59	51.9	65.0	53.1	48.2
	07:00	07:59	48.5	61.9	49.9	46.3
	08:00	08:59	49.1	59.9	51.1	46.9
	09:00	09:59	50.4	68.7	52.4	47.5
	10:00	10:59	50.6	68.9	52.3	47.4
	11:00	11:59	53.8	76.0	54.2	47.5
	12:00	12:59	53.6	84.0	53.4	47.7
	13:00	13:59	51.0	72.1	53.0	47.7
	14:00	14:59	52.1	75.4	53.8	48.1
	15:00	15:59	51.2	67.6	53.2	47.7
	16:00	16:59	51.2	73.8	52.7	47.4
	17:00	17:59	50.4	65.8	52.6	47.2
	18:00	18:59	50.1	65.4	52.1	47.3
	19:00	19:59	51.7	77.0	51.9	47.1
	20:00	20:59	49.1	67.3	50.9	47.0
	21:00	21:59	42.9	59.8	50.8	47.1

APPENDIX 2 – GLOSSARY OF TERMS

Decibel (dB)

The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithm's are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

A-Weighting

The 'A' weighting is a correction term applied to the frequency range in order to mimic the sensitivity of the human ear to noise. It is generally used to obtain an overall noise level from octave or third octave band frequencies. An 'A' weighted value would be written as dB(A).

$L_{Aeq,T}$

The A-Weighted equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.

$L_{A90,T}$

The A-Weighted noise level exceeded for 90% of the specified measurement period (T). This is generally taken to indicate the prevailing background noise level.

L_{Amax}

The highest A-Weighted noise level recorded during a noise event.

APPENDIX 3 – LIST OF MEASUREMENT EQUIPMENT

Measurements

Rion type NL-28 Sound Level Meter	S/N 01260202
Rion type NH-23 pre-amplifier	S/N 60105
Rion type UC-59 Microphone	S/N 282

Additional Equipment

Rion Type NC-74 Calibrator	S/N 34172706

The above equipment fulfils IEC 61672 Class 1 and is traceable to calibration under BS7580:Part 1:1997.

The equipment was calibration-checked before and after measurement – no adverse deviation was observed.