NICKOS ARNAOUTIS AND JOBI DONNACHIE

DOWNTEX MILL , MARY STREET, MANCHESTER

ACOUSTIC REPORT FOR PLANNING PURPOSES

21 October 2013

AEC REPORT: P2836/R1A/BT

Prepared by:



B Tomlin
BSc(Hons) MIOA

Acoustic & Engineering Consultants Limited
Lockside 1 Stockport Road Marple Stockport Cheshire SK6 6BD
Telephone 0161 449 5900 Fax 0161 449 5901

committed to CSCS

constructionline

ANC THE ASSOCIATION OF NOISE CONSULTANTS

CONTENTS

		Page
1.0	INTRODUCTION	3
2.0	BACKGROUND AND SITE DESCRIPTION	3
3.0	BASELINE NOISE AND VIBRATION MEASUREMENTS	4
4.0	BASIS OF ASSESSMENT	5
5.0	ASSESSMENT	5
6.0	CONCLUSIONS	7

Figure 1 –Site Plan Showing Noise Monitoring Positions
Figure 2 – Internal Site Layout (Ground floor)

APPENDIX A - Measurement Procedure
APPENDIX B - Acoustic Terminology in Brief
APPENDIX C - Example Calculations

DOCUMENT STATUS

Revision	Date	Document Details	Author	Checked By
Original	2 October 2013	Original Issue	BT	RJ
R1A				

1.0 INTRODUCTION

1.1 Acoustic & Engineering Consultants Ltd (AEC) has been instructed by Nickos Arnaoutis and Jobi Donnachie to undertake an acoustic assessment for planning purposes of the proposed nightclub, 'Hidden', on Mary Street, Manchester M3.

1.2 The proposals are to convert a disused warehouse into a nightclub/music venue.

1.3 Prior to undertaking any works, contact was made with the Local Authority to confirm their requirements. However, due to timescales, a specific response was not able to be returned by Manchester City Council (MCC). However, our experience of other similar projects, and the guidance in their document '*GD 03 - Environmental and Public Protection Information for Developers - Version: 1.00*', dated February 2013, has been considered.

1.4 As part of the assessment, sound insulation measurements and noise surveys were undertaken, which are detailed in Appendix A. A brief overview of the acoustic terminology used in this report is provided in Appendix B.

2.0 BACKGROUND AND SITE DESCRIPTION

2.1 The site is located on Mary Street, Manchester, M3 as identified in Figure 1, and was formerly a warehouse. The warehouse used to belong to a firm called Downtex, and for simplicity the site will be referred to as the Downtex building in this report.

2.2 Behind the site is the river Irwell, with residential apartments about 150m beyond, on Springfield Lane. These apartments would appear to be the nearest noise sensitive location, and are 5 storeys high, equivalent to around 25m.

2.3 There are also apartments on Trinity Way, but these are both significantly shielded from any potential noise, and further away. These buildings are identified as locations C and D on Figure 1. Other locations around the site are all industrial or commercial. The two nearest units to the Downtex building are both unoccupied.

2.4 At this stage the club is not operational, but it is intended to operate on Monday, Thursday and Sunday nights from 2200-0400h, and from 2200-0600h on Friday and Saturday nights. Additionally, music may be played in the garden area during the day on a Sunday afternoon from 1200-2200h.

2.5 The club will be operated in the basement, and on the ground floor only. The two main ground floor rooms are to be called the Red Room and the Blue Room, and are identified on Figure 2. The basement is not shown, but is located beneath the Blue Room. Above the blue room are another three storeys, at this stage unused.

2.6 The Blue Room is buffered by at least one room in every direction, except for the Mary Street elevation, and the entire building is adjoined to the adjacent buildings to at least 2nd floor level. However, the Red Room is buffered to the west, but otherwise comprises external elevations.

2.7 At this stage, no significant sound insulation improvement measures have been undertaken or are planned at this stage in the Red Room, which is constructed from lightweight wall panels and a lightweight roof.

2.8 There is also a garden area, to the rear of the building, which is surrounded on all sides by walls. It is intended to use this area on Sunday afternoons potentially, as a cafe/barbeque area with music.

3.0 SOUND INSULATION AND BACKGROUND NOISE MEASUREMENTS

Sound Insulation

3.1 In order to understand the sound insulation performance of the external envelope, indicative 'internal to external' sound insulation measurements were performed on Thursday 12 September 2013.

3.2 A loudspeaker playing continuous pink noise was installed in a number of rooms, and the noise level measured over 30s periods, then measured outside at two locations; on the footpath behind the warehouse, at around 4m, and in front on the large roller shutter doors on Mary Street, at around 2m.

3.3 This procedure was carried out at a number of internal locations, and included measurements with and without the internal doors indicated on Figure 2 closed. All measurements were undertaken in one-third octave bands between 50Hz and 10kHz. The internal measurement locations are shown on Figure 2.

3.4 The measured overall sound reduction performance of the external envelope were as detailed in Table 1, below.

Table 1 – Results of Indicative Internal to External Sound Insulation Measurements

Source Location	Receiver Location	Sound Reduction, dB	Comments
Red Room	Footpath (A)	23	-
Blue Room	Footpath (A)	43	Internal doors open
Blue Room	Mary Street (B)	32	Internal doors open
Blue Room	Footpath (A)	50	Internal doors closed
Blue Room	Mary Street (B)	40	Internal doors closed
Basement	Mary Street (A)	>42	Internal doors open

3.5 The above measured sound insulation performances have been used as the basis of our calculations. The above values have been used in our calculations, which have also taken into account the area of the walls and roof. However, as music noise is very frequency dependent, the actual octave band sound reduction values measured have been used in our calculations, rather than a simplistic single figure value.

Background Noise Levels

3.6 Based on the proposed operating hours, it would appear that Sunday daytime and Sunday night would be the most onerous periods, and hence, background noise surveys were undertaken at these times.

3.7 Full details of the measurements are provided in Appendix A, but, in summary, noise levels in the day and at night are dominated by traffic on Trinity Way. Noise levels were very consistent, and at location C, the lowest measured background noise levels were around 45dBL_{A90} in the day, and 39dBL_{A90} at night.

3.8 Noise levels at location D were significantly higher than at C, so only one measurement was taken at this location, so as to gather more data at the more onerous location.

3.9 As octave band levels form part of the criteria, the lowest measured daytime and night-time octave band background noise levels are also detailed in Appendix A.

4.0 BASIS OF ASSESSMENT

4.1 In terms of the acoustic criteria, AEC have been advised by Manchester City Council that the advice in their document "*GD 03 Environmental and Public Protection Information for Developers"* is appropriate.

4.2 In terms of noise break-out, MCC would ideally want noise controlled to a noise level 10dB lower than the background noise level during the periods of operation. In terms of music noise, this also needs to be controlled to 10dB below the lowest measured background noise level in the 63Hz and 125Hz octave bands.

4.3 Based on the above, and the measured noise level data, noise in the day would need to be controlled to 35dBL_{Aeq} or below, with the bass controlled to 44dBL_{Aeq} in the 63Hz octave band, and 37dBL_{Aeq} in the 125Hz octave band.

4.4 At night, the criteria would be 29dBL_{Aeq}, with a maximum of 50dBL_{eq} in the 63Hz octave band, and 33dBL_{eq} in the 125Hz octave band.

5.0 ASSESSMENT

5.1 It is understood that, based on initial discussions relating to the sound insulation measurements, that the roller shutter door will be bricked up prior to opening, and, given the lack of noise sensitive locations in this direction, noise from the front of the building is not considered further.

5.2 At this stage, as internal noise levels have not been established, we have based our calculations on noise levels measured at other music venues, and a typical spectrum might be as shown in Table 2, below.

TABLE 2 –Typical Music Noise Levels, Leq

Octave Band Centre Frequency/Hz	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**Overall A Weighted**
Music Noise Level, dBL_{eq}	100	99	98	98	95	93	91	82	101

5.3 Based on these noise levels being played in the Red Room, noise levels at Location C would be around 42dBL_{Aeq}, which is about 3dB louder than the night-time background noise level, with similar levels at 63Hz and 125Hz. Therefore, music could not be played at this volume in the Red Room without additional acoustic treatment.

5.4 However, calculations show that if the overall level was reduced by 13dB in both the 63Hz and 125Hz octave bands, and the rest of the spectrum adjusted to suit, then the requirements of MCC would be met. Example calculations are provided in Appendix C, as calculations C1 and C2, demonstrating this.

5.5 A limit for this room could be similar to that shown in Table 3, below.

TABLE 3 –Indicative Music Noise Levels, Octave Band

Frequency/Hz	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**Overall A Weighted**
Music Noise Level, dBL_{eq}	87	82	81	81	81	80	78	69	86

5.6 These levels could be enforced using an appropriately calibrated noise limiter, if required.

5.7 Noise from the Blue Room, either with or without the doors closed, would be significantly (20dB or more) lower than the lowest measured background noise level, including at low frequencies. The calculations to demonstrate this are provided as calculations C3 and C4.

5.8 Therefore, even if slightly louder, music could be played in the Blue Room without affecting the residents of Springfield Court, particularly if the door to the Red Room is kept closed, or even sealed.

External Area

5.9 The garden area is equivalent to the ground floor level of Mary Street, i.e. around 2m below the floor level of the Blue and Red Room, and the footpath. There is a perimeter wall which extends around 2m above the floor levels of the Red Room, and hence, the overall height of the barrier is around 4m, relative to the floor level of the garden area.

5.10 Given that the area is to be used as a café/barbeque area, it is unlikely that noise levels would ever exceed $80dBL_{Aeq}$ in the garden.

5.11 As any external events are proposed to take place in the day only, the criteria would be $35dBL_{Aeq}$ or below at the residents, with the bass controlled to $44dBL_{Aeq}$ in the 63Hz octave band, and $37dBL_{Aeq}$ in the 125Hz octave band.

5.12 Based on the distance attenuation to 157m of 44dB (20log(157/1)), the resultant noise level at Springfield Lane would be $36dBL_{Aeq}$. Even allowing a marginal acoustic screening provided by the wall of 5dB, the noise levels would be reduced to below the criteria, and also significantly lower than existing daytime ambient noise levels.

5.13 While not as loud as a nightclub, this is equivalent to noise levels in a busy pub with background music, and therefore should still be at a reasonable volume for enjoyment of music, particularly in a small environment such as the garden area.

6.0 CONCLUSIONS

6.1 AEC has been instructed to undertake an acoustic assessment for planning purposes of a proposed nightclub at the former Downtex Mill on Mary Street, Manchester M3, based on the guidance in Manchester City Council's document '*GD 03 - Environmental and Public Protection Information for Developers - Version: 1.00*', dated February 2013.

6.2 The apparent sound insulation of the existing mill external envelope has been measured, along with background noise measurements at locations representative of the nearest potentially affected residential properties. Based on the proposed opening hours of the club, it was decided that Sunday afternoon and Sunday night/Monday morning would be the most onerous time periods.

6.3 Based on the measured data, and music noise levels measured at other nightclubs, calculations have been made to calculate the potential noise levels at the nearest affected locations.

6.4 Where the predicted noise levels exceeded the required criteria, limiting sound power levels have been detailed. These can be enforced by using a noise limiter, if required.

6.5 Potential noise from the garden area has also been calculated, based on an assumed music level, which would be significantly lower than MCC's criteria at the nearest affected noise sensitive location.

6.6 Overall, therefore, noise should not be a limiting factor with regards to the planning application for the development.



Ben Tomlin

FIGURE 1 – Site Plan Showing Monitoring Locations

N

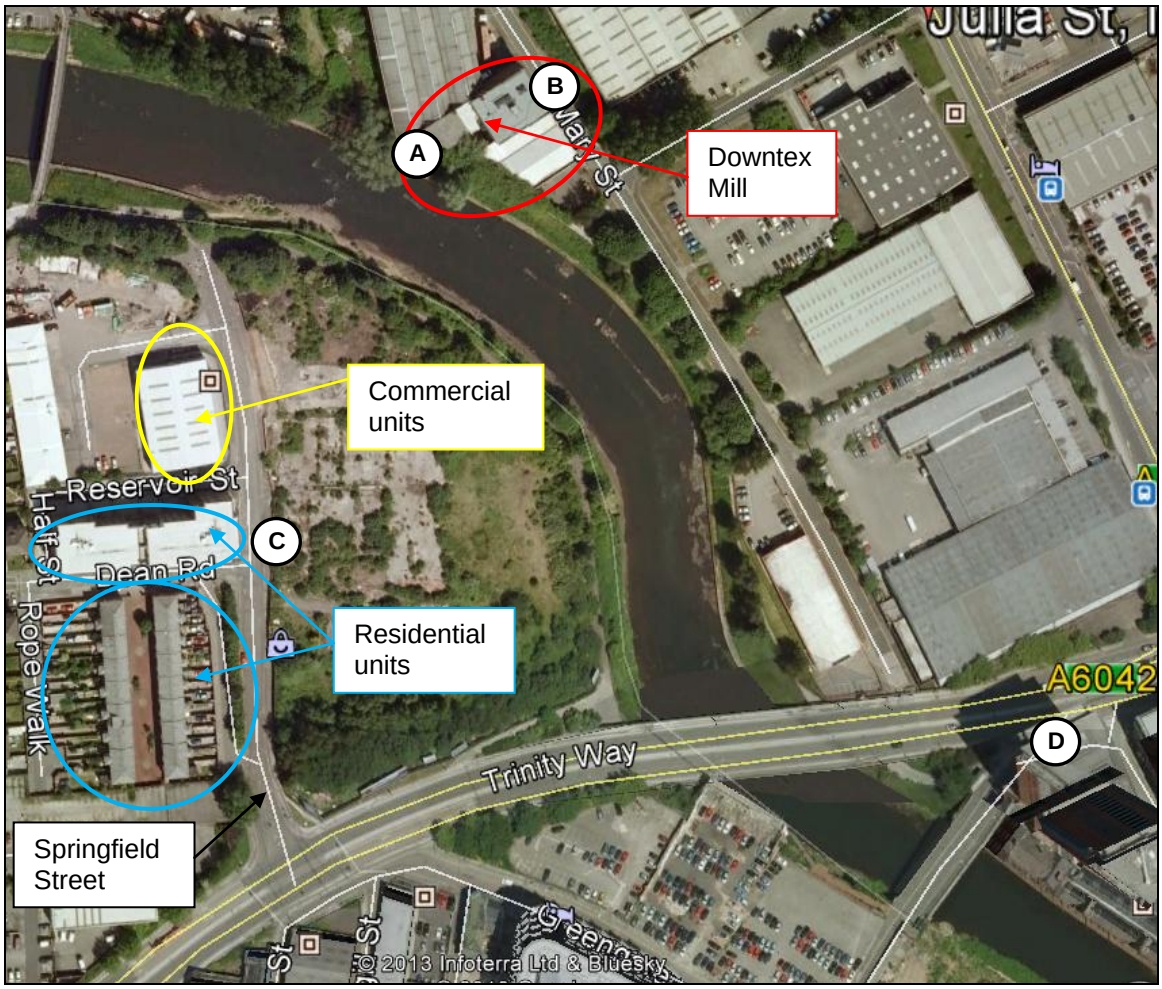
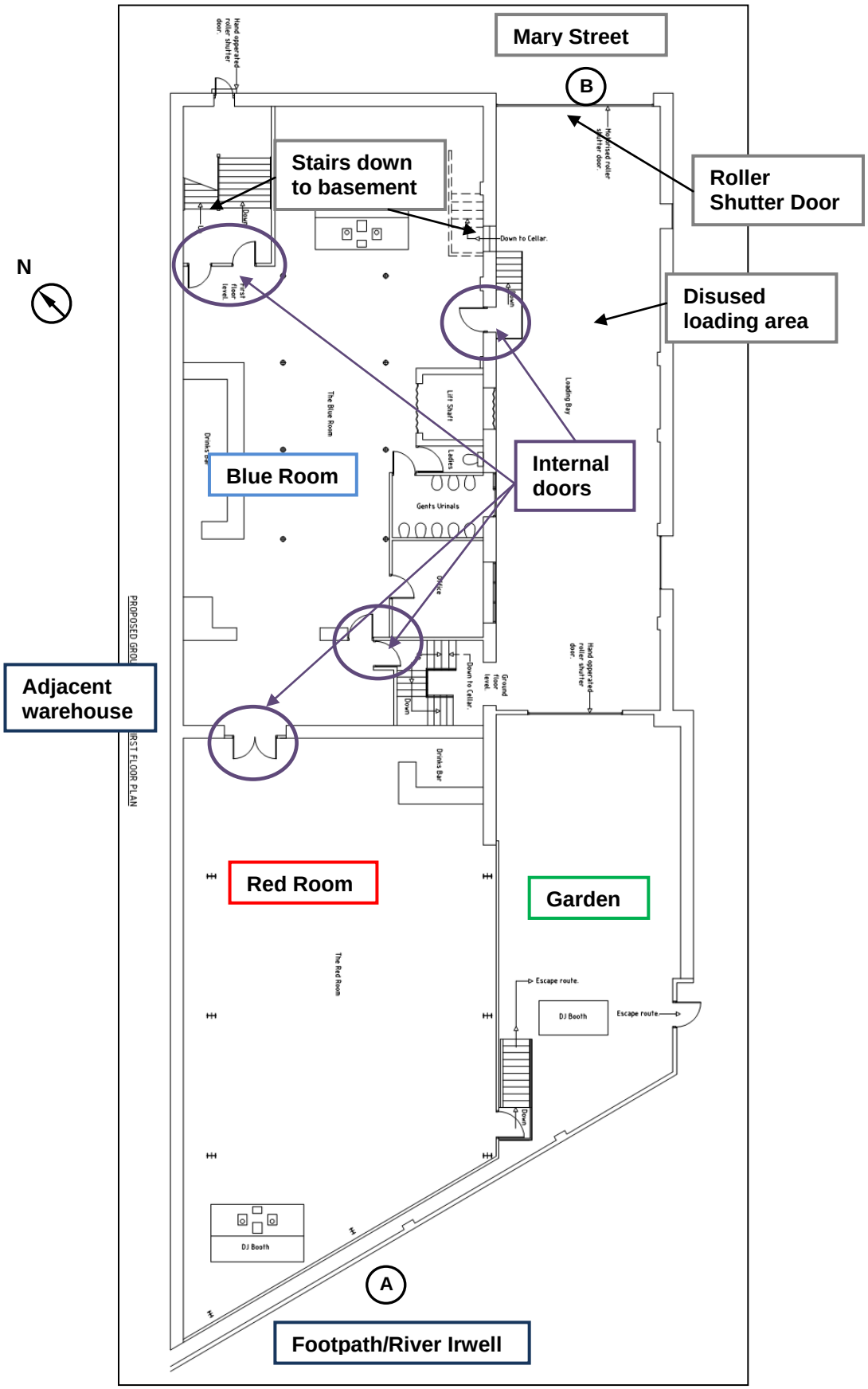


FIGURE 2 – INTERNAL SITE LAYOUT (GROUND FLOOR)



APPENDIX A – Measurement Procedure

Dates & Times of Survey	Thursday 12 September 2013, 1300-1600h – background and sound insulation measurements Sunday 22 September 2013, 1600h-1700h – background measurements Monday 23 September 2013, 0315-0415h - background measurements
Personnel Present	Ben Tomlin (AEC)
Equipment Used	B&K 2260 Real Time Analyser (AEC Kit 1) – Thursday 12 September B&K 2250 Real Time Analyser (AEC Kit 3) – Sunday and Monday 22-23 September
Weather Conditions	Thursday 12 September – 17^0C, clear, calm Sunday 22 September – 23^0C, calm, clear skies Monday 23 September – 18^0C, clear, calm
Measurement Procedure	Indicative sound insulation measurements, and ambient, maximum and background noise levels were measured at 4 locations, identified as A to D on Figure 1, and described below. A – On the footpath behind the warehouse, about 2m from the external envelope. B – About 1m from the roller shutter doors on Mary Street C – Outside the apartments on Springfield Street, about 5m from the external elevation D – Outside the apartments on Trinity Way, about 5m from the external envelope. Locations A and B were selected to measure the indicative sound insulation performance of the building. Locations C and D were selected to measure general ambient and background noise levels at locations representative of the nearest noise sensitive locations, which were measured in terms of L_{Aeq}, $L_{A90,}$ L_{A10} and L_{Amax} (fast and slow response), typically over 5 minute periods. All the measurements were taken at a height of 1.5m above ground unless stated, and all were free field measurements. The sound level analysers, which conform to BS EN 61672-12003 *'Electro acoustics – sound level meters - Part1: Specifications'* for Class 1 Type Z meters, were in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration.
Measured Data	A summary of the baseline indicative background noise measurements are presented in Tables A1 to A3.

TABLE A1 –Measured Baseline Noise Levels, Daytime

Location	Period, h	Noise Level, dB				Comments
		L_{Aeq}	L_{A90}	L_{A10}	L_{Amax}	
C	1604-1609	51.1	**46.1**	53.5	62.5	Dominated by traffic on Trinity Way.
	1609-1614	54.8	**46.6**	54.7	72.1	Dominated by traffic on Trinity Way. Car pass-by on Springfield Street causes max.
	1616-1621	52.9	**47.6**	54.7	68.4	Dominated by traffic on Trinity Way, with an aircraft overhead adding to the overall level.
	1647-1652	49.6	**44.8**	51.9	62.9	Dominated by traffic on Trinity Way.
	1655-1700	50.5	**44.6**	53.3	58.9	Dominated by traffic on Trinity Way.
	1702-1707	55.5	**48.0**	57.5	72.4	Dominated by traffic on Trinity Way.
D	1635-1640	73.1	**62.7**	76.8	82.3	Dominated by traffic on Trinity Way.

TABLE A2 –Measured Baseline Noise Levels, Night-time

Location	Period, h	Noise Level, dB				Comments
		L_{Aeq}	L_{A90}	L_{A10}	L_{Amax}	
C	0318-0323	47.9	**40.9**	51.6	60.1	At all times noise levels were dominated by traffic on Trinity Way, distant plant and distant traffic.
	0324-0329	47.4	**39.2**	51.0	59.9	
	0330-0335	49.5	**39.6**	53.2	59.9	
	0335-0341	46.6	**39.6**	50.3	56.2	
	0342-0347	46.8	**40.3**	50.1	61.2	
	0347-0352	47.8	**38.7**	52.2	64.0	
	0353-0354	57.2	**43.1**	61.9	69.7	Louder due to police siren.
	0356-0401	46.2	**40.4**	49.2	56.5	At all times noise levels were dominated by traffic on Trinity Way, distant plant and distant traffic.
	0402-0407	46.7	**41.1**	50.5	58.9	
	0407-0413	47.6	**40.3**	51.2	58.8	

TABLE A3 –Lowest Measured Background Noise Levels, Octave Band

	Octave Band Centre Frequency, Hz								
	dBA	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Daytime, dBL_{90}	45	54	47	41	37	41	34	24	16
Night-time, dBL_{90}	39	50	43	37	36	35	26	16	13

APPENDIX B - Acoustic Terminology in Brief

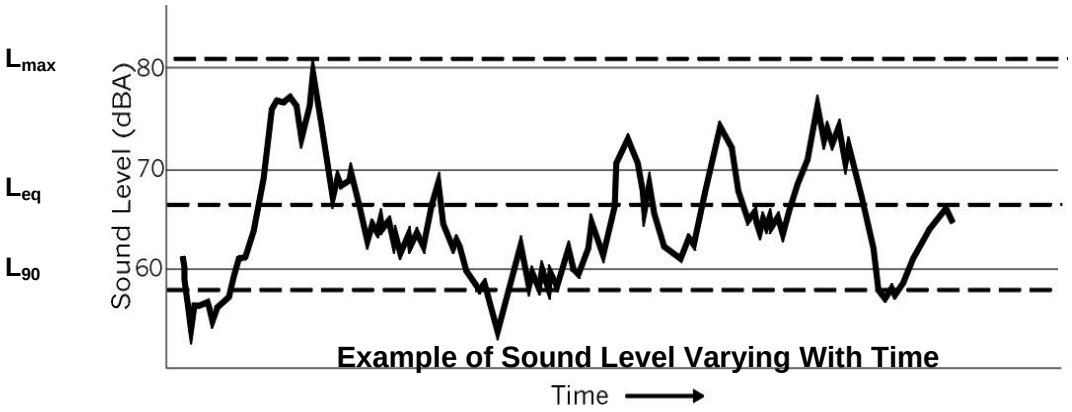
Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz *(Hz)*, that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discreet frequency - a 'pure tone' - most noise is made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA,* normally used to assess the effect of noise on people. The dBA weighting emphasises or reduces the importance of certain frequencies within the audible range.

Noise Units

In order to assess environmental noise, measurements are carried out by sampling over specific periods of time, such as fifteen minutes or one hour, the statistically determined results being used to quantify various aspects of the noise.

The figure below shows an example of sound level varying with time. Because of this time variation the same period of noise can be described by several different levels. The most common of these are described below.



$L_{Aeq,T}$ The equivalent continuous (A-weighted) sound level may be considered as the "average" sound level over a given time, T. It is used for assessing noise from various sources including transportation, industrial and construction sources and can be considered as the "ambient" noise level.

L_{A90} The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value used to describe the "background" noise.

L_{Amax} The maximum (A-weighted) sound level during a measurement period.

L_{AE} The sound exposure level is a notional noise level and describes the average L_{Aeq} noise level of an event over a given time period as if it occurred during a one second period. This allows the L_{Aeq} to be determined over a time period with a number of distinct events.

Free-field Level This refers to the sound level measured outside, away from reflecting surfaces.

APPENDIX C – Example Calculations

Calculation C1 – Noise breakout, Red Room - Wall

AEC Ltd						**Date:**	30/09/13			
Contract No:	**2836**									
Client:	**Nickos Arnaoutis**					Consultant:	**BT**			
Project:	**Hidden Club**									
		NOISE BREAK OUT TO OUTSIDE								
Source	Night Club									
Noise Level	86	dBA								
	Corrections to obtain Lp at element ?									
	(eg distance/directivity)									
Building & Element	External envelope (Red Room wall)									
Area (S)	75	m^2	Width(a)=	15	m	Height(b)=	5	m		
Position Directivity (Q)	4	(=4 for a wall, 2 for a roof)								
Additional Directivity										
Receiver	Springfield Court									
Distance (R) from element	157	m								
Propagation Corrections										
Barrier	0									
Façade	0									
Calculation										
Frequency, Hz		**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dBA**
Internal Level,	dB	87	82	81	81	81	80	78	69	86
Internal Corrections ,	dB	0	0	0	0	0	0	0	0	
Corrected Internal Level,Lin,	dB	87	82	81	81	81	80	78	69	86
SRI of Element,	dB	15.3	16.9	19.7	18.0	22.5	31.5	33.6	38.0	
Additional Directivity,	dB	0								
Propagation Corrections										
Barrier,	dB	0								
Façade,	dB	0								
Level (1) at Receiver	dB	36	29	25	27	22	12	8	-5	27
Level (2) at Receiver	dB	34	27	23	25	20	10	6	-7	25
Criterion	dB	50	43	37	36	35	26	16	13	
Shortfall (1)	dB	-14	-14	-12	-9	-13	-14	-8	-18	
Shortfall (2)	dB	-16	-16	-14	-11	-15	-16	-10	-20	

Calculation C2 – Noise breakout, Red Room - Roof

AEC Ltd						**Date:**	30/09/13			
Contract No:	**2836**									
Client:	**Nickos Arnaoutis**					Consultant:	**BT**			
Project:	**Hidden Club**									
		NOISE BREAK OUT TO OUTSIDE								
Source	Night Club									
Noise Level	86 dBA									
	Corrections to obtain Lp at element ?									
	(eg distance/directivity)									
Building & Element	External envelope (Red Room wall)									
Area (S)	270 m^2	Width(a)=	15 m			Height(b)=	18 m			
Position Directivity (Q)	2	(=4 for a wall, 2 for a roof)								
Additional Directivity										
Receiver	Springfield Court									
Distance (R) from element	157 m									
Propagation Corrections										
Barrier	0									
Façade	0									
Calculation										
Frequency, Hz		**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dBA**
Internal Level,	dB	87	82	81	81	81	80	78	69	86
Internal Corrections ,	dB	0	0	0	0	0	0	0	0	
Corrected Internal Level,Lin,	dB	87	82	81	81	81	80	78	69	86
SRI of Element,	dB	15.3	16.9	19.7	18.0	22.5	31.5	33.6	38.0	
Additional Directivity,	dB	0								
Propagation Corrections										
Barrier,	dB	0								
Façade,	dB	0								
Level (1) at Receiver	dB	38	32	28	29	25	15	11	-3	30
Level (2) at Receiver	dB	36	30	26	27	23	13	9	-5	28
Criterion	dB	50	43	37	36	35	26	16	13	
Shortfall (1)	dB	-12	-11	-9	-7	-10	-11	-5	-16	
Shortfall (2)	dB	-14	-13	-11	-9	-12	-13	-7	-18	
Calculation Method	(1)	Lp = Lin - R - 6 + 10Log(S) - 20Log(R) - 11 + 10Log(Q)						far field		
	(2)	Lp = Lin - R - 6 + 10Log(ab/(pi^2*R^2)) + 10Log(Q/2)								

Calculation C3 – Noise breakout, Blue Room (via Red Room) – Wall

AEC Ltd						**Date:**	30/09/13			
Contract No:	**2836**									
Client:	**Nickos Arnaoutis**						Consultant: **BT**			
Project:	**Hidden Club**									
		NOISE BREAK OUT TO OUTSIDE								
Source	Blue Room									
Noise Level	101 dBA									
	Corrections to obtain Lp at element ?									
	(eg distance/directivity)									
Building & Element	External envelope (Red Room wall)									
Area (S)	75 m^2	Width(a)=	15 m			Height(b)=	5 m			
Position Directivity (Q)	4	(=4 for a wall, 2 for a roof)								
Additional Directivity										
Receiver	Springfield Court									
Distance (R) from element	157 m									
Propagation Corrections										
Barrier	0									
Façade	0									
Calculation										
Frequency, Hz		**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dBA**
Internal Level,	dB	100	99	98	98	95	93	91	82	101
Internal Corrections ,	dB	0	0	0	0	0	0	0	0	
Corrected Internal Level,Lin,	dB	100	99	98	98	95	93	91	82	**101**
										Rw
SRI of Element,	dB	33.7	39.9	41.0	40.1	39.4	48.3	50.0	53.9	**43**
Additional Directivity,	dB	0								
Propagation Corrections										
Barrier,	dB	0								
Façade,	dB	0								
Level (1) at Receiver	**dB**	**30**	**23**	**21**	**22**	**19**	**9**	**5**	**-8**	**23**
Level (2) at Receiver	**dB**	**28**	**21**	**19**	**20**	**18**	**7**	**3**	**-10**	**21**
Criterion	dB	50	43	37	36	35	26	16	13	**38.5**
Lowest measured background										
Shortfall (1)	dB	-20	-20	-16	-14	-16	-17	-11	-21	
Shortfall (2)	dB	-22	-22	-18	-16	-17	-19	-13	-23	
Calculation Method	(1)	Lp = Lin - R - 6 + 10Log(S) - 20Log(R) - 11 + 10Log(Q)						far field		
	(2)	Lp = Lin - R - 6 + 10Log(ab/(pi^2*R^2)) + 10Log(Q/2)								

Calculation C4 – Noise breakout, Blue Room (via Red Room) – Roof

AEC Ltd						**Date:**	30/09/13			
Contract No:	**2836**									
Client:	**Nickos Arnaoutis**						Consultant: **BT**			
Project:	**Hidden Club**									
		NOISE BREAK OUT TO OUTSIDE								
Source	Blue Room									
Noise Level	101 dBA									
	Corrections to obtain Lp at element ?									
	(eg distance/directivity)									
Building & Element	External envelope (Red Room roof)									
Area (S)	270	m^2	Width(a)=	15	m	Height(b)=	18	m		
Position Directivity (Q)	2	(=4 for a wall, 2 for a roof)								
Additional Directivity										
Receiver	Springfield Court									
Distance (R) from element	157	m								
Propagation Corrections										
Barrier	0									
Façade	0									
Calculation										
Frequency, Hz		**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dBA**
Internal Level,	dB	100	99	98	98	95	93	91	82	**101**
Internal Corrections ,	dB	0	0	0	0	0	0	0	0	
Corrected Internal Level,Lin,	dB	100	99	98	98	95	93	91	82	**101**
										Rw
SRI of Element,	dB	33.7	39.9	41.0	40.1	39.4	48.3	50.0	53.9	**43**
Additional Directivity,	dB	0								
Propagation Corrections										
Barrier,	dB	0								
Façade,	dB	0								
Level (1) at Receiver	**dB**	**33**	**26**	**23**	**24**	**22**	**11**	**7**	**-6**	**25**
Level (2) at Receiver	**dB**	**31**	**24**	**21**	**22**	**20**	**9**	**5**	**-7**	**23**
Criterion	dB	50	43	37	36	35	26	16	13	38.5
Lowest measured background										
Shortfall (1)	dB	-17	-17	-14	-12	-13	-15	-9	-19	
Shortfall (2)	dB	-19	-19	-16	-14	-15	-17	-11	-20	
Calculation Method	(1)	Lp = Lin - R - 6 + 10Log(S) - 20Log(R) - 11 + 10Log(Q)						far field		
	(2)	Lp = Lin - R - 6 + 10Log(ab/(pi^2*R^2)) + 10Log(Q/2)								