Proposed Live Music Venue, Mayfield Warehouse, Manchester

PLANNING AND BUILDING CONTROL
28 JUN 2013

Environmental Noise Impact Assessment

Doc No: P2005437/(REP)U001
Issue: Final
Rev: B
Date: June 2013

Prepared for:
The Addy Consultancy
19 Hurricane Court
Hurricane Drive
Liverpool
L24 8RL

Prepared by:
BDP Acoustics
11 Ducie Street
PO Box 85
Piccadilly Basin
Manchester
M60 3JA

BDP.

ARCHITECTURE ▪ DESIGN ▪ ENGINEERING ▪ URBANISM ▪ SUSTAINABILITY ▪ LIGHTING ▪ ACOUSTICS

Contents

1. Introduction 1
1.1 Proposed Development 1
1.2 Noise Impact Assessment 1
2. Environmental Noise Surveys 2
2.1 Local Area Description 2
2.2 Survey Details 2
2.3 Survey Procedure 4
2.4 Description of Noise Climate 4
2.5 Survey Results Summary 4
3. Existing Entertainment Noise 5
4. Entertainment Noise Assessment Criteria 6
4.1 Manchester City Council Guidance 6
4.2 Entertainment Noise Limits Based on MCC Guidance 6
5. Noise Propagation Assessment 7
5.1 Introduction 7
5.2 Input Data and Assumptions 7
5.3 Noise Modelling Results 8
5.4 Comments on Noise Modelling Results 11
6. Operational Noise Policy 13
6. Operational Noise Policy 13
6.1 Introduction 13
6.2 Operational Noise Recommendations 13
7. Plant Noise Limits 14
7.1 BS 4142:1997 'Rating Industrial Noise Affecting Mixed Residential and Industrial Areas' 14
7.2 Proposed Plant Noise Limits 14
8. Summary of Recommendations 15
8.1 Entertainment Noise 15
8.2 Plant Noise 15

Appendix I – Glossary of Acoustic Terms 16
Appendix II – Detailed Graphical Noise Measurement Data (Position 1) 17

Report written by:

P. Edwards BSc (Hons) MAES MIOA
Senior Acoustic Consultant

[redacted]

Report checked by:

G. Stevenson PG Dip MIOA
Acoustics Associate

[redacted]

1. Introduction

1.1 Proposed Development

BDP Acoustics have been commissioned by The Addy Consultancy to undertake an acoustic assessment and report to supplement a planning application for a new live music venue.

It is proposed to adapt a disused warehouse, located near to Manchester Piccadilly Station, into an event space for a maximum capacity of 9,600 people.

This report includes an assessment of operational noise levels from the proposed venue with comparison to the existing background noise levels at the nearest noise sensitive premises.

The proposed operational hours of the venue are as follows:

Weekdays – 19:00 – 01:00 hours
Weekends / Bank Holidays – 22:00 – 05:00 / 06:00 hours

1.2 Noise Impact Assessment

In summary this report considers the existing noise climate and addresses the following:

- Noise climate in the vicinity of the closest noise sensitive premises to the site
- Assessment of existing entertainment noise sources
- Assessment of operational noise levels from the development
- Acoustic recommendations for façade constructions
- Recommendations for appropriate plant noise limits
- Recommendations for the control of crowd dispersal noise

A glossary of acoustic terms is presented in Appendix I.

2. Environmental Noise Surveys

2.1 Local Area Description

The proposed development site currently comprises a disused warehouse on Baring Street, Manchester.

The local area is mixed industrial and residential in character. To the north of the site is Manchester Piccadilly Station and associated railway lines; to the south and east of the site lies Baring Industrial Estate with the Mancunian Way beyond; to the west of the site on Baring Street and Buxton Street are residential apartments.

To the north of the site on Fairfield Street is The Star and Garter, a lively public house with music playing until 03:00 hours on weekends.

2.2 Survey Details

Unattended noise level measurements were undertaken continuously between 12:10 hours on Friday 05/10/12 and 09:00 hours on Tuesday 09/10/12. The readings were taken from an opening in the south façade at Platform Level, at the south-west corner of the building.

The unattended measurements were supplemented by manned noise measurements between 02:58 and 05:45 hours on Sunday 07/10/12. The weather conditions during the manned noise survey were calm with an occasional light breeze and misty with dry road surfaces. The readings were taken at a height of approximately 1.5m above the ground in free field positions.

The noise monitoring locations were as follows:

Position 1 (unattended, long-term monitoring position) – Projecting from an opening at Platform Level, facing South

Position 2 – Baring Street, adjacent to an apartment block

Position 3 – Chapeltown Street, opposite residential apartments

Position 4 – Fairfield Street, to the north of the site

Position 5 – Thirsk Street, adjacent to residential premises

Measurement positions for the manned measurements were selected to be at the closest noise sensitive receptors to the site around the site, with the exception of position 5 which was immediately to the north of the site. A site plan detailing all of the measurement positions can be seen in Figure 1.

Figure 1 – Noise Monitoring Locations



Table 4: Noise limits for entertainment noise based on MCC Guidance

Noise Sensitive Receiver	L_{90} Background Noise Level (dB) at Octave Band Centre Frequency (Hz)						
	63	125	250	500	1000	2000	4000
Apartments on Baring Street	42	35	32	31	32	27	17
Apartments on Chapeltown Street	53	42	34	28	26	22	13
Houses on Thirsk Street	40	35	32	26	27	23	12

5. Noise Propagation Assessment

5.1 Introduction

The noise propagation from the proposed development during events has been assessed by utilising the environmental noise modelling software package, *Cadna/A.*

Cadna/A is an internationally recognised software package for calculation and assessment of environmental noise. From input of calibrated noise sources, topographical data and building locations, a 3D model of an area can be produced. The propagation of noise from user defined sources can then be evaluated, taking into account height data and building locations. Noise levels at specific locations (such as a particular building façade) can then be calculated.

The standard outdoor noise propagation model used in the Cadna/A program is in accordance with ISO 9123-1&2:1993 'Attenuation of sound during propagation outdoors'.

5.2 Input Data and Assumptions

The Cadna/A model has been based on the following data and assumptions:

1. Acremoss Designs Ltd drawings:
    a. Proposed Plan and Elevation, ref. 196, 21/07/11
    b. Site Plan, ref. 196, 21/07/11

2. The internal activity noise level indicated in Table 3, which is based on data collected in an existing entertainment venue.

3. The façade performance values indicated in Table 4. At this stage, we have assumed that all facades have the equivalent acoustic performance of **dense** 100mm solid-core blockwork (density 1900 kg/m^3). Therefore any elements of construction with a lower performance than this, such as the vented openings to

4. Entertainment Noise Assessment Criteria

4.1 Manchester City Council Guidance

We have made contact with the Environmental and Public Protection department of Manchester City Council and have been provided with the following guidance in relation to entertainment noise:

> *Noise from entertainment venues, for example noise from recorded music, live bands, or karaoke, can be particularly annoying for local residents and businesses if it is not adequately contained within the venue.*
>
> *When considering the potential impact of a proposal for an entertainment venue consultants should consider the overall noise level (L_{Aeq}) and the 63 Hz and 125 Hz octave band noise levels (L_{eq}). Music noise in the 63 Hz and 125 Hz octave bands, which is often described as "bass noise", is particularly difficult to contain and the impulsive character of this low frequency music noise is particularly disturbing for local residents exposed to it. The target noise criteria here should be 10dB (L_{Aeq}) below the existing L_{A90} in each octave band at the nearest noise sensitive location.*
>
> *Applicants and consultants should note that although a particular business model may require a "chilled out" or "acoustic" venue Planning Approval for an entertainment venue will remain in place as long as the development exists. Subsequent owners or tenants may wish to provide much louder entertainment in the future. For this reason applicants and consultants should predict the noise impact of a proposed entertainment venue using noise levels that are representative of those found in "typical" venues of the kind being applied for. Consultants should provide their rational for using particular noise levels and reference the source of the noise levels used during their predictions.*

4.2 Entertainment Noise Limits Based on MCC Guidance

Table 3 indicates the lowest L_{90} (background noise level) Octave Band noise levels measured at each of the closest residential premises to the proposed development between 02:58 – 05:45 hours on Sunday 07/10/12

Table 3: The Octave Band spectrum for the lowest $L_{A90(5\ min)}$ noise levels measured at the closest residential premises to the proposed development

Noise Sensitive Receiver	L_{90} Background Noise Level (dB) at Octave Band Centre Frequency (Hz)						
	63	125	250	500	1000	2000	4000
Apartments on Baring Street	52	45	42	41	42	37	27
Apartments on Chapeltown Street	63	52	44	38	36	32	23
Houses on Thirsk Street	50	45	42	36	37	33	22

The corresponding noise limits for entertainment noise based on the Manchester City Council guidance are provided in Table 4.

Table 2: Summary of spot noise level measurements, 02:58 – 05:45 hours on Sunday 07/10/12

Monitoring Location	Period	$L_{AFmax(5\ mins)}$ dB	$L_{Aeq(5\ mins)}$ dB	$L_{A90(5\ mins)}$ dB
Position 2	Night-time	58 – 75	50 – 58	45 – 49
Position 3	Night-time	52 – 75	45 – 60	44 – 46
Position 4	Night-time	71 – 82	61 – 66	45 – 59
Position 5	Night-time	72 – 76	62 – 65	42 – 55

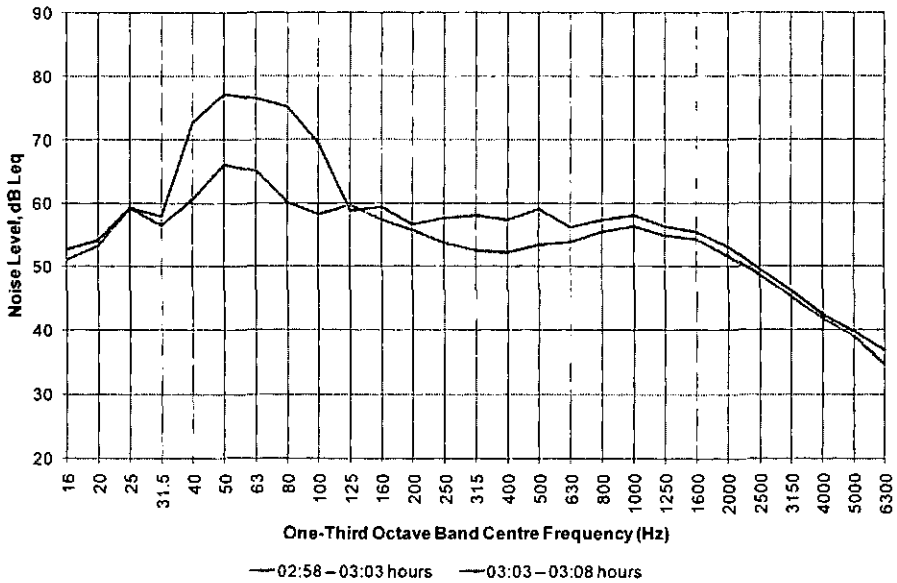
Graphs of the noise level data measured during the unattended noise survey can be sound in Appendix II.

3. Existing Entertainment Noise

To the north of the site, lies The Star and Garter, which was found during the Saturday night noise survey to produce significant levels of entertainment noise.

Figure 2, shows the frequency content of the noise produced by The Star and Garter during full operation (02:58 – 03:03 hours) and after closing (03:03 – 03:08 hours). The noise levels were collected at noise monitoring Location 4, approximately 40m from the closest façade of the premises.

Figure 2 – Entertainment noise produced by The Star and Garter public house



It can be seen that there is a significantly greater low and mid frequency contribution to the ambient noise level in the area when The Star and Garter is operating due to their amplified music at this time.

2.3 Survey Procedure

The instrumentation used for the long-term survey was a Rion NA-28 Class 1 Sound Level Meter. The sound level meter was calibrated before and after the survey using a Rion NC-74 calibrator and no drift in level was observed.

The instrumentation used for the spot measurements were two Brüel & Kjær Type 2260 Precision Sound Level Meters. The sound level meters were calibrated before and after the survey using a Brüel & Kjær calibrator type 4231 and no drift in level was observed.

A-weighted and octave-band fast response levels were measured throughout using 5 minute sample periods.

2.4 Description of Noise Climate

The noise climate during the manned noise measurements was dominated by traffic, both local and more distant (from the Mancunian Way).

Other sources included: public address announcements from Manchester Piccadilly Station, voices from passing pedestrians and entertainment noise from The Star and Garter public house (see Section 3).

2.5 Survey Results Summary

Table 1 presents a summary of the noise levels at Position 1. Table 2 presents a summary of the manned spot measurements.

Table 1: Summary of noise levels from Position 1 (long-term survey)

Date	Period	Duration (hrs)	$L_{AFmax(5\ mins)}$ dB	$L_{Aeq(5\ mins)}$ dB	$L_{A90(5\ mins)}$ dB
Friday 05/10/12	Daytime	12:10 – 23:00	63 – 86	58 – 67	54 – 62
	Night-time	23:00 – 07:00	62 – 77	54 – 61	49 – 56
Saturday 06/10/12	Daytime	07:00 – 23:00	62 – 91	54 – 64	48 – 60
	Night-time	23:00 – 07:00	58 – 76	50 – 64	46 – 61
Sunday 07/10/12	Daytime	07:00 – 23:00	62 – 89	56 – 63	52 – 61
	Night-time	23:00 – 07:00	60 – 71	51 – 59	45 – 54
Monday 08/10/12	Daytime	07:00 – 23:00	63 – 97	57 – 68	52 – 63
	Night-time	23:00 – 07:00	59 – 88	50 – 62	46 – 60
Tuesday 09/10/12	Daytime	07:00 – 09:00	66 – 71	61 – 64	58 – 62

the north, profiled panelling to the south, and unused entrance doors will be sealed with the 100mm blockwork. The large existing metal door to the north will be retained and the doors to the smoking area at the rear will be replaced with good fitting solid core doors with perimeter seals.

Table 5: Internal activity noise assumed for the Cadna/A model

L_{eq} (dB) at Octave Band Centre Frequency (Hz)							L_{Aeq} (dB)
63	**125**	**250**	**500**	**1000**	**2000**	**4000**	
107	107	105	102	100	94	91	105

Table 6: Sound insulation performance values assumed for façade elements

	Sound Reduction, R (dB) at Octave Band Centre Frequency (Hz)							R_w (dB)
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	
Façade walls	33.7	38.2	40.8	46.2	53.3	62.0	70.0	51
Existing metal door	10	10	10	10	10	10	10	11
Replacement doors	20	26	28	28	27	23	25	26

5.3 Noise Modelling Results

Figures 3 shows a 3D view of the Cadna/A model and Figure 4 indicates the noise map produced for the scenario detailed in Section 5.2 indicating the sound propagation from the proposed development during operation.

Figure 3: Cadna/A noise model

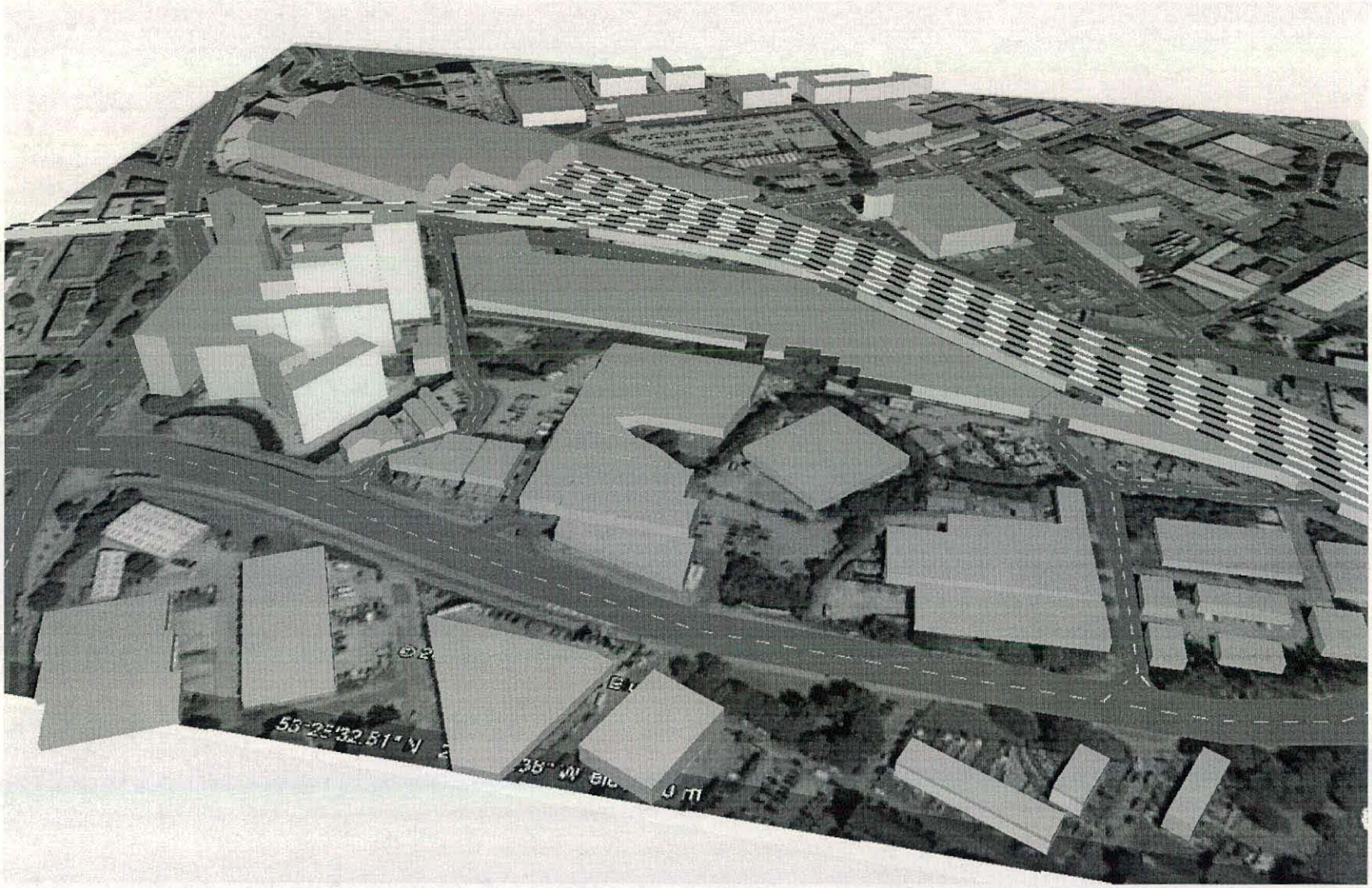
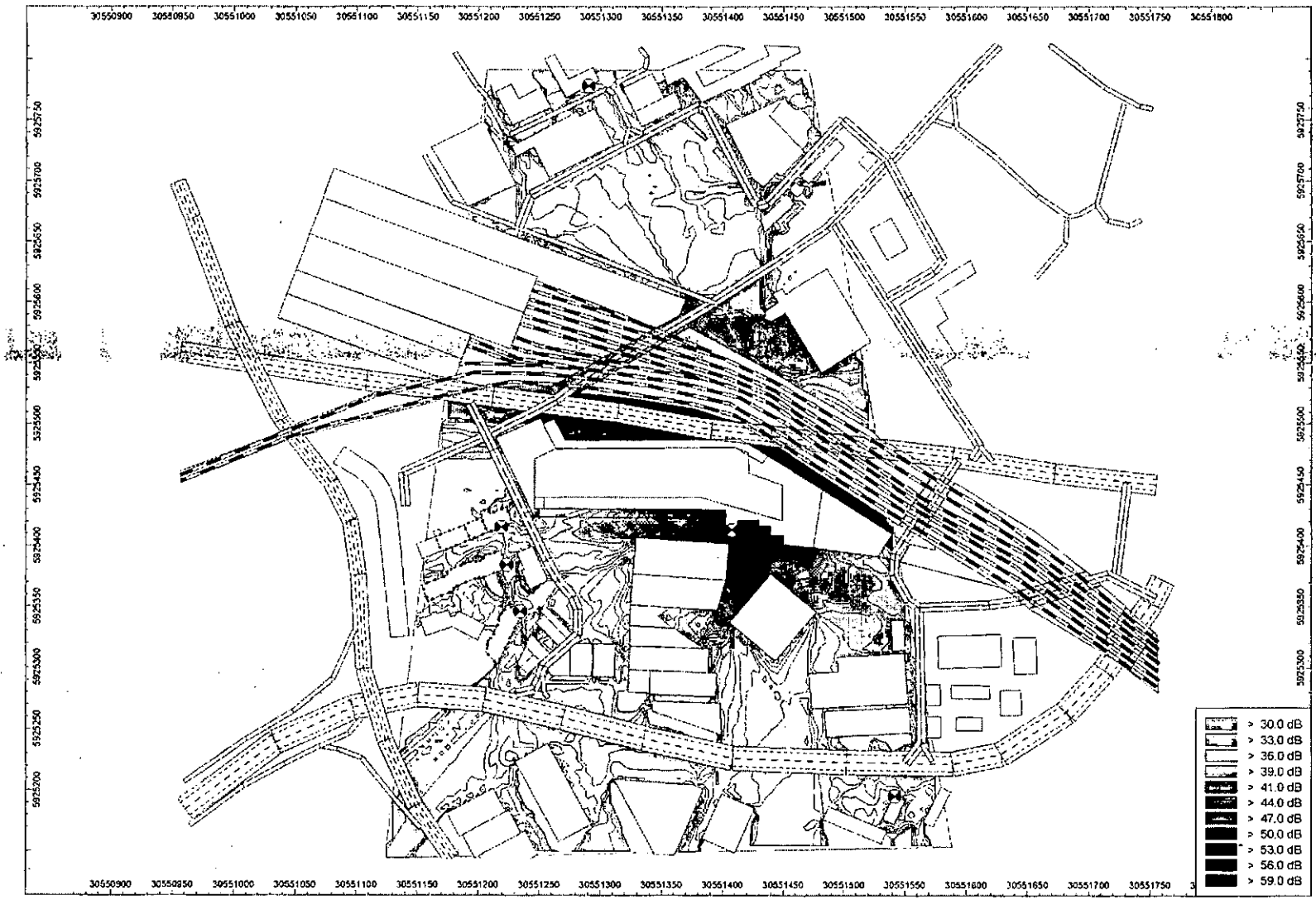


Figure 4: Noise propagation pattern from the proposed development for the scenario detailed in Section 5.2



5.4 Comments on Noise Modelling Results

As can be seen in Table 7 for the closest residential receptor on Baring Street, the noise modelling results for the initial scenario indicate that additional acoustic measures will be required to achieve the entertainment noise limits in Table 4. Primarily, this is due to the existing entrance door on Fairfield Street being poorly sealed.

Table 7: Predicted entertainment noise level at Baring Street from the initial scenario

	L_{90} Background Noise Level (dB) at Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**
Predicted entertainment noise level	46	41	36	37	38	31	21
Entertainment noise limit	42	35	32	31	32	27	17
Difference	**+4**	**+6**	**+4**	**+6**	**+6**	**+4**	**+4**

We therefore recommend that in addition to the doors for the rear smoking area being lobbied, the main door on Fairfield Street should also be provided with a lobby arrangement. Lobbies can be constructed from 100mm dense blockwork. Figure 5 indicates approximate locations for the additional doors based on acoustic requirements only.

Table 8 indicates the noise level predicted at the apartments on Baring Street following the inclusion of these acoustic measures.

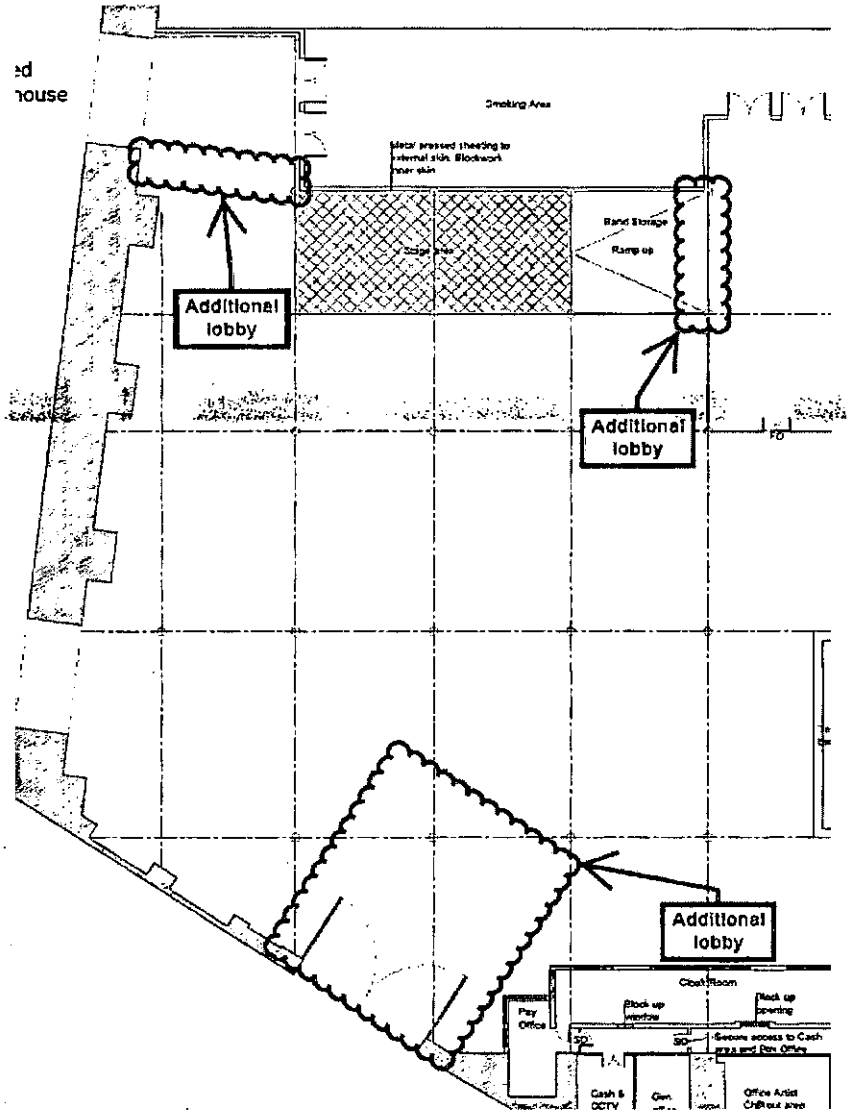
Table 8: Predicted entertainment noise level at Baring Street including additional acoustic measures

	L_{90} Background Noise Level (dB) at Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**
Predicted entertainment noise level	42	35	31	25	22	17	6
Entertainment noise limit	42	35	32	31	32	27	17
Difference	**0**	**0**	**-1**	**-6**	**-10**	**-10**	**-11**

It should be noted that careful management of the lobbies will be required minimise noise break-out. However, even with careful management, external noise levels will be temporarily raised when patrons pass through the doors. Opening of the doors should therefore be kept to a minimum.

All other openings (windows, doors, vents etc) will need to be made good with blockwork.

Figure 5: Proposed additional acoustic lobbies



6. Operational Noise Policy

6.1 Introduction

The client has produced a policy entitled 'Sound' detailing measures which can be implemented during events to minimise and monitor noise levels at local residential premises. The key recommendations are reproduced below.

6.2 Operational Noise Recommendations

- Noise from any regulated entertainment at the premises shall be controlled and monitored.

- The contact numbers of DPS and of the event managers will be provided to McDonalds hotel and a representative from the residential bloc on Baring/ Buxton street. In the unlikely event where a noise nuisance can be heard at these locations the event manager shall be contactable on the number during the venue opening hours.

- Noise levels shall be monitored from outside McDonalds Hotel and the residential bloc every 30minutes and a record shall be kept of the result of that noise monitoring. The record shall be made available to any Officer of Manchester City Council before and following the event.

- A noise monitoring device shall be fitted to the sound system and all music played at the premises shall be routed through this device. This noise monitor shall be set at a reasonable level agreed by Environmental Health at least 2 days before the premises opens to the public.

- No external speakers shall be operated from the premises.

- Upon receipt of a complaint from a local resident concerning noise nuisance, either directly or via any Responsible Authority, noise monitoring will be undertaken from or as close as possible to the source of the compliant and where noise from regulated entertainment is audible, the level of entertainment shall be reduced to a level so that it no longer poses a nuisance.

- Door supervisors to supervise the area immediately outside the premises to reduce any unnecessary noise

7. Plant Noise Limits

7.1 BS 4142:1997 'Rating Industrial Noise Affecting Mixed Residential and Industrial Areas'

This code of practice describes a method of determining the level of noise of an industrial nature, together with procedures for assessing whether the noise in question is likely to give rise to complaints from noise sensitive premises.

Section 9 of the code of practice, 'Assessment Method', assesses the likelihood of complaints by subtracting the measured background noise level (L_{A90}) from the rating level (L_{Aeq}).

It states the following guidance:

- A difference of around + 10 dB or more indicates that complaints are likely.
- A difference of + 5 dB is of marginal significance.
- If the rating level is more than 10 dB below the measured background noise level then this is a positive indication that complaints are unlikely.

7.2 Proposed Plant Noise Limits

We propose a plant noise limit (rating level) 5 dBA below the measured background noise level at the existing noise sensitive premises. Table 5 indicates the lowest background noise level measurements at the closest noise sensitive receivers and the corresponding plant noise limit.

Table 7: Proposed noise limits for external plant installations

Noise Sensitive Receiver	Lowest Background Noise Level, dB $L_{A90(5\ min)}$	Proposed Plant Noise Limit, dB $L_{Aeq,T}$
Apartments on Baring Street	45	**40**
Apartments on Chapeltown Street	44	**39**
Houses on Thirsk Street	42	**37**

Designing external plant installations to achieve the above limits would be assessed by BS 4142 as 'of marginal significance', tending towards complaints being unlikely.

8. Summary of Recommendations

An acoustic assessment has been made of the proposal to create a new live music venue within the currently disused Mayfield Warehouse, Fairfield Street, Manchester.

A noise survey has been completed to determine the existing noise climate at the closest residential premises to the proposed development.

8.1 Entertainment Noise

Using the noise survey information a noise propagation model has been created. This model indicates that in order to achieve the Manchester City Council guideline noise limits for entertainment noise break-out, the following measures will be required:

- The façade construction shall comprise minimum 100mm solid dense blockwork (minimum density 1900 kg/m^3).
- All external doorsets to be provided with lobby arrangements, comprising 100mm solid dense blockwork (minimum density 1900 kg/m^3) and minimum R_w 30 dB doorsets.

Based on these constructions, we predict that it is feasible to produce music suitable sound levels for a venue of this type and still achieve the Manchester City Council noise limits for entertainment noise.

Other good practice advice has also been provided, including in relation to the management of the venue and the minimisation of disruption from patrons leaving the area.

A noise limiter has also been recommended to ensure that the agreed-upon sound level cannot be increased.

8.2 Plant Noise

Based on the noise survey information, noise limits for external plant installations have been specified, in accordance with the guidance within British Standard 4142: 1997.

Appendix I – Glossary of Acoustic Terms

A-Weighting

Normal hearing covers the frequency range from about 20Hz to 20kHz but sensitivity is greatest between about 500Hz and 8kHz. The 'A-Weighting' is an electronic filters network incorporated in sound level meters which approximately corresponds to the frequency response of the ear. The unit of measurement of A-weighted sound level is dBA.

Decibel, dB

This is the unit to measure sound. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). We therefore use a logarithmic scale to describe sound pressure level, intensities and sound power levels. Subjectively, an increase of 10 dB corresponds to a doubling in the perceived loudness of sound.

Equivalent Continuous Sound Level L_{eq} or L_{Aeq}

The continuous equivalent sound level, L_{Aeq} is a notional sound level. It is the sound level, which, if maintained for a given length of time, would produce the same acoustic energy as a fluctuating noise over the same time period. The A-weighted L_{eq} is widely used to measure any environmental noise which varies considerably with time and is denoted as the L_{Aeq}.

Octave and Third Octave Bands

The human ear is sensitive to sound over a range of approximately 20Hz to 20kHz, and is generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum is divided into frequency bands, and the sound pressure level is measured in each band. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. (For instance the octave bands above and below the 500Hz octave band are 1kHz and 250Hz respectively). For finer analysis, each octave band may be split into three one-third octave bands or in some cases, fine frequency bands.

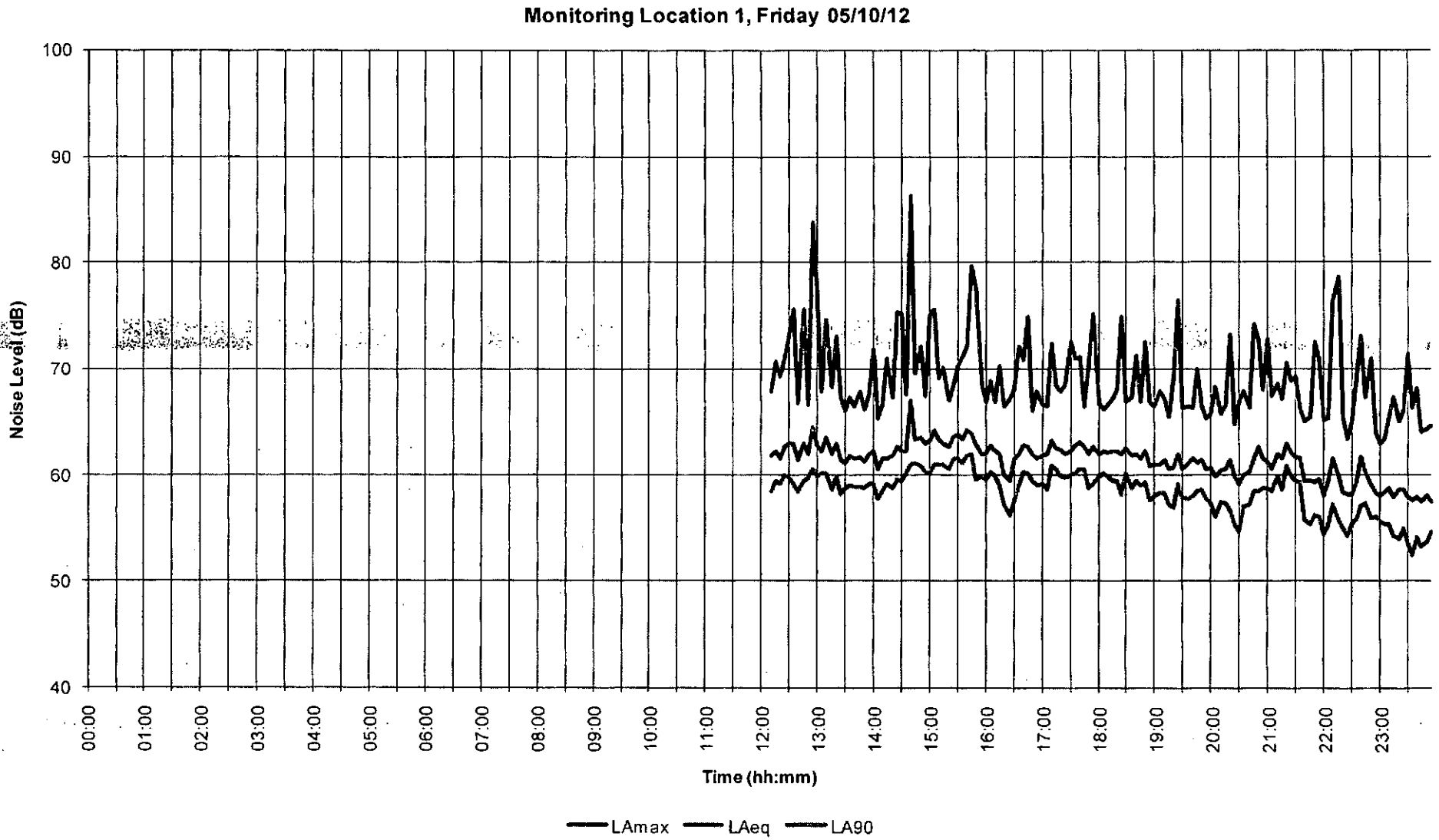
Statistical Level: L_{90}

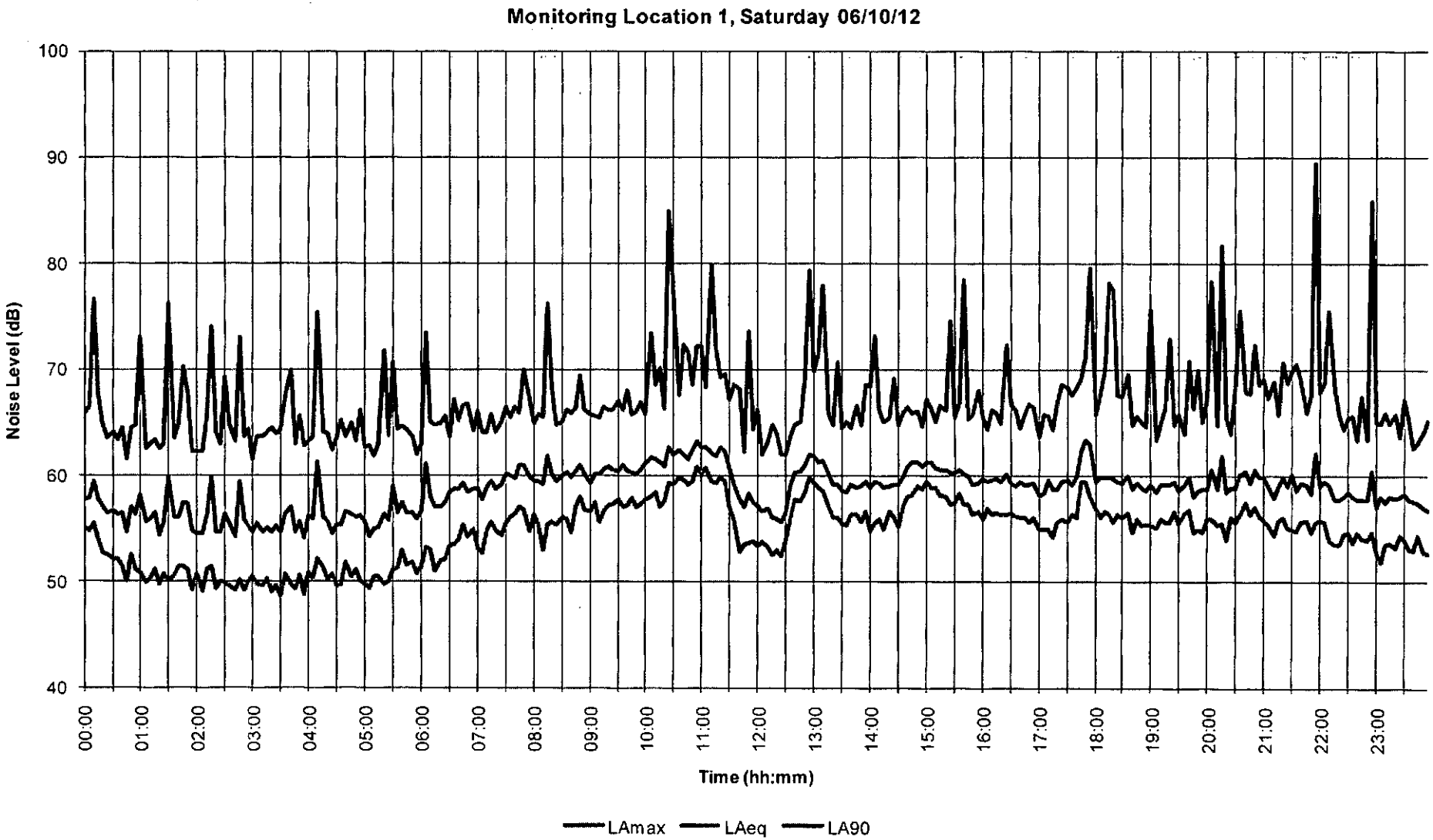
Sound pressure level that is exceeded for 90% of the measurement time. Consequently it is indicative of the general background noise level in the absence of any higher level short duration events that occur during the period.

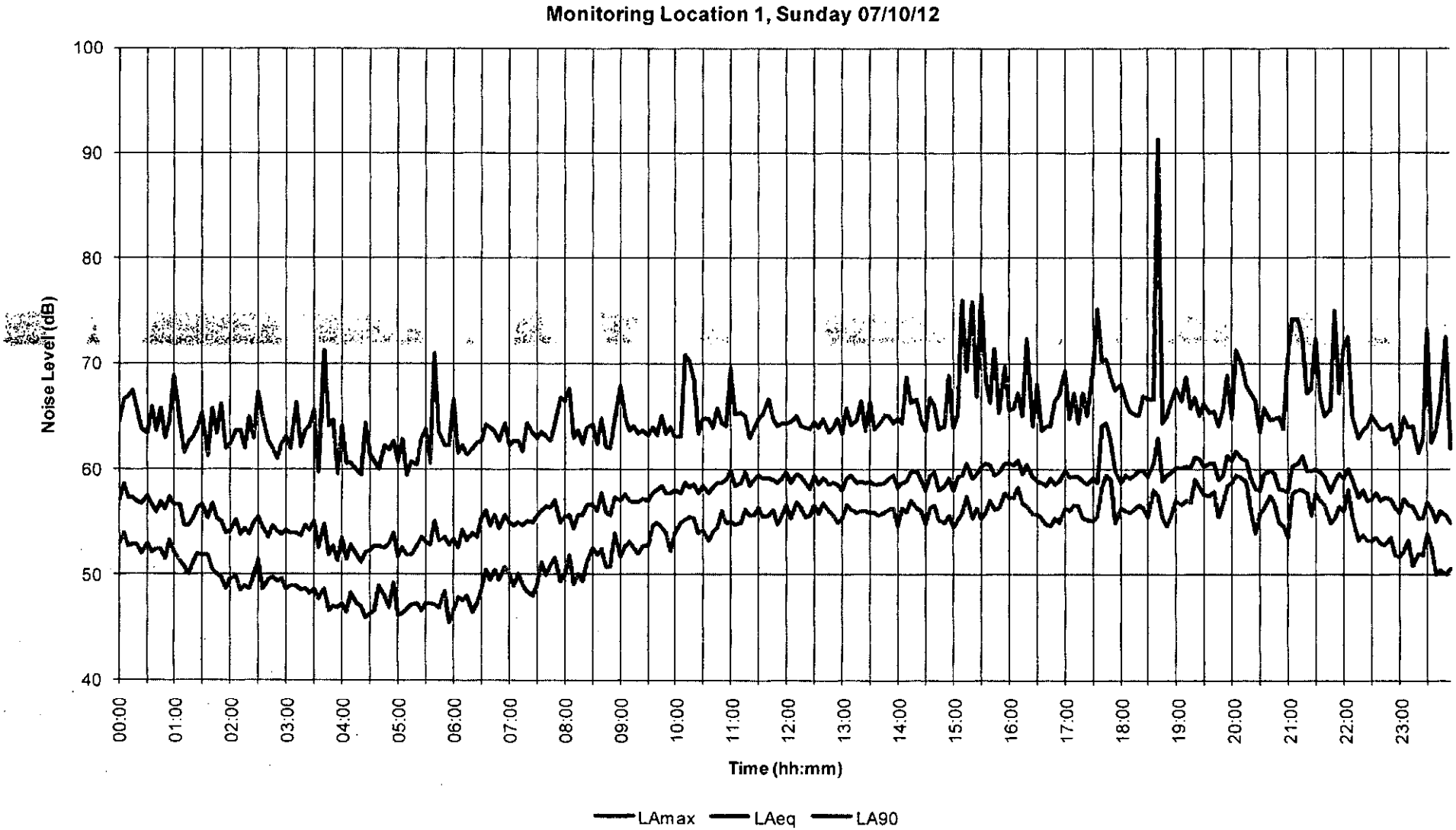
Weighted Sound Reduction Index, R_w

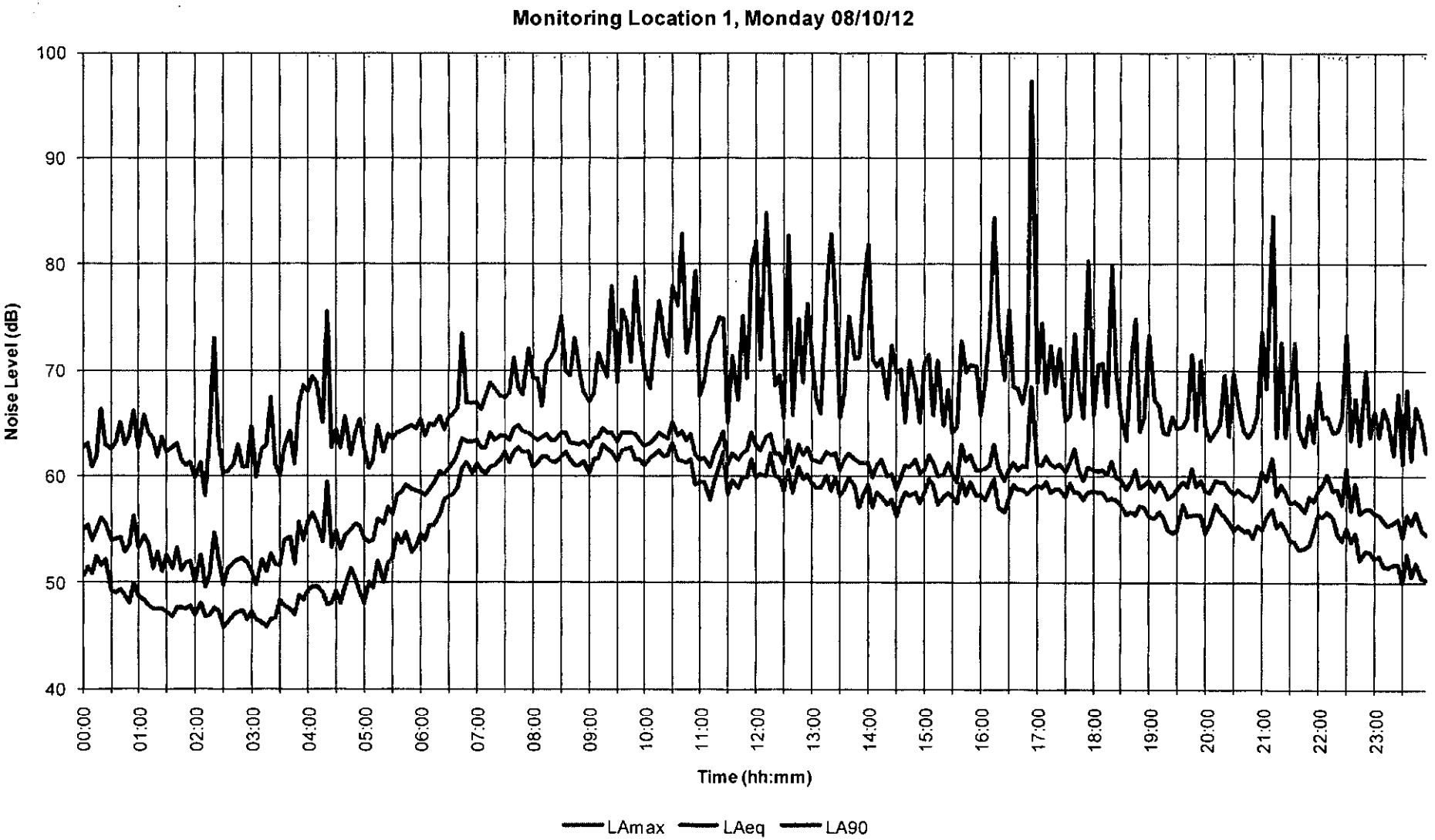
This is a weighted single figure descriptor of the sound insulation performance of a partition measured under laboratory conditions. The sound reduction index in each of the one-third octave bands from 100Hz to 3150Hz is compared with a standard set of curves. The value of R_w for a given partition is obtained from the standard curve which when compared with the measured SRI values produces an adverse deviation as close to -32dB as possible. Only the SRI values which fall below a particular standard curve are considered in the sum. Positive deviations from the standard curve are not taken into account.

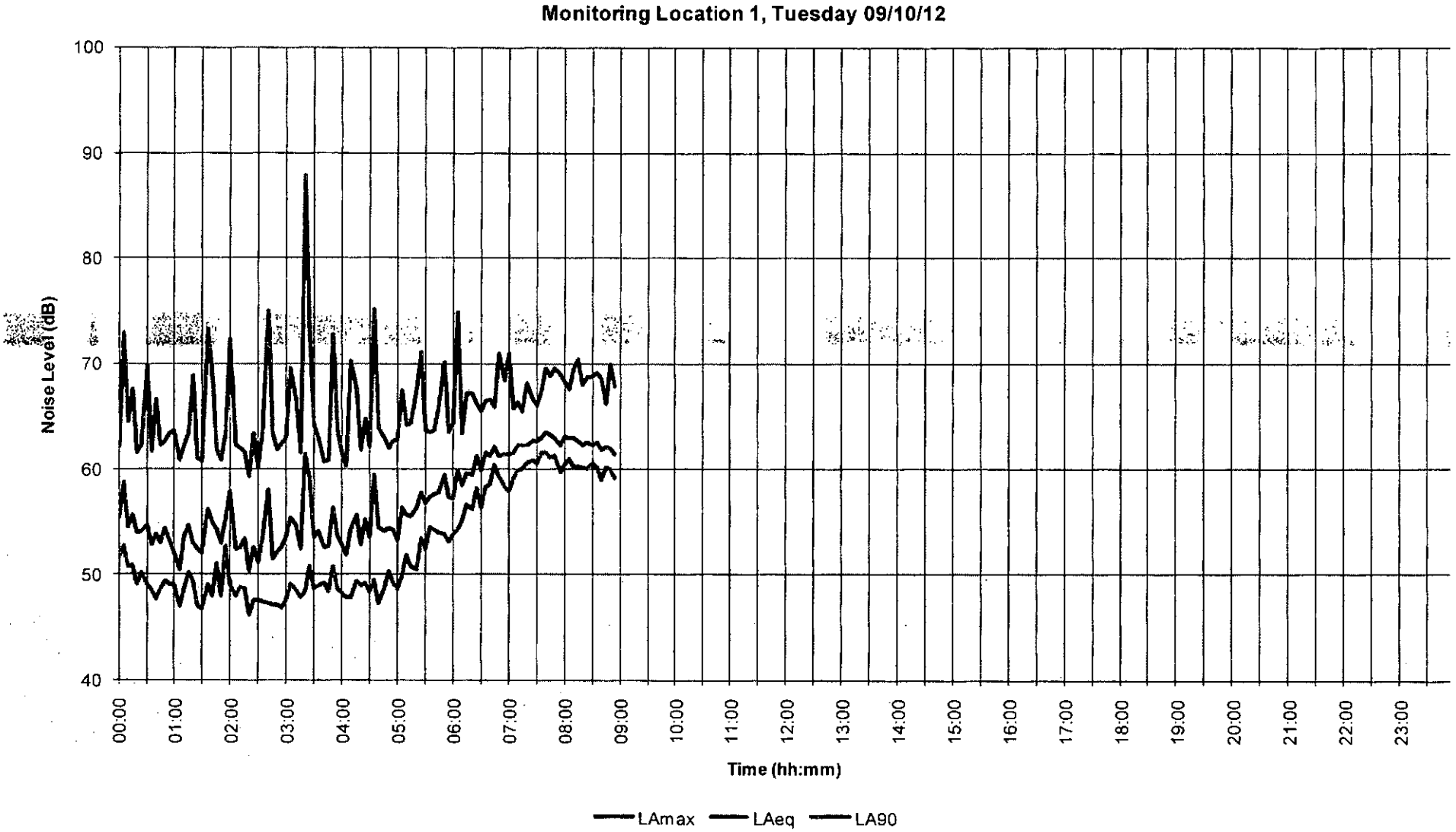
Appendix II – Detailed Graphical Noise Measurement Data (Position 1)


Monitoring Location 1, Friday 05/10/12
Noise Level (dB)
100
90
80
70
60
50
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
LAmax
LAeq
LA90


Monitoring Location 1, Saturday 06/10/12
Noise Level (dB)
100
90
80
70
60
50
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
LAmax
LAeq
LA90


Monitoring Location 1, Sunday 07/10/12
Noise Level (dB)
100
90
80
70
60
50
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
LAmax
LAeq
LA90


Monitoring Location 1, Monday 08/10/12
Noise Level (dB)
100
90
80
70
60
50
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
LAmax
LAeq
LA90


Monitoring Location 1, Tuesday 09/10/12
Noise Level (dB)
100
90
80
70
60
50
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
LAmax
LAeq
LA90