environmental
equipment
corporation

Richmond House, Churchfield Road, Walton-on-Thames, Surrey KT12 2TP
Tel: 01932 230940 Fax: 01932 230941 email: info@eecnoisecontrol.co.uk

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Project : Gloucester Avenue

BACKGROUND NOISE SURVEY AND PLANT ASSESSMENT

Client: Pye International
Heron Court
3 High Street
Hampton
Middlesex
TW12 2SQ

Report Compiled By:-

Toby Park MEng (Hons)
CONSULTANCY DIVISION

Report Checked By:-

Jon Mudd BEng (Hons) MIOA
CONSULTANCY DIVISION

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REPORT

ENVIRONMENTAL EQUIPMENT CORPORATION

CONTENTS

1.00 INTRODUCTION

1.01 Environmental Equipment Corporation Limited have been commissioned by Pye International to undertake a background noise survey at Gloucester Avenue, with a view to ascertaining prevailing background noise levels for the immediate vicinity.

1.02 Proposals are being submitted to the Borough of Camden to install mechanical service plant. Noise levels from the plant need to be assessed as part of the planning application and are therefore addressed in this report.

1.03 This report is prepared solely for Pye International. Environmental Equipment Corporation Ltd accepts no responsibility for its use by any third party.

2.00 SITE

2.01 The proposed works are located on the roofs of two adjacent buildings to the rear of a row of terraced houses and a public house on Gloucester Avenue. The rear of the property is bordered by a railway line. Appendix A shows a plan of the proposed roof layout and notes indicating properties in the surrounding area.

2.02 The nearest noise sensitive properties are the residences on Gloucester Avenue.

Photo 2.1: View from plant location overlooking public house.

Photo 2.1: Measurement location opposite Gloucester Avenue residences.

3.00 MEASUREMENTS

3.01 Background noise levels have been measured over a 26 hour period at a suitable location, representative of the immediate noise environment, as shown on the site plan in Appendix A.

3.02 The equipment was set up to integrate sound levels over 5 minute intervals between 1247hrs, Monday 17 November and 1432hrs, Tuesday 18 November 2008. However, the period of interest is between 0700 hrs and 1900 hrs which covers the proposed operating times

3.03 Levels were recorded as A weighted L_{eq}, L_{10} and L_{90}.

3.04 Weather conditions during the survey were calm and mostly dry throughout

4.00 EQUIPMENT

4.01 Equipment for the survey was as follows:-

- Brüel & Kjær type 2238 Integrating Sound Level Meter conforming to type 1 BS EN 60804 & BS EN 60651: 1994.
- Brüel & Kjær Condenser Microphone and Connecting Leads.
- Brüel & Kjær Outdoor Microphone Kit, type UA1404.
- Tripod.

4.02 The equipment holds current UKAS or equivalent accreditation and serial numbers as follows:

Sound Level Meter B&K2238	Serial No.	262287
	Calibration Date	28th August 2008
	Cal Certificate No.	C0806385
½" Condenser Mic. B&K4188	Serial No.	2641221
	Calibration Date	28th August 2008
	Cal Certificate No.	C0806385
Calibrator B&K4231	Serial No.	2389051
	Calibration Date	20th August 2008
	Cal. Certificate No.	4344

N.B. Copies of calibration certificates are available upon request.

4.03 The equipment was calibrated both before and after the survey with no difference noted in the levels.

5.00 RESULTS

5.01 A list of the levels measured is included in Appendix B and represented graphically in Appendix C.

5.02 A summary of the average ambient and lowest measured background levels is shown in Table 5.1, below.

Period	L_{Aeq} – dB	L_{A90} – dB
Day time (0700-1900 hrs)	55.3	42.5
Evening (1900-2300 hrs)	53.6	41.5
Night-time (2300-0700 hrs)	49.5	36.5

Table 5.1: Measured Ambient and Background Noise Levels

6.00 DISCUSSION

6.01 The Borough of Camden Environmental Health Department require that noise levels generated by mechanical services plant should be designed to a level of 10 dB below the lowest measured background level during the proposed period of operation and as measured at the nearest residential windows.

6.02 It is assumed that plant will only operate during office hours 0700 hrs – 1900 hrs, therefore, noise emitted from the proposed plant should not exceed 32.5 dB(A) at 1m external of the nearest residential window.

7.00 PLANT ASSESSMENT

7.01 Allowing for distance attenuation over approximately 15m, the noise levels of the proposed plant is summarised in table 7.1 below, based upon the manufacturers' stated noise levels, all @ 1m free-field.

Model	Reference	Sound Pressure Level @ 1m	Sound Pressure Level @ Residential Windows
East Office Building			
Mitsubishi PURY P600	G Floor Left	61 dB(A)	42 dB(A)
Mitsubishi PURY P500	G Floor Right	60 dB(A)	41 dB(A)
Mitsubishi PURY P400	1st Floor Left	61 dB(A)	42 dB(A)
Mitsubishi PURY P400	1st Floor Right	61 dB(A)	42 dB(A)
VES ECO642	Supply AHU	74 dB(A) *(60° off-axis)*	51 dB(A)
VES ECO642	Supply AHU	74 dB(A) *(60° off-axis)*	51 dB(A)
VES FLO113	Toilet Extract Fan	69.5 dB(A)	46 dB(A)
Cumulative Total		**78 dB(A)**	**55 dB(A)**
Noise Limit			**32.5 dB(A)**
West Office Building			
Mitsubishi PURY P750	G Floor Left	61 dB(A)	42 dB(A)
Mitsubishi PUMY P100	G Floor Reception	54 dB(A)	35 dB(A)
Mitsubishi PURY P700	1st Floor Left	61 dB(A)	42 dB(A)
Mitsubishi PURY EP200	1st Floor Right	56 dB(A)	37 dB(A)
Mitsubishi PURY P500	2nd Floor Left	60 dB(A)	41 dB(A)
Mitsubishi PURY EP200	2nd Floor Right	56 dB(A)	37 dB(A)
VES ECO844	Supply AHU	78 dB(A) *(60° off-axis)*	55 dB(A)
VES ECO844	Exhaust AHU	78 dB(A) *(60° off-axis)*	55 dB(A)
VES FLO113	Toilet Extract Fan	69.5 dB(A)	46 dB(A)
Cumulative Total		**81 dB(A)**	**59 dB(A)**
Noise Limit			**32.5**

Table 7.1: Summary of Plant Assessment for East and West Buildings

7.02 As discussed in section 6 of this report, the applicable noise level design criterion for the proposed new plant has been set at 32.5 dB(A) outside the nearest noise sensitive windows, based on daytime operation of the proposed plant.

7.03 The calculated plant noise levels at the residences opposite the east and west buildings are 55 dB(A) and 59 dB(A) respectively. Hence, the proposed plant on both buildings fails to satisfy the planning requirements of the Borough of Camden.

7.04 By assessing each item of plant individually (as shown in Table 7.1) it can be seen that all units are individually in excess of the noise limit. The noisiest items are the air handling units.

7.05 Hence, it is recommended that atmosphere side attenuators be fitted to the four air handling units. These attenuators should provide a minimum insertion loss of 24 dB(A). All other plant should be individually attenuated or screened with a common acoustic barrier (i.e. one screen per building). This solution is shown on the roof plans in appendix A.

7.06 The minimum broadband sound reduction indices for the two barriers are show in table 7.2:

Location	Minimum Sound Reduction Index (dB)
East Barrier	18 dB
West Barrier	18 dB

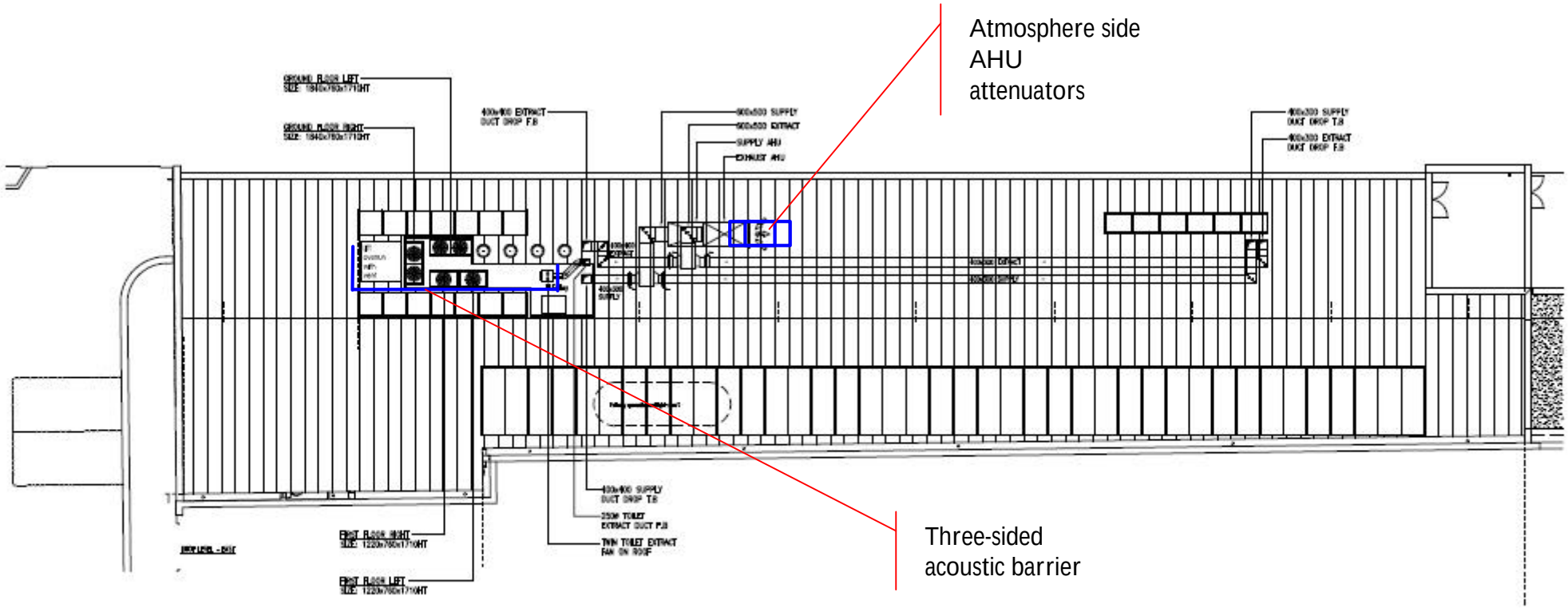
Table 7.2: Minimum Required Sound Reduction Index of Acoustic Barriers

7.07 Such a barrier should be built so that the line of sight between the proposed plant and any residential property along Gloucester Avenue is blocked, both vertically and horizontally. Hence, in order to protect the houses further along Gloucester Road, the barriers should either extend considerably along the length of the buildings, or be three sided as demonstrated in Appendix A. Assuming the minimum airflow requirement of the units is not inhibited, the barriers should be of solid construction and extend fully down to the roof.

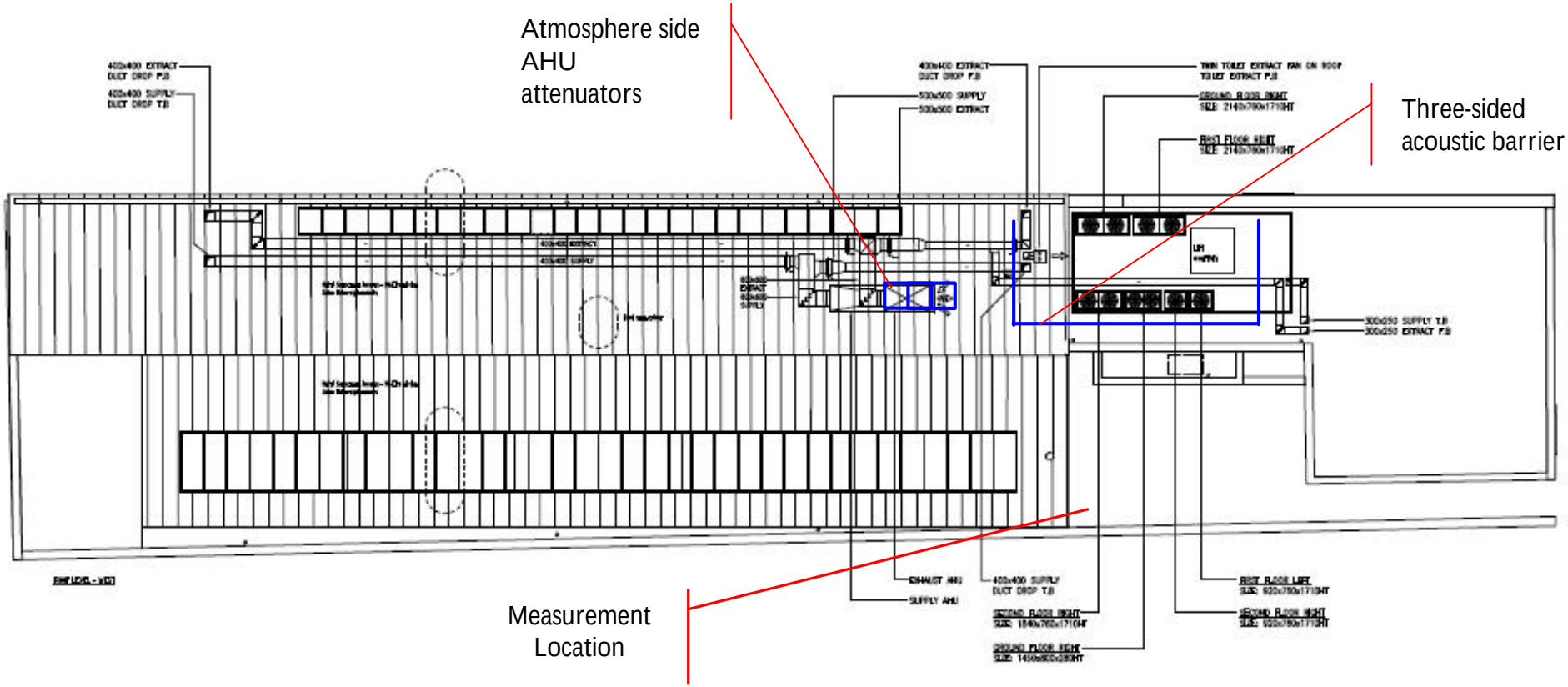
7.08 Alternatively, all plant units can be individually attenuated with atmosphere side attenuators. If this solution is preferred, each individual item of plant (including the air handling units as described in section 7.05) should be attenuated to below 25 dB(A) at 15m, in order to achieve the cumulative noise limit of 32 dB(A) at 15m.

APPENDIX A

SITE PLAN
&
MEASUREMENT LOCATION



Residential façade approximately 15m from proposed plant.



Residential façade approximately 15m from proposed plant.

Public House

APPENDIX B

SURVEY RESULTS
(TABULAR)

EC 9784 - Gloucester Avenue

Pye International

24 Hour Noise data

Time	$L_A$eq	L_A10	L_A90
12:47	65	61	52
12:52	54	56	52
12:57	54	56	52
13:02	53	55	52
13:07	55	58	52
13:12	53	56	51
13:17	53	55	51
13:22	54	56	51
13:27	53	55	51
13:32	53	55	51
13:37	54	56	52
13:42	54	56	51
13:47	53	54	51
13:52	53	54	51
13:57	53	55	51
14:02	53	54	51
14:07	53	54	51
14:12	52	54	51
14:17	53	55	51
14:22	53	55	51
14:27	52	53	51
14:32	52	54	51
14:37	53	55	52
14:42	53	55	51
14:47	55	56	52
14:52	53	55	51
14:57	52	53	51
15:02	53	54	51
15:07	52	54	51
15:12	54	56	51
15:17	53	55	51
15:22	53	54	52
15:27	53	54	51
15:32	53	55	51
15:37	54	56	52
15:42	53	55	51
15:47	54	55	51
15:52	53	56	51
15:57	53	55	51
16:02	53	55	51
16:07	53	55	51
16:12	53	56	51
16:17	52	54	50
16:22	52	54	50
16:27	53	56	50
16:32	53	56	51
16:37	53	56	50
16:42	53	55	50

Time	$L_A$eq	L_A10	L_A90
16:47	53	55	51
16:52	54	57	52
16:57	52	53	51
17:02	53	56	51
17:07	52	55	51
17:12	55	57	51
17:17	54	58	51
17:22	54	59	51
17:27	54	57	51
17:32	54	57	52
17:37	56	58	51
17:42	54	57	51
17:47	53	53	51
17:52	54	59	51
17:57	53	55	51
18:02	54	57	51
18:07	54	57	51
18:12	53	55	50
18:17	54	55	51
18:22	56	60	52
18:27	53	54	51
18:32	55	59	51
18:37	54	57	51
18:42	53	55	51
18:47	56	60	51
18:52	54	56	51
18:57	53	56	51
19:02	54	55	51
19:07	55	59	51
19:12	53	56	51
19:17	54	56	51
19:22	54	59	51
19:27	52	53	51
19:32	55	59	51
19:37	55	59	51
19:42	54	55	51
19:47	55	58	51
19:52	54	55	51
19:57	54	56	50
20:02	56	57	51
20:07	55	55	51
20:12	52	53	51
20:17	53	55	51
20:22	56	59	51
20:27	52	54	51
20:32	54	56	51
20:37	54	55	51
20:42	54	58	51

EC 9784 - Gloucester Avenue

Pye International

24 Hour Noise data

Time	$L_A$eq	L_A10	L_A90
20:47	54	54	51
20:52	52	53	51
20:57	52	54	51
21:02	54	56	51
21:07	56	58	51
21:12	55	58	51
21:17	54	57	51
21:22	54	56	51
21:27	54	57	51
21:32	52	53	51
21:37	56	60	51
21:42	55	58	51
21:47	52	53	51
21:52	54	57	51
21:57	54	56	51
22:02	55	57	51
22:07	53	54	51
22:12	48	51	42
22:17	49	52	44
22:22	50	52	46
22:27	49	51	47
22:32	51	55	47
22:37	51	55	47
22:42	52	55	47
22:47	54	56	51
22:52	52	56	42
22:57	52	57	46
23:02	50	52	47
23:07	47	50	43
23:12	49	50	45
23:17	48	50	45
23:22	45	47	42
23:27	47	51	42
23:32	48	52	43
23:37	59	60	44
23:42	60	58	43
23:47	50	54	43
23:52	50	53	42
23:57	50	54	43
00:02	44	46	41
00:07	46	49	42
00:12	51	54	44
00:17	46	49	42
00:22	52	57	43
00:27	44	46	41
00:32	49	49	46
00:37	61	58	46
00:42	53	59	41

Time	$L_A$eq	L_A10	L_A90
00:47	44	47	40
00:52	41	43	39
00:57	44	45	40
01:02	44	47	40
01:07	46	52	40
01:12	46	51	39
01:17	43	45	41
01:22	41	43	39
01:27	42	43	39
01:32	46	43	38
01:37	41	43	39
01:42	42	43	39
01:47	41	43	38
01:52	42	43	38
01:57	43	43	37
02:02	41	43	37
02:07	41	43	38
02:12	40	42	37
02:17	41	43	38
02:22	40	42	37
02:27	41	43	38
02:32	40	42	38
02:37	41	42	37
02:42	41	43	38
02:47	40	42	37
02:52	41	43	39
02:57	40	42	37
03:02	41	43	39
03:07	44	48	38
03:12	41	43	38
03:17	41	43	37
03:22	50	49	39
03:27	57	56	42
03:32	42	44	38
03:37	41	44	38
03:42	42	43	41
03:47	51	50	40
03:52	41	44	38
03:57	42	44	39
04:02	43	46	39
04:07	43	42	38
04:12	50	46	38
04:17	40	43	39
04:22	41	43	38
04:27	46	43	39
04:32	42	44	38
04:37	48	48	38
04:42	40	43	38

EC 9784 - Gloucester Avenue

Pye International

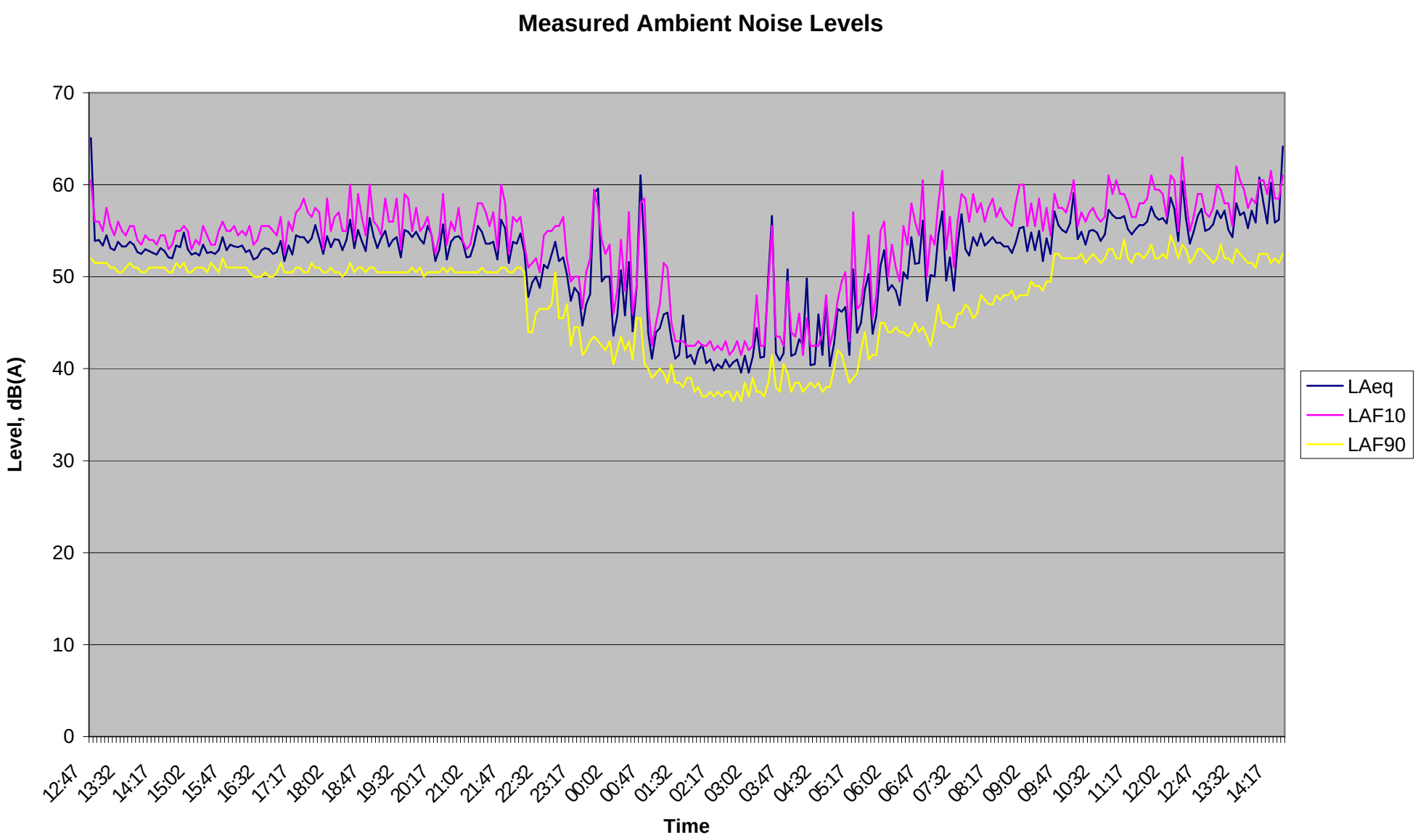
24 Hour Noise data

Time	$L_A$eq	L_A10	L_A90
04:47	43	45	40
04:52	47	48	42
04:57	46	50	42
05:02	47	51	40
05:07	42	43	39
05:12	51	57	39
05:17	44	47	40
05:22	45	47	42
05:27	49	51	44
05:32	50	55	41
05:37	44	46	42
05:42	46	48	42
05:47	51	55	45
05:52	53	56	45
05:57	49	50	44
06:02	49	54	44
06:07	49	51	45
06:12	47	50	44
06:17	51	56	44
06:22	50	54	44
06:27	54	58	44
06:32	51	56	45
06:37	52	55	44
06:42	56	61	45
06:47	47	50	44
06:52	50	55	43
06:57	50	54	45
07:02	55	58	47
07:07	57	62	45
07:12	50	53	45
07:17	52	57	45
07:22	49	51	43
07:27	53	56	46
07:32	57	59	46
07:37	53	59	47
07:42	52	56	47
07:47	54	59	46
07:52	53	57	46
07:57	55	58	48
08:02	53	56	48
08:07	54	58	47
08:12	54	59	47
08:17	54	57	48
08:22	54	58	48
08:27	53	57	48
08:32	53	56	48
08:37	53	56	49
08:42	54	58	48

Time	$L_A$eq	L_A10	L_A90
08:47	55	60	48
08:52	55	60	48
08:57	53	56	48
09:02	55	58	50
09:07	53	56	49
09:12	55	59	49
09:17	52	55	49
09:22	54	58	50
09:27	53	55	50
09:32	57	59	53
09:37	56	58	53
09:42	55	58	52
09:47	55	57	52
09:52	56	59	52
09:57	59	61	52
10:02	54	56	52
10:07	55	57	53
10:12	54	56	52
10:17	55	57	52
10:22	55	58	53
10:27	55	57	52
10:32	54	56	52
10:37	55	57	52
10:42	57	61	53
10:47	57	59	53
10:52	56	61	52
10:57	56	59	52
11:02	57	59	54
11:07	55	58	52
11:12	55	57	52
11:17	55	57	53
11:22	56	58	53
11:27	56	58	52
11:32	56	59	53
11:37	58	61	54
11:42	57	60	52
11:47	56	60	52
11:52	56	59	53
11:57	56	57	52
12:02	59	61	55
12:07	57	61	54
12:12	54	55	52
12:17	60	63	54
12:22	56	59	53
12:27	54	55	52
12:32	55	57	52
12:37	57	59	53
12:42	57	59	53

APPENDIX C

SURVEY RESULTS (GRAPHICAL)


Measured Ambient Noise Levels
Level, dB(A)
70
60
50
40
30
20
10
0
12:47
13:32
14:17
15:02
15:47
16:32
17:17
18:02
18:47
19:32
20:17
21:02
21:47
22:32
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03:47
04:32
05:17
06:02
06:47
07:32
08:17
09:02
09:47
10:32
11:17
12:02
12:47
13:32
14:17
Time
LAeq
LAF10
LAF90

APPENDIX D

GLOSSARY OF TECHNICAL TERMS

TECHNICAL TERMS AND UNITS

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

Sound Power Level (PWL) - This is a function of the noise source alone and is independent of its surroundings. It is a measure of the amount of sound power output measured in decibels.

Sound Pressure Level (SPL) - This is a function of the source and its surroundings and is a measure of the sound pressure at a point in space. For example, a sound pressure level measured at 1 metre from a sound source of certain sound power in reverberant room will not be the same as the sound pressure level a 1 metre from the sound source measured in open space.

Octave and One-Third Octave Bands - The human ear is sensitive to sound over a range of approximately 20 Hz to 20 KHz 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 finer analysis, each octave band may be split into three one-third octave bands.

"A" Weighting - A number of frequency weightings have been developed to imitate the ear's varying sensitivity to sound of different frequencies. The most commonly used weighting is the "A" weighting. The "A" weighted SPL can be measured directly or derived from octave or one-third octave band SPLs. The result is a single figure index which gives some idea of the subjective loudness of the sound, but which contains no information as to its frequency content.

Noise Rating (NR) Curves - The "A" weighted sound pressure level cannot be used to define a spectrum or to compare sounds of different frequencies. NR curves convey frequency information in a single-figure index. This is done by defining the maximum permissible sound pressure level at each frequency for each curve. To measure the noise rating of a given environment, the SPL is measured in octave or one-third octave bands and the noise rating is then the highest NR curve touched by the measured levels.

Typical NR levels for various environments are shown below:

Workshops	NR 60-70
Mechanised Office	NR 50-55
Gymnasium, Sport Halls, Swimming Baths	NR 40-50
Restaurants, Bars, Cafeterias	NR 35-45
Cinemas, Hospitals, Churches, Small Conference Rooms	NR 25-35
Concert Halls, Theatres	NR 20-25
Diagnostic Clinics, Audiometric Rooms	NR 10-20
Broadcasting Studios	NR 5-15

Intermittency and Time-Weighting - The degree of annoyance caused by a noise also depends on its duration and intermittency of a noise. Intermittent, impulsive or repetitive noises tend to be more annoying than continuous noises. Various time-weightings have been derived to measure sounds of differing intermittences and these can be measured directly on modern equipment. The most common time-weightings in use are as follows:-

L_{90} This is the sound pressure level exceeded for 90% of the measurement period. It is widely used to measure background noise levels.

L_{10} This is the sound pressure level exceeded for 10% of the measurement period. It is widely used to measure traffic noise. For a given measurement period, the L_{10} level is by definition greater than or equal to the L_{90} level.

L_{eq} The equivalent continuous noise level is often used to measure intermittent noise. It is defined as the notional steady noise level that would contain the same acoustic energy as the varying noise. Because the averaging process used is logarithmic, the L_{eq} level tends to be dominated by the higher noise levels measured.