Littlemoor, Clitheroe

Proposed Housing Development - Noise Impact Assessment

Trustees of the Standen Estate

23 April 2011
Final Report
9V7186

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SUMMARY

A noise impact assessment was undertaken for a proposed residential development site at Littlemoor, Clitheroe, by Royal Haskoning on behalf of the Trustees of the Standen Estate.

A baseline noise survey was conducted on 18 – 19 August 2011 to establish the existing noise levels in the vicinity of the proposed development site. The dominant source of noise affecting the site was found to be road traffic noise from Whalley Road to the north-west of the site, with lesser noise contributions from Little Moor View and Littlemoor Road. Noise from car movements and car washing activities at Primrose Garage also affected the site along the north-western boundary.

Noise levels were measured between 52.5dB to 54.3dB $L_{Aeq(16h)}$ for the daytime and 46.4dB to 47.6dB $L_{Aeq(8h)}$ at night. In terms of Planning Policy Guidance Note 24 'Planning and Noise', these levels of noise correspond to Noise Exposure Category A for the daytime and Noise Exposure Category B at night. The corresponding guidance states that where sites fall into NEC B '*noise should be taken into account and steps taken to ensure an adequate level of protection against noise*'. Where sites fall into NEC A, *'noise need not be considered as a determining factor in granting planning permission'.*

Mitigation measures have been considered for the most exposed dwellings classified as NEC B at night and with regard to achieving internal noise levels of 30dB L_{Aeq} in bedrooms and living rooms. These internal noise levels will be achieved using typical façade materials of double-leaf cavity brick wall and standard thermal double glazed units (4mm glass/12-16mm air gap/4mm glass). For bedrooms with a view to Whalley Road and Little Moor View it is recommended that an acoustically attenuated method of ventilation (e.g. Passivent Airbrick) is provided to avoid using operable windows for ventilation and thereby exceeding the recommended internal noise levels.

A noise impact assessment of the car wash activities was conducted using the methodology and criteria contained in British Standard 4142 'Method for rating industrial noise affecting mixed residential and industrial areas'. Although noise from car washes may not be considered to be industrial in nature, the guidance was adopted here to provide an indication of the likelihood of complaints arising from the operation of the car wash bays. The results were considered to be of marginal significance according to the assessment criteria.

CONTENTS

			Page
1	INTRODUCTION		1
	1.1	Proposals	1
	1.2	Consultation	1
	1.3	Objectives	1
2	PLANNING POLICY GUIDANCE		2
	2.1	National Guidance	2
	2.2	National Planning Policy	2
3	NOISE SURVEY		3
	3.1	Methodology	3
	3.2	Procedure	4
	3.3	Significance Criteria	4
	3.3.1	PPG 24 ‘Planning and Noise’	4
	3.3.2	BS 8233 ‘Sound insulation and noise reduction for buildings - Code of practice’	5
	3.3.3	BS 4142 ‘Method for rating industrial noise affecting mixed residential and industrial areas’	5
	3.4	Results	6
4	NOISE IMPACT ASSESSMENT		8
	4.1	General Ambient Noise	8
	4.2	Car Wash Noise	8
	4.3	Mitigation	9
5	CONCLUSIONS		11
	Glossary of Acoustic terms		12
	Noise survey results		14

1 INTRODUCTION

Royal Haskoning was commissioned by the Trustees of the Standen Estate to conduct a noise impact assessment of a proposed residential development site at Littlemoor, Clitheroe in relation to an outline planning application.

This report provides details of the assessment of the principal noise sources affecting the proposed development, including recommended measures where necessary, to achieve acceptable internal noise levels with regard to relevant legislation and guidance.

1.1 Proposals

The Trustees of the Standen Estate plan to develop an area known as Littlemoor to the south of Clitheroe, Lancashire. Initial proposals are to construct 49 semi-detached and detached dwellings on the 1.75 ha site. The site lies 900 metres to the south-west of the Clitheroe town centre. The site is bounded by Littlemoor to the south-east; Copperfield Close and playing fields to the north-east; Little Moor View and the back of properties fronting Whalley Road (including a petrol filling station and local store) to the west; and a cleared site and private properties to the south. A pedestrian route runs outside the site along the north-east boundary. Immediately north of the site is approx. 0.5 acres of public open space (incorporating an equipped play area).

The potential noise sources affecting the proposed development site are road traffic along Whalley Road and Littlemoor Road, car movements and car washing activities to Primrose Garage service station and local traffic.

1.2 Consultation

Consultation was undertaken with Mr James Russell of Ribble Valley Environmental Protection Department. It was agreed[1] that the approach of the noise impact assessment should follow the guidance in Planning Policy Note 24 'Planning and Noise' to assess the suitability of the site for residential development and conduct a noise impact assessment of the car washing activities with regard to the guidance contained in British Standard 4142 'Method for rating industrial noise affecting mixed residential and industrial areas'.

The agreement of the assessment criteria was made prior to the National Planning Policy Framework (NPPF) superseding PPG 24 on 27 March 2012 and therefore must still apply during this transition period.

1.3 Objectives

The objectives of this report are:

- To establish the noise levels likely to be affecting the proposed residential development;
- Through comparisons with the criteria contained in PPG 24, indicate the suitability for residential development with regard to noise;

[1] Telephone conversation between Royal Haskoning and James Russell, 2 September 2011

- Where necessary, provide appropriate mitigation measures to achieve an acceptable internal noise standard;
- Evaluate the likelihood of complaints from the operation of the car wash with regard to the method and procedure in BS 4142.

2 PLANNING POLICY GUIDANCE

To provide information and guidance on the suitability for residential development of the site, the following guidance has been considered.

2.1 National Guidance

BS 7445: Parts 1 and 2 - Description and measurement of environmental noise[2&3]. The Standard provides details of the instrumentation and measurement techniques to be used when assessing environmental noise, and defines the basic noise quantity as the continuous A-weighted sound pressure level (L_{Aeq}). Part 2 of BS 7445 replicates ISO standard 1996-2.

BS 4142: 1997 - Method for rating industrial noise affecting mixed residential and industrial areas[4]. The Standard provides a method for determining noise levels from factories and other industrial premises, and the existing background noise level. It also prescribes a method for assessing whether the noise of an industrial nature is likely to give rise to complaints.

BS 8233: 1999 - Sound insulation and noise reduction for buildings - Code of practice[5]. This Standard gives recommendations for the control of noise in and around buildings, and suggests appropriate criteria and limits for different situations. These criteria and limits are primarily intended to guide the design of new or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise level. It covers room acoustics for simple situations, but not the design of buildings where the acoustics are critical, such as auditoria.

2.2 National Planning Policy

Planning Policy Guidance (PPG) 24: Planning and Noise[6]. This document provides guidance to local authorities in England on the use of the planning system to minimise the adverse impact of noise, principally with regard to new development but also regarding noise from new noise-causing developments. It introduces the concept of Noise Exposure Categories (NEC) for determining the suitability of sites for residential development based on existing and predicted noise levels affecting the site.

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[2] British Standard 7445-1:2003 - Description and measurement of environmental noise. Guide to quantities and procedures. BSI, London

[3] British Standard 7445-2:1991 - Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use. BSI, London

[4] British Standard 4142:1997 - Method for rating industrial noise affecting mixed residential and industrial areas. BSI, London

[5] British Standard 8233: 1999 - Sound insulation and noise reduction for buildings - Code of practice. BSI, London

[6] Department of the Environment, (1994). PPG 24 Planning and Noise. HMSO, London

National Planning Policy Framework (NPPF). PPG 24 was superseded on 27 March 2012 with the National Planning Policy Framework (NPPF) which provides guidance for Local Authorities setting their own planning policies. The NPPF requires Local Authorities to produce their own planning policies within 12 months. During this transitional period the agreements made for the assessment criteria prior to the introduction of the NPPF must still apply.

3 NOISE SURVEY

3.1 Methodology

A baseline noise survey was undertaken to establish the noise levels affecting the proposed development site. The noise survey was conducted using a combination of both automated and manual measurements; automated noise measurements were used to measure the ambient noise levels over a 24 hour period and manual noise measurements were conducted of the car wash operations at Primrose Garage adjacent to the development site and at satellite locations across the site. The noise survey was conducted on the Thursday 18 – Friday 19 August 2011, encompassing a full 24 hours of measurement data.

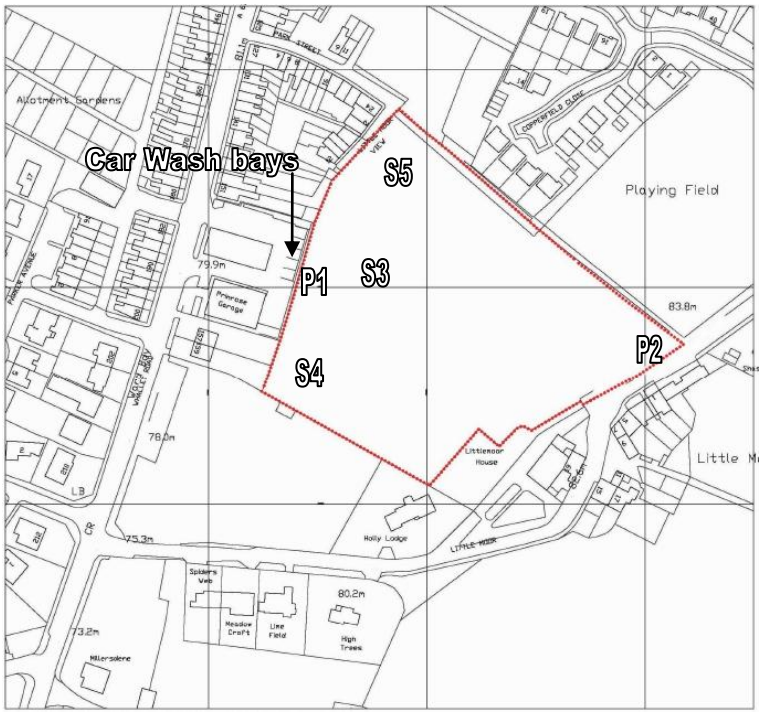

Figure 1 Noise Measurement locations

- P1 and P2: Automated noise measurement positions. These noise measurement positions were selected to establish the ambient daytime and night-time noise levels.
- S3 – S5: Manual noise measurement positions. These noise measurement positions were selected to measure the noise levels from the car wash (S3) and the extents of the site.

3.2 Procedure

All noise measurements were conducted with regard to the procedures outlined in BS 7445 and BS 4142. Measurements were made at a microphone height of 1.5 metres, 3.5 metres away from any reflective surface other than the ground in free-field conditions. Manual noise measurements were conducted over 10 minute periods and the automated logging positions were conducted 5 minute periods. Various noise indices were measured but the parameters relevant to this assessment were the equivalent continuous level (L_{Aeq}), maximum noise level (L_{Amax}) and the statistical parameter, L_{A90} (90^{th} percentile level).

Noise measurements of the car wash were conducted at a distance approximate to that of the closest proposed dwelling. Noise measurements were conducted when the car wash was in use and when not in use, permitting a comparison of the two noise levels in accordance with the method in BS 4142. The time periods for the measurements were not as above, but were altered according to when the car wash started and stopped usage. (Note: whilst on-site Primrose Garage was offering half-price car washes. This may have contributed to a high usage of the jet wash bays on the survey days).

Noise measurements were made with fully calibrated instrumentation traceable to UKAS standards. The calibration of the sound level meter was checked before and after all measurement surveys, with no significant variance in sensitivity observed.

3.3 Significance Criteria

The noise measurement results were compared to the following criteria to indicate the suitability of residential development and the likelihood of complaints from the car wash.

3.3.1 PPG 24 'Planning and Noise'

PPG 24 introduces the concept of Noise Exposure Categories (NECs) for the classification of residential development sites. Noise Exposure Categories (NECs) have been derived to assist local planning authorities in their consideration of planning applications for residential development near various noise sources.

Table 1: PPG 24 Noise Exposure Categories

Noise Source	Time period	Noise Exposure Category *(dB L_{Aeq})*			
		A	**B**	**C**	**D**
Road Traffic	(07:00-23:00 hrs)	<55	55-63	63-72	>72
	(23:00-07:00 hrs)*	<45	45-57	57-66	>66
Rail Traffic	(07:00-23:00 hrs)	<55	55-66	63-74	>74
	(23:00-07:00 hrs)*	<45	45-59	59-66	>66
Air Traffic	(07:00-23:00 hrs)	<57	57-66	66-72	>72
	(23:00-07:00 hrs)*	<48	48-57	57-66	>66
Mixed Sources	(07:00-23:00 hrs)	<55	55-63	63-72	>72
	(23:00-07:00 hrs)*	<45	45-57	57-66	>66

[* sites where noise events regularly exceed 82 dB L_{Amax} several times in any hour at night should be treated as being in Category C]

Category A: Noise need not be considered as a determining factor in granting planning permission
Category B: Noise should be taken into account and steps taken to ensure an adequate level of protection against noise
Category C: Planning permission should not normally be granted. Where development is permitted, steps should be taken to ensure a commensurate level of protection against noise
Category D: Planning permission should normally be refused.

The development site at Littlemoor was assessed based on the Mixed Sources criteria contained in Table 1.

3.3.2 BS 8233 'Sound insulation and noise reduction for buildings - Code of practice'

Guidance on suitable internal noise levels is provided in BS 8233, (Appendix C2 Table A.6). This provides recommended internal noise levels to ensure that adequate noise reduction occurs to reduce direct and flanking transmission across facade elements. Recommended internal noise levels are reproduced in Table 2 below:

Table 2 Recommended Internal Noise Levels – BS 8233

Citation	**Typical Situation**	**Design Range, $L_{Aeq,T}$** *(dB)*	
		Good	**Reasonable**
Reasonable resting/ sleeping conditions	Living rooms	30	40
	Bedrooms*	30	35

*For a reasonable standard in bedrooms at night, individual noise events (measured with F time weighting) should not normally exceed 45 dB L_{Amax}.

The design range of 30 – 40dB L_{Aeq} in Living rooms and 30 – 35dB L_{Aeq} in Bedrooms from Table 2 above will be considered for the proposed development.

3.3.3 BS 4142 'Method for rating industrial noise affecting mixed residential and industrial areas'

BS4142:1997 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. The source noise level is referred to as the specific noise level. If the specific noise level is expected to contain one or more of the following features then +5dB should be applied to derive the noise rating level:

- The noise contains a distinguishable, discrete, continuous note (whine, hiss, screech, hum, etc.);
- The noise contains distinct impulses (bangs, clicks, clatters, or thumps);

- The noise is irregular enough to attract attention.

The noise rating level ($L_{Aeq,Tr}$) of the noise source is compared to the measured background noise level (L_{A90}) at noise sensitive positions. The difference between the rating level and the background noise level is referred to as the assessment level. BS4142:1997 gives the following guidelines to indicate the likelihood of complaints arising;

- An assessment level of around +10dB or more indicates that complaints are likely;
- An assessment level of +5dB (A) is of marginal significance;
- An assessment level of -10dB is a positive indication that complaints are unlikely.

Based on these criteria the calculated noise rating levels at the closest proposed residential properties were compared to the measured background noise level at these locations. The derived assessment level will indicate likelihood of complaints arising from the operation of the car wash.

3.4 Results

The results of the noise measurement are detailed in full in Appendix B. A summary of the average noise levels are provided below in Table 4.

Table 3 Automated noise level summary

Location	**Time Period** *(hours)*		**Noise indices** *(dB)*			
			L_{Aeq}	**L_{Amax}**	**L_{A10}**	**L_{A90}**
P1	Daytime	(07:00 – 23:00)	52.5	83.7	53.9	45.8
	Night-time	(23:00 - 07:00)	47.6	78.2	47.3	35.8
P2	Daytime	(07:00 – 23:00)	54.3	81.4	52.9	43.8
	Night-time	(23:00 - 07:00)	46.4	81.8	45.4	34.1

The dominant noise source affecting the site is generated by vehicular traffic along Whalley Road, and to a lesser extent, Littlemoor Road. Car movements at Primrose Garage adjacent to the site were also a component of the noise affecting the site. The noise from the car wash bays at the garage affected the site along the north-western boundary; the noise from the car wash operations and vehicle movements in Primrose Garage forecourt are included in the P1 noise measurements in Table 4. Primrose Garage is open 24 hours, with the kiosk open until 11pm. After 11pm, a hatch used for night-time fuel payments.

Table 4 Manual noise measurements - Position 3

No.	**Time** *(hh:mm)*	**Period** *(h:mm:ss)*	**Noise indices** *(dB)*			**Car Wash Status**
			L_{Aeq}	**L_{A90}**	**L_{Amax}**	
30	13:30	0:10:00	51.0	48.8	64.1	ON
31	13:39	0:10:00	50.0	47.4	66.9	ON
32	14:02	0:10:00	50.7	49.0	61.3	OFF
33	14:17	0:10:00	52.8	48.7	65.0	ON

Noise from the car washes is also included in the P2 noise measurements in Table 4 and is specifically reported in Table 5.

During the time of the survey Primrose Garage had a half price offer displayed for car washes; the five car wash bays were in frequent use, and this may have been a greater use than normal due to the offer. A single ten minute noise measurement was completed (No. 32) without any of the five car wash bays in use. The noise data reported for the car wash periods includes maxima from the high pressure water noise which is reflected in the L_{Amax} noise levels. Subjectively the noise was generally masked by almost constant traffic noise from Whalley Road, although peaks of noise from the high pressure water hoses could be regularly heard.

Table 5 Manual noise measurements - Position 4

No	Time	Period	Noise indices *(dB)*			
	(hh:mm)	*(h:mm:ss)*	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
34	14:39	0:10:00	52.6	57.9	54.8	48.6
35	14:49	0:10:00	52.4	61.1	54.5	48.9
36	15:03	0:10:00	48.8	63.4	50.5	45.3
29	11:47	0:10:00	55.1	75.4	54.9	49.9
30	11:58	0:10:00	51.6	66.1	52.8	49.8
31	12:10	0:10:00	53.3	60.6	55.6	49.6
	Average		**52.7**	**75.4**	**53.9**	**48.7**

Table 6 Manual noise measurements - Position 5

No	Time	Period	Noise indices *(dB)*			
	(hh:mm)	*(h:mm:ss)*	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
37	15:12	0:10:00	47.5	57.3	49.3	44.8
38	15:41	0:10:00	50.4	65.6	51.3	44.4
32	12:31	0:10:00	49.5	55.0	51.0	47.7
	Average		**49.3**	**65.6**	**50.5**	**45.6**

Sample noise measurements were conducted at positions 4 and 5 to confirm the noise levels in these areas were also dominated by Whalley Road. The noise levels measured at position 4 were similar to those measured at automated position 1 and a similar distance away from Whalley Road; reflected in the average noise levels of 52.7dB L_{Aeq} and 52.5dB L_{Aeq} respectively.

Noise levels measured at position 5 were less than at positions 1 and 4, which are both a similar distance away from Whalley Road. This was due to the screening from Whalley Road provided by the houses along Park Street and Whalley Road.

4 NOISE IMPACT ASSESSMENT

4.1 General Ambient Noise

The results of the automated logging noise measurements were compared to the significance criteria from PPG 24 outlined in Table 1.

Table 7 Noise Exposure Categories

Location	Time Period *(hours)*		Noise indices *(dB)*		Noise Exposure Category
			L_{Aeq}	L_{Amax}	
P1	Daytime	(07:00 – 23:00)	52.5	83.7	A
	Night-time	(23:00 - 07:00)	47.6	78.2	B
P2	Daytime	(07:00 – 23:00)	54.3	81.4	A
	Night-time	(23:00 - 07:00)	46.4	81.8	B

Noise levels measured on the site during the daytime fall into NEC A. The corresponding guidance for sites that fall into NEC A is that *'noise need not be considered as a determining factor in granting planning permission'*.

The noise levels measured on the site during the night-time just fall into NEC B. The corresponding guidance for NEC B is that *'noise should be taken into account and steps taken to ensure an adequate level of protection against noise'*.

Where the site falls into NEC B for night-time noise, appropriate mitigation measures have been considered in section 4.3.

4.2 Car Wash Noise

The noise impact of the car wash has been considered following the guidance outlined in BS 4142. The methodology contained in this standard is specifically intended for noise of an industrial nature and therefore the nature of the noise generated by the car jet washes may not be considered strictly applicable to this situation. However, in absence of any other specific guidance, and as agreed with Ribble Valley Environmental Protection Department, an assessment following this method was conducted to provide an indication on the likelihood of complaints arising.

Table 9 shows the steps for deriving the assessment level. Noise levels were measured at position 3 at the approximate location of the closest proposed dwelling from the car wash bays. The noise levels in Table 4 display very little change whilst the car washes are in use and not in use, which supports the observation that the most dominant source of noise affecting the development site is due to road traffic noise from Whalley Road.

Photo 1 Car wash noise measurements

Table 8 BS4142 noise impact assessment

Ref	Description		Noise Level *(dB)*
1	Max. Source noise	L_{Aeq}	52.8
2	Residual level without source	L_{Aeq}	50.7
3	Specific noise level (1 – 2)	L_{Aeq}	48.6
4	Rating level (line 3, +5dB acoustic correction)	L_{Aeq}	53.6
5	Background without car wash	L_{A90}	49.0
6	BS4142 Assessment level (line 4 – 5)		+4.6

The assessment level in accordance with the method of BS 4142 is +4.6dB, even with the inclusion of a +5dB correction for the presence of intermittent noise. The corresponding guidance is that a difference between the rating level and the existing background noise level of up to +5dB is of marginal significance with respect to the likelihood of complaints.

The car jet wash bays are in operation from 8am until 9pm, Monday – Saturday and until 5pm on Sundays, therefore the noise from the car washes is restricted to reasonable daytime hours only.

4.3 Mitigation

With regard to the ambient noise levels measured across the proposed development site, the night-time noise levels were found to be classified as NEC B and therefore noise needs to be considered in accordance with the guidance in PPG 24.

Using a double-leaf cavity wall construction and standard thermal double glazing the 'Good' standard of noise from Table 2 will be generally achieved, with internal daytime noise levels in the order of 28dB L_{Aeq} and internal night-time noise levels approximately 23dB L_{Aeq}, with windows closed. It is desirable for maximum noise levels in bedrooms to not regularly exceed 45dB L_{Amax}; based on the survey data it is predicted that this would occur twice during the 8 hour night-time period (23:00 – 07:00 hours).

If operable windows are used for rapid ventilation, the internal noise levels will increase; the sound insulation properties of an open window typically reduce to 10 – 15dB[7]. Based on this assumption, internal noise levels will be approximately 37dB L_{Aeq} at night and 43 – 44dB L_{Aeq} in the daytime for the most exposed dwellings around the perimeter of the development. To provide an attenuated method of ventilation whilst maintaining the sound insulation properties of the building façade, acoustic airbricks (e.g. Passivent Airbrick) should be considered for bedrooms facing towards Whalley Road or Little Moor View.

Mitigation options to screen the noise from the car washes are limited; there is already a large barrier erected to the rear of the car wash bays and the proposed development land is at a lower level than the garage. The screening provided by the houses when constructed, will provide an adequate additional barrier to reduce noise levels to the rear.

[7] British Standard 8233:1999, page 27, Table 10

5 CONCLUSIONS

A noise impact assessment was conducted of a proposed residential development at Littlemoor, on behalf of the Trustees of the Standen Estate. The noise impact assessment was required to evaluate the noise affecting the proposed development site to indicate the suitability of the site for residential new build with regard to the criteria contained in PPG 24. A noise assessment of the car wash at Primrose Garage on the north-west boundary of the site was undertaken to indicate the likelihood of complaints in accordance with the method and procedure in BS 4142.

The dominant noise source affecting the proposed development site is road traffic noise generated by vehicles along Whalley Road, and to a lesser extent Little Moor View and Littlemoor Road. Noise from Primrose Garage also contributes to the noise climate across the development site, including vehicle movements in the forecourt and car washing activities.

The baseline noise measurement survey established the existing ambient noise levels on the proposed development site to be 52.5dB to 54.3dB L_{Aeq} during the daytime, and 46.4dB – 47.2dB L_{Aeq} at night.

Using the criteria from PPG 24, these measured noise levels are classified as NEC A for the daytime and NEC B at night. PPG 24 states that '*noise need not be a determining factor'* where sites are classified into NEC A and where classified as NEC B, *'noise should be taken into account and steps provided to provide adequate protection against noise'*.

Mitigation measures have been considered to achieve the recommended internal noise criteria from BS 8233. The 'good' standard of internal noise level will be achieved using standard façade materials of double-leaf cavity wall and standard thermal double-glazing (4mm glass/12-16mm air gap/4mm glass). If operable windows are to be used for rapid ventilation then bedrooms with a view towards Whalley Road and Little Moor View should be provided with an acoustically attenuated method of ventilation (e.g. Passivent Airbrick).

Car washing operations were audible over the noise generated by Whalley Road at measurement position 3, approximately 18 metres away from the car wash bays. The results of the BS 4142 assessment were considered to be of marginal significance in accordance with the assessment criteria.

Mitigation options to reduce the noise generated by the car wash bays in outdoor amenity areas are limited due to the natural topography and the existing barrier to the rear of the car wash bays. Beneficial screening will be introduced by the construction of the houses, and noise levels on the opposite side of the houses facing the car wash will be reduced.

With regard to the criteria in PPG 24, the site is considered as suitable for residential development with the inclusion of the recommended mitigation measures.

Appendix A
Glossary of Acoustic terms

Term	Description
Decibel (dB)	A unit of noise level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 µPa, the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A)	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
$L_{Aeq,T}$	The 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.
$L_{A10,T}$	The A weighted noise level exceeded for 10% of the specified measurement period (T). L_{A10} is the index generally adopted to assess traffic noise.
$L_{A90,\ T}$	The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 1990 it is used to define the 'background' noise level.
L_{Amax}	The maximum A-weighted sound pressure level recorded during a measurement.
L_{Amin}	The minimum A-weighted sound pressure level recorded during a measurement.
R_w	The weighted sound reduction index, R_w, is a single figure description of sound reduction index which is defined in BS EN ISO 717-1: 1997. The R_w is calculated from measurements in an acoustic laboratory to BS EN ISO 140-3:1997 and ratings to BS EN ISO 717-1:1997. Sound insulation ratings derived from site (which are invariably lower than the laboratory figures) are referred to as the R'_w ratings and measured to BS EN ISO 140-4:1998

Appendix B
Noise survey results

Table 9 Noise measurement results - Position 1

Address	Time	Measurement Time	Noise indices *(dB)*			
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
2	18/08/2011 11:15	0:05:00	49.2	55.2	52.2	44.8
3	18/08/2011 11:20	0:05:00	51.9	59.3	53.9	47.5
4	18/08/2011 11:25	0:05:00	52.8	62.8	54.4	50.4
5	18/08/2011 11:30	0:05:00	50.9	58.6	53.3	47.3
6	18/08/2011 11:35	0:05:00	59.0	64.6	55.2	50.4
7	18/08/2011 11:40	0:05:00	54.6	65.2	56.7	50.8
8	18/08/2011 11:45	0:05:00	52.6	63.0	54.4	50.5
9	18/08/2011 11:50	0:05:00	52.1	67.4	54.2	46.0
10	18/08/2011 11:55	0:05:00	51.0	67.9	53.0	44.2
11	18/08/2011 12:00	0:05:00	52.0	70.1	54.1	45.8
12	18/08/2011 12:05	0:05:00	51.4	61.5	53.8	47.0
13	18/08/2011 12:10	0:05:00	51.0	57.2	53.5	47.6
14	18/08/2011 12:15	0:05:00	49.9	63.7	52.3	45.5
15	18/08/2011 12:20	0:05:00	51.7	57.9	54.1	48.7
16	18/08/2011 12:25	0:05:00	51.0	56.5	53.3	47.7
17	18/08/2011 12:30	0:05:00	51.8	61.9	53.8	48.1
18	18/08/2011 12:35	0:05:00	50.9	62.1	53.0	47.5
19	18/08/2011 12:40	0:05:00	51.1	59.2	53.1	47.9
20	18/08/2011 12:45	0:05:00	53.1	63.9	55.0	49.5
21	18/08/2011 12:50	0:05:00	54.7	62.9	55.9	53.3
22	18/08/2011 12:55	0:05:00	54.1	59.8	55.9	50.9
23	18/08/2011 13:00	0:05:00	52.1	73.6	53.6	49.3
24	18/08/2011 13:05	0:05:00	50.9	64.9	53.2	47.4
25	18/08/2011 13:10	0:05:00	52.1	66.4	54.1	49.2
26	18/08/2011 13:15	0:05:00	53.0	67.4	54.6	50.1
27	18/08/2011 13:20	0:05:00	53.0	63.3	55.3	49.9
28	18/08/2011 13:25	0:05:00	54.7	63.3	56.4	52.9
29	18/08/2011 13:30	0:05:00	54.7	71.9	57.5	51.2
30	18/08/2011 13:35	0:05:00	51.8	59.7	54.2	48.4
31	18/08/2011 13:40	0:05:00	51.2	61.9	53.4	47.0
32	18/08/2011 13:45	0:05:00	50.4	57.1	53.1	44.8
33	18/08/2011 13:50	0:05:00	53.1	60.0	55.2	51.0
34	18/08/2011 13:55	0:05:00	53.2	65.6	54.3	51.5
35	18/08/2011 14:00	0:05:00	54.1	63.0	56.9	49.8
36	18/08/2011 14:05	0:05:00	51.2	61.7	53.2	48.1
37	18/08/2011 14:10	0:05:00	51.3	63.9	53.9	45.6
38	18/08/2011 14:15	0:05:00	51.9	67.4	53.8	46.5
39	18/08/2011 14:20	0:05:00	52.7	70.3	55.0	48.1
40	18/08/2011 14:25	0:05:00	53.0	61.0	54.7	50.6
41	18/08/2011 14:30	0:05:00	51.9	58.8	54.4	47.7
42	18/08/2011 14:35	0:05:00	52.3	59.2	54.7	48.6

Address	Time	Measurement Time	Noise indices *(dB)*			
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
43	18/08/2011 14:40	0:05:00	52.4	58.5	54.4	49.6
44	18/08/2011 14:45	0:05:00	51.0	57.3	53.3	46.2
45	18/08/2011 14:50	0:05:00	51.9	60.3	53.8	49.1
46	18/08/2011 14:55	0:05:00	51.8	64.9	54.3	48.2
47	18/08/2011 15:00	0:05:00	53.4	64.3	54.9	51.3
48	18/08/2011 15:05	0:05:00	51.8	65.2	53.8	49.0
49	18/08/2011 15:10	0:05:00	50.8	63.1	53.2	45.9
50	18/08/2011 15:15	0:05:00	51.8	60.0	54.6	46.7
51	18/08/2011 15:20	0:05:00	53.9	61.2	56.2	50.7
52	18/08/2011 15:25	0:05:00	53.9	63.0	57.3	47.9
53	18/08/2011 15:30	0:05:00	51.1	66.6	53.3	47.5
54	18/08/2011 15:35	0:05:00	51.8	67.0	54.0	47.8
55	18/08/2011 15:40	0:05:00	51.6	61.8	54.2	46.5
56	18/08/2011 15:45	0:05:00	55.6	69.9	57.6	52.9
57	18/08/2011 15:50	0:05:00	52.1	60.5	54.4	46.4
58	18/08/2011 15:55	0:03:00	51.8	60.1	54.3	46.8
2	18/08/2011 16:10	0:05:00	53.7	66.3	55.5	48.7
3	18/08/2011 16:15	0:05:00	51.6	62.4	54.1	47.0
4	18/08/2011 16:20	0:05:00	50.4	60.8	53.2	46.1
5	18/08/2011 16:25	0:05:00	51.6	61.7	54.3	45.2
6	18/08/2011 16:30	0:05:00	55.5	63.5	57.1	52.7
7	18/08/2011 16:35	0:05:00	54.0	65.7	56.5	49.0
8	18/08/2011 16:40	0:05:00	51.1	60.4	53.7	47.0
9	18/08/2011 16:45	0:05:00	50.9	62.8	53.2	46.7
10	18/08/2011 16:50	0:05:00	51.1	60.2	53.9	46.1
11	18/08/2011 16:55	0:05:00	53.1	61.5	54.8	51.1
12	18/08/2011 17:00	0:05:00	54.5	58.5	55.7	53.1
13	18/08/2011 17:05	0:05:00	51.1	58.7	54.0	44.5
14	18/08/2011 17:10	0:05:00	50.2	62.0	53.0	45.1
15	18/08/2011 17:15	0:05:00	50.1	60.4	53.4	43.0
16	18/08/2011 17:20	0:05:00	54.8	67.3	58.2	51.3
17	18/08/2011 17:25	0:05:00	53.4	60.0	56.2	48.9
18	18/08/2011 17:30	0:05:00	51.0	60.4	53.6	46.2
19	18/08/2011 17:35	0:05:00	49.3	56.8	52.1	45.0
20	18/08/2011 17:40	0:05:00	49.5	58.8	52.4	44.5
21	18/08/2011 17:45	0:05:00	50.3	58.2	53.4	45.2
22	18/08/2011 17:50	0:05:00	50.8	74.1	52.5	43.5
23	18/08/2011 17:55	0:05:00	49.7	58.1	52.9	44.0
24	18/08/2011 18:00	0:05:00	49.4	57.4	53.5	42.0
25	18/08/2011 18:05	0:05:00	51.6	75.1	52.5	42.0
26	18/08/2011 18:10	0:05:00	49.0	57.2	52.7	41.6
27	18/08/2011 18:15	0:05:00	49.8	57.2	53.4	42.8
28	18/08/2011 18:20	0:05:00	49.6	58.7	53.0	43.2

Address	Time	Measurement Time	Noise indices *(dB)*			
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
29	18/08/2011 18:25	0:05:00	51.1	59.5	54.0	45.1
30	18/08/2011 18:30	0:05:00	50.2	57.9	53.4	44.6
31	18/08/2011 18:35	0:05:00	49.4	59.3	52.9	43.6
32	18/08/2011 18:40	0:05:00	52.8	59.3	55.3	49.5
33	18/08/2011 18:45	0:05:00	53.1	60.5	54.8	51.2
34	18/08/2011 18:50	0:05:00	52.6	60.2	55.1	45.5
35	18/08/2011 18:55	0:05:00	50.9	59.0	54.1	45.7
36	18/08/2011 19:00	0:05:00	51.0	60.1	54.2	46.1
37	18/08/2011 19:05	0:05:00	50.9	62.7	53.8	46.1
38	18/08/2011 19:10	0:05:00	50.0	62.2	53.5	45.6
39	18/08/2011 19:15	0:05:00	53.2	75.8	54.2	43.0
40	18/08/2011 19:20	0:05:00	49.1	57.8	53.4	42.1
41	18/08/2011 19:25	0:05:00	50.0	58.6	54.4	40.9
42	18/08/2011 19:30	0:05:00	49.7	59.2	53.5	42.2
43	18/08/2011 19:35	0:05:00	48.1	60.2	52.3	39.5
44	18/08/2011 19:40	0:05:00	48.6	57.6	52.6	40.1
45	18/08/2011 19:45	0:05:00	48.9	62.4	53.2	38.8
46	18/08/2011 19:50	0:05:00	49.8	58.7	53.2	45.4
47	18/08/2011 19:55	0:05:00	50.1	60.0	53.5	44.7
48	18/08/2011 20:00	0:05:00	50.3	69.8	52.7	40.7
49	18/08/2011 20:05	0:05:00	49.0	62.5	53.1	40.2
50	18/08/2011 20:10	0:05:00	46.8	62.6	50.8	39.7
51	18/08/2011 20:15	0:05:00	48.6	63.9	51.7	39.9
52	18/08/2011 20:20	0:05:00	47.4	58.0	51.8	38.6
53	18/08/2011 20:25	0:05:00	49.2	68.1	53.2	38.9
54	18/08/2011 20:30	0:05:00	48.1	59.1	52.2	39.7
55	18/08/2011 20:35	0:05:00	47.2	62.4	51.7	37.5
56	18/08/2011 20:40	0:05:00	48.5	58.3	52.6	40.2
57	18/08/2011 20:45	0:05:00	46.3	57.0	50.6	37.4
58	18/08/2011 20:50	0:05:00	48.1	60.5	52.3	40.3
59	18/08/2011 20:55	0:05:00	48.5	59.1	53.0	39.2
60	18/08/2011 21:00	0:05:00	48.5	60.5	52.8	38.2
61	18/08/2011 21:05	0:05:00	47.7	60.2	51.9	39.1
62	18/08/2011 21:10	0:05:00	45.4	57.6	49.5	36.4
63	18/08/2011 21:15	0:05:00	47.5	57.9	52.3	38.3
64	18/08/2011 21:20	0:05:00	44.8	56.3	49.2	36.5
65	18/08/2011 21:25	0:05:00	48.1	59.1	52.8	38.5
66	18/08/2011 21:30	0:05:00	46.4	63.0	49.5	38.3
67	18/08/2011 21:35	0:05:00	48.1	62.8	51.9	36.0
68	18/08/2011 21:40	0:05:00	45.4	60.4	48.7	36.5
69	18/08/2011 21:45	0:05:00	47.2	58.4	52.4	37.1
70	18/08/2011 21:50	0:05:00	47.9	59.5	52.8	38.8
71	18/08/2011 21:55	0:05:00	48.0	60.9	52.3	38.9

Address	Time	Measurement Time	Noise indices *(dB)*			
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
72	18/08/2011 22:00	0:05:00	48.1	64.1	52.6	39.6
73	18/08/2011 22:05	0:05:00	46.0	59.7	49.6	37.1
74	18/08/2011 22:10	0:05:00	47.4	59.6	52.4	37.9
75	18/08/2011 22:15	0:05:00	47.6	59.9	52.6	38.1
76	18/08/2011 22:20	0:05:00	45.8	58.9	49.3	34.3
77	18/08/2011 22:25	0:05:00	45.0	58.8	48.7	37.4
78	18/08/2011 22:30	0:05:00	46.8	60.2	51.6	33.3
79	18/08/2011 22:35	0:05:00	46.5	61.0	49.8	35.3
80	18/08/2011 22:40	0:05:00	41.2	53.9	43.8	32.6
81	18/08/2011 22:45	0:05:00	45.2	57.4	48.7	33.3
82	18/08/2011 22:50	0:05:00	45.6	60.3	48.8	34.6
83	18/08/2011 22:55	0:05:00	45.9	61.1	48.7	31.4
84	18/08/2011 23:00	0:05:00	42.2	56.9	45.9	29.8
85	18/08/2011 23:05	0:05:00	44.5	55.7	48.1	36.5
86	18/08/2011 23:10	0:05:00	44.2	60.4	46.2	36.7
87	18/08/2011 23:15	0:05:00	45.0	59.5	47.3	36.3
88	18/08/2011 23:20	0:05:00	42.0	58.2	44.5	32.7
89	18/08/2011 23:25	0:05:00	45.2	60.9	46.5	34.2
90	18/08/2011 23:30	0:05:00	46.0	62.4	46.6	34.7
91	18/08/2011 23:35	0:05:00	44.5	59.4	46.5	31.2
92	18/08/2011 23:40	0:05:00	45.2	57.2	49.1	36.3
93	18/08/2011 23:45	0:05:00	47.2	61.5	51.8	33.6
94	18/08/2011 23:50	0:05:00	40.6	57.1	42.9	31.4
95	18/08/2011 23:55	0:05:00	43.0	60.2	44.1	30.0
96	19/08/2011 00:00	0:05:00	46.2	63.5	45.3	31.2
97	19/08/2011 00:05	0:05:00	43.9	59.7	46.5	33.3
98	19/08/2011 00:10	0:05:00	43.6	58.6	45.9	35.0
99	19/08/2011 00:15	0:05:00	42.6	57.1	45.6	33.6
100	19/08/2011 00:20	0:05:00	37.3	53.6	38.8	31.4
101	19/08/2011 00:25	0:05:00	45.6	62.3	47.2	32.6
102	19/08/2011 00:30	0:05:00	45.5	60.8	48.3	33.4
103	19/08/2011 00:35	0:05:00	44.4	56.7	47.4	36.1
104	19/08/2011 00:40	0:05:00	44.7	59.5	47.3	36.0
105	19/08/2011 00:45	0:05:00	45.2	61.8	45.9	29.7
106	19/08/2011 00:50	0:05:00	42.1	62.8	41.6	29.2
107	19/08/2011 00:55	0:05:00	35.2	53.5	36.0	28.8
108	19/08/2011 01:00	0:05:00	41.6	56.4	44.1	29.6
109	19/08/2011 01:05	0:05:00	44.9	67.2	45.1	32.8
110	19/08/2011 01:10	0:05:00	43.2	58.4	44.7	34.1
111	19/08/2011 01:15	0:05:00	45.0	61.7	46.6	31.8
112	19/08/2011 01:20	0:05:00	43.3	60.5	45.0	29.5
113	19/08/2011 01:25	0:05:00	39.0	60.1	31.1	28.0
114	19/08/2011 01:30	0:05:00	42.9	59.3	43.7	28.2

Address	Time	Measurement Time	Noise indices *(dB)*			
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
115	19/08/2011 01:35	0:05:00	43.5	58.8	45.6	30.4
116	19/08/2011 01:40	0:05:00	40.1	57.0	38.7	29.6
117	19/08/2011 01:45	0:05:00	42.7	61.3	42.0	29.2
118	19/08/2011 01:50	0:05:00	41.1	62.4	40.4	28.1
119	19/08/2011 01:55	0:05:00	40.4	57.8	42.2	29.5
120	19/08/2011 02:00	0:05:00	43.9	62.2	45.0	31.2
121	19/08/2011 02:05	0:05:00	44.5	62.2	45.1	34.0
122	19/08/2011 02:10	0:05:00	41.2	59.6	42.7	29.7
123	19/08/2011 02:15	0:05:00	35.4	56.3	37.5	30.4
124	19/08/2011 02:20	0:05:00	43.0	62.2	43.8	29.3
125	19/08/2011 02:25	0:05:00	40.2	60.0	39.6	28.9
126	19/08/2011 02:30	0:05:00	43.2	60.6	44.5	31.5
127	19/08/2011 02:35	0:05:00	43.4	59.3	44.7	31.5
128	19/08/2011 02:40	0:05:00	43.2	57.3	46.7	32.2
129	19/08/2011 02:45	0:05:00	39.0	56.1	38.8	30.7
130	19/08/2011 02:50	0:05:00	39.5	60.0	40.0	29.9
131	19/08/2011 02:55	0:05:00	44.3	62.8	44.6	35.4
132	19/08/2011 03:00	0:05:00	45.1	61.0	47.3	34.9
133	19/08/2011 03:05	0:05:00	42.0	60.9	42.6	31.8
134	19/08/2011 03:10	0:05:00	39.5	54.2	41.9	30.6
135	19/08/2011 03:15	0:05:00	34.7	46.2	37.0	31.2
136	19/08/2011 03:20	0:05:00	41.7	57.5	43.0	32.9
137	19/08/2011 03:25	0:05:00	42.1	56.6	45.8	33.4
138	19/08/2011 03:30	0:05:00	36.8	53.4	38.1	32.3
139	19/08/2011 03:35	0:05:00	43.2	63.7	46.2	34.0
140	19/08/2011 03:40	0:05:00	40.8	60.2	41.3	30.1
141	19/08/2011 03:45	0:05:00	44.9	63.3	46.8	33.5
142	19/08/2011 03:50	0:05:00	45.7	62.1	47.6	34.2
143	19/08/2011 03:55	0:05:00	41.4	57.1	41.9	33.6
144	19/08/2011 04:00	0:05:00	39.9	54.7	41.7	33.6
145	19/08/2011 04:05	0:05:00	43.4	60.5	43.6	31.6
146	19/08/2011 04:10	0:05:00	39.4	55.1	40.9	32.6
147	19/08/2011 04:15	0:05:00	43.7	59.8	46.2	35.3
148	19/08/2011 04:20	0:05:00	46.1	66.6	50.0	35.8
149	19/08/2011 04:25	0:05:00	53.7	75.7	55.3	37.7
150	19/08/2011 04:30	0:05:00	54.4	78.2	56.0	44.5
151	19/08/2011 04:35	0:05:00	47.3	59.9	50.8	40.0
152	19/08/2011 04:40	0:05:00	48.4	64.1	50.8	38.8
153	19/08/2011 04:45	0:05:00	47.4	59.3	51.8	39.4
154	19/08/2011 04:50	0:05:00	49.1	61.1	52.2	41.9
155	19/08/2011 04:55	0:05:00	50.9	60.9	55.1	43.0
156	19/08/2011 05:00	0:05:00	47.4	63.3	50.2	39.2
157	19/08/2011 05:05	0:05:00	45.7	59.1	48.7	38.3

Address	Time	Measurement Time	Noise indices *(dB)*			
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
158	19/08/2011 05:10	0:05:00	50.4	69.6	54.4	40.4
159	19/08/2011 05:15	0:05:00	48.1	59.5	51.5	42.3
160	19/08/2011 05:20	0:05:00	49.2	62.5	53.5	40.2
161	19/08/2011 05:25	0:05:00	47.1	61.1	51.0	39.7
162	19/08/2011 05:30	0:05:00	49.0	61.6	53.6	40.4
163	19/08/2011 05:35	0:05:00	48.8	60.6	52.7	41.7
164	19/08/2011 05:40	0:05:00	49.5	60.1	53.1	42.8
165	19/08/2011 05:45	0:05:00	51.3	64.5	54.9	44.5
166	19/08/2011 05:50	0:05:00	52.2	62.3	55.6	47.1
167	19/08/2011 05:55	0:05:00	52.5	64.8	56.4	46.1
168	19/08/2011 06:00	0:05:00	53.9	71.1	57.7	46.5
169	19/08/2011 06:05	0:05:00	52.0	61.7	55.9	45.3
170	19/08/2011 06:10	0:05:00	52.8	65.0	56.2	46.8
171	19/08/2011 06:15	0:05:00	52.5	63.4	56.1	47.6
172	19/08/2011 06:20	0:05:00	52.1	65.0	55.4	46.7
173	19/08/2011 06:25	0:05:00	52.0	62.4	55.8	46.1
174	19/08/2011 06:30	0:05:00	51.5	61.5	55.0	45.9
175	19/08/2011 06:35	0:05:00	52.2	61.8	55.7	46.7
176	19/08/2011 06:40	0:05:00	52.5	66.8	55.8	46.3
177	19/08/2011 06:45	0:05:00	51.9	59.2	55.3	47.4
178	19/08/2011 06:50	0:05:00	52.2	61.3	55.2	47.2
179	19/08/2011 06:55	0:05:00	52.4	60.5	55.5	47.5
180	19/08/2011 07:00	0:05:00	52.3	62.8	54.8	47.8
181	19/08/2011 07:05	0:05:00	52.0	59.8	55.1	46.9
182	19/08/2011 07:10	0:05:00	53.5	63.0	56.1	48.6
183	19/08/2011 07:15	0:05:00	52.8	61.2	55.9	47.2
184	19/08/2011 07:20	0:05:00	52.9	67.3	55.5	48.5
185	19/08/2011 07:25	0:05:00	53.9	61.5	56.5	50.8
186	19/08/2011 07:30	0:05:00	56.5	65.1	59.8	51.7
187	19/08/2011 07:35	0:05:00	53.7	60.9	56.3	47.7
188	19/08/2011 07:40	0:05:00	54.6	78.2	55.5	45.3
189	19/08/2011 07:45	0:05:00	51.5	60.5	54.6	44.7
190	19/08/2011 07:50	0:05:00	52.0	69.7	55.0	45.9
191	19/08/2011 07:55	0:05:00	51.2	63.4	54.3	45.6
192	19/08/2011 08:00	0:05:00	50.3	59.8	53.6	44.2
193	19/08/2011 08:05	0:05:00	51.2	59.4	54.1	45.2
194	19/08/2011 08:10	0:05:00	50.8	59.1	54.1	43.2
195	19/08/2011 08:15	0:05:00	52.0	69.2	54.8	46.5
196	19/08/2011 08:20	0:05:00	52.6	58.8	55.3	48.9
197	19/08/2011 08:25	0:05:00	52.0	58.3	54.9	47.9
198	19/08/2011 08:30	0:05:00	52.1	62.3	55.2	46.3
199	19/08/2011 08:35	0:05:00	55.2	79.1	55.6	47.6
200	19/08/2011 08:40	0:05:00	52.5	63.1	54.8	47.6

Address	Time	Measurement Time	Noise indices *(dB)*			
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
201	19/08/2011 08:45	0:05:00	52.5	65.1	55.0	48.6
202	19/08/2011 08:50	0:05:00	51.5	62.5	54.3	46.6
203	19/08/2011 08:55	0:05:00	51.1	57.3	53.9	47.2
204	19/08/2011 09:00	0:05:00	51.5	61.9	54.2	46.6
205	19/08/2011 09:05	0:05:00	51.3	58.2	54.4	45.7
206	19/08/2011 09:10	0:05:00	56.8	83.7	56.8	51.1
207	19/08/2011 09:15	0:05:00	55.0	63.7	57.3	52.5
208	19/08/2011 09:20	0:05:00	54.4	70.2	56.3	50.7
209	19/08/2011 09:25	0:05:00	57.3	82.5	57.8	50.6
210	19/08/2011 09:30	0:05:00	52.8	65.0	55.2	47.9
211	19/08/2011 09:35	0:05:00	52.0	58.7	54.9	47.3
212	19/08/2011 09:40	0:05:00	53.1	63.9	55.2	49.3
213	19/08/2011 09:45	0:05:00	50.5	60.5	53.4	46.5
214	19/08/2011 09:50	0:05:00	54.3	74.7	55.3	49.1
215	19/08/2011 09:55	0:05:00	51.7	62.4	54.1	47.2
216	19/08/2011 10:00	0:05:00	52.7	64.0	54.9	48.7
217	19/08/2011 10:05	0:05:00	53.9	68.8	55.5	51.2
218	19/08/2011 10:10	0:05:00	53.6	64.4	55.6	50.9
219	19/08/2011 10:15	0:05:00	53.4	66.3	55.0	50.9
220	19/08/2011 10:20	0:05:00	53.4	73.5	55.3	48.3
221	19/08/2011 10:25	0:05:00	53.8	70.0	55.0	48.0
222	19/08/2011 10:30	0:05:00	53.1	61.7	54.7	50.2
223	19/08/2011 10:35	0:05:00	54.5	61.0	57.1	50.7
224	19/08/2011 10:40	0:05:00	55.8	62.7	57.2	54.2
225	19/08/2011 10:45	0:05:00	56.2	63.5	57.5	54.7
226	19/08/2011 10:50	0:05:00	55.2	66.1	56.8	52.9
227	19/08/2011 10:55	0:05:00	55.2	62.7	57.6	51.4
228	19/08/2011 11:00	0:05:00	51.8	60.8	54.5	47.3
229	19/08/2011 11:05	0:05:00	52.7	58.9	54.8	49.9
230	19/08/2011 11:10	0:05:00	54.7	61.3	56.2	53.1
231	19/08/2011 11:15	0:05:00	53.4	63.1	55.3	50.3
232	19/08/2011 11:20	0:05:00	53.0	67.1	54.8	50.6
233	19/08/2011 11:25	0:05:00	53.9	62.6	55.5	52.1
234	19/08/2011 11:30	0:00:21	52.8	55.5	53.5	51.8
	Daytime		52.5	83.7	53.9	45.8
	Night-time		47.6	78.2	47.3	35.8

Table 10 Noise measurement results - position 2

Address	Time	Measurement Time	Noise indices *(dB)*			
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
1	18/08/2011 12:04	0:05:00	53.0	67.9	56.6	42.3
2	18/08/2011 12:09	0:05:00	51.3	69.3	52.8	43.0
3	18/08/2011 12:14	0:05:00	52.9	67.8	56.2	42.7
4	18/08/2011 12:19	0:05:00	50.9	68.3	53.5	41.4
5	18/08/2011 12:24	0:05:00	52.6	70.9	55.0	41.6
6	18/08/2011 12:29	0:05:00	49.0	65.4	51.2	41.0
7	18/08/2011 12:34	0:05:00	54.8	79.2	55.3	42.5
8	18/08/2011 12:39	0:05:00	52.0	68.1	54.3	41.7
9	18/08/2011 12:44	0:05:00	52.5	67.1	56.4	42.5
10	18/08/2011 12:49	0:05:00	52.2	69.9	53.2	43.0
11	18/08/2011 12:54	0:05:00	53.0	66.1	57.6	42.9
12	18/08/2011 12:59	0:05:00	50.1	65.1	52.7	42.4
13	18/08/2011 13:04	0:05:00	49.6	67.5	50.7	42.4
14	18/08/2011 13:09	0:05:00	53.5	67.8	57.4	39.9
15	18/08/2011 13:14	0:00:01	42.4	43.6	43.2	42.3
1	18/08/2011 16:15	0:05:00	53.9	73.1	56.5	46.2
2	18/08/2011 16:20	0:05:00	52.2	64.8	54.6	46.1
3	18/08/2011 16:25	0:05:00	52.8	65.6	56.4	45.1
4	18/08/2011 16:30	0:05:00	51.2	64.4	54.1	44.9
5	18/08/2011 16:35	0:05:00	57.4	80.0	58.6	46.2
6	18/08/2011 16:40	0:05:00	50.1	62.4	51.8	44.7
7	18/08/2011 16:45	0:05:00	52.3	66.6	56.6	44.5
8	18/08/2011 16:50	0:05:00	50.7	63.5	51.8	44.3
9	18/08/2011 16:55	0:05:00	52.5	65.2	56.7	44.2
10	18/08/2011 17:00	0:05:00	54.0	68.7	57.9	45.3
11	18/08/2011 17:05	0:05:00	50.0	68.0	52.8	42.9
12	18/08/2011 17:10	0:05:00	52.0	65.5	56.1	45.2
13	18/08/2011 17:15	0:05:00	53.1	68.1	57.3	42.9
14	18/08/2011 17:20	0:05:00	52.4	66.3	55.3	43.1
15	18/08/2011 17:25	0:05:00	50.7	64.3	52.5	42.0
16	18/08/2011 17:30	0:05:00	51.5	65.2	54.1	43.4
17	18/08/2011 17:35	0:05:00	51.1	64.5	53.0	43.3
18	18/08/2011 17:40	0:05:00	52.2	66.8	54.1	46.7
19	18/08/2011 17:45	0:05:00	51.3	61.9	53.7	47.1
20	18/08/2011 17:50	0:05:00	52.2	64.4	54.3	46.3
21	18/08/2011 17:55	0:05:00	52.9	67.1	55.9	47.2
22	18/08/2011 18:00	0:05:00	51.0	63.9	52.9	44.3
23	18/08/2011 18:05	0:05:00	52.8	67.0	54.3	45.5
24	18/08/2011 18:10	0:05:00	51.8	66.3	54.2	45.9
25	18/08/2011 18:15	0:05:00	51.5	63.8	53.6	46.1
26	18/08/2011 18:20	0:05:00	52.2	65.5	53.2	46.8
27	18/08/2011 18:25	0:05:00	57.9	66.2	61.0	49.1

Address	Time	Measurement Time	Noise indices *(dB)*			
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
28	18/08/2011 18:30	0:05:00	54.8	64.4	57.5	50.8
29	18/08/2011 18:35	0:05:00	54.8	64.5	57.1	51.4
30	18/08/2011 18:40	0:05:00	53.8	67.3	54.3	50.1
31	18/08/2011 18:45	0:05:00	54.4	68.1	54.6	50.9
32	18/08/2011 18:50	0:05:00	55.8	71.8	58.1	50.7
33	18/08/2011 18:55	0:05:00	57.6	77.3	58.1	50.7
34	18/08/2011 19:00	0:05:00	55.6	70.3	56.0	51.6
35	18/08/2011 19:05	0:05:00	56.0	67.9	58.5	51.2
36	18/08/2011 19:10	0:05:00	56.1	69.6	56.8	52.0
37	18/08/2011 19:15	0:05:00	53.4	66.0	54.5	50.2
38	18/08/2011 19:20	0:05:00	53.4	69.3	54.2	46.6
39	18/08/2011 19:25	0:05:00	51.2	67.4	52.4	46.2
40	18/08/2011 19:30	0:05:00	49.8	62.2	51.8	44.8
41	18/08/2011 19:35	0:05:00	53.3	67.2	56.2	43.8
42	18/08/2011 19:40	0:05:00	49.2	66.7	49.9	40.7
43	18/08/2011 19:45	0:05:00	49.9	64.4	51.5	42.6
44	18/08/2011 19:50	0:05:00	50.1	66.5	51.0	42.3
45	18/08/2011 19:55	0:05:00	49.8	62.7	51.5	42.7
46	18/08/2011 20:00	0:05:00	47.7	60.2	50.3	40.7
47	18/08/2011 20:05	0:05:00	50.1	65.2	51.5	41.6
48	18/08/2011 20:10	0:05:00	47.7	62.0	50.5	40.6
49	18/08/2011 20:15	0:05:00	49.4	68.4	49.6	39.6
50	18/08/2011 20:20	0:05:00	49.2	64.0	51.5	40.8
51	18/08/2011 20:25	0:05:00	51.7	65.9	53.8	40.6
52	18/08/2011 20:30	0:05:00	46.8	53.5	49.4	41.6
53	18/08/2011 20:35	0:05:00	49.7	64.0	50.9	41.2
54	18/08/2011 20:40	0:05:00	48.3	62.0	49.8	42.2
55	18/08/2011 20:45	0:05:00	49.3	68.9	48.1	40.4
56	18/08/2011 20:50	0:05:00	46.8	62.2	46.6	40.1
57	18/08/2011 20:55	0:05:00	47.6	64.6	46.9	38.7
58	18/08/2011 21:00	0:05:00	47.4	66.7	47.1	38.7
59	18/08/2011 21:05	0:05:00	47.6	64.5	47.0	38.0
60	18/08/2011 21:10	0:05:00	44.6	61.4	46.3	35.0
61	18/08/2011 21:15	0:05:00	46.0	62.6	47.8	37.6
62	18/08/2011 21:20	0:05:00	43.6	56.8	46.8	36.0
63	18/08/2011 21:25	0:05:00	47.4	64.5	47.2	37.8
64	18/08/2011 21:30	0:05:00	50.0	66.8	50.6	37.0
65	18/08/2011 21:35	0:05:00	47.3	64.8	46.2	33.9
66	18/08/2011 21:40	0:05:00	46.9	67.1	45.2	35.4
67	18/08/2011 21:45	0:05:00	43.2	59.4	45.2	34.3
68	18/08/2011 21:50	0:05:00	46.4	62.6	48.6	37.1
69	18/08/2011 21:55	0:05:00	43.7	52.0	47.5	36.1
70	18/08/2011 22:00	0:05:00	42.7	54.2	46.9	34.0

Address	Time	Measurement Time	Noise indices *(dB)*			
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
71	18/08/2011 22:05	0:05:00	45.1	58.7	48.8	34.1
72	18/08/2011 22:10	0:05:00	47.9	62.9	49.3	37.5
73	18/08/2011 22:15	0:05:00	46.3	62.7	49.0	35.0
74	18/08/2011 22:20	0:05:00	43.5	53.9	47.2	35.6
75	18/08/2011 22:25	0:05:00	39.7	52.1	44.4	31.5
76	18/08/2011 22:30	0:05:00	46.5	65.9	47.1	35.0
77	18/08/2011 22:35	0:05:00	40.1	50.7	44.4	31.0
78	18/08/2011 22:40	0:05:00	39.8	52.4	43.0	31.2
79	18/08/2011 22:45	0:05:00	39.0	50.3	43.1	31.4
80	18/08/2011 22:50	0:05:00	43.1	53.7	46.9	36.0
81	18/08/2011 22:55	0:05:00	41.5	52.5	46.4	30.6
82	18/08/2011 23:00	0:05:00	43.7	62.5	44.6	29.5
83	18/08/2011 23:05	0:05:00	41.8	53.6	47.1	31.0
84	18/08/2011 23:10	0:05:00	39.1	50.6	43.1	31.1
85	18/08/2011 23:15	0:05:00	46.3	64.8	47.0	31.1
86	18/08/2011 23:20	0:05:00	39.7	51.1	44.1	31.3
87	18/08/2011 23:25	0:05:00	40.0	53.9	43.6	32.5
88	18/08/2011 23:30	0:05:00	42.5	54.1	46.4	31.0
89	18/08/2011 23:35	0:05:00	39.7	50.3	44.1	31.4
90	18/08/2011 23:40	0:05:00	42.9	59.1	46.5	31.4
91	18/08/2011 23:45	0:05:00	45.7	64.7	48.5	31.3
92	18/08/2011 23:50	0:05:00	44.3	62.0	47.2	31.5
93	18/08/2011 23:55	0:05:00	38.6	56.9	38.9	30.1
94	19/08/2011 00:00	0:05:00	41.1	56.9	43.7	31.9
95	19/08/2011 00:05	0:05:00	47.2	67.0	49.2	31.4
96	19/08/2011 00:10	0:05:00	44.9	68.0	45.3	30.5
97	19/08/2011 00:15	0:05:00	45.3	61.9	47.5	30.9
98	19/08/2011 00:20	0:05:00	33.6	46.6	36.9	28.6
99	19/08/2011 00:25	0:05:00	38.7	49.9	43.4	29.7
100	19/08/2011 00:30	0:05:00	49.4	69.2	48.5	31.1
101	19/08/2011 00:35	0:05:00	50.8	65.9	54.0	33.2
102	19/08/2011 00:40	0:05:00	42.3	52.7	46.6	32.5
103	19/08/2011 00:45	0:05:00	43.8	55.8	48.7	32.7
104	19/08/2011 00:50	0:05:00	39.6	57.8	39.0	29.0
105	19/08/2011 00:55	0:05:00	36.6	50.7	38.5	29.6
106	19/08/2011 01:00	0:05:00	35.8	49.6	39.4	29.7
107	19/08/2011 01:05	0:05:00	36.8	49.2	40.6	30.2
108	19/08/2011 01:10	0:05:00	39.5	51.9	43.6	30.5
109	19/08/2011 01:15	0:05:00	41.5	55.3	44.7	30.6
110	19/08/2011 01:20	0:05:00	37.7	52.2	41.1	29.1
111	19/08/2011 01:25	0:05:00	34.6	51.0	36.1	27.4
112	19/08/2011 01:30	0:05:00	38.3	55.5	39.5	27.4
113	19/08/2011 01:35	0:05:00	41.4	57.0	45.9	28.6

Address	Time	Measurement Time	Noise indices *(dB)*			
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
114	19/08/2011 01:40	0:05:00	43.2	64.1	41.4	27.4
115	19/08/2011 01:45	0:05:00	38.3	51.5	42.0	29.0
116	19/08/2011 01:50	0:05:00	31.9	46.5	34.6	27.7
117	19/08/2011 01:55	0:05:00	44.4	65.4	41.6	28.5
118	19/08/2011 02:00	0:05:00	44.0	63.4	43.9	30.3
119	19/08/2011 02:05	0:05:00	46.4	66.1	45.4	30.4
120	19/08/2011 02:10	0:05:00	45.1	64.6	45.7	31.5
121	19/08/2011 02:15	0:05:00	31.1	46.9	32.7	29.2
122	19/08/2011 02:20	0:05:00	39.8	54.8	42.6	30.1
123	19/08/2011 02:25	0:05:00	35.9	49.8	38.7	29.1
124	19/08/2011 02:30	0:05:00	37.6	51.7	41.1	29.2
125	19/08/2011 02:35	0:05:00	41.2	54.2	45.7	29.9
126	19/08/2011 02:40	0:05:00	39.0	51.0	42.9	30.8
127	19/08/2011 02:45	0:05:00	42.5	60.8	43.7	30.7
128	19/08/2011 02:50	0:05:00	34.4	48.2	35.9	30.6
129	19/08/2011 02:55	0:05:00	40.4	54.8	44.2	30.0
130	19/08/2011 03:00	0:05:00	41.4	54.3	44.8	33.6
131	19/08/2011 03:05	0:05:00	41.4	53.9	45.8	32.5
132	19/08/2011 03:10	0:05:00	41.2	58.0	42.8	33.3
133	19/08/2011 03:15	0:05:00	33.9	47.4	35.5	31.9
134	19/08/2011 03:20	0:05:00	39.3	50.2	42.3	33.5
135	19/08/2011 03:25	0:05:00	38.0	50.3	40.2	33.4
136	19/08/2011 03:30	0:05:00	35.5	44.1	37.2	32.9
137	19/08/2011 03:35	0:05:00	43.1	62.0	42.3	33.8
138	19/08/2011 03:40	0:05:00	35.2	46.8	37.7	32.2
139	19/08/2011 03:45	0:05:00	39.7	56.6	42.3	31.6
140	19/08/2011 03:50	0:05:00	41.1	52.5	45.8	33.5
141	19/08/2011 03:55	0:05:00	40.4	54.6	43.8	33.4
142	19/08/2011 04:00	0:05:00	46.8	67.4	44.2	33.4
143	19/08/2011 04:05	0:05:00	41.4	53.0	45.5	33.7
144	19/08/2011 04:10	0:05:00	36.4	47.0	39.3	32.9
145	19/08/2011 04:15	0:05:00	37.2	47.8	40.0	33.0
146	19/08/2011 04:20	0:05:00	39.9	49.3	43.1	34.8
147	19/08/2011 04:25	0:05:00	42.6	53.1	46.3	35.8
148	19/08/2011 04:30	0:05:00	46.1	65.1	47.3	35.5
149	19/08/2011 04:35	0:05:00	43.3	53.7	46.5	38.2
150	19/08/2011 04:40	0:05:00	46.7	64.2	48.3	35.5
151	19/08/2011 04:45	0:05:00	42.9	53.3	46.7	36.5
152	19/08/2011 04:50	0:05:00	46.3	59.7	48.6	38.8
153	19/08/2011 04:55	0:05:00	49.1	66.2	50.3	41.3
154	19/08/2011 05:00	0:05:00	50.7	68.4	51.9	39.7
155	19/08/2011 05:05	0:05:00	43.0	53.1	45.9	37.6
156	19/08/2011 05:10	0:05:00	45.1	53.3	48.3	37.8

Address	Time	Measurement Time	Noise indices *(dB)*			
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
157	19/08/2011 05:15	0:05:00	48.7	62.8	53.1	38.0
158	19/08/2011 05:20	0:05:00	47.8	63.9	49.8	38.5
159	19/08/2011 05:25	0:05:00	44.4	56.3	48.3	37.9
160	19/08/2011 05:30	0:05:00	43.5	55.9	47.6	35.6
161	19/08/2011 05:35	0:05:00	45.7	63.3	47.5	38.7
162	19/08/2011 05:40	0:05:00	47.2	65.4	48.7	38.3
163	19/08/2011 05:45	0:05:00	50.7	67.6	53.0	40.3
164	19/08/2011 05:50	0:05:00	51.2	65.9	52.1	42.0
165	19/08/2011 05:55	0:05:00	52.3	71.1	52.3	44.1
166	19/08/2011 06:00	0:05:00	51.9	64.3	53.3	44.5
167	19/08/2011 06:05	0:05:00	52.9	68.0	54.6	44.0
168	19/08/2011 06:10	0:05:00	49.5	63.3	52.0	43.1
169	19/08/2011 06:15	0:05:00	48.1	64.3	49.8	41.1
170	19/08/2011 06:20	0:05:00	51.5	66.4	53.3	44.6
171	19/08/2011 06:25	0:05:00	52.0	68.0	53.6	42.7
172	19/08/2011 06:30	0:05:00	49.7	62.9	51.3	44.2
173	19/08/2011 06:35	0:05:00	52.4	66.0	53.9	45.8
174	19/08/2011 06:40	0:05:00	55.6	81.8	52.9	42.8
175	19/08/2011 06:45	0:05:00	53.3	66.7	55.6	45.9
176	19/08/2011 06:50	0:05:00	51.8	65.0	51.7	44.6
177	19/08/2011 06:55	0:05:00	50.2	62.2	51.3	44.5
178	19/08/2011 07:00	0:05:00	54.2	73.9	56.0	45.5
179	19/08/2011 07:05	0:05:00	51.4	70.4	50.8	44.0
180	19/08/2011 07:10	0:05:00	51.6	64.0	53.1	44.2
181	19/08/2011 07:15	0:05:00	51.1	64.9	52.2	44.7
182	19/08/2011 07:20	0:05:00	52.1	68.8	53.7	44.9
183	19/08/2011 07:25	0:05:00	51.6	66.9	54.8	43.2
184	19/08/2011 07:30	0:05:00	53.3	65.5	57.7	45.4
185	19/08/2011 07:35	0:05:00	51.0	64.9	53.3	43.2
186	19/08/2011 07:40	0:05:00	52.8	66.1	56.9	44.2
187	19/08/2011 07:45	0:05:00	52.0	64.5	56.2	43.5
188	19/08/2011 07:50	0:05:00	55.9	75.9	58.3	45.0
189	19/08/2011 07:55	0:05:00	52.4	65.9	55.2	43.4
190	19/08/2011 08:00	0:05:00	51.2	66.5	53.0	43.0
191	19/08/2011 08:05	0:05:00	52.1	66.4	55.1	44.5
192	19/08/2011 08:10	0:05:00	49.1	65.2	50.4	44.1
193	19/08/2011 08:15	0:05:00	48.3	63.0	50.2	42.3
194	19/08/2011 08:20	0:05:00	51.7	64.7	54.1	45.0
195	19/08/2011 08:25	0:05:00	50.9	64.2	52.5	43.7
196	19/08/2011 08:30	0:05:00	49.8	64.7	51.2	42.8
197	19/08/2011 08:35	0:05:00	49.8	67.4	50.6	43.9
198	19/08/2011 08:40	0:05:00	50.8	66.4	52.7	44.5
199	19/08/2011 08:45	0:05:00	51.1	62.3	53.5	46.9

Address	Time	Measurement Time	Noise indices *(dB)*			
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
200	19/08/2011 08:50	0:05:00	54.3	71.9	56.0	47.7
201	19/08/2011 08:55	0:05:00	51.3	63.1	53.6	45.2
202	19/08/2011 09:00	0:05:00	50.8	65.6	52.6	45.8
203	19/08/2011 09:05	0:05:00	51.5	65.7	53.2	44.6
204	19/08/2011 09:10	0:05:00	50.6	65.7	51.9	46.2
205	19/08/2011 09:15	0:05:00	48.9	62.5	49.5	43.2
206	19/08/2011 09:20	0:05:00	48.5	66.9	49.3	43.5
207	19/08/2011 09:25	0:05:00	54.2	72.6	55.9	45.4
208	19/08/2011 09:30	0:05:00	54.8	67.3	58.5	48.2
209	19/08/2011 09:35	0:05:00	51.7	64.7	53.8	46.7
210	19/08/2011 09:40	0:05:00	53.1	67.8	55.7	46.7
211	19/08/2011 09:45	0:05:00	51.1	62.1	52.3	47.2
212	19/08/2011 09:50	0:05:00	51.7	63.0	53.0	47.9
213	19/08/2011 09:55	0:05:00	56.3	74.1	57.9	48.0
214	19/08/2011 10:00	0:05:00	50.5	62.2	52.9	46.8
215	19/08/2011 10:05	0:05:00	55.2	69.2	57.6	49.4
216	19/08/2011 10:10	0:05:00	54.0	67.9	55.7	48.5
217	19/08/2011 10:15	0:05:00	51.9	64.9	54.1	47.8
218	19/08/2011 10:20	0:05:00	52.0	63.9	53.9	48.2
219	19/08/2011 10:25	0:05:00	52.8	66.2	55.1	46.4
220	19/08/2011 10:30	0:05:00	52.2	69.0	53.4	47.2
221	19/08/2011 10:35	0:05:00	53.7	66.5	55.3	47.8
222	19/08/2011 10:40	0:05:00	53.9	69.7	55.4	48.9
223	19/08/2011 10:45	0:05:00	51.4	64.1	52.9	48.1
224	19/08/2011 10:50	0:05:00	52.4	69.7	53.8	46.6
225	19/08/2011 10:55	0:05:00	54.6	69.4	57.3	48.8
226	19/08/2011 11:00	0:05:00	53.1	68.0	55.1	47.1
227	19/08/2011 11:05	0:05:00	53.8	68.3	55.2	48.5
228	19/08/2011 11:10	0:05:00	52.4	68.4	53.6	47.0
229	19/08/2011 11:15	0:05:00	52.1	75.6	53.7	47.4
230	19/08/2011 11:20	0:05:00	51.4	64.8	52.7	47.6
231	19/08/2011 11:25	0:05:00	54.3	67.9	53.9	47.9
232	19/08/2011 11:30	0:05:00	52.6	65.8	54.6	48.1
233	19/08/2011 11:35	0:05:00	53.9	68.6	55.7	48.3
234	19/08/2011 11:40	0:05:00	54.3	67.5	56.4	49.2
235	19/08/2011 11:45	0:05:00	51.5	62.8	53.3	48.0
236	19/08/2011 11:50	0:05:00	52.6	66.2	53.6	48.7
237	19/08/2011 11:55	0:05:00	58.2	74.7	59.3	49.2
238	19/08/2011 12:00	0:05:00	54.2	71.4	54.6	46.6
239	19/08/2011 12:05	0:05:00	57.8	76.5	57.5	47.4
240	19/08/2011 12:10	0:05:00	54.7	69.1	57.9	48.1
241	19/08/2011 12:15	0:05:00	56.9	78.6	54.6	46.7
242	19/08/2011 12:20	0:00:04	51.8	52.6	52.4	51.3

Address	Time	Measurement Time	Noise indices *(dB)*			
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
	Daytime		54.4	80.0	52.9	43.8
	Night-time		46.4	81.8	45.4	34.1