Sound Advice
ACOUSTICS LTD

REFUSE

Report Reference: SA – 483
Report Date: 12th November 2010

EXTERNAL - INTERNAL
NOISE AND VIBRATION ASSESSMENT

CLIENT

Ravenswood Holdings
Riverside House
Upper Wharf
Fareham
PO16 0LY

SITE

Proposed Residential Premises
Land Adjacent to
No. 2 New Road
Havant

SURVEY DATES

6th – 7th September 2007

(Sound Advice Acoustics Ltd consider the survey data captured on these dates to still be relevant as the environmental character noise is unlikely to be unchanged)

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1. Introduction:

Sound Advice Acoustics Ltd has been instructed by Ravenswood Holdings Ltd, to review our previous acoustic assessment, report dated 4th October 2007, in connection with a development at Land Adjacent to No.2 New Road Havant, Hampshire. A survey to monitor the ambient noise and vibration levels was carried out on the 6th & 7th September 2007. The data obtained from this assessment is considered to still be relevant for this particular site and the proposed residential development. This survey was undertaken in order to assess the impact of airborne noise and ground borne vibration arising from trains passing the proposed site and associated traffic and mixed noise source noise levels.

This planning application for residential development of a building comprising one, two bed dwelling and two, one bed flats. The planning consultant appointed by the developer has requested that the original acoustic assessment be reviewed to identify the appropriate noise category in accordance with the guidelines within PPG24.

Ambient noise and vibration levels were measured during 6th – 7th September 2007. This report by Sound Advice Acoustics Ltd gives the results of these measurements and an assessment in accordance with government planning guidelines and relevant standards together with mitigation measures as required.

With regards to external ambient noise, noise levels are to be monitored generally in accordance with Planning and Policy Guidance PPG 24 and assessments and calculation made in accordance with BS 8233 : 1999 Sound Insulation and Noise Reduction for Buildings Code of Practice. The levels recorded are to be used to evaluate the NEC Category in accordance with PPG 24 and the minimum window specification required for the proposed development.

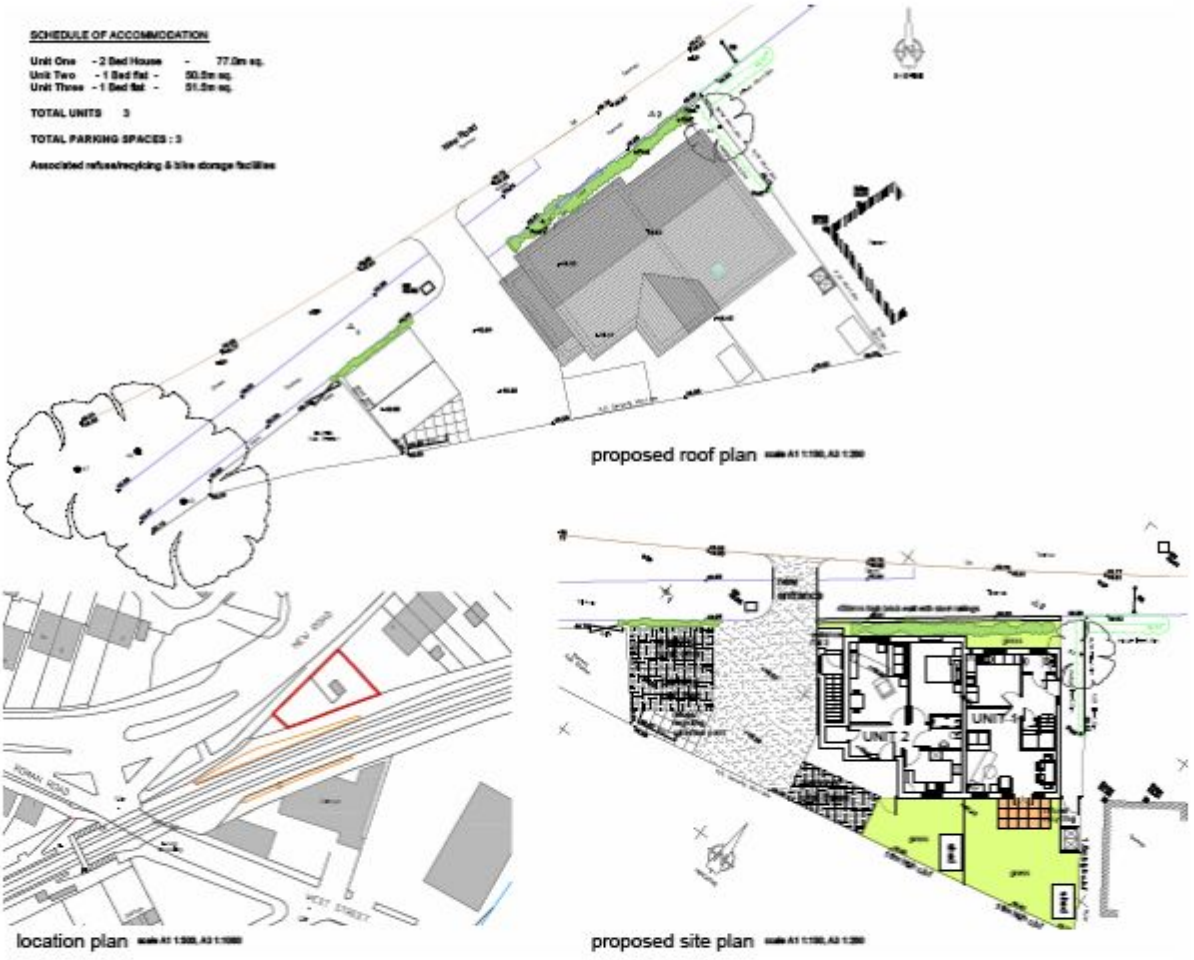
External noise levels are to be recorded over, what has been considered for the site, an average / typical time period in order to assess the daytime and night time averages associated with the proposed development.

A brief description of the site and the selected measurement locations are given.

2. Description Of The Site:

The development site in is located at the end of New Road direct adjacent to No.2 and separates the main road from the railway line with the railway line approximately 5m from the proposed residential development. The site currently consists of overgrown vegetation.

Noise and vibration levels were recorded on the proposed site at the positions stated on the attached sketch.



3. Noise Assessment:

PROCEDURE

External noise levels were recorded over a typical weekday period 6th September 2007 – 7th September 2007 at first floor height at the position of the nearest proposed residential window to the railway line. Sample measurements were recorded over continuous 5 minute samples and from this data the hourly LAeq daytime values have been evaluated. Sound Pressure Levels were recorded on the following setting along with a full octave band frequency analysis measured simultaneously and between 31.5 Hz and 16.0 kHz.

Daytime 07:00 – 23:00		**Night time 23:00 – 07:00**	
$L_{Aeq\ 1\ HOUR}$ dB	$L_{A10\ 1\ HOUR}$ dB	$L_{Aeq\ 5\ MINUTE}$ dB	$L_{A10\ 5\ MINUTE}$ dB
$L_{AMAX\ 1\ HOUR}$ dB	$L_{A50\ 1\ HOUR}$ dB	$L_{AMAX\ 5\ MINUTE}$ dB	$L_{A50\ 5\ MINUTE}$ dB
$L_{AMIN\ 1\ HOUR}$ dB	$L_{A90\ 1\ HOUR}$ dB	$L_{AMIN\ 5\ MINUTE}$ dB	$L_{A90\ 5\ MINUTE}$ dB

The external results recorded were assessed in accordance with Planning and Policy Guidance PPG 24. Calculations have also been made in accordance with BS 8233 : 1999 'Sound Insulation and Reduction of Buildings - Code of Practice'. Recommendations were made for any additional acoustics measures to conform to these standards.

From the downloaded recorded results the daytime and night time periods were assessed and used within the above calculations as $L_{Aeq\ 16\ HOUR}$ dB levels for daytime and $L_{Aeq\ 8\ HOUR}$ dB levels for night time. These are detailed on the attached figure.

APPARATUS

The above equipment was calibrated using a sound pressure level of 114.00 dB at an octave band centre frequency of 1000Hz with reference to 2 x 10^{-5} Nm^{-2} before and after the tests and the equipment set to have no inaccuracy greater than 0.2 dB.

All the following equipment was calibrated by AV Calibrations Ltd, Shefford, Bedfordshire (UKAS NO: 0653) in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service (UKAS) on the following dates.

Calibration schedules are implemented within Sound Advice Acoustics Ltd in accordance with UKAS directive LAB 23.

Description	Make	Type	Serial No.	Calibration Intervals	Last Calibrated	Next Due Calibration
Integrated Sound Level Meter	Norsonic	118	28191	2 YEARS	17.04.07	16.04.09
12.5mm Microphone (with windshield)	Norsonic	1220	73337	2 YEARS	17.04.07	16.04.09
Microphone Pre – Amplifier	Norsonic	1206	27587	2 YEARS	17.04.07	16.04.09
Calibrator	Norsonic	1251	31310	1 YEAR	25.07.07	24.07.08

FULL UKAS CALIBRATION DATA SHEETS AND CERTIFICATES ARE AVAILABLE UPON REQUEST.

ENVIRONMENTAL CONDITIONS

START OF TEST	-	6th September 2007
Temperature:		17°C
Relative Humidity		62%
Average Wind Speed:		<0.5 m/s
Cloud Cover:		Moderate
Road Surface		Dry
Atmospheric Pressure:		1004

END OF TEST	-	7th September 2007
Temperature:		19°C
Relative Humidity		82%
Average Wind Speed:		<0.5 m/s
Cloud Cover:		Moderate / Heavy
Road Surface		Damp
Atmospheric Pressure:		1001

* Wind speed, temperature and relative humidity were all recorded using standard equipment supplied by RS Components, Hedge End, Southampton and are taken as an average over the designated time period.

RESULTS

$L_{Aeq,t}$ - The equivalent A weighted sound pressure level recorded over a time interval of 1 hourly daytime & 5 minute night time.

$L_{A90,t}$ - The A weighted sound pressure level that is exceeded for 90% of the time period 1 hourly daytime & 5 minute night time.

$L_{A50,t}$ - The A weighted sound pressure level that is exceeded for 50% of the time period 1 hourly daytime & 5 minute night time.

$L_{A10,t}$ - The A weighted sound pressure level that is exceeded for 10% of the time period 1 hourly daytime & 5 minute night time.

L_{Amax} - The maximum A weighted sound pressure level recorded over a time interval of 1 hourly daytime & 5 minute night time.

L_{Amin} - The minimum A weighted sound pressure level recorded over a time interval of 1 hourly daytime & 5 minute night time.

See attached figure 1 for full downloaded results, and averages.

6TH – 7TH SEPTEMBER 2007																
Date / Time	LAeq	Lmax	Lmin	LA10	LA50	LA90	Octave Band Centre Frequency (Hz)									
							31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
DAYTIME LOWEST	60.1	78.0	39.1	59.5	51.0	42.7	57.7	63.2	58.4	55.7	55.9	55.9	52.2	48.7	49.1	42.0
DAYTIME HIGHEST	68.2	91.3	51.3	61.4	57.8	53.6	64.3	67.5	60.6	67.1	66.8	62.4	56.2	53.2	47.8	42.0
DAYTIME AVERAGE	62.8	79.9	47.2	62.3	56.5	50.9	63.1	66.6	60.1	58.3	58.8	58.9	53.6	50.8	51.2	43.6
NIGHT TIME LOWEST	38.4	51.9	26.4	41.3	31.4	28.0	42.9	45.2	42.6	36.3	36.7	34.7	26.7	18.4	17.7	19.5
NIGHT TIME HIGHEST	65.0	80.8	36.9	67.1	48.4	39.6	59.5	65.0	61.6	59.0	61.0	60.1	56.4	55.2	57.1	48.2
NIGHT TIME AVERAGE	50.7	65.4	31.8	52.1	39.4	33.7	51.9	55.2	48.5	46.6	47.3	47.9	40.2	31.0	28.3	24.2

DISCUSSION OF RESULTS

It can be seen from the attached graph and downloaded results that the external noise levels have followed the expected path and remained fairly constant throughout the day. The levels then gradually dropped off as the evening progressed and began to rise when morning traffic levels increased.

With regards to maximum levels, PPG 24 states that

"Night-time noise levels (23:00 – 07:00): sites where individual noise events regularly exceed 82 dB L_{Amax} (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the $L_{Aeq,8h}$ (except where the $L_{Aeq,8h}$ already puts the site in NEC D)."

However, it can be seen from the attached figure 1 that the L_{Amax} level has not been exceeded between 23:00 hrs and 07:00 hrs. Therefore the above statement does not apply.

Although the planning refusal 08/6023/010 issued by Havant Borough Council indicates the site to be Noise Exposure Category (NEC) C for Planning and Policy Guidance 24 (PPG 24), our assessment has deemed the site to be Noise Exposure Category (NEC) B for both daytime and night time periods.

NOISE EXPOSURE CATEGORIES

The following noise exposure categories have been assessed in accordance with Planning Policy Guidance Planning and Noise PPG 24 and assessed to the nearest affected façade of the proposed residential dwelling:-

AVERAGE LEVELS	DATE OF ASSESSMENT	
	6th – 7th September 2007	PPG 24 Category
DAYTIME 07:00–23:00	62.8	B
NIGHT TIME 23.00-07.00	50.7	B

Policy Planning Guidance PPG 24 states within Annex 1 that for NEC category B:-

NEC B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.

Table 1. Noise Exposure Categories

Noise Source	NEC A dB L_{Aeq}	NEC B dB L_{Aeq}	NEC C dB L_{Aeq}	NEC D dB L_{Aeq}
Mixed				
07:00 to 23:00 hrs	<55	55-63	63-72	>72
23:00 to 07:00 hrs	<45	45-57	57-66	>66

Table 2. PPG 24 Values

PPG 24 introduces the concept of Noise Exposure Categories (NECs) for residential developments; these are classified as shown in Table 1. Mixed noise sources have been used as a category and assessed for this site. The noise levels corresponding to the noise exposure categories for new housing are given in Table 2.

Therefore, given the evaluated noise exposure categories on this particular site, mitigation measures will be introduced within the window and ventilation design in order to meet the requirements of BS 8233 : 1999 in relation to the existing ambient noise levels associated with the proposed development.

RECOMMENDATIONS

Therefore in order to achieve the required noise levels of L_{Aeq} 35 dB for living rooms and L_{Aeq} 30 dB for Bedroom at night within the proposed residential properties, the following additional acoustic measures have been calculated. (Details on calculation sheet Figure 2). It should be noted that the calculations have been made with the proposed windows closed.

MINIMUM ACOUSTIC PERFORMANCE

It should be noted that this window specification has been selected using a standard cavity wall giving the following reduction value. This wall construction should be applied to all the proposed properties within this development.

STANDARD WALL CONSTRUCTION

63	125	250	500	1.0k	2.0k	4.0k	Frequency (Hz)
36.0	40.0	44.0	45.0	51.0	56.0	56.0	dB reduction

WINDOW CONSTRUCTION (4 / 14 / 6)

63	125	250	500	1.0k	2.0k	4.0k	Frequency (Hz)
22.0	24.4	26.5	36.2	41.7	40.3	42.6	dB reduction

ROOF CONSTRUCTION – MINIMUM VALUE

63	125	250	500	1.0k	2.0k	4.0k	Frequency (Hz)
14.0	26.0	35.0	37.0	46.0	52.0	54.0	dB reduction

D_{NE} TRICKLE VENTS

63	125	250	500	1.0k	2.0k	4.0k	Frequency (Hz)
34.0	33.0	32.0	29.0	29.0	31.0	30.0	dB reduction

The above trickle vents have been specified in order to ensure 8000mm^2 ventilation through the proposed dwellings with the windows closed.

The above are the minimum acoustic performance values that need to be implemented to each detailed area of the development.

4. Vibration Assessment:

PROCEDURE

Ground borne vibration needs to be assessed with regard to the likelihood of disturbance to humans and damage to building structure. With regard to human disturbance, vibration criteria are specified in terms of Vibration Dose Values (VDV) in accordance with BS 6472[1]. The following table shows the VDV with various degrees of adverse comment, which may be expected in residential buildings.

For residential buildings	Low probability of adverse comment	Adverse comment possible	Adverse comment probable
16 hr day 07:00 to 23:00	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
8 hr night 23:00 to 07:00	0.13	0.26	0.51

Table 2. Vibration Dose Values (given in $m/s^{1.75}$)

The vibration dose reflects the accumulated acceleration vibration value over a given time period, integrated by time on a root mean quad basis, hence the unit $m/s^{1.75}$.

Human beings have different sensitivity to vibration in different directions, e.g. vertical and horizontal. It is relevant to consider vibration in the vertical axis (z-axis) during daytime, when most people would be expected to be sitting or standing. For the night-time period, vibration levels in the horizontal direction are more significant, as most people would be expected to be lying in bed.

In terms of the likelihood of damage to buildings, vibration is measured in peak particle velocity (ppv) mm/s and assessed in accordance with BS 7385[2]. In this particular case, the main source of vibration is trains and this is considered to cause transient vibration. The BS7385 standard states that for transient vibration, guide values at which cosmetic damage could occur to residential buildings are 15mm/s at 4 Hz, rising to 20mm/s at 15 Hz and rising further to 50mm/s at 40 Hz and above for new buildings. These limits can be reduced by 50% for older buildings.

[1] BS 6472:1992, Evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz)
[1] BS 7385:1993, Evaluation and measurement for vibration in buildings

VIBRATION RESULTS

Detailed results of ground borne measurements are given in Table 3 below. The last event of 62.4 mm/s ppv, is likely to be caused by the operator at the time of collecting the equipment. The event causing 21.2 mm/s ppv at 14:28 hrs on the first day also appears to be rogue event, e.g. disturbance to equipment, as for the rest of the measurement period the vibration does not exceed 5.0 mm/s.

The measurement record shows that there are regular events causing vibration levels up to and at times above 4.0 mm/s. Vibration levels are lower for a couple of hours at night-time when no trains are operating. Also, refer to the time history in Figure 3.

TABLE 3. RESULTS OF VIBRATION MEASUREMENTS

	Vibration dose value (vdv)						Peak particle velocity (ppv)		
	X	Y	Z	X	Y	Z		Bank B	
Daytime					Cumulative		Hourly		
		1 Hour			Total		Max.		
Hour 1	0.196	0.017	0.016	0.192	0.016	0.015	2.50mm/s	12:15:36	06/09/2007
Hour 2	0.122	0.017	0.016	0.199	0.02	0.019	3.03mm/s	13:47:46	06/09/2007
Hour 3	0.25	0.017	0.016	0.188	0.022	0.021	21.2mm/s	14:28:06	06/09/2007
Hour 4	0.117	0.017	0.016	0.194	0.024	0.022	1.67mm/s	15:00:06	06/09/2007
Hour 5	0.163	0.017	0.016	0.214	0.025	0.024	2.00mm/s	16:51:26	06/09/2007
Hour 6	0.114	0.017	0.016	0.218	0.026	0.025	1.58mm/s	17:07:06	06/09/2007
Hour 7	0.212	0.017	0.016	0.256	0.027	0.026	3.47mm/s	18:27:56	06/09/2007
Hour 8	0.133	0.017	0.016	0.262	0.028	0.027	1.77mm/s	19:44:46	06/09/2007
Hour 9	0.204	0.017	0.016	0.282	0.029	0.028	2.95mm/s	20:30:06	06/09/2007
Hour 10	0.103	0.017	0.016	0.284	0.03	0.029	1.95mm/s	21:35:36	06/09/2007
Hour 11	0.198	0.017	0.017	0.3	0.031	0.03	3.47mm/s	22:49:36	06/09/2007
					16 Hour				
				0.328	0.034	0.033	21.2mm/s	14:28:06	06/09/2007
Night-time					Cumulative		Hourly		
		1 Hour			Total		Max.		
Hour 1	0.14	0.01	0.017	0.14	0.01	0.017	2.17mm/s	23:37:10	06/09/2007
Hour 2	0.142	0.01	0.017	0.168	0.013	0.02	2.50mm/s	00:34:40	07/09/2007
Hour 3	0.027	0.01	0.017	0.168	0.014	0.022	.250mm/s	01:33:00	07/09/2007
Hour 4	0.018	0.01	0.017	0.168	0.015	0.024	.175mm/s	02:00:10	07/09/2007
Hour 5	0.038	0.01	0.017	0.168	0.016	0.025	.575mm/s	03:43:00	07/09/2007
Hour 6	0.171	0.011	0.017	0.202	0.017	0.026	2.60mm/s	04:46:20	07/09/2007
Hour 7	0.107	0.011	0.017	0.206	0.017	0.027	1.88mm/s	05:07:50	07/09/2007
Hour 8	0.193	0.011	0.017	0.236	0.018	0.028	3.28mm/s	06:55:30	07/09/2007
					8 Hour				
				0.236	0.018	0.028	3.28mm/s	06:55:30	07/09/2007
Daytime					Cumulative		Hourly		
		1 Hour			Total		Max.		
Hour 1	0.167	0.018	0.017	0.167	0.018	0.017	3.75mm/s	07:13:40	07/09/2007
Hour 2	0.174	0.018	0.017	0.202	0.021	0.02	3.60mm/s	08:28:20	07/09/2007
Hour 3	0.173	0.017	0.017	0.224	0.024	0.022	3.10mm/s	09:35:00	07/09/2007
Hour 4	0.199	0.017	0.016	0.254	0.025	0.024	3.58mm/s	10:14:50	07/09/2007
Hour 5	0.156	0.017	0.016	0.262	0.026	0.025	4.30mm/s	11:35:10	07/09/2007
Hour 6	0.196	0.017	0.016	0.28	0.027	0.026	3.63mm/s	12:57:50	07/09/2007
Hour 7	0.179	0.017	0.016	0.292	0.028	0.027	4.30mm/s	13:57:50	07/09/2007
Hour 8	0.13	0.017	0.016	0.294	0.029	0.028	3.28mm/s	14:48:10	07/09/2007
Hour 9	2.78	1.62	0.23	2.22	1.29	0.182	62.4mm/s	15:23:30	07/09/2007
					16 Hour				
				2.61	1.52	0.214	62.4mm/s	15:23:30	07/09/2007

ASSESSMENT OF VIBRATION LEVELS

Measurements at the site in New Road, Havant.
The maximum vibration levels were 4.30 mm/s ppv during daytime and only slightly lower at 3.28 mm/s during night-time.

Detailed results of the vibration measurements are given in the tables above and a summary is given in the table below.

Time Period	Vibration Dose Value $m/s^{1.75}$			Peak Particle Velocity mm/s
	X - radial	Y - lateral	Z - Vertical	Resultant Vector
Thursday daytime	0.328	0.034	0.033	3.47
Friday daytime	0.294*	0.029*	0.028*	4.30
Thursday night-time	0.236	0.018	0.028	3.28

* prior to the rouge event in penultimate hour

Table 4. Summary of Vibration Assessment

ASSESSMENT OF FINDINGS

The measured vibration dose value for the daytime at this location is average of 0.31 $m/s^{1.75}$. This falls in the range 0.2 to 0.4, which represents 'low probability of adverse comment'.

For night-time, the highest VDV in the horizontal axes was 0.24 $m/s^{1.75}$. This is close to the value for 'adverse comment possible'.

In terms of cosmetic damage to building, the highest level of peak particle velocity measured at Havant was of the order of 4.3 mm/s. This is well below the limit at which cosmetic damage to new buildings is likely; i.e. 15 mm/s. Consequently, the likelihood of vibration from trains to cause cosmetic damage to building is very low.

VIBRATION RECOMMENDATIONS

The measured levels of vibration at New Road, Havant are at a level where, in terms of human discomfort in accordance with the guidelines in BS6487, 'adverse comment is possible' for night-time and 'low probability of adverse comment' during day-time. Consequently, some mitigation is necessary to lower the vibration to minimise adverse comment.

As regards building damage, in accordance with BS7385, there is no likelihood of damage, even cosmetic, to the building.

Our previous assessment recommended that, for a new residential building, further detailed measurements should be undertaken to identify the major frequency components of the vibration. Following these further measurements, it was recommended that the building be erected on tuned vibration isolator pads following advice from their manufacturer/supplier. Circumstances remain unchanged and following planning permission being granted, a further detailed vibration assessment will be carried out at foundation depth in order to ascertain the vibration pads specification and remedial works requirement to meet the above standards.

5. Conclusions:

NOISE ASSESSMENT

In accordance with the Planning and Policy Guidance, PPG 24, summary of the average daytime noise levels show that the site is Category B and not Category C as stated in the refusal notice 08/60233/010. Consideration of the noisy events at night-time also confirms that the site is within Category B. In accordance with guidance within PPG24, therefore, Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.

The results show noise levels of L_{Aeq} 62.8 dB during daytime periods 07:00 – 23:00 hrs during daytime hours and L_{Aeq} 50.7 dB during night-time periods 23:00 – 07:00 hrs close to the railway. BS 8233:1999 calculations into the proposed residential dwellings have been carried out and have evaluated that a window specification of 4mm glass / 14mm air gap / 6mm glass will be required. With regards to ventilation, calculations have been carried out using standard trickle vents. However, it is suggested that Greenwood HD vents are incorporated within the window frames as these supply the 8000mm^2 of ventilation required for Building Regulations Approved Document F1. This will negate the need to open a window for minimum ventilation requirements.

VIBRATION ASSESSMENT

In terms of the peak particle velocity, the results for a location at New Road, Havant show that the measured value is well within the limit with respect to building damage. Consequently, the likelihood of cosmetic damage to building due to vibration from trains is low.

In terms of the human disturbance, measurements indicate that ground borne vibration levels are likely to lead to adverse comments particularly for night-time.

It is recommended that further measurements are undertaken to identify the main frequency components of the vibration. Following these measurements advice should be sought from a supplier of vibration isolation pads.

6. Plan Sketch Layout:



EXTERNAL NOISE ASSESSMENT
NEW ROAD, HAVANT

DOWNLOADED RESULTS
RECORDED 06-07.09.2007

DAYTIME NOISE LEVELS 07:00 - 23:00																
Date / Time	LAeq	Lmax	Lmin	LA10	LA50	LA90	Octave Band Centre Frequency (Hz)									
							31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
07:00 - 08:00	63.3	82.2	47.5	62.7	57.9	52.0	63.8	67.2	60.1	60.5	60.6	59.8	53.0	48.4	44.6	34.0
08:00 - 09:00	62.6	79.0	50.0	62.8	58.7	53.7	65.2	68.5	60.3	57.6	58.1	59.5	53.5	49.2	50.8	43.8
09:00 - 10:00	65.6	82.6	48.4	65.3	56.9	52.0	66.4	68.0	60.5	60.1	60.6	60.0	56.7	57.8	58.1	52.2
10:00 - 11:00	61.6	77.3	50.2	61.6	57.4	53.0	64.4	67.8	60.1	56.8	57.8	57.0	51.8	49.8	54.3	45.2
11:00 - 12:00	63.3	81.2	51.8	61.4	57.5	54.1	63.6	66.9	59.9	57.8	59.3	59.9	54.7	50.2	50.7	43.9
12:00 - 13:00	61.7	77.4	48.6	62.1	56.9	51.8	62.5	65.9	58.9	56.8	57.8	58.1	53.1	49.6	49.5	40.8
13:00 - 14:00	62.5	79.2	46.2	63.5	56.6	50.6	63.2	68.0	60.3	57.9	58.3	59.2	53.7	49.8	49.1	42.1
14:00 - 15:00	62.0	78.5	47.9	62.9	57.6	51.6	64.1	67.2	59.3	57.3	57.9	58.4	52.9	51.0	48.6	39.1
15:00 - 16:00	68.2	91.3	51.3	61.4	57.8	53.6	64.3	67.5	60.6	67.1	66.8	62.4	56.2	53.2	47.8	42.0
16:00 - 17:00	64.2	80.1	50.1	64.9	57.9	53.4	67.4	68.5	61.9	59.0	59.1	60.0	55.6	54.9	53.9	45.3
17:00 - 18:00	63.3	79.7	49.3	62.3	57.9	53.3	65.2	67.5	61.1	58.5	58.9	60.3	53.8	50.3	51.9	46.4
18:00 - 19:00	62.4	78.0	47.5	62.0	57.6	52.4	62.5	66.9	61.8	58.3	58.0	58.5	52.5	51.1	54.0	48.4
19:00 - 20:00	62.7	79.5	45.5	61.8	56.5	50.1	60.7	65.5	60.4	57.4	57.7	58.8	54.1	51.3	52.8	44.6
20:00 - 21:00	61.8	78.3	43.4	62.6	54.3	47.4	61.3	64.0	58.9	56.8	57.5	58.0	53.0	50.1	51.4	44.6
21:00 - 22:00	60.4	76.1	38.3	60.5	51.7	42.6	57.7	62.6	58.4	55.2	56.6	56.0	51.1	48.0	53.2	43.1
22:00 - 23:00	60.1	78.0	39.1	59.5	51.0	42.7	57.7	63.2	58.4	55.7	55.9	55.9	52.2	48.7	49.1	42.0

FIGURE 1

NIGHT TIME NOISE LEVELS 23:00 - 07:00																
Date / Time	LAeq	Lmax	Lmin	LA10	LA50	LA90	Octave Band Centre Frequency (Hz) 31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
23:00 - 00:00	53.1	65.3	38.4	57.1	48.8	40.2	53.0	58.6	53.9	51.6	50.5	50.2	41.4	29.1	21.8	22.0
	51.6	61.3	36.8	55.8	47.1	39.6	51.5	53.8	49.8	48.0	48.1	49.2	40.9	29.3	23.7	21.2
	53.2	62.2	37.4	58.1	47.7	40.2	55.5	59.3	50.3	49.4	49.7	50.9	42.9	30.6	23.7	22.0
	52.4	61.4	37.6	57.3	47.1	40.2	53.9	59.1	47.7	48.0	48.6	50.3	41.7	27.9	20.6	21.2
	57.4	74.4	38.5	57.6	48.0	40.1	56.6	61.7	54.2	53.0	54.2	53.5	49.0	45.2	40.1	31.1
	57.7	72.3	38.0	58.8	49.5	40.0	58.5	66.4	55.7	53.0	54.5	55.1	47.9	40.9	34.0	25.2
	62.1	74.5	36.6	65.6	52.6	38.7	56.4	62.0	59.0	56.5	57.7	57.1	54.9	53.6	45.4	33.5
	65.0	80.8	36.9	67.1	48.4	39.6	59.5	65.0	61.6	59.0	61.0	60.1	56.4	55.2	57.1	48.2
	58.8	77.2	37.8	58.9	47.1	39.6	54.9	59.8	59.6	55.2	54.8	53.7	51.1	49.3	47.1	40.3
	60.4	81.5	36.9	57.2	47.3	39.9	54.4	60.4	53.9	52.4	53.0	52.3	49.4	55.0	56.0	48.7
	49.5	60.1	36.3	53.9	42.1	38.3	49.6	53.5	45.4	46.0	45.5	47.6	38.2	24.3	20.0	22.0
	50.3	60.8	37.1	55.2	43.4	39.7	51.5	59.7	52.4	46.8	46.7	47.8	39.5	25.9	20.5	22.1
00:00 - 01:00	57.0	74.9	37.8	55.4	44.0	39.8	54.3	59.2	54.1	52.4	53.7	53.7	48.2	42.7	39.1	29.3
	49.2	59.5	34.8	54.6	42.0	36.7	52.2	54.0	43.7	44.9	45.4	47.1	38.3	25.4	20.4	22.2
	46.5	58.4	34.0	51.5	39.0	35.8	50.0	48.8	44.9	42.5	42.8	44.4	35.5	22.0	19.0	21.8
	49.1	64.0	35.2	52.6	41.6	37.1	51.3	53.3	50.2	48.0	45.9	46.2	38.0	27.6	23.6	22.2
	59.7	77.4	33.4	57.0	46.0	38.1	51.5	57.9	54.8	52.8	55.9	55.6	51.7	49.8	43.3	35.3
	48.9	60.2	33.3	52.9	40.5	34.7	54.4	55.5	45.3	45.3	44.8	46.8	38.0	24.6	19.5	21.1
	59.6	77.3	32.6	55.3	39.8	34.9	57.9	62.8	58.5	54.5	56.5	55.4	52.2	47.8	40.0	29.9
	48.6	75.0	33.4	52.6	39.4	35.3	49.8	52.5	44.4	44.4	45.5	46.0	37.8	31.1	31.0	26.5
	47.6	64.3	31.5	47.5	37.3	32.8	47.9	56.5	48.7	42.5	43.1	45.8	36.0	23.1	18.8	20.0
	47.5	58.6	32.1	51.5	40.9	35.6	50.2	52.2	48.4	44.3	43.6	45.4	36.6	22.7	18.7	20.2
	47.9	59.7	32.2	51.3	39.2	34.9	48.6	53.5	54.2	44.8	43.8	45.5	36.5	23.9	19.1	20.2
	45.0	58.2	30.6	48.5	36.3	32.5	44.6	50.5	39.9	41.1	41.5	42.7	33.8	23.6	19.2	20.7
01:00 - 02:00	45.7	59.2	29.8	48.3	35.3	31.5	48.8	54.9	43.7	42.2	42.4	43.3	34.3	21.6	18.7	20.3
	44.5	58.6	31.3	46.6	36.6	33.1	48.8	52.5	44.1	41.0	42.4	41.7	33.0	22.9	19.1	20.5
	49.2	60.7	30.2	53.9	36.4	31.9	48.6	51.7	46.8	45.6	44.9	47.2	38.1	24.5	19.4	20.8
	47.2	59.9	30.3	51.1	34.8	31.5	47.0	54.2	41.2	42.5	43.0	45.3	36.0	22.2	18.3	19.9
	44.8	60.5	27.7	46.0	32.6	29.5	47.8	48.0	43.6	40.4	41.9	42.5	32.9	20.5	17.8	19.3
	43.8	59.9	27.0	43.3	29.9	27.9	44.5	44.8	38.5	39.2	39.4	42.1	32.2	18.4	17.3	19.3
	47.6	62.8	27.7	51.2	32.6	28.9	55.5	61.4	50.8	44.1	44.3	44.5	36.7	24.4	19.3	19.6

NIGHT TIME NOISE LEVELS 23:00 - 07:00																
Date / Time	LAeq	Lmax	Lmin	LA10	LA50	LA90	Octave Band Centre Frequency (Hz)									
							31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
01:00 - 02:00 *Continued*	40.7	59.0	27.8	37.2	30.6	28.8	44.3	42.1	37.4	35.4	37.5	38.7	28.9	16.8	17.3	19.9
	51.1	65.6	29.0	54.7	35.1	29.7	57.6	60.5	54.7	50.5	48.3	47.8	39.1	26.1	20.0	19.8
	45.7	59.8	27.3	48.4	31.8	28.2	47.0	48.5	41.8	41.1	42.0	43.6	34.7	21.2	18.0	20.0
	46.6	59.6	26.7	50.1	31.8	28.2	46.8	51.9	42.6	42.4	43.0	44.3	36.0	22.4	18.7	19.9
02:00 - 03:00	45.9	60.1	27.9	48.3	32.2	29.2	48.0	48.0	41.7	42.2	42.2	43.8	34.4	23.0	19.3	20.3
	48.9	63.5	26.5	53.0	32.7	28.3	49.4	51.3	43.7	43.3	45.5	47.0	37.5	25.4	19.7	20.7
	44.6	58.6	28.1	47.7	32.2	29.0	45.5	50.1	42.8	40.7	40.6	42.6	33.0	20.4	18.4	19.8
	39.9	56.5	26.7	41.0	29.8	28.0	42.3	44.6	37.3	36.7	36.3	37.7	28.3	16.4	17.6	20.1
	39.8	56.6	27.6	41.3	29.8	28.0	45.6	50.0	38.3	35.4	36.0	37.5	29.0	18.1	17.6	19.9
	42.7	58.5	27.3	39.6	30.0	28.0	44.8	43.6	38.0	36.4	39.0	40.8	31.0	19.1	17.8	20.1
	47.6	61.9	26.3	49.5	34.9	27.1	49.6	50.3	44.2	44.1	45.0	45.1	36.1	25.8	20.0	20.3
	44.8	60.7	26.3	41.5	30.1	27.2	43.6	56.9	45.7	41.0	40.5	42.5	33.6	19.5	17.9	20.3
	46.5	60.1	27.9	49.1	32.6	28.6	48.4	50.1	42.7	42.3	43.8	44.1	34.9	23.6	19.4	20.5
	48.1	60.6	26.3	51.9	31.3	27.5	46.5	50.7	48.2	43.2	44.0	46.0	37.3	24.0	19.3	20.5
	46.6	60.2	28.5	49.9	34.5	29.9	48.1	50.0	46.9	43.4	42.8	44.3	36.1	24.3	19.8	20.4
	47.8	62.9	28.0	51.0	32.3	28.8	48.1	50.1	47.0	44.0	44.1	45.8	36.8	23.4	18.5	20.5
03:00 - 04:00	43.0	59.7	25.3	39.2	28.9	26.2	42.7	39.6	35.9	37.6	38.8	41.0	32.5	18.8	17.6	20.2
	48.7	63.9	26.8	51.7	31.4	27.7	49.2	52.8	47.7	44.1	45.5	46.4	38.1	25.8	20.5	20.6
	44.0	63.4	26.4	38.4	28.3	27.0	45.0	43.9	43.0	40.4	41.4	41.5	32.5	21.6	18.6	20.5
	42.6	60.3	26.4	40.1	29.4	27.3	45.3	42.1	38.3	39.4	39.2	40.5	31.1	17.9	17.5	25.1
	46.1	60.9	27.1	49.0	32.2	28.2	43.8	45.8	38.5	41.0	42.4	44.2	35.0	21.7	17.9	19.3
	41.1	60.0	26.1	33.3	29.8	26.8	42.2	48.4	37.7	37.0	38.2	38.8	29.0	19.9	18.2	19.5
	47.0	64.0	27.2	45.7	31.7	28.4	51.5	56.7	47.5	46.7	44.6	43.4	35.3	26.3	19.7	19.7
	38.4	51.9	26.4	41.3	31.4	28.0	42.9	45.2	42.6	36.3	36.7	34.7	26.7	18.4	17.7	19.5
	41.9	57.6	27.7	40.1	32.3	29.5	46.8	52.1	39.6	37.1	38.3	39.6	31.1	20.1	18.0	19.4
	58.5	76.4	26.9	54.9	33.9	28.6	61.4	66.0	61.5	56.5	56.1	54.7	49.4	41.6	37.0	27.8
	45.4	61.4	26.1	46.4	31.6	27.7	46.6	49.5	40.2	40.3	42.5	43.0	34.7	24.0	19.9	20.0
	48.8	64.3	25.6	51.8	33.5	27.9	56.6	59.4	47.6	45.8	45.6	46.4	37.5	26.5	20.0	19.8
04:00 - 05:00	38.8	56.8	25.4	34.4	28.9	26.7	41.2	38.2	33.1	35.0	36.0	36.0	28.7	16.6	17.4	19.7
	51.0	64.3	26.7	54.9	36.4	29.6	55.2	57.3	48.8	48.2	48.0	48.6	39.2	27.8	21.8	20.1
	41.3	57.6	25.3	42.4	28.6	26.4	45.1	48.5	39.7	38.0	38.4	38.3	31.9	21.6	19.3	19.8
	49.8	63.3	25.8	52.6	33.3	26.8	52.4	57.1	45.3	44.7	46.7	47.7	38.5	26.5	23.6	20.6

NIGHT TIME NOISE LEVELS 23:00 - 07:00

Date / Time	LAeq	Lmax	Lmin	LA10	LA50	LA90	Octave Band Centre Frequency (Hz)									
							31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
	42.8	60.0	25.8	46.8	30.8	26.8	48.3	49.4	39.1	40.3	39.2	40.2	31.8	21.4	27.6	20.5
	48.4	66.7	25.3	49.2	29.2	26.3	52.8	55.6	46.0	44.0	45.4	46.1	37.1	26.9	23.0	20.3
	49.5	66.4	27.6	50.2	34.5	29.5	48.5	51.0	43.2	43.7	45.3	47.7	38.3	25.4	31.0	22.1
04:00 - 05:00	57.4	76.5	27.5	57.1	36.5	28.6	60.5	59.9	49.8	52.7	55.0	53.9	48.7	43.7	38.6	30.7
Continued	41.4	57.8	27.0	42.7	30.9	28.4	48.3	49.5	40.4	40.9	39.2	37.8	30.1	21.3	19.1	21.0
	47.0	60.7	28.1	50.9	33.2	29.3	46.6	51.4	42.6	42.8	43.3	44.8	36.4	24.2	27.1	21.1
	58.5	76.8	27.3	52.4	36.6	28.7	55.2	61.7	58.0	53.1	55.7	53.0	51.6	48.5	39.8	28.0
	56.8	74.6	27.7	57.9	44.0	31.6	56.7	60.0	53.7	51.3	53.5	53.9	48.3	42.2	35.8	27.1
	46.6	58.0	26.4	50.7	36.0	27.6	49.5	53.6	45.7	44.1	43.0	43.8	35.9	30.0	30.7	21.2
	47.8	63.3	27.4	50.8	31.8	28.3	45.7	52.0	57.0	45.8	43.3	44.4	34.9	28.5	37.9	22.1
	62.9	78.0	29.4	57.6	42.4	31.5	57.5	61.6	59.1	57.0	60.3	59.5	54.2	48.5	46.3	38.0
	47.6	59.5	30.4	51.3	40.6	31.5	48.7	52.6	43.6	43.7	43.1	44.2	36.0	35.2	39.8	22.4
	49.0	61.5	34.2	52.4	42.0	33.6	54.1	56.6	44.0	44.0	44.8	46.3	36.3	35.7	39.4	22.2
05:00 - 06:00	61.4	77.3	31.7	56.9	44.4	33.7	55.1	59.6	57.4	56.4	58.6	57.5	53.3	48.8	44.2	33.4
	52.0	63.3	33.8	56.5	46.1	36.7	58.3	58.8	50.9	50.8	49.4	48.8	41.2	32.7	34.4	21.3
	58.5	76.7	33.4	57.6	45.8	34.8	54.4	59.7	55.3	54.2	56.0	53.5	50.6	48.1	41.8	31.9
	57.1	74.8	37.8	58.5	49.2	41.9	56.8	61.4	52.5	52.2	53.2	54.1	48.0	43.8	43.7	34.2
	61.7	81.7	40.9	60.1	53.1	45.7	67.3	65.9	60.8	56.1	59.6	58.4	48.5	42.1	40.4	27.1
	54.1	62.6	38.5	58.9	49.8	41.7	56.4	59.8	51.1	50.2	50.7	51.7	43.1	34.4	35.6	26.7
	57.8	74.5	37.3	59.1	49.7	40.3	65.1	65.2	56.1	54.1	54.3	55.0	49.0	42.4	40.5	29.4
	51.7	62.2	38.2	56.2	45.7	39.4	54.3	54.5	51.8	49.7	48.3	48.9	40.4	31.4	40.4	26.3
	63.9	77.3	39.5	66.0	56.3	43.5	59.2	63.5	58.9	58.2	61.1	59.7	55.9	53.3	44.4	35.4
	63.0	75.6	37.7	63.4	48.9	39.4	59.8	65.4	60.6	57.2	60.0	59.0	54.7	51.0	45.6	33.3
	56.1	65.1	44.8	60.1	53.0	45.9	58.3	62.7	55.4	50.7	51.0	52.4	44.7	43.8	49.3	29.9
	54.7	64.2	39.9	58.8	51.8	42.1	58.2	61.1	50.0	50.7	51.5	52.0	43.0	36.5	43.3	25.2
	54.3	62.7	38.5	58.5	50.5	41.7	56.8	61.9	54.5	51.1	50.9	51.7	43.1	32.0	35.2	22.8
06:00 - 07:00	63.8	79.1	38.8	60.1	49.7	40.9	58.9	64.6	60.0	57.8	61.6	60.3	54.8	48.8	44.3	33.0
	63.2	79.1	41.9	62.6	54.0	46.4	68.3	66.7	57.5	56.7	60.7	60.0	54.1	48.4	43.3	33.1
	57.7	70.3	40.7	60.5	53.4	44.3	61.7	63.8	56.3	53.7	55.0	54.5	48.5	40.1	34.3	24.3
	62.2	75.8	38.4	63.7	53.4	45.6	58.2	64.1	60.0	57.1	58.9	58.4	54.1	49.9	44.2	29.8
	57.3	66.6	44.7	61.3	54.4	47.9	59.2	63.6	55.7	53.6	54.3	54.7	46.7	36.1	34.1	21.9
	59.5	75.5	45.8	60.9	54.6	48.2	59.8	65.1	59.1	54.6	56.6	57.0	48.6	41.1	35.2	23.7

EXTERNAL NOISE ASSESSMENT
NEW ROAD, HAVANT

DOWNLOADED RESULTS
RECORDED 06-07.09.2007

NOISE LEVEL SUMMARY ASSESSMENT

Date / Time	LAeq	Lmax	Lmin	LA10	LA50	LA90	Octave Band Centre Frequency (Hz) 31.5	63	125	250	500	1.0 k	2.0 k	4.0 k	8.0 k	16.0 k
DAYTIME LOWEST	60.1	78.0	39.1	59.5	51.0	42.7	57.7	63.2	58.4	55.7	55.9	55.9	52.2	48.7	49.1	42.0
DAYTIME HIGHEST	68.2	91.3	51.3	61.4	57.8	53.6	64.3	67.5	60.6	67.1	66.8	62.4	56.2	53.2	47.8	42.0
DAYTIME AVERAGE	62.8	79.9	47.2	62.3	56.5	50.9	63.1	66.6	60.1	58.3	58.8	58.9	53.6	50.8	51.2	43.6
NIGHT TIME LOWEST	38.4	51.9	26.4	41.3	31.4	28.0	42.9	45.2	42.6	36.3	36.7	34.7	26.7	18.4	17.7	19.5
NIGHT TIME HIGHEST	65.0	80.8	36.9	67.1	48.4	39.6	59.5	65.0	61.6	59.0	61.0	60.1	56.4	55.2	57.1	48.2
NIGHT TIME AVERAGE	50.7	65.4	31.8	52.1	39.4	33.7	51.9	55.2	48.5	46.6	47.3	47.9	40.2	31.0	28.3	24.2

PPG 24 NOISE EXPOSURE CATEGORY

road traffic 07:00 - 23:00 23:00 - 07:00	B B
rail traffic 07:00 - 23:00 23:00 - 07:00	B B
air traffic 07:00 - 23:00 23:00 - 07:00	B B
mixed sources 07:00 - 23:00 23:00 - 07:00	B B

FIGURE 1
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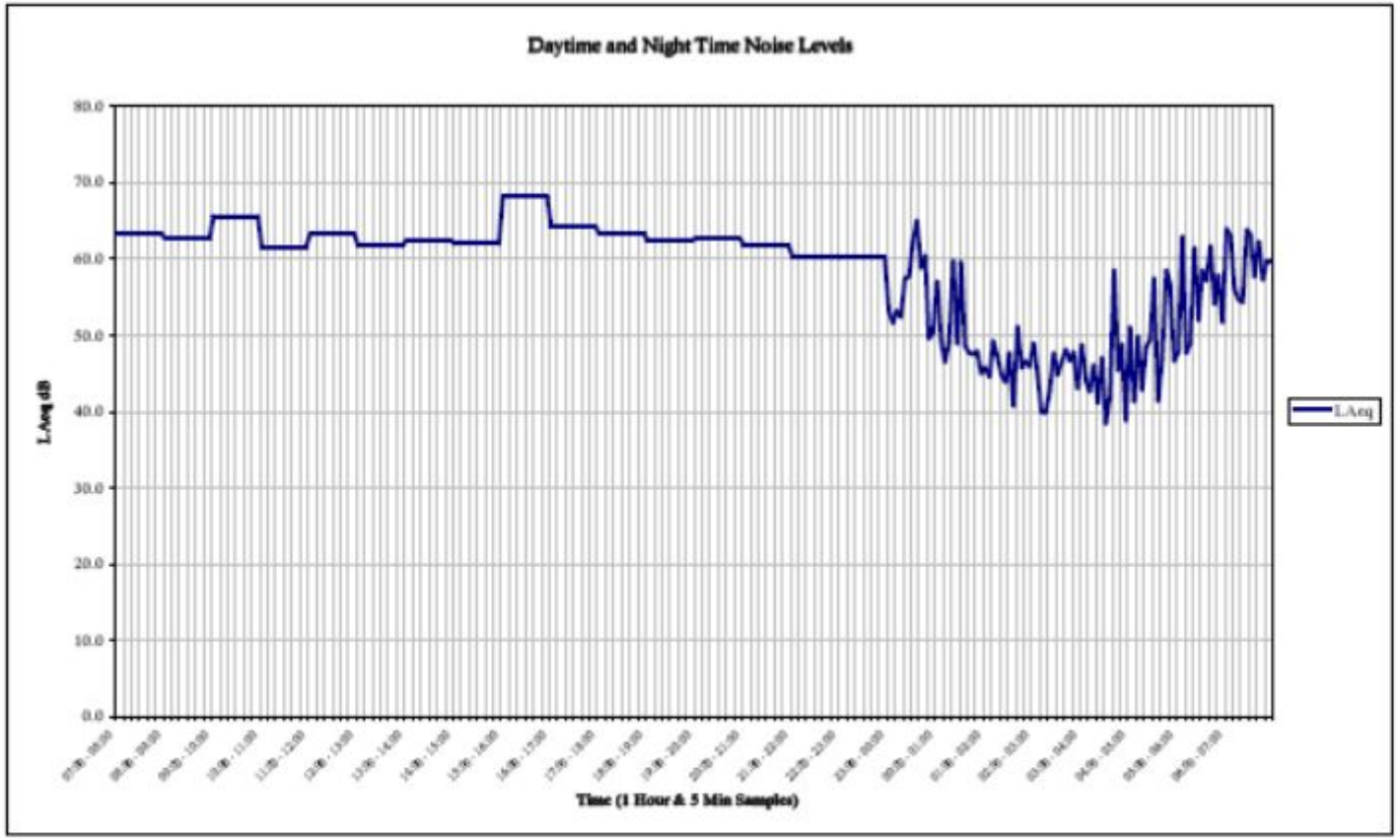

FIGURE 1
PAGE 6 OF 6

Sound Advice
ACOUSTICS LTD

Report Reference: SA – 483
Report Date: 12th November 2010

Calculation Sheet BS 8233:1999 (Table 3)

Client	City Assets Southern Ltd
Site	New Road, Havant
Figure	2

Maximum Criteria	
Daytime	Night Time
35	30

Floor	Ground
Room	Typical Lounge

Daytime	MET
Evening	MET

Proposed Window Configeration 4mm Glass / 14mm Air Gap / 6mm Glass

Leqff	*The equivalent continuous sound pressure level outside the room elements under consideration*
A0	*The reference absorption area of 10m2 and is independent of frequency*
Sf	*The total façade area of the room in question*
Swi	*The area of the windows in the room*
Sew	*The area of the external wall of the room*
Srr	*The area of the ceiling of the room (if applicable)*
S	*The total area of the elements through which sound enters the room*
Dne	*The insulation value of the trickle ventilator (if applicable)*
Rwi	*The sound reduction index of the window*
Rew	*The sound reduction index of the external wall*
Rrr	*The sound reduction index of the ceiling / roof (if applicable)*
A	*The equivalent absorption area of the receiving room where A=0.163V/T*

Formula Leq2=Leqff+10log[A0/S*10^(-Dne/10)+Swi/S*10^(-Rwi/10)+Sew/10*10^(-Rew/10)+Srr/S*10^(-Rrr/10)] +10log(S/A) +3

	Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**
Sf	12	12	12	12	12	12	12
Sr	0	0	0	0	0	0	0
Swi	5.88	5.88	5.88	5.88	5.88	5.88	5.88
Sew	6.12	6.12	6.12	6.12	6.12	6.12	6.12
Srr	0	0	0	0	0	0	0
S	12	12	12	12	12	12	12
A0	10	10	10	10	10	10	10
V	45	45	45	45	45	45	45
T (BS8233)	0.50	0.50	0.50	0.50	0.50	0.50	0.50
A	14	14	14	14	14	14	14
Daytime Leqff	66.6	60.1	58.3	58.8	58.9	53.6	50.8
Night time Leqff	55.2	48.5	46.6	47.3	47.9	40.2	31.0
Dne	36.0	33.0	32.0	29.0	29.0	31.0	30.0
Rwi	22	24.4	26.5	36.2	41.7	40.3	42.6
Rew	40.0	40.0	44.0	45.0	51.0	56.0	56.0
Rrr	26.0	28.0	34.0	40.0	45.0	49.0	54.0

***estimated**

Predicted dB(A) Level Within The Above Room During Daytime Hours (07:00-23:00)	$L_{Aeq\ 16\ HOUR}$	34.9	dB(A)

Predicted dB(A) Level Within The Above Room During Night Time Hours (23:00-07:00)	$L_{Aeq\ 8\ HOUR}$	23.2	dB(A)