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REPORT AS7603.140807.NVIA

**BARTONS ROAD
HAVANT**

NOISE AND VIBRATION ASSESSMENT



Prepared: 07 August 2014

Registered in England Company No.
3758093

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1. INTRODUCTION

It is proposed to develop land at Bartons Road, Havant for residential use. The site is currently occupied by a residential properties and a canine fitness centre. The site is bounded by Bartons Road the south, green fields to the north and east, and a railway line to the west.

Clarke Saunders Associates has been commissioned by Linden Homes Southern to undertake an assessment of the current environmental noise and vibration impact on the site. Noise impact will be assessed under the National Planning Policy Framework with reference made to guidance specified in the World Health Organisation *Guidelines for Community Noise* (1999). Vibration impact will be assessed in accordance with BS6472: Part 1: 2008 *Guide to evaluation of human exposure to vibration in buildings Vibration sources other than blasting*.

This assessment will also consider the requirement for any outline mitigation measures as appropriate for the proposed residential development.

2. ASSESSMENT METHODOLOGY

2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in March 2012 and revoked all previous planning policy statements and guidance notes.

The document sets out the Government's planning policies and how these are expected to be applied. Paragraph 123 refers to noise impact:

123. Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have*

unreasonable restrictions put on them because of changes in nearby land uses since they were established;

and

- *identify and protect areas of tranquility which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

Liaison with Havant Borough Council's Mark Moss has advised that an evaluation of the external noise should be undertaken to achieve the internal noise levels stated in the World Health Organisation *Guidelines for Community Noise* (1999).

2.2 WHO Guidelines for Community Noise (1999)

The guidance in this document details suitable noise levels for various activities within residential and commercial buildings.

The relevant sections of this document are shown in the following table:

Criterion	Environment	Upper limit $L_{Aeq,T}$ dB
Maintain speech intelligibility and avoid moderate annoyance, daytime and evening	Living Rooms	35
Prevent sleep disturbance, night time	Bedrooms	30

Table 2.1 – Levels stated in WHO 1999

[dB ref. 20 μ Pa]

This guidance also states that individual noise events should not normally exceed 45 dB $L_{Amax,fast}$ within bedrooms at night.

For outdoor living areas, it is stated that:

'To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55dB L_{Aeq} on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50dB L_{Aeq} . Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development.'

Havant Borough Council's Mark Moss has advised that a maximum of 50dB L_{Aeq} should be targeted.

2.3 BS6472: Part 1: 2008

BS6472: Part 1: 2008 *Guide to evaluation of human exposure to vibration in buildings* Vibration sources other than blasting specifies building vibration with respect to human response to be measured and assessed in the form of a vibration dose value (VDV). The VDV defines a relationship that yields a consistent assessment of continuous, intermittent, occasional and impulsive vibration and correlates well with subjective response. The vibration is to be evaluated for the axis in which the magnitude of weighted acceleration is greatest, against the values in Table 2.2.

Place and Time	Low probability of adverse comment	Adverse comment possible	Adverse comment probable
16h day (07:00 – 23:00)	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
8h night (23:00 – 07:00)	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

Table 2.2 - VDV ranges resulting in risk of probable comment

[values ref. $\text{m/s}^{-1.75}$]

3. SURVEY PROCEDURE & EQUIPMENT

3.1 Environmental Noise Survey

A survey of the existing background noise levels was undertaken at the locations shown on site plan A57603/SP1. The microphone at position 1 was approximately 25m from the railway track. The microphone at position 2 was approximately 10m from the railway track. Measurements of consecutive 15-minute L_{Aeq} , L_{Amax} , L_{A10} and L_{A90} sound pressure levels were taken between 15:00 hours on Thursday 20th and 08:50 hours on Monday 24th March 2014.

The following equipment was used during the course of the survey:

- Norsonic data logging sound level meter type 118;
- Norsonic data logging sound level meter type 116;
- Norsonic sound level calibrator type 1523;
- Vibrock seismograph type V901-GSM.

The calibration of the sound level meters was verified before and after use. No calibration drift was detected.

The weather during the survey was dry with light winds, which made the conditions suitable for the measurement of environmental noise.

Measurements were made generally in accordance with ISO 1996-2:2007 *Acoustics - Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels*.

Please refer to Appendix A for details of the acoustic terminology used throughout this report.

3.2 Vibration Survey

An automated vibration monitor (Vibrocock V901-GSM) was installed at the position shown on the attached Site Plan AS7603/SP1 to record vibration levels due to train movements.

The monitor was set to record vibration levels in three perpendicular axes, from which Vibration Dose Values were determined for day and night-time periods following the procedures described in BS6472: Part 1: 2008 *Guide to evaluation of human exposure to vibration in buildings: Vibration sources other than blasting*.

The measurement location was at the nearest position available (with a structure with good adhesion with the surrounding geology) to the nearest proposed residential façade to the railway line. On this basis, worst case results, with regard to levels across the site, would be obtained. All measurements were made generally in accordance with BS6472 and ANC guidelines for vibration measurement.

Vibration levels were monitored at site over consecutive 30 second periods in three axes between 10:00 hours on Thursday 27th and 15:30 hours on Monday 31st March 2014.

4. RESULTS

4.1 Environmental Noise Survey

The site is affected by train pass-bys and road traffic using Bartons Road.

Figures AS7603/TH1-TH4 and figures AS7603/TH5-8 show the L_{Aeq} , L_{Amax} , L_{A10} and L_{A90} sound pressure levels as time histories at measurement positions 1 and 2 respectively.

Two periods of unusually high noise levels occurred at monitoring position 2 between 03:00 and 04:30 and between 12:30 and 13:30 on Sunday 23rd March, as shown on AS7603/TH7. After discussing this with the land owner, John Tiller, who currently lives on

site, he was unaware of any noisy events at this time. However, liaison with National Rail has revealed that trains were cancelled on this day on this section of railway due to emergency works taking place. The data collected during these two periods has been omitted from the assessment.

The average $L_{Aeq, T}$ noise levels for the daytime and night-time periods and the typical L_{AFmax} noise levels for night-time periods are shown in Table 4.1.

Monitoring Position	Daytime $L_{Aeq, 16 \text{ hour}}$	Night-time, $L_{Aeq, 8 \text{ hour}}$	Night-time, L_{AFMax}
Position 1	64 dB	56 dB	74 dB
Position 2	62 dB	58 dB	84 dB

Table 4.1 - Daytime and night-time average noise level at position

[dB ref. 20 μ Pa]

4.2 Vibration Survey

The maximum results of the vibration measurements during the survey period are shown in Table 4.2 in terms of vibration dose values (VDV) for day and night periods.

Daytime $VDV_{day} (m/s^{-1.75})$	Night-time $VDV_{night} (m/s^{-1.75})$
0.173	0.164

Table 4.1 - Daytime and night-time VDV

5. SUITABILITY OF THE SITE FOR RESIDENTIAL DEVELOPMENT

5.1 Noise Assessment

Protection of sensitive habitable spaces from train noise should be a consideration in the finalised layout of the development. Distance of residential building lines from the western boundary should be maximised, and habitable rooms and external amenity areas should be orientated away from the noise sources, wherever possible.

For bedrooms directly facing the railway or Bartons Road, it is anticipated that installation of a standard proprietary well sealed thermal double glazed unit, of the order of 10-12-6.4 (around the order R_w 39dB), will be required to control L_{Amax} levels at night, along with appropriate acoustically-specified trickle ventilation.

It is anticipated that windows comprising a proprietary thermal double glazed unit, of the order 6-16-4 or similar, would provide sufficient attenuation for satisfactory internal

noise levels to be achieved across the remainder of the site. The design targets are likely to be exceeded in some areas, however, with windows open. Allowance should therefore be made in these areas for an alternative means of background ventilation such that windows can remain closed as required to ensure satisfactory internal noise levels. N.B. There is no reason why windows in these rooms cannot be opened for personal preference or purge ventilation, provided the required performance is reliably achieved when they are closed.

The gardens adjacent to the railway will need to be provided with a 2m high close boarded boundary fence, which will offer sufficient mitigation to achieve 55dB(A) stated in the WHO guidelines for external amenity areas.

Plot 19 is the only property with a garden exposed to the road, the distance provides enough mitigation of the road noise level to achieve the above criterion.

5.2 Vibration Assessment

Subjective observations on site were that vibration was not perceptible. Further analysis of the vibration levels recorded by the buried transducer, suggest that levels will be imperceptible during the daytime and for the majority of the night time. At a worst case, during heavy freight traffic, night time periods are within the *low probability of adverse comment range* when assessed in accordance with BS6472-1:2008.

6. CONCLUSION

Measurements have been made of noise and vibration at the proposed site for residential development at Bartons Road, Havant.

The measured levels have been assessed against currently available standards and guidance documents including the National Planning Policy Framework, World Health Organisation *Guidelines for Community Noise* (1999) and BS6472-1:2008 *Guide to evaluation of human exposure to vibration in buildings Vibration sources other than blasting*, to consider whether the site is suitable for its proposed residential use.

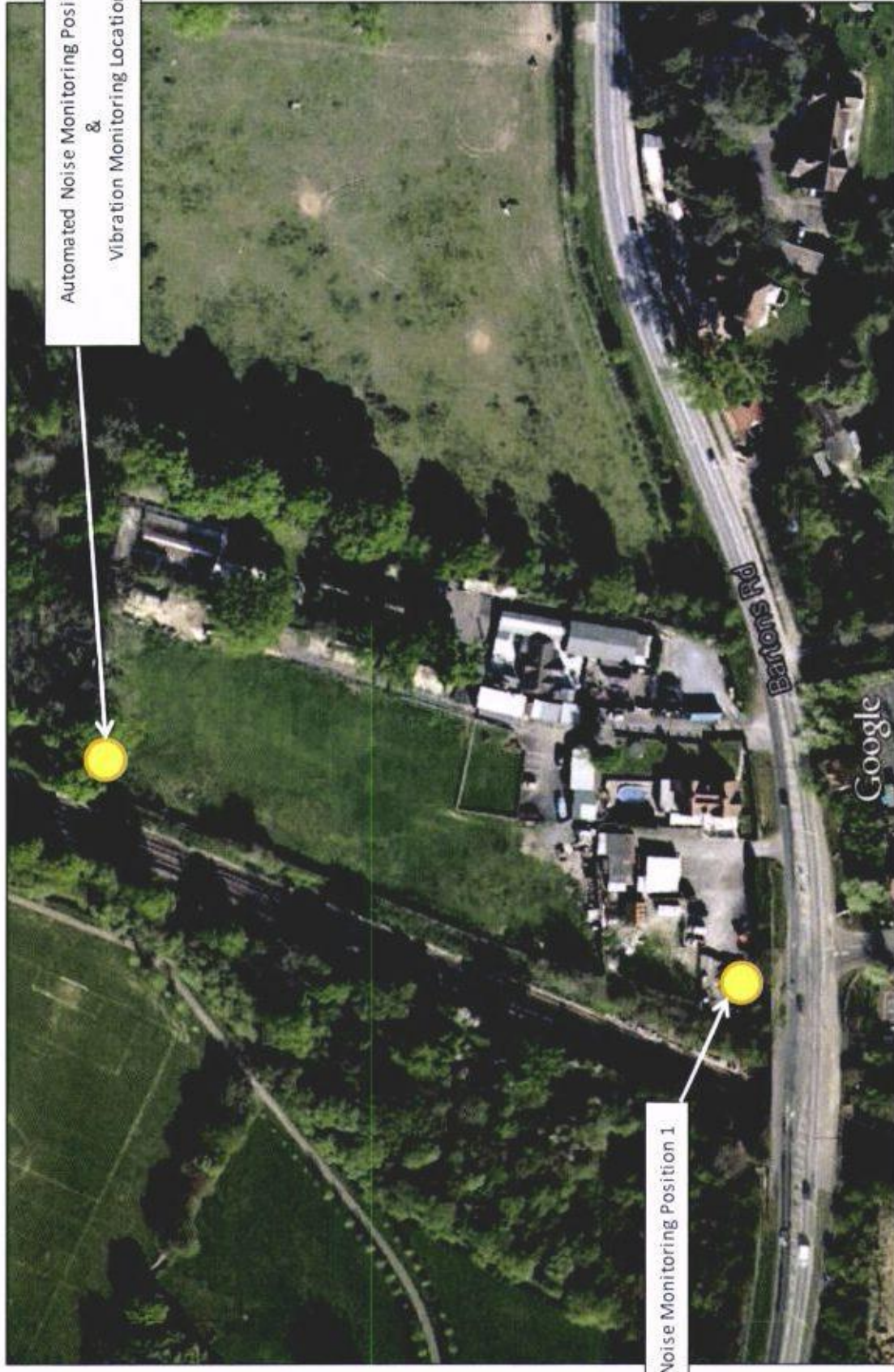
Mitigation measures have been proposed to ensure that the internal and external noise targets may be achieved.

The acoustic performance of the external building fabric would be fully determined as the design progresses.


Alex Arnold (Aug 7, 2014)

Alex Arnold AMIOA

CLARKE SAUNDERS ASSOCIATES



Automated Noise Monitoring Position 2
&
Vibration Monitoring Location

Automated Noise Monitoring Position 1

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Project:
Bartons Road, Havant

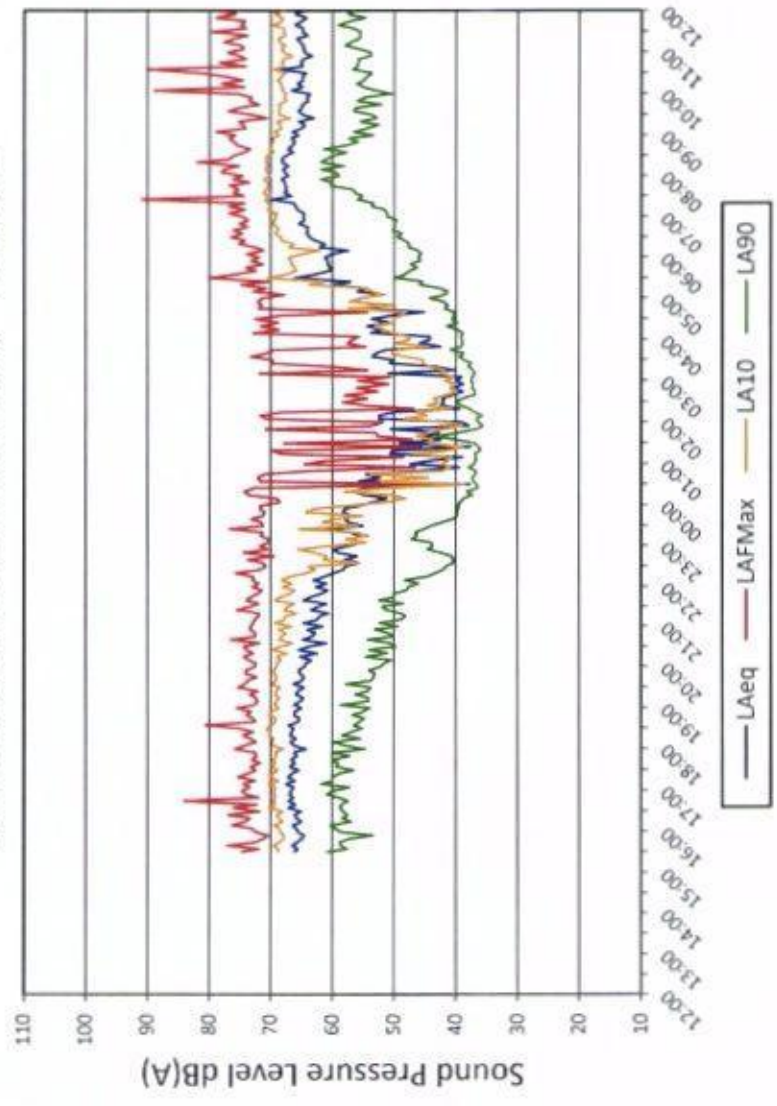
Title:
Indicative Site Plan

Figure:
AS7603/SP1

Date:
07 August 2014

Bartons Road, Havant

Environmental Noise Time History - Position 1

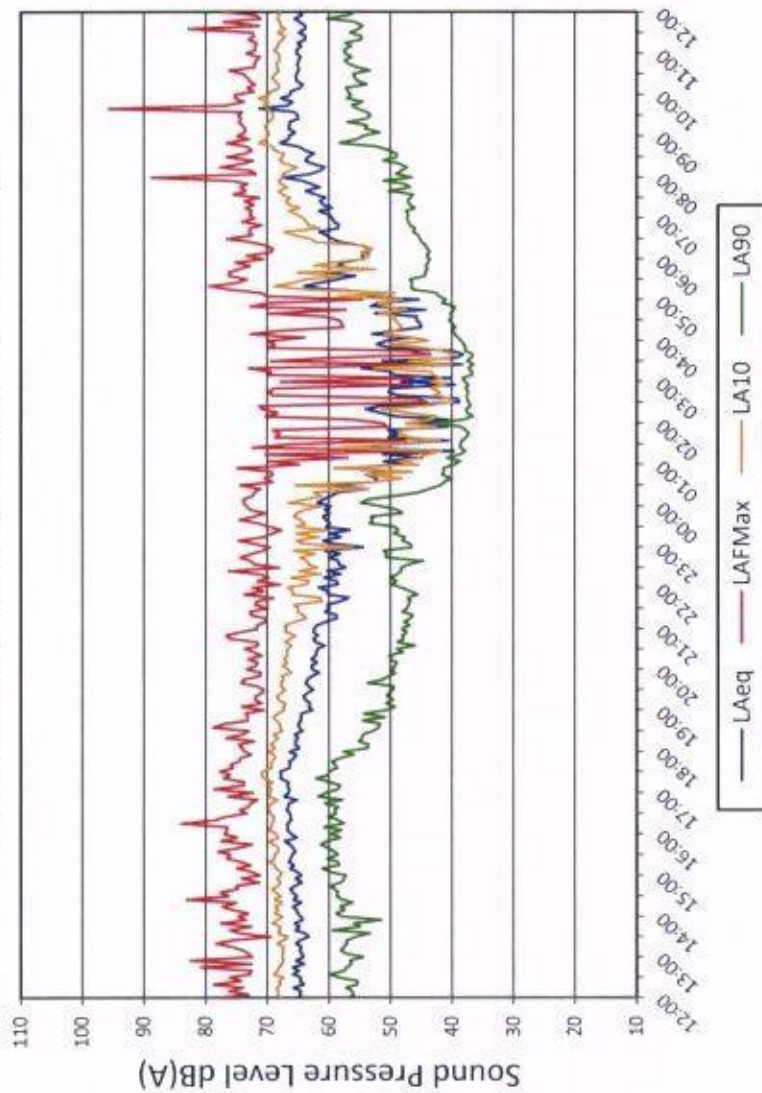


Thursday 20 March to Friday 21 March 2014

Figure AS7603/TH1

Bartons Road, Havant

Environmental Noise Time History - Position 1

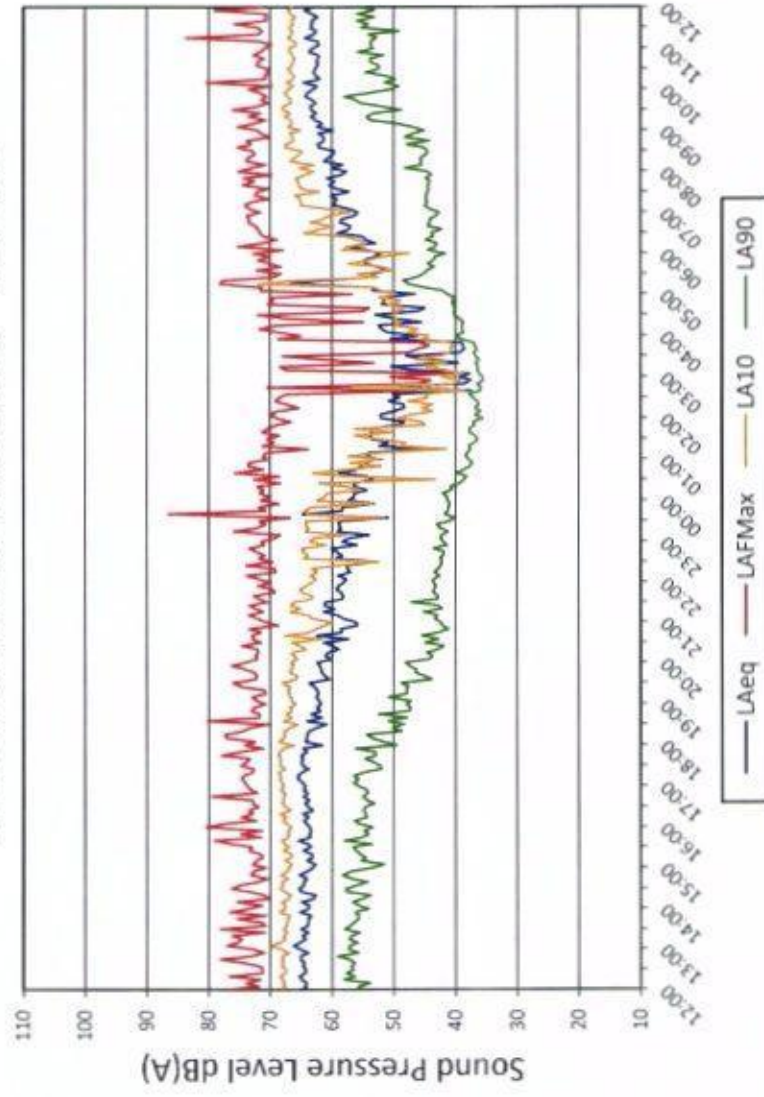


Friday 21 March to Saturday 22 March 2014

Figure AS7603/TH2

Bartons Road, Havant

Environmental Noise Time History - Position 1

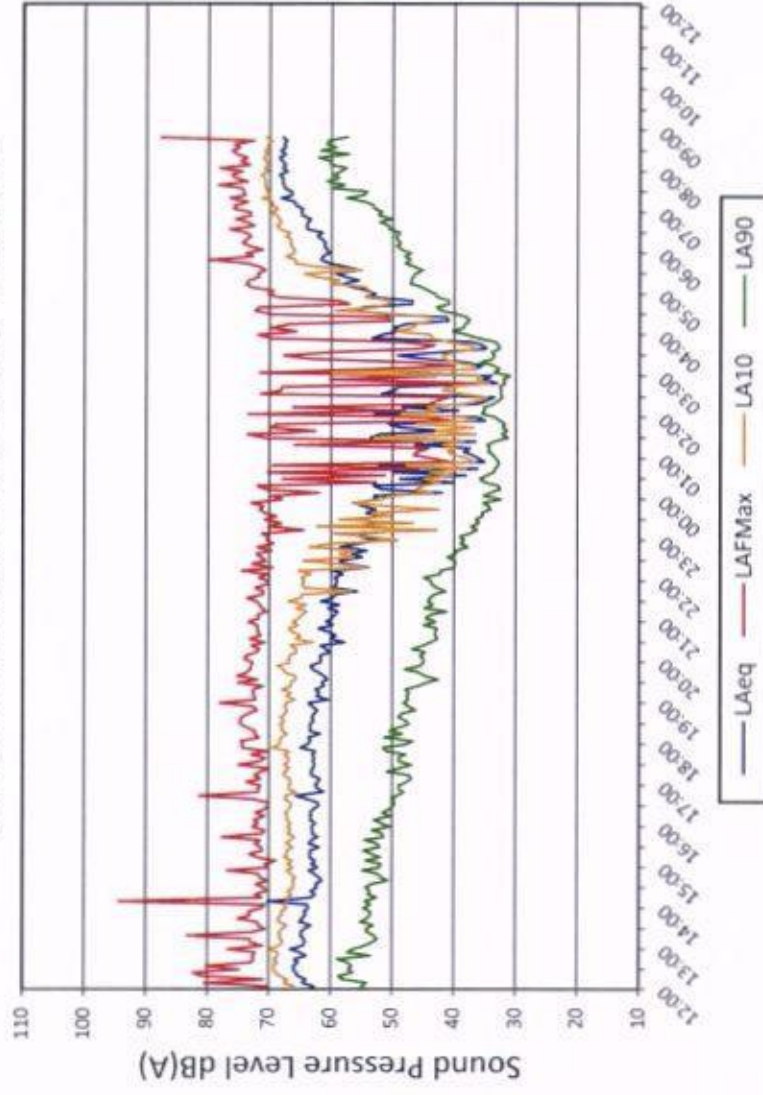


Saturday 22 March to Sunday 23 March 2014

Figure AS7603/TH3

Bartons Road, Havant

Environmental Noise Time History - Position 1

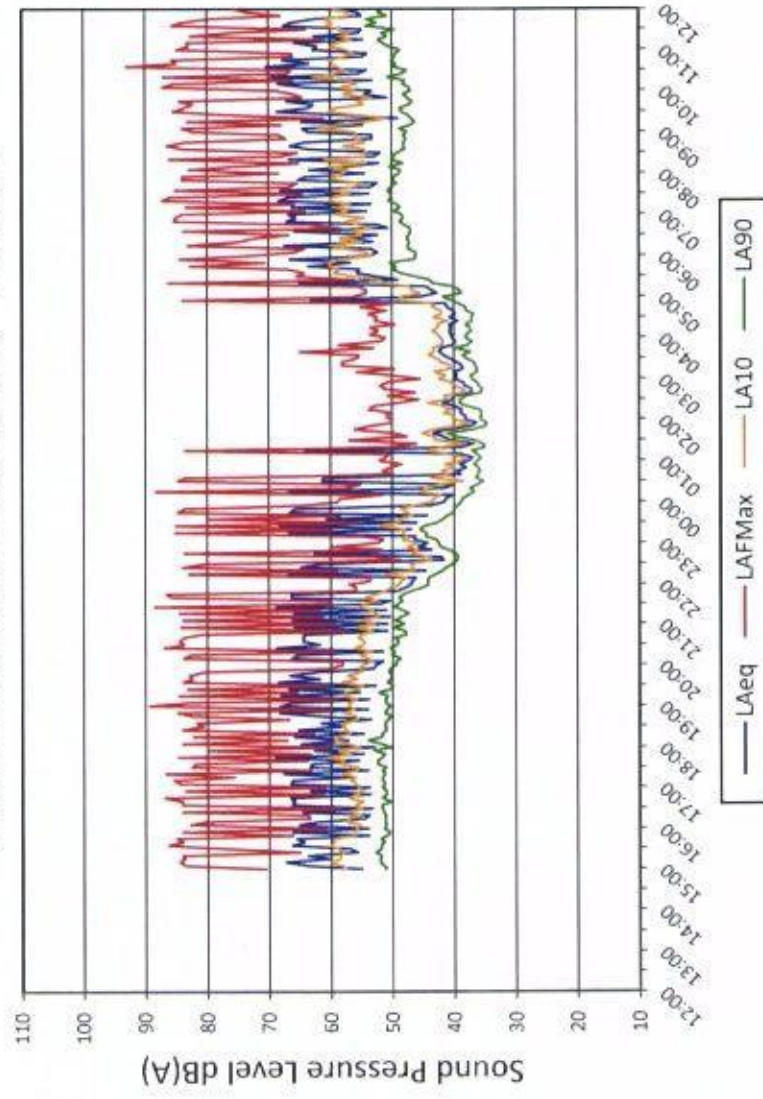


Sunday 23 March to Monday 24 March 2014

Figure AS7603/TH4

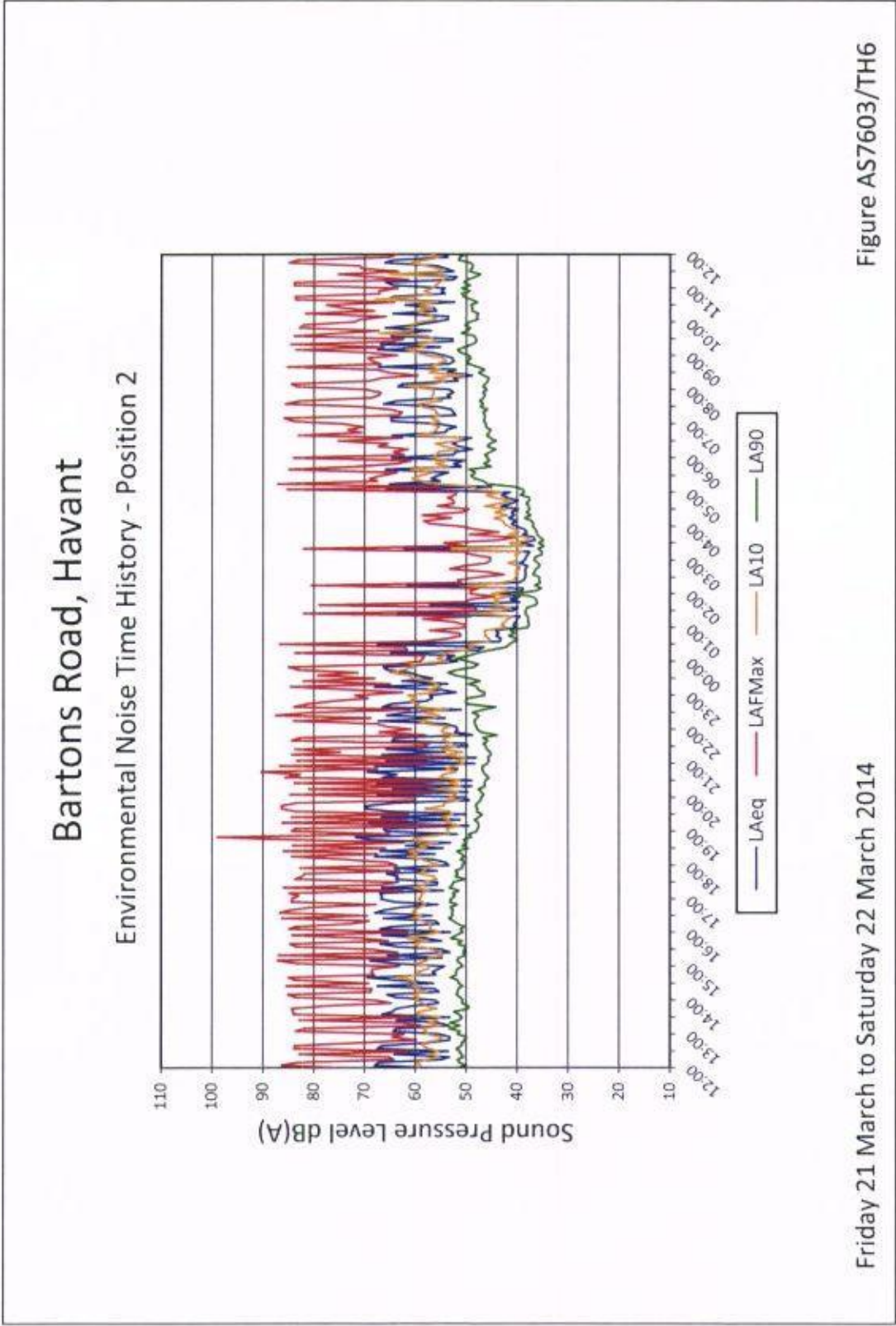
Bartons Road, Havant

Environmental Noise Time History - Position 2



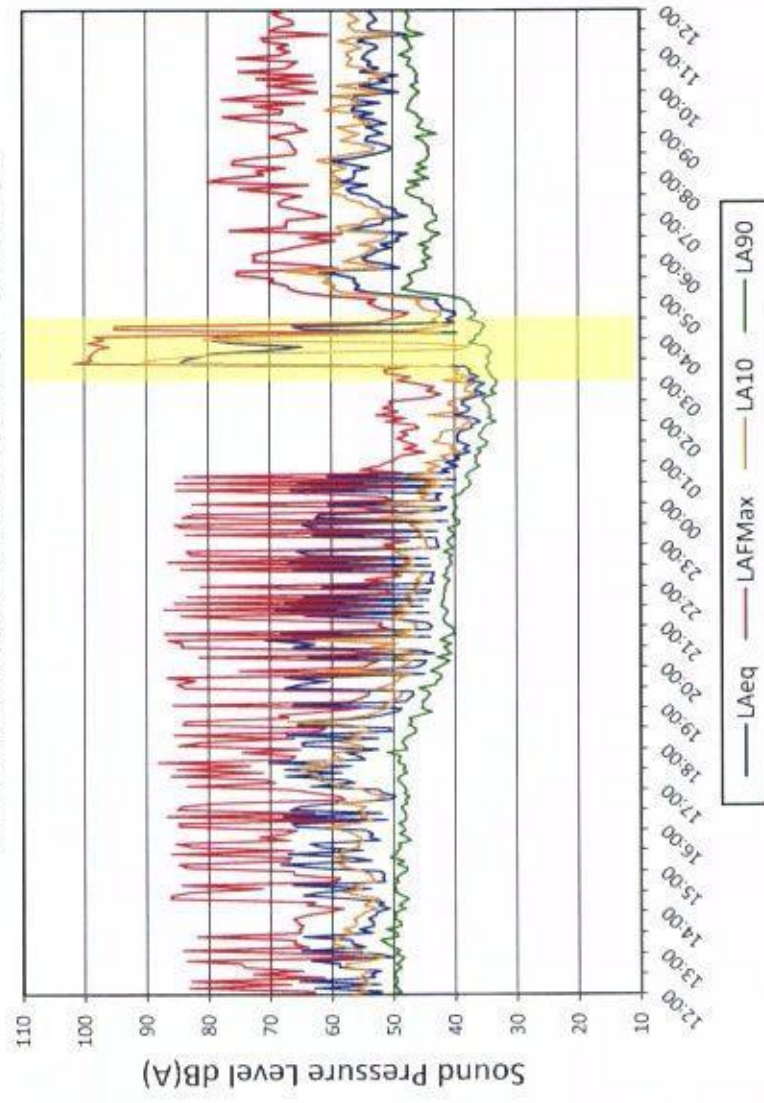
Thursday 20 March to Friday 21 March 2014

Figure AS7603/TH5



Bartons Road, Havant

Environmental Noise Time History - Position 2

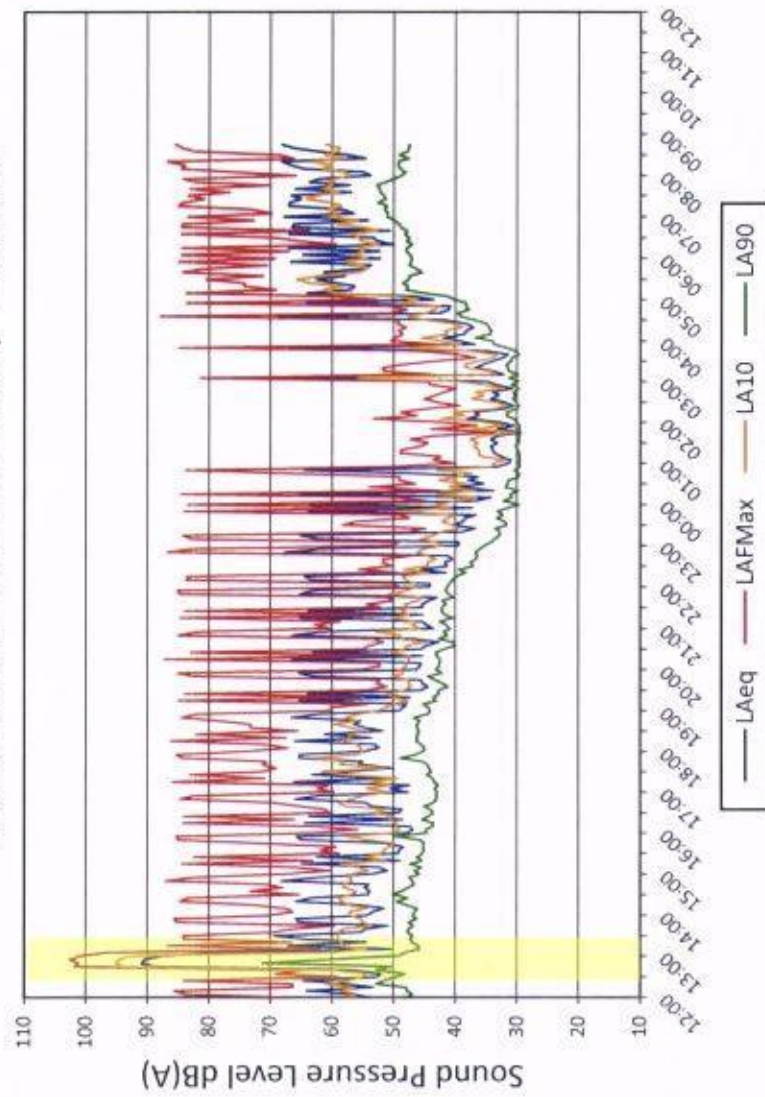


Saturday 22 March to Sunday 23 March 2014

Figure AS7603/TH7

Bartons Road, Havant

Environmental Noise Time History - Position 2



Sunday 23 March to Monday 24 March 2014

Figure AS7603/TH8

APPENDIX A

ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND NOISE

1.0 ACOUSTIC TERMINOLOGY

The annoyance produced by noise is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and any variations in its level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

dB (A): The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level.

L_{10} & L_{90} : If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.

It is common practice to use the L_{10} index to describe traffic noise, as being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic noise.

L_{eq} : The concept of L_{eq} (equivalent continuous sound level) has up to recently been primarily used in assessing noise in industry but seems now to be finding use in defining many other types of noise, such as aircraft noise, environmental noise and construction noise.

L_{eq} is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc).

The use of digital technology in sound level meters now makes the measurement of L_{eq} very straightforward.

Because L_{eq} is effectively a summation of a number of noise events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute noise limit.

L_{max} : L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

D The sound insulation performance of a construction is a function of the difference in noise level either side of the construction in the presence of a loud noise source in one of the pair of rooms under test. D , is therefore simply the *level difference* in decibels between the two rooms in different frequency bands.

D_w D_w is the *Weighted Level Difference* The level difference is determined as above, but weighted in accordance with the procedures laid down in BS EN ISO 717-1.

$D_{nT,w}$ $D_{nT,w}$ is the *Weighted Standardised Level Difference* as defined in BS EN ISO 717-1 and represents the *weighted level difference*, as described above, corrected for room reverberant characteristics.

C_{tr} C_{tr} is a spectrum adaptation term to be added to a single number quantity such as $D_{nT,w}$, to take account of characteristics of a particular sound.

$L'_{nT,w}$ $L'_{nT,w}$ is the *Weighted Standardised Impact Sound Pressure Level* as defined in BS EN ISO 717-2 and represents the level of sound pressure when measured within room where the floor above is under excitation from a calibrated tapping machine, corrected for the receive room reverberant characteristics.

APPENDIX A

ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND NOISE

2.0 OCTAVE BAND FREQUENCIES

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation have agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band. In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, eg. 250 Hz octave band runs from 176 Hz to 353 Hz. The most commonly used bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000
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3.0 HUMAN PERCEPTION OF BROADBAND NOISE

Because of the logarithmic nature of the decibel scale, it should be borne in mind that noise levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) is not twice as loud as 50 dB(A) sound level. It has been found experimentally that changes in the average level of fluctuating sound, such as traffic noise, need to be of the order of 3 dB(A) before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10 dB(A) is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in traffic noise level can be given.

INTERPRETATION

Change in Sound Level dB(A)	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

4.0 EARTH BUNDS AND BARRIERS - EFFECTIVE SCREEN HEIGHT

When considering the reduction in noise level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a 3 metre high barrier exists between a noise source and a listener, with the barrier close to the listener, the listener will perceive the noise source is louder, if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the noise source would seem quieter than it was if he were standing. This may be explained by the fact that the "effective screen height" is changing with the three cases above, the greater the effective screen height, in general, the greater the reduction in noise level.

Where the noise sources are various roads, the attenuation provided by a fixed barrier at a specific property will be greater for roads close to the barrier than for roads further away.