



Venta Acoustics

Report VA2223.180503.NIA

**Land at Junction of Addison Road and
Meadow Road, Reading**

Noise Impact Assessment

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Attachments

VA2223/SP1	Indicative Site Plan
VA2223/TH1-TH5	Environmental Noise Time Histories
Appendix A	Acoustic Terminology

1. Introduction

It is proposed to develop the land at the junction of Addison Road and Meadow Road, Reading for residential use with 5 new dwellings facing Addison Road.

Venta Acoustics has been commissioned by Natta Homes to undertake an assessment of the current environmental noise impact on the site and provide recommendations of acoustic mitigation where required in support of an application for planning permission.

An environmental noise survey has been undertaken to determine the noise levels incident on the site. These levels are then used to undertake an assessment of the likely impact in accordance with the National Planning Policy Framework with reference to relevant standards, guidance and the planning requirements of Reading Borough Council.

Outline mitigation measures are considered and an appraisal of the requirements of external building fabric elements are provided where appropriate.

2. Guidance and Legislation

2.1 The National Planning Policy Framework (2012)

The *National Planning Policy Framework* (NPPF), adopted in 2012, sets out the Government's planning policies for England, superseding all previous planning policy statements and guidance.

In respect of noise, the NPPF states that the planning system should contribute to and enhance the natural and local environment by preventing both new and existing developments from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution.

Hence, Paragraph 123 states that "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 tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

In regards to the term adverse impact reference is made to the Noise Policy for England:

2.2 Noise Policy Statement for England (2010)

The Noise Policy Statement for England (NPSE) sets out the long term vision of Government noise policy: to promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

This vision is supported by the following aims:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life.*

The terms “significant adverse” and “adverse” are related to the following concepts:

- No Observed Effect Level (NOEL) - the level below which no effect on health and quality of life can be detected.
- Lowest Observed Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected.
- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

The guidance acknowledges that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations, but will be different for different noise sources, receptors and times.

In order to enable assessment of impacts in line with these requirements, reference should be made to other currently available guidance.

2.3 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 Table 2.1.

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

Table 2.1 – Excerpt from WHO

[dB ref. 20µPa]

This guidance also states:

For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10-15 times a night (Vallet & Vernet 1991).

During daytime periods, for avoidance of annoyance, the NOEL relates to anything up to 50dB(A) (typically applied to external areas, such as gardens), whilst the onset of the LOAEL occurs at 50dB(A) and above.

2.4 BS8233:2014

BS8233 *Guidance on sound insulation and noise reduction for buildings* provides guidance as to desirable internal ambient noise levels for different areas within residential buildings.

The relevant section of the standard is shown below in Table 2.2.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB LAeq, 16 hour	-
Dining	Dining Room	40 dB LAeq, 16 hour	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq, 16 hour	30 dB LAeq, 8 hour

Table 2.2 – Excerpt from BS8233:2014 - Indoor ambient noise levels for dwellings

[dB ref. 20µPa]

2.5 Reading Borough Council Planning Requirements

Condition 9 of the planning consent for the site ref. 130882 states:

9. No development shall take place until a detailed scheme, informed by an assessment of the current noise environment, for protecting the dwellings from the external noise environment of the area has been submitted to and approved, in writing, by the Local Planning Authority. The scheme itself shall be designed, specified and constructed so that the sound insulation performance of the structure and the layout of the dwellings are such that the indoor ambient noise levels do not exceed the values detailed in Table 4 of BS 8233:2014. Thereafter, the development shall not be carried out other than in accordance with the approved scheme which shall be completed before any part of the accommodation hereby approved is occupied.

3. Site Description

As illustrated on attached site plan VA2223/SP1, the site is currently vacant and is bounded by residential dwellings to the north, a commercial premises to the west, Meadow Road to the south and Addison Road to the east.

The dominant noise source expected to affect the site is road traffic noise from the surrounding roads.

4. Environmental Noise Survey

4.1 Survey Procedure & Equipment

In order to establish the existing background noise levels at the site, a noise survey was carried out between Thursday 26th and Monday 30th April at the location shown in site plan VA2223/SP1. This location was chosen to be representative of the ambient noise levels affecting the proposed residential site.

Continuous 5-minute samples of the L_{Aeq} , L_{Amax} , L_{A10} and L_{A90} sound pressure levels were undertaken at the measurement location.

The weather during the survey period was generally dry with light winds, with some periods of rain. The background noise data is not considered to have been compromised by these conditions.

Measurements were made generally in accordance with ISO 1996 2:2017 *Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of sound pressure levels*.

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

Manufacturer	Model Type	Serial No	Calibration	
			Certificate No.	Date
Svantek Class 1 Integrating SLM	958A	59177	Not numbered	10/1/17
Larson Davis calibrator	CAL200	13049	UCRT18/1431	20/4/18

Table 4.1 – Equipment used for the survey

The calibration of the sound level meter was verified before and after use with no significant calibration drift observed.

4.2 Results

The measured sound levels are shown as time-history plots on the attached charts VA2223/TH1-5.

The average noise levels for the Daytime and Night-time periods, as measured at the automated monitoring position were:

Monitoring Period	$L_{Aeq,T}$
07:00 – 23:00 hours	56 dB
23:00 – 07:00 hours	46 dB

Table 4.2 – Ambient noise levels at measurement locations

[dB ref. 20µPa]

The typical night time L_{Amax} events, generated by vehicle passbys, were recorded to be in the order of 66dB $L_{Amax,fast}$.

5. Internal Noise Assessment

5.1 Internal Noise Assessment

A review of the Robert Rigby Architects drawings for the proposed scheme has been undertaken.

5.1.1 Sound Reduction Performances of Building Elements

It has been assumed that all the non-glazed elements, i.e. walls and roof systems, will be capable of providing the following minimum sound insulation performance, when tested in accordance with BS EN ISO 10140-2:2010 *Acoustics - Laboratory measurement of sound insulation of building elements – Part 2: Measurement of airborne sound insulation*.

Building Element	Single figure weighted sound reduction index, dB
Masonry	R_w 51

Table 5.1 – Assumed sound reductions performances of non-glazed elements

5.1.2 Sound Reduction Performance of Windowsets and Vents

The monitoring data along with the architectural drawings have been used to calculate the required sound insulation performance for the windowsets (glazing and frame combination) and open ventilators for the building. These are summarised in Table 5.2 below.

Glazing Reference	Required Glazing SRI, dB	Ventilator Performance, dB
Type A	$R_w < 28$	$D_{n,e,w} < 28$

Table 5.2 – Required minimum sound reduction indices for glazing and ventilators

In order that windows may remain closed to maintain the internal noise levels, it is expected that attenuated means of background ventilation will be required. If trickle vents are used the performance shown in Table 5.2 will be required. The figures stated are for a single vent per room. If multiple vents are required, then the performance requirement shown in Table 5.2 will increase by a value equal to $+10\log(N)$, with N being the total number of vents serving the room. It should be noted that there is no reason why windows could not be opened as a matter of personal preference or for purge ventilation.

The above performance would be expected to be achieved by high quality thermal double glazing and ‘non-acoustic’ trickle vents.

5.1.3 Glazing Locations

Table 5.3 shows on which façades and levels of the building the glazing with the sound reduction performances shown in Table 5.2 should be installed.

Facade	Floor	Glazing Reference
All	All	Type A

Table 5.3 – Glazing locations

5.1.4 Windowset Performances

It is important that the performance shown in Table 5.2 are achieved by the entire windowset including frames, ventilators, seals, etc. Glass performance alone would not be likely to show compliance with the specification as the other elements typically provide the weakest noise transmission path.

The ventilator performances provided would need to be achieved with the vents open. Should this performance not be achievable, a mechanical ventilation solution may be required.

5.2 Openable Windows

BS8233 suggests that a loss of around 15dB can be expected from a partially open window. On this basis the recommended internal ambient noise levels would be expected to be 1dB louder than the internal noise requirements of BS8233.

Note 7 of Table 4 recommends that internal targets can be relaxed by up to 5dB whilst still achieving reasonable internal noise conditions. Considering this, windows should be openable, with the option of trickle vents for the purposes of background ventilation, such that windows may remain closed if preferred. This does not preclude the opening of windows for personal preference or purge ventilation.

With the above recommendations implemented, the noise levels within the proposed dwellings would be expected to be in line with recommendations given in the WHO 1999 and BS8233:2014 guidance. Internal noise levels can therefore be considered to be between the NOEL the LOAEL levels.

5.3 Areas of External Amenity

External noise levels are currently 1dB higher than the World Health Organisation guideline value for external amenity of $L_{Aeq,16hour}$ 55dB.

Once the residential dwellings have been constructed providing screening from Addison Road, and solid garden fences, 1.8m high have been installed to the boundaries of the gardens, external noise levels would be expected to be reduced to below the guideline value of $L_{Aeq,16hour}$ 55dB. No further mitigation measures are deemed necessary in relation to external noise levels.

The outdoor noise levels across the site can therefore be considered to fall between the LOAEL and SOAEL levels, generally being below the level that is expected to cause significant annoyance.

6. Conclusion

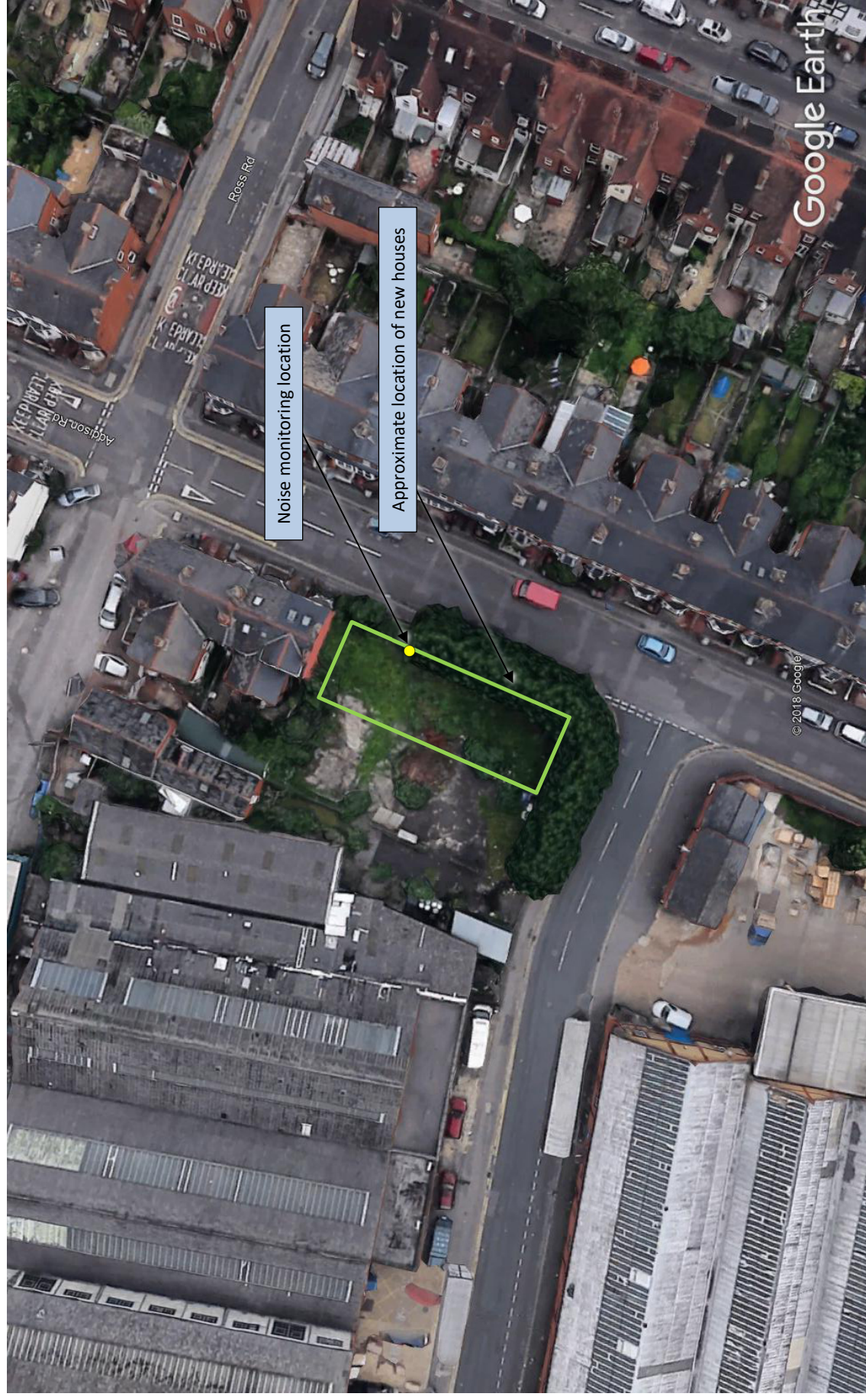
A baseline noise survey has been undertaken by Venta Acoustics to establish the prevailing noise climate in the locality of Land at Junction of Addison Road and Meadow Road, Reading in support of a planning application for the proposed development of new residential dwellings.

The measured levels have been assessed against the National Planning Policy Framework and currently available standards and guidance documents including World Health Organisation *Guidelines for Community Noise* (1999) and BS8233:2014 *Guidance on sound Insulation and noise*.

Appropriate external and internal noise criteria have been considered to minimise adverse impacts on health and quality of life as a result of the new development. Appropriate mitigation measures have been outlined including proprietary thermal double-glazing and trickle vents.

The proposed scheme is not expected to experience a significant adverse noise impact and the site is considered acceptable for the proposed residential use.

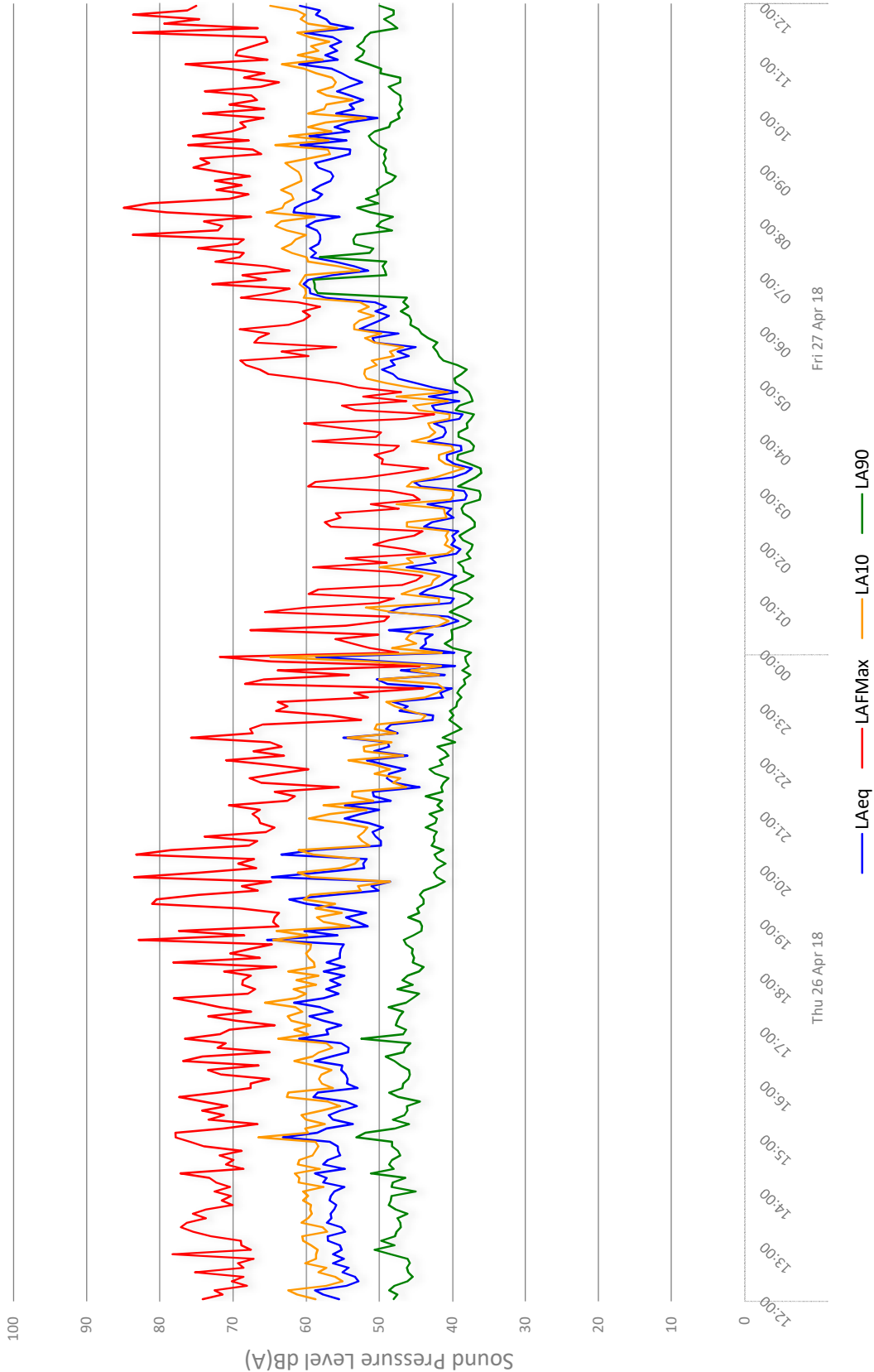
Jamie Duncan MIOA



Land at Junction of Addison Road and Meadow Road, Reading
Environmental Noise Time History: 1



Figure VA2223/TH1



Land at Junction of Addison Road and Meadow Road, Reading
Environmental Noise Time History: 2



Figure VA2223/TH2

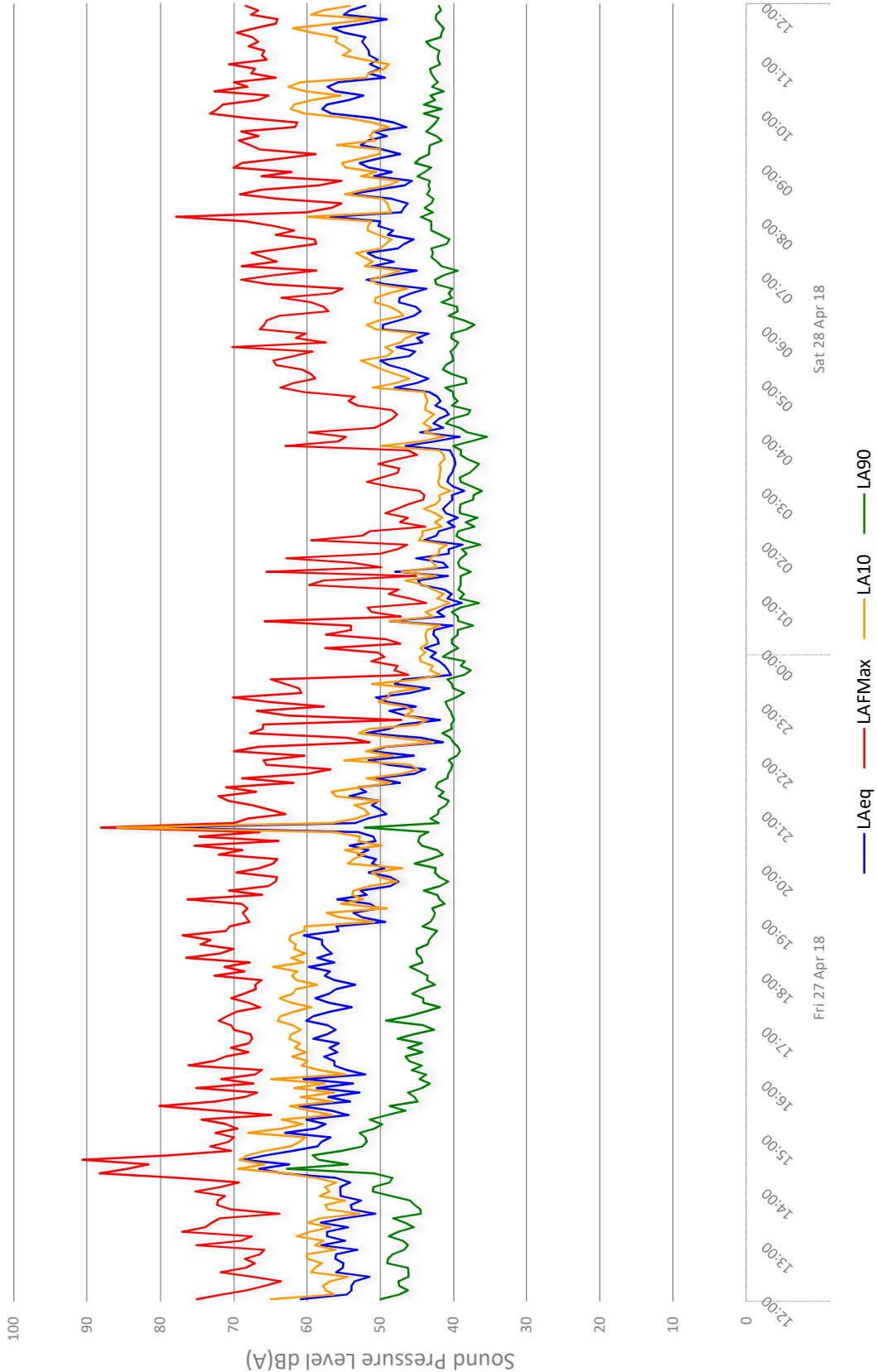
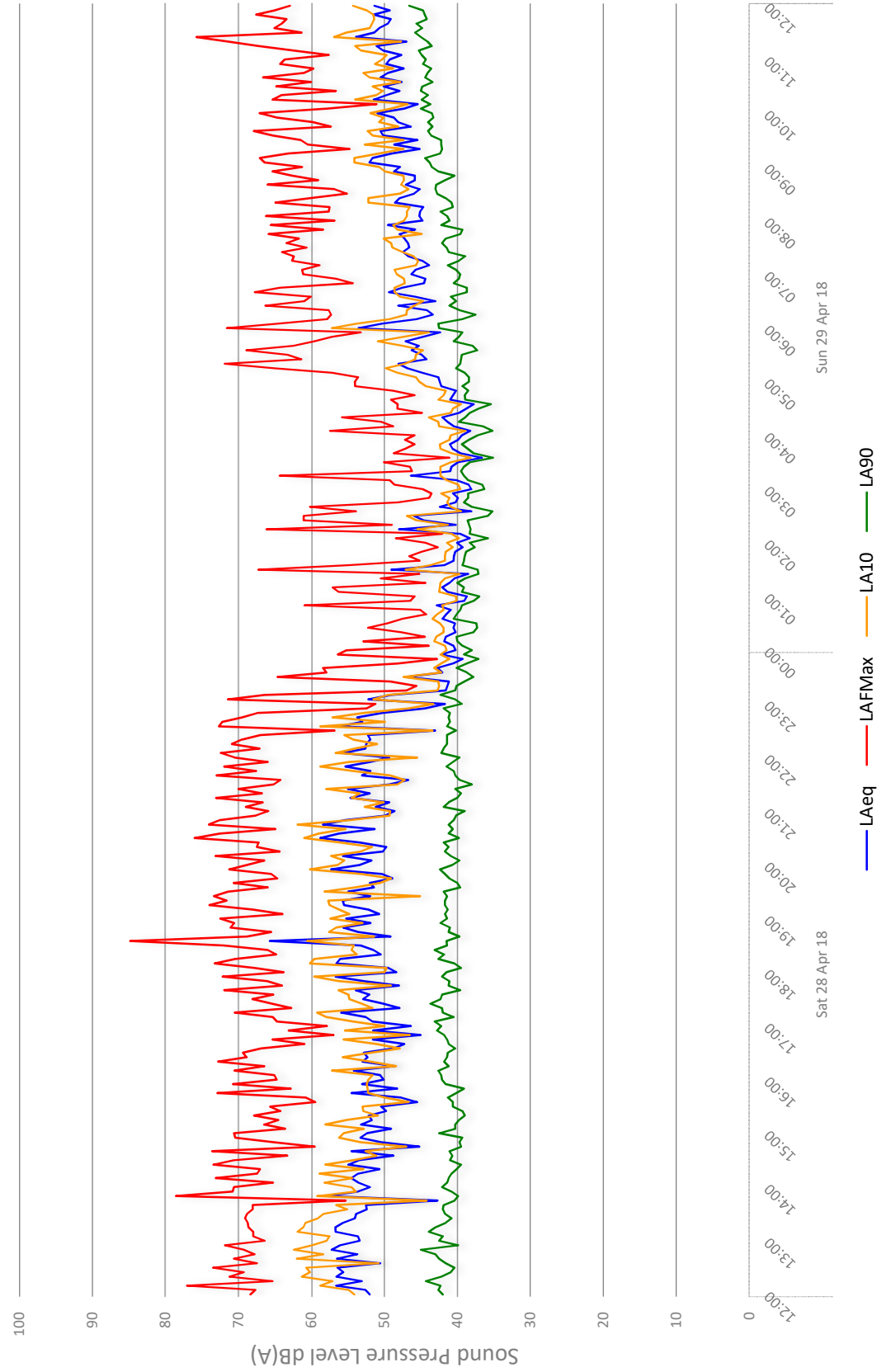


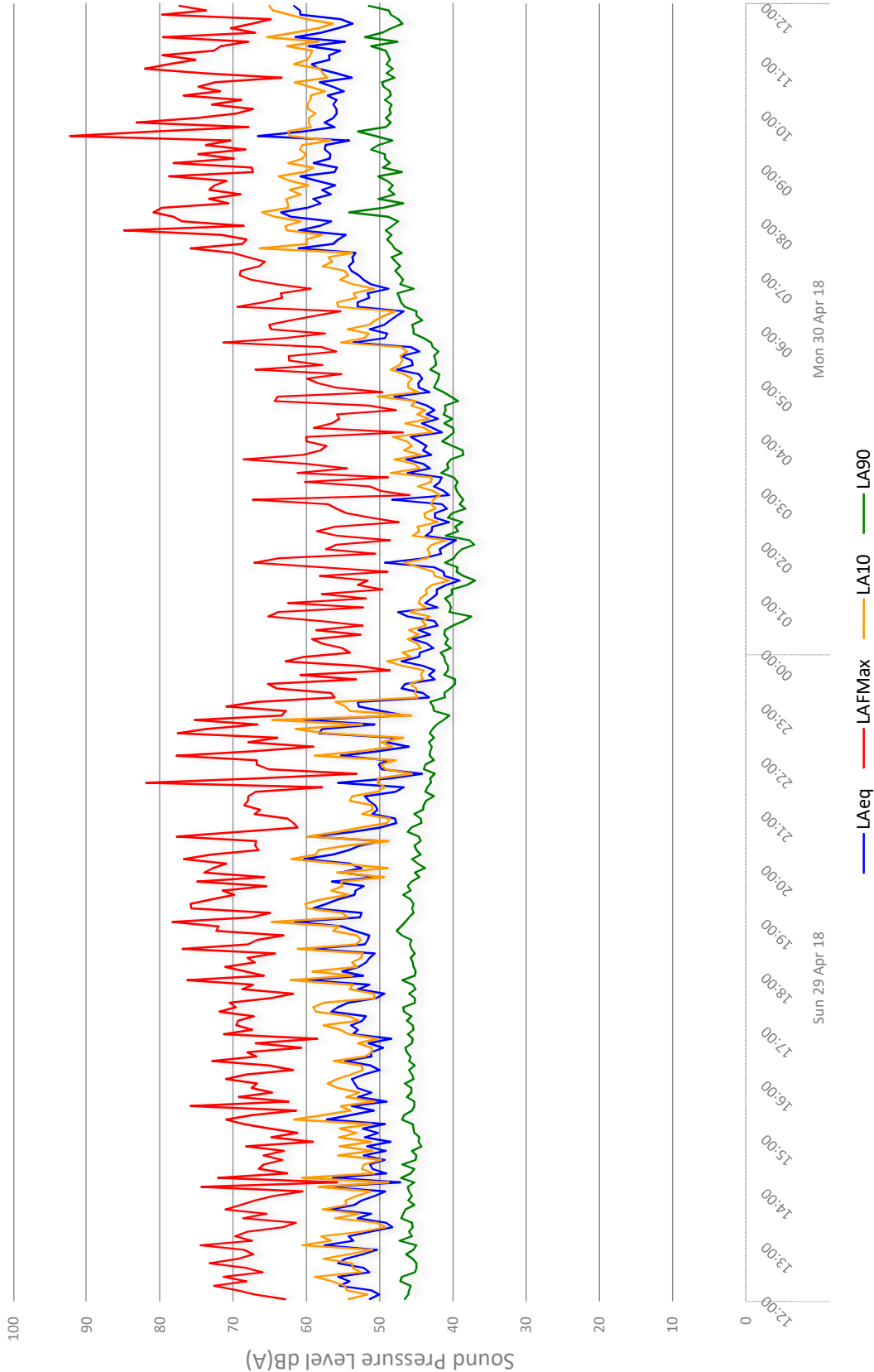
Figure VA2223/TH3



Land at Junction of Addison Road and Meadow Road, Reading
Environmental Noise Time History: 4



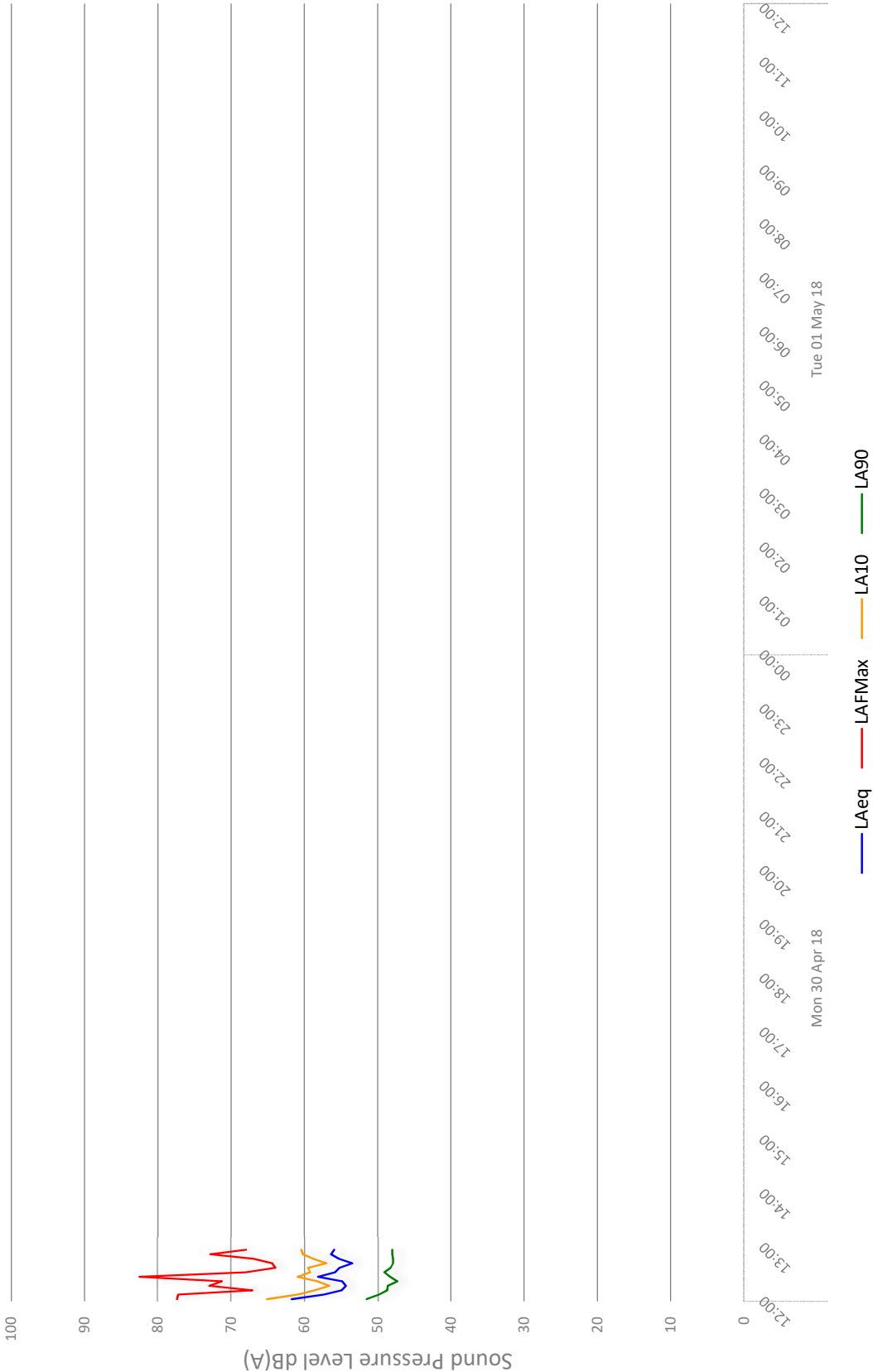
Figure VA2223/TH4



Land at Junction of Addison Road and Meadow Road, Reading
Environmental Noise Time History: 5



Figure VA2223/TH5



1.1 Acoustic Terminology

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

Sound	Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.
Noise	Sound that is unwanted by or disturbing to the perceiver.
Frequency	The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.
dB(A):	Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or L_A . 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).
L_{eq} :	The concept of L_{eq} (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction. Because L_{eq} is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.
L_{10} & L_{90} :	Statistical L_n indices are used to describe the level and the degree of fluctuation of non-steady sound. 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 a typical maximum level. Similarly, L_{90} is the typical minimum level and is often used to describe background noise. It is common practice to use the L_{10} index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.
L_{max} :	The maximum sound pressure level recorded over a given period. L_{max} is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged L_{eq} value.

1.2 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 has 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, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000
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1.3 Human Perception of Broadband Noise

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

Change in Sound Level dB	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

1.4 Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in sound level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a tall barrier exists between a sound source and a listener, with the barrier close to the listener, the listener will perceive the sound as being 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 sound would seem quieter than if he were standing. This is explained by the fact that the "effective screen height" is changing with the three cases above. In general, the greater the effective screen height, the greater the perceived reduction in sound level.

Similarly, the attenuation provided by a barrier will be greater where it is aligned close to either the source or the listener than where the barrier is midway between the two.