Report VA3720.210702.NIA

Unit 1 Tower Retail Park, Crayford

Noise Impact Assessment

05 July 2021

JMS Planning
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Contents

Attachments

1. Introduction

It is proposed to open a new Greggs store at Unit 1 Tower Retail Park, Crayford.

Venta Acoustics has been commissioned by JMS Planning & Development to undertake an assessment the potential noise impact of the use on nearby residential receivers with the intent of operating from 05:00 until 22:00 daily.

An environmental noise survey was undertaken to determine the background noise levels at the site as well as the sound levels generated by the surrounding premises. These levels were then used to undertake an assessment of the likely impact with reference to the methodology in BS4142:2014 *Methods for rating and assessing industrial and commercial sound*, BS8233: 2014 *Guidance on sound insulation and noise reduction for buildings.* This report also compares the measured levels with the aims and intents of the National Planning Policy Framework (2019), Noise Policy Statement for England (2010), Planning Policy Guidance and the World Health Organisation Guidelines for Community Noise (1999).

All staff at Venta Acoustics are fully qualified and members of the Institute of Acoustics, the recognised UK professional body for acoustics, noise and vibration professionals and are fully competent to undertake BS4142 assessments.

2. Site Description

As illustrated on attached site plan VA3720/SP1, the site building is located on the roundabout at the entrance to Tower Retail Park, with Crayford Road to the south and dwellings above retail use to the east.

The most affected noise sensitive receiver is expected to be the flat above 135 Crayford Road.

3. Design Criterion and Assessment Methodology

3.1 BS4142:2014

British Standard BS4142:2014 *Methods for rating and assessing industrial and commercial sound* describes a method for rating and assessing sound of an industrial and/or commercial nature, which includes:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises, and;
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes.

The Standard is therefore suited to this assessment.

The assessment methodology considers the Specific Sound Level, as measured or calculated at a potential noise sensitive receptor, due to the source under investigation in terms of a L_{Aeq} value over a one-hour period during daytime operation (07:00-23:00 hours) and a fifteen-minute period during night-time operation (23:00-07:00 hours).

A correction factor is added to this level to account for the acoustic character of the sound. This is determined as follows when using the subjective assessment methodology:

Tonality - For sound ranging from not tonal to prominently tonal, the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be allocated as a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible.

Impulsivity - A correction of up to +9dB can be applied for sound that is highly impulsive considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be allocated as a penalty of 3 dB for impulsivity which is just perceptible at the receiver, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible.

Other sound characteristics - Where the specific sound contains characteristics that are neither tonal nor impulsive, but are otherwise startling, disturbing or incongruous with the residual acoustic environment, a penalty of +3 dB can be applied.

Intermittency - When the specific sound has identifiable on/off conditions, if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.

An initial estimate of the impact of the source is then obtained by subtracting the typical background noise level, in terms of a LA90 value over the relevant period of operation, from the corrected Specific Sound Level.

- Typically, the greater this difference, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB could be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that there will be an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context.

The initial estimate of the impact may then be modified by taking consideration of the context in which the sound occurs.

3.2 The National Planning Policy Framework (2019)

The revised *National Planning Policy Framework* (NPPF), adopted in 2019, sets out the Government's planning polices 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 180 states that *planning policies and decisions should also ensure new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life

b) identify and protect tranquil areas 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:

3.3 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.

3.4 BS8233:2014

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

The relevant section of the standard is shown below in Table 3.1.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq,\ 16\ hour}$	-
Dining	Dining Room	40 dB $L_{Aeq,\ 16\ hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,\ 16\ hour}$	30 dB $L_{Aeq,\ 8\ hour}$

Table 3.1 - Excerpt from BS8233: 2014 **[dB ref. 20µPa]**

3.5 World Health Organisation Guidelines for Community Noise (1999)

The guidance provided in this document with regard to internal noise levels is the same as that provided in BS8233, but it also provides advice regarding maximum noise levels inside during the night-time period.

> *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).*

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 24th and Monday 28th June 2021 at the location shown in site plan VA3720/SP1. This location was chosen to be representative of the background noise level at the most affected noise sensitive receivers.

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 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
NTi Class 1 Integrating SLM	XL2	A2A-15993-E0	UCRT21/1390	22/3/21
Larson Davis calibrator	CAL200	13049	UCRT21/1385	22/3/21

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.

5. Results

The measured sound levels are shown as time-history plots on the attached charts VA3720/TH1-5.

The background noise level is determined by traffic noise from Crayford Road.

The typical background noise levels measured were:

Monitoring Period	Typical[1] $L_{A90,5min}$
07:00 – 23:00 hours	51 dB
23:00 – 07:00 hours	40 dB
05:00 – 22:00 hours	50 dB

Table 5.1 – Typical background noise levels **[dB ref. 20 µPa]**

[1] The typical L_{A90} value is taken as the 10th percentile of all L_{A90} values measured during the relevant period.

6. BS4142 Noise Impact Assessment

There are likely to be two noise sources that would be associated with the premises.

- new plant servicing the building
- noise from customer vehicles to the premises.

Due to the early stage of the design, plant has not yet been designed for the scheme, and so would need to comply with the Council's standard noise requirements which can be based off the background noise levels measured in the survey and summarised in Table 5.1 and so are not considered in this assessment.

It is understood that the amount of plant associated with the new use is relatively minimal.

6.1 Source Noise Levels

The noise sources summarised in Table 6.1 have been used for the assessment.

Noise Source	Measurement Distance	Sound Level (L_{Aeq})	Source
Vehicle Movements	1m	65 dB	Library Data – Diesel Van
Car Door Slams	1m	81 dB(L_{Amax})	Library Data

Table 6.1 – Measured and library data noise sources used for assessment

6.2 Acoustic Character Correction

The subjective method of allocating corrections to the sound source has been used following the methodology provided in BS4142:2014 and summarised in section 3.1.

Noise Source	Subjective Description	Allocated Corrections
Vehicle Movements	Engine noise from vehicle movements along access road, car doors, people talking as they enter shop	Tonality: +2dB Impulsivity: +3dB Intermittency: +3dB

Table 6.2 – Acoustic character corrections

These penalties are applied to the specific noise level in section 6.3 to obtain the rating noise level.

6.3 Rating Noise Level and Assessment

Specific sound levels due to the plant and vehicle movements are calculated at the nearby receivers, approximately 11m away, as summarised in Appendix B.

The rating noise levels at the assessment locations are compared against the relevant background noise levels to assess the notional significance of the noise impact as follows. Operations are adjusted to the appropriate on times.

Table 6.3 show the assessment for the store opening times on the most affected façade of the nearby residential dwelling.

Results		Relevant Clause	Commentary
Source Sound Levels	65dB @ 1m	7.3.4	As measured on site
Distance Loss (11m)	-21dB	7.3.5	Assumed a point source
Specific Sound Level	L_{Aeq} 44dB		Assessment at first floor level
Assume 3 minutes of every 15 minutes (20%)	-7 dB	7.2	3 minutes of continuous vehicle movements and associated doors and people noise. Assumed all vehicle park in spaces nearest dwelling
Acoustic feature correction	+8 dB	9.2	+2 dB for tonality, +3dB for impulsivity, +3dB for intermittency
Rating level	L_{Ar} 45 dB	9.2	
Background sound level	L_{A90} 50 dB	8	15-min period for between 05:00 – 07:00
Excess of rating over background sound level	-8 dB	11	
Assessment indicates **Low impact**		11	Depending on context

Table 6.3 – BS4142 Assessment – Customer Noise (car park)

Allowing for a 15dB loss through a partially open window, the noise levels above would result in internal levels in the dwellings that comfortably meet the levels stated in BS8233: 2014 *Guidance on sound Insulation and noise reduction for buildings* and so would indicate agreement with the low impact assessments.

6.4 Context

The site is located on a retail park, with Crayford Road to the south, a busy main road. The two nearest receivers appear to be above 135 and 137 Crayford Road, with 137 being a café with extract plant to the rear.

Within this context, the estimated impact of the sound sources is expected to remain valid or be slightly reduced.

6.5 Uncertainty

This section considers the variable in the assessment that may cause variations within the final results and describes how these have been addressed.

- Use of a Class 1 sound level meter is considered to reduce instrument error to insignificant levels as compared with environmental variations. The calibration of the instrumentation was confirmed before and after the noise surveys.
- The background measurements were undertaken under suitable weather conditions over a period designed to include reasonable temporal variations in background noise levels, including a weekend period. The measurement location was selected to be representative of the background noise levels expected to be experienced at the nearby noise sensitive receiver without being unduly influenced by extraneous noise sources.
- Where library data has been used, propagation calculations have been used to correct noise levels to the relevant distance at the receiver.

Overall, the uncertainty is considered to have been be minimised to a suitable range so as not to risk significant variations in the impact assessment of typical operations.

7. Maximum Event Levels

Noise levels from car door slams in the space nearest the dwellings, which would likely be the loudest events associated with the proposed extension of opening hours, have been assessed to 135 Crayford Road.

WHO Maximum Levels – Car Door Slams	
Car door slam @1m (library data)	81 dB
Distance loss, 11m	-21 dB
Level outside window	60 dB
Loss for partially open window (BS8233)	-15 dB
Internal Noise Level	45 dB

Table 7.1 – Assessments of maximum noise levels

Internal noise levels from car door slams with the windows partially open have been predicted to be L_{Amax} 45dB, which achieves the guideline level stated in the WHO Guidelines, and is lower than existing maximum events occurring during this time period measured during the survey.

8. Conclusion

A baseline noise survey has been undertaken by Venta Acoustics to establish the background noise climate in the locality of Unit 1 Tower Retail Park, Crayford.

The measured noise levels have been assessed against BS4142:2014 *Methods for rating and assessing industrial and commercial sound*, BS8233: 2014 *Guidance on sound insulation and noise reduction for buildings* and the World Health Organisation *Guidelines for Community Noise* (1999) to assess potential noise impacts on operational hours of the premises due to customer noise.

When assessed using BS4142, noise from activities on site have been shown to have a low impact.

When considered against the guidance provide in the BS8233 and WHO, average and maximum noise levels are at a level which would be considered of low impact with partially open windows.

Jamie Duncan MIOA


Unit 1 Entrance
Noise monitoring location
Most Affected Receiver
NO ENTRY
A207
© 2021 Google
Google Earth

Unit 1 Tower Retail Park, Crayford

Environmental Noise Time History: 1

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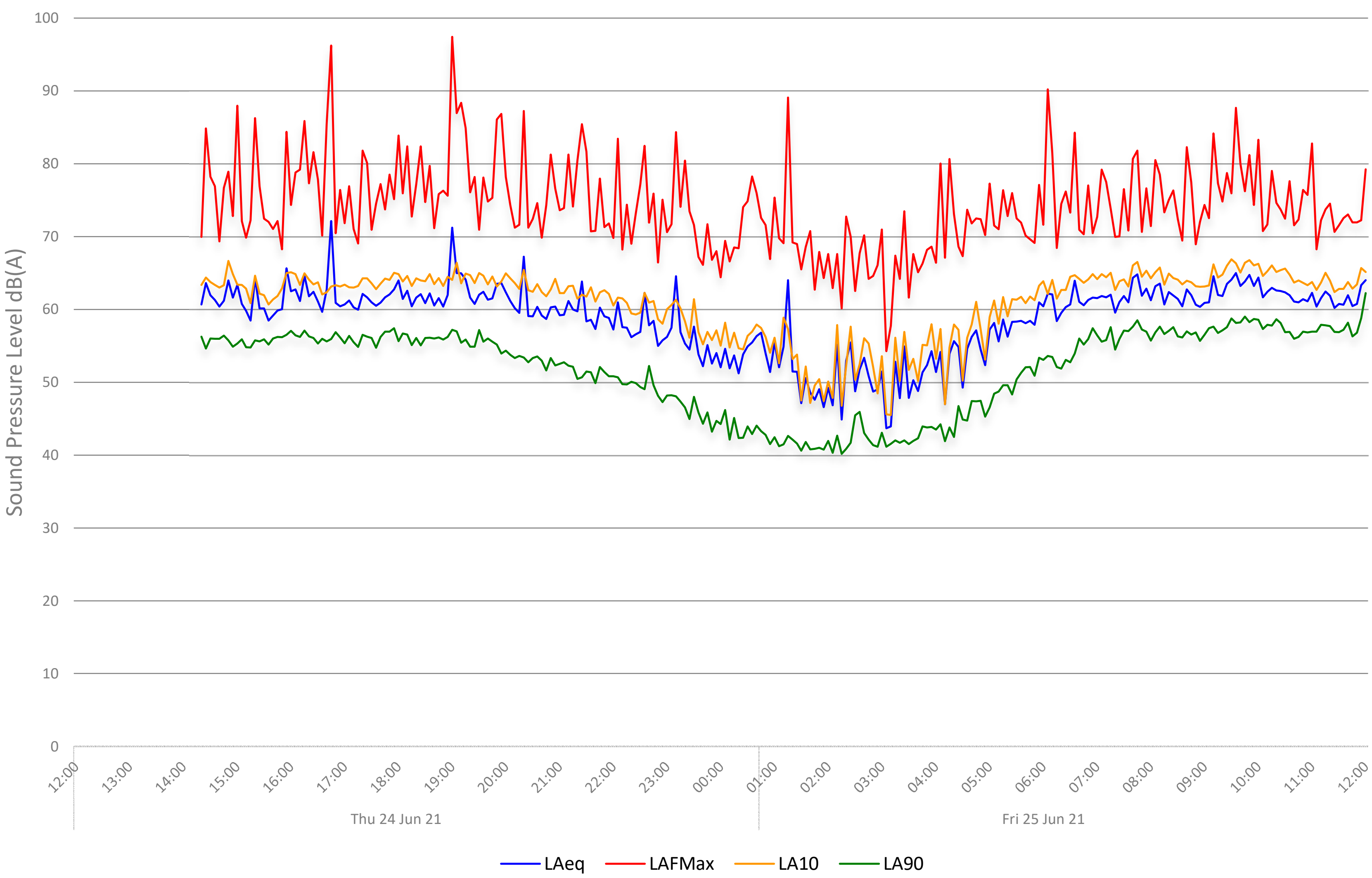
Figure VA3720/TH1



Unit 1 Tower Retail Park, Crayford

Environmental Noise Time History: 2

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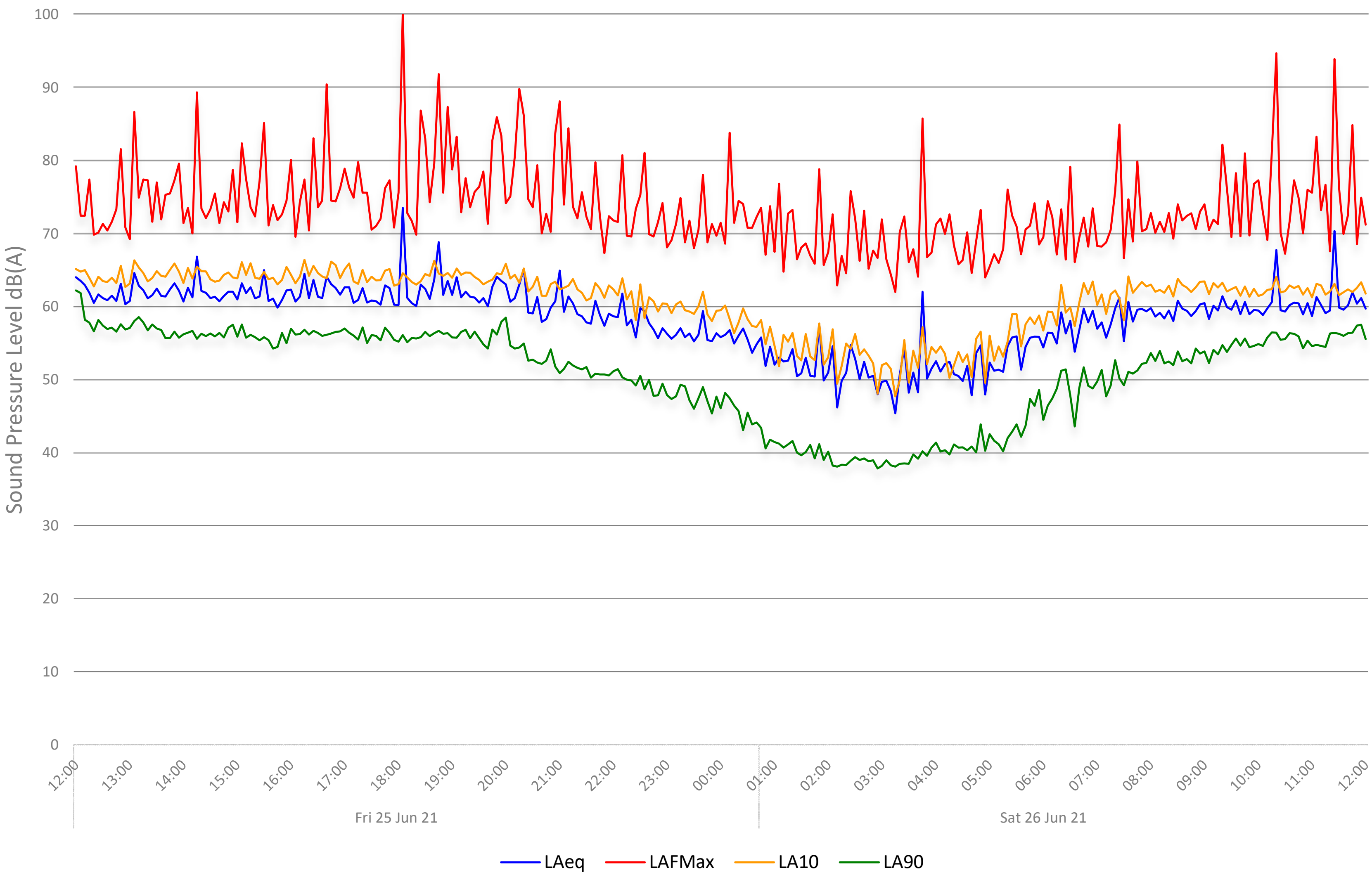
Figure VA3720/TH2



Unit 1 Tower Retail Park, Crayford

Environmental Noise Time History: 3

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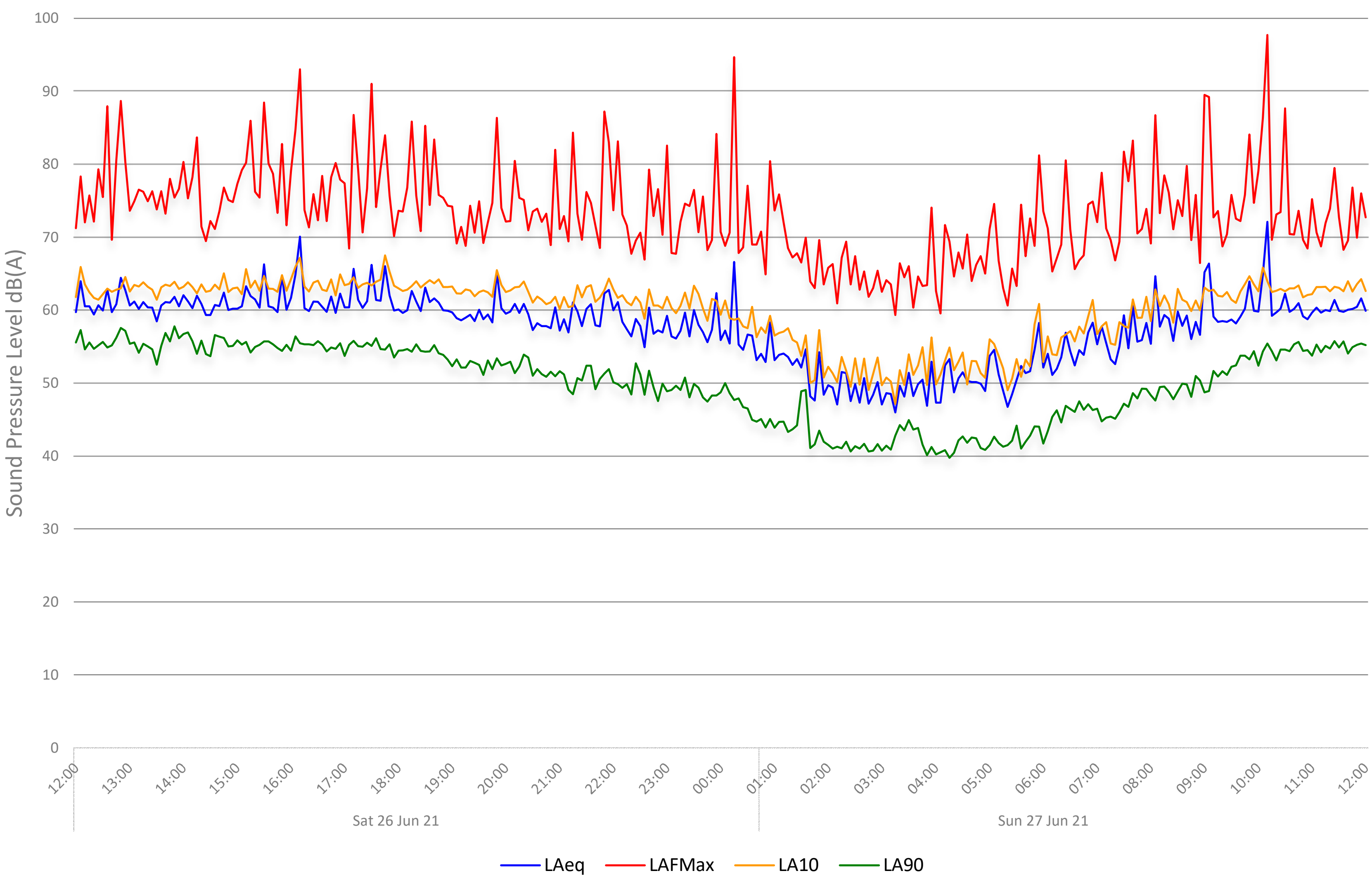
Figure VA3720/TH3



Unit 1 Tower Retail Park, Crayford

Environmental Noise Time History: 4

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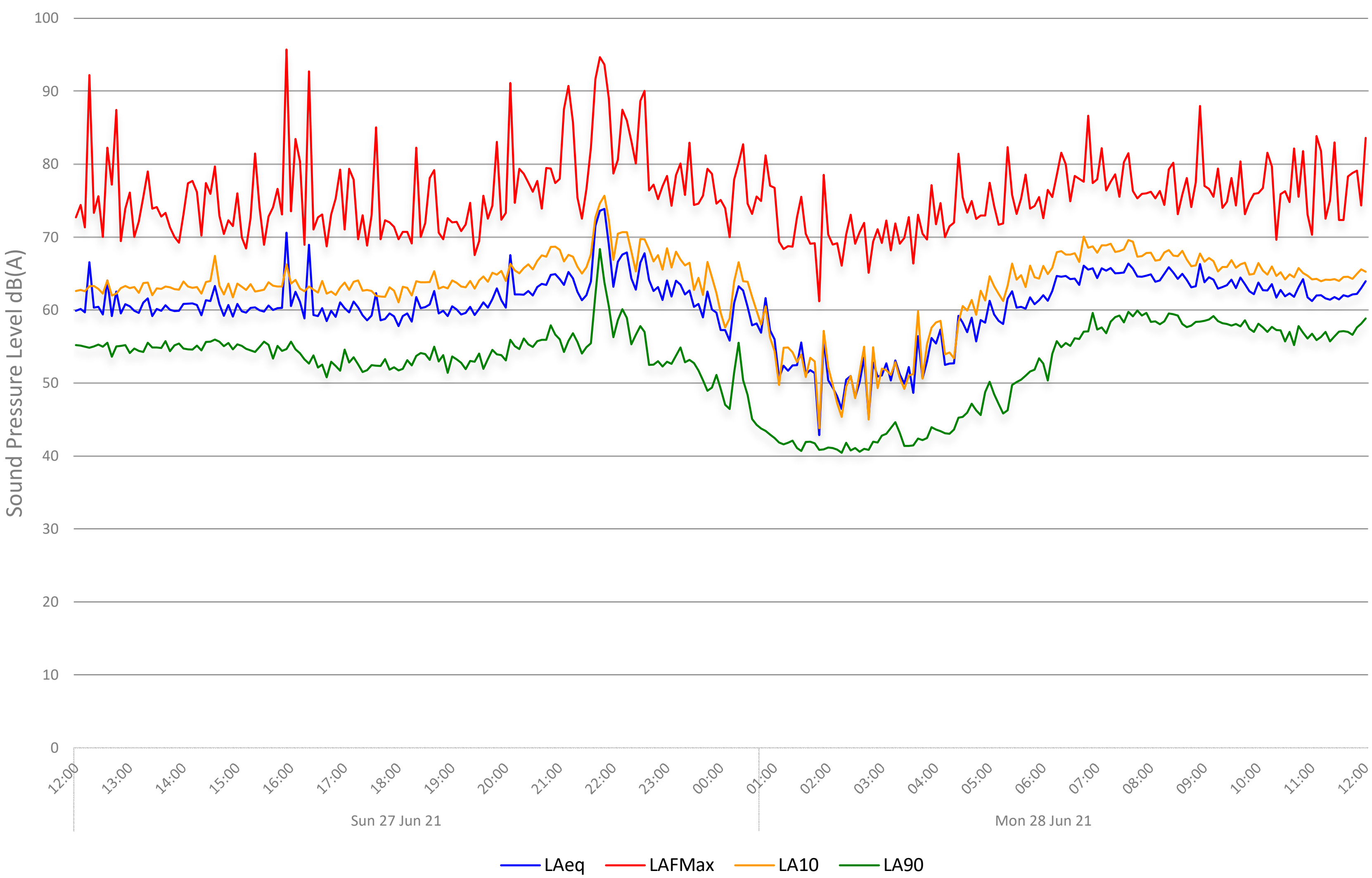
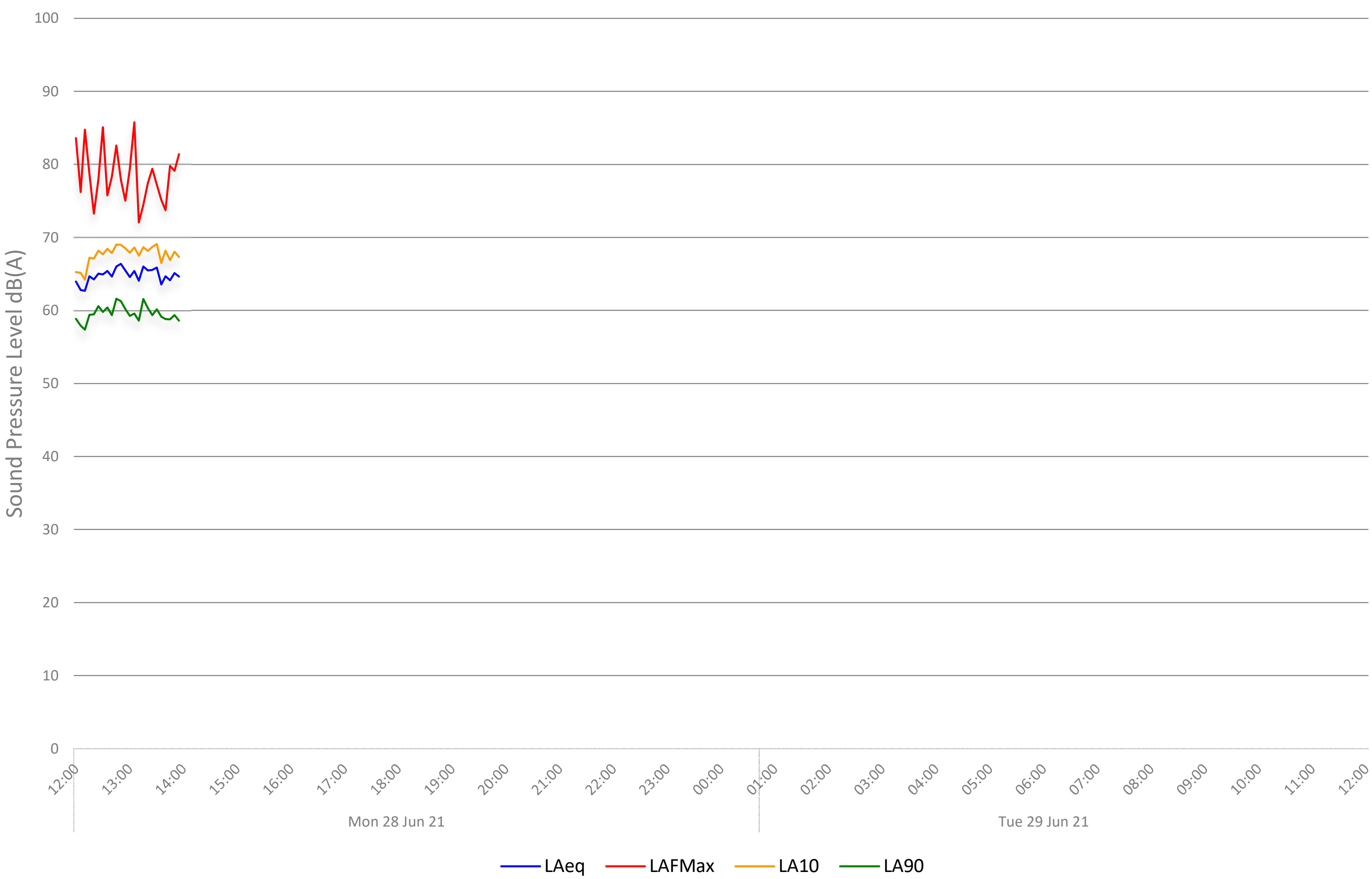
Figure VA3720/TH4



Unit 1 Tower Retail Park, Crayford

Environmental Noise Time History: 5

Figure VA3720/TH5



APPENDIX A

Acoustic Terminology & Human Response to Broadband Sound

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.
L_{eq} :	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 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.
R	*Sound Reduction Index.* Effectively the *Level Difference* of a building element when measured in an accredited laboratory test suite in accordance with the procedures laid down in BS EN ISO 10140-2:2010 and corrected for its size and the reverberant characteristics of the receive room.

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

1.3 Human Perception of Broadband Noise

APPENDIX A

Acoustic Terminology & Human Response to Broadband Sound

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