EAST PARK ENERGY

East Park Energy

EN010141

Environmental Statement

Volume 2 – Technical Appendices

Appendix 10-1: Noise and Vibration Terminology

Document Reference: EN010141/DR/6.2

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009: Regulation 5(2)(a)

September 2025

Version P01

EAST PARK ENERGY

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Environmental Statement
Volume 2 – Technical Appendices

Appendix 10-1: Noise and Vibration Terminology

APFP Regulation Reference:	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference:	EN010141
Application Document Number:	EN010141/DR/6.2
Author:	Noise and Vibration Consultants Ltd

Version	Date	Status
P01	September 2025	DCO Submission

© AXIS P.E.D. Ltd 2025. All rights reserved.

This document and its accompanying documents contain information which is confidential and is intended only for the use of the client. If you are not one of the intended recipients any disclosure, copying, distribution or action taken in reliance on the contents of the information is strictly prohibited.

Unless expressly agreed, any reproduction of material from this document must be requested and authorised in writing from AXIS P.E.D. Ltd. Authorised reproduction of material must include all copyright and proprietary notices in the same form and manner as the original and must not be modified in any way. Acknowledgement of the source of the material must also be included in all references.

CONTENTS

TABLES

1.0 NOISE

1.1 Background

1.1.1 Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air.

1.1.2 Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure level. It is because of this wide range that a noise level scale based on logarithms is used in noise measurement. This is the decibel or dB scale.

1.1.3 Audibility of sound covers a range of about 0 to 140 decibels (dB) corresponding to the intensity of the sound pressure level. The ability to recognise a particular sound is dependent on the pitch or frequencies present in the source. Sound pressure measurements taken with a microphone cannot differentiate in the same way as the ear, consequently a correction is applied by the noise measuring instrument in order to correspond more closely to the frequency response of the ear which responds to sounds from 20 Hz to 20000 Hz. This is known as 'A weighting' and written as dB(A).

1.1.4 The use of this unit is internationally accepted and correlates well with subjective annoyance to noise.

1.1.5 The logarithmic basis of noise measurements means that when considering more than one noise source their addition must be undertaken in terms of logarithmic arithmetic. Thus, two noise sources each of 40 dB(A) acting together would not give rise to 40 + 40 = 80 dB(A) but rather 40 + 40 = 43 dB(A). This 3 dB(A) increase represents a doubling in sound energy but would be only just perceptible to a human ear.

1.1.6 Table 1 below gives typical noise levels in terms of dB(A) for common situations:

Table 1: Examples of Typical Noise Levels

Source/Activity	Indicative noise level [dB(A)]
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom	35
Wind farm at 350m	35-45
Busy road at 5km	35-45
Car at 65km/h at 100m	55
Busy general office	60
Conversation	60
Truck at 50km/h at 100m	65
City Traffic at 5m	75-85
Pneumatic drill at 7m	95
Jet aircraft at 250m	105
Threshold of pain	140

1.1.7 Noise levels can vary with time according to source activity and indices have been developed in order to be able to assign a value to represent a period of noise level variations and to correspond with subjective response.

1.2 Terms

1.2.1 A definition in layman's terms is given below for terminology used in the measurement and results obtained during the survey work:

- **A-weighting:** Normal hearing covers the frequency (pitch) range from about 20Hz to 20,000 Hz but sensitivity of the ear is greatest between about 500Hz and 5000Hz. The "A-weighting" is an electrical circuit built into noise meters to mimic this characteristic of the human ear.
- **Ambient noise:** The totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.
- **Attenuation:** Noise reduction
- **Background noise:** The general quiet periods of ambient noise when the noise source under investigation is not there.
- **Decibel (dB):** The unit of measurement for sound based on a logarithmic scale. 0dB is the threshold of normal hearing; 140dB is the threshold of pain. A change of 1dB is only detectable under controlled laboratory conditions.
- **dB(A) [decibel A weighted]:** Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) serves to distinguish sounds of different frequency (or pitch) in a similar way to how the human ear responds. Measurements in dB(A) broadly agrees with an individual's assessment of loudness. A change of 3dB(A) is the minimum perceptible under normal everyday conditions, and a change of 10dB(A) corresponds roughly to doubling or halving the loudness of sound.
- **dB(C): [decibel C weighted]:** Frequency weighting which does not alter low frequency octave band levels by very much compared to ‘A' weighting. Similar to linear reading (i.e. linear does not alter frequency spectra at all)
- **Frequency (Hz):** The number of sound waves to pass a point in one second.
- **L_{Aeq}:** This is a noise index used to describe the “average” level of a noise that varies with time (T). It allows for the different sensitivities of the human ear to different frequencies (pitch), and averages fluctuating noise levels in a manner, which correlates well with human perceptions of loudness.
- **$L_{A10,T}$:** This noise index gives an indication of the upper limit or peak levels of the fluctuating noise. It is the “A weighted” noise level exceeded for 10

per cent of the specified measurement period (T). e.g. If the measurement period was over 10 hours and the L_{A10} reading was say 60dB, then this means that for 1 hour out of 10 the level went above 60dB.

- **$L_{A90,T}$:** This noise index gives an indication of the lower limit or levels of the fluctuating noise. It is the "A weighted" noise level exceeded for 90 per cent of the specified measurement period (T). e.g. If the measurement period was over 10 hours and the L_{A90} reading was say 50dB, then this means that for 9 hours out of 10 the level went above 50dB.
- **L_{Amax}:** This is the highest A weighted noise level recorded during a noise measurement period.
- **$L_{night,outside}$:** This is the A-weighted long-term average sound level measured outside as defined in ISO 1996-2: 1987, determined over all the night periods of a year.
- **Residual noise:** The ambient noise remaining at a given position in a given situation when the noise source under investigation is not there.
- **Specific noise:** The noise source under investigation for assessing the likelihood of complaints

2.0 VIBRATION

2.1 Ground Borne Vibrations

2.1.1 For any source of vibration on or near the surface of the ground, energy propagates away from the source via:

i) Elastic body (or compression) waves – which radiate energy into the ground in all directions
ii) Surface (or shear) waves – which carry energy along the ground surface, caused when body waves are reflected back into the ground at the ground-surface interface

2.1.2 Thus, at any point away from that source, the ground motion is the sum of all the wave motions at that point. When wave motion has been generated, the waves will be attenuated as they travel away from the source. The two main mechanisms for attenuation are:

i) Enlargement of the wavefront as the distance from the source increases, and
ii) Internal damping of the transmitting medium (the ground)

2.1.3 Ground borne vibration is therefore made up of a combination of different waves, travelling in different directions, at different speeds and at different frequencies. The frequency component of the vibration will affect the rate at which attenuation occurs since the internal damping of the ground is frequency dependent.

2.1.4 Since vibration enters buildings through the foundations, the hard structure of the building is normally affected to a greater degree than by air borne vibration. Often ground borne vibrations are more noticeable when standing or sitting near the middle of suspended wooden floors.

2.2 Ground Borne Vibration Measurement Units

2.2.1 Ground borne vibration is caused when the individual particles making up the strata are caused to oscillate by the passage of a pressure wave. The resulting vibration can be summarized in terms of 4 main parameters:

i) **Velocity** – how fast the particles move when they are oscillating. Since the velocity of these particles continually change as the pressure wave passes the most useful value that is often reported is the maximum or peak particle velocity (PPV). PPVs are usually expressed in terms of ms-1 or mms^{-1}.

ii) **Acceleration** – is the rate at which the particle velocity changes during oscillation. It is usually measured in ms^{-2} mms^{-2} or “g’s”. 1g is that acceleration imparted to an object by the earth’s gravitational pull and is approximately 9.81 ms^{-2}.

iii) **Displacement** – is the distance moved by oscillating particles. This is usually very small and measured in mm or even μm.

iv) **Frequency** – is the number of oscillations per second which a particle undergoes due to the passage of a vibration wave. It is measured in cycles per second or Hertz (Hz).

2.2.2 The movement of particles induced to oscillate by vibration waves are usually measured in three mutually perpendicular directions to fully describe the vibration intensity, as particles will be oscillating in three dimensions. These are:

i) **Longitudinal** – back and forth particle movement in the same direction that the vibration wave is travelling.

ii) **Vertical** – up and down movement perpendicular to the direction the vibration wave is travelling.

iii) **Transverse** – left and right particle movement perpendicular to the direction the vibration wave is travelling.