Appendix 5.1

Glossary of Acoustic Terms

Noise is usually defined as unwanted sound. The perception of sound arises from small pressure fluctuations at the eardrum leading to the sense of hearing. Human ears can respond to sound in the frequency range of approximately 20 Hertz (Hz) (low pitch) to 20,000 Hz (high pitch). Whilst the level of sound could be described in terms of different pressures, the range of sensitivity of the human ear is very large and it is easier to use the unit of decibel (dB) to quantify sounds. The human ear can detect sounds in the approximate range of 0 dB (the threshold of perception) to 140 dB (commonly described as the threshold of pain).

The ear does not respond equally to sounds of the same magnitude at different frequencies, but, instead, it is more responsive to mid frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, an electronic weighting mechanism is used when sound is measured. This weighting reduces the importance of lower and higher frequencies, in a similar manner to the human ear. The most commonly used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement and assessment, and the levels are denoted as dB(A).

Whether sound is perceived as noise depends on a number of factors, which should be considered in any assessment. Generally, the extent of the impact and effect of noise depends upon:

- its level;
- the margin by which the particular source of noise exceeds the prevailing baseline level;
- the character of the source in relation to the character of the baseline noise environment;
- how the sound varies over a given period of time;
- when the sound occurs, i.e. during the day, evening or night; or at weekdays or weekends; and
- the acoustic features of the source (such as its general frequency content, whether it has tonal qualities or whether the source is impulsive in nature).

The decibel scale is logarithmic. This means that if two sources of the same sound pressure level are combined, this doubling of the sound energy gives a resultant level 3 dB higher than the decibel value of the single source.

Subjectively, experiments have shown that in general a 10 dB increase is regarded as a doubling of perceived loudness, and a change in sound level of 3 dB is generally the minimum difference that can be perceived under normal listening conditions.

Sound levels are rarely constant, and a range of indicators are used to describe the varying sounds that occur. A description of the main indicators is given below, along with some other technical terms that tend to be used in noise impact assessments.

$L_{Aeq,T}$ The equivalent continuous A-weighted sound or noise level over the time period (T). This is the A-weighted sound pressure level of a continuous, steady sound that, over the given time period (T), contains the same sound energy as the actual fluctuating sound over the same time period.

$L_{A90,T}$ This is the 'A' weighted noise level exceeded for 90% of the measurement period, T. This is often described the background sound or noise level.

$L_{A10,T}$ This is the 'A' weighted noise level exceeded for just 10 % of the measurement period, T.

$L_{A10,18h}$ This is the arithmetic average of the hourly ($L_{A10,1h}$) values for each of the eighteen one-hour periods between 06:00 and 24:00 hours. This indicator is normally used to describe road traffic noise.

$L_{Amax,T}$ This is the maximum 'A' weighted noise level that occurs during the measurement period, T. It is used to show the highest noise level that occurred in that time period. In some situations the effect of noise is more associated with the maximum value than, for example, the $L_{Aeq,T}$ indicator.

Façade Level: The sound level at a position 1 m in front of a reflecting façade of a building. The façade noise level is assumed to be 3 dB(A) higher than the level measured or predicted at the same position but without the influence of the reflecting façade.

Free-field Level: The sound level in an open area well away from any buildings or other sound reflecting surfaces other than the ground. Generally, the minimum distance from building facades required for free-field measurements is 3.5 m.

BS 4142:2014 Terminology

- **Background Sound Level:** The A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval. Expressed as $L_{A90,T}$ and generally considered to be the average minimum noise level.
- **Ambient Sound Level:** Totally encompassing sound in a given situation at any given time, usually composed of sound from many sources near and far. Usually expressed in terms of $L_{Aeq,T}$ and includes the residual and specific sound when present.
- **Residual Noise Level:** The ambient noise remaining at the assessment location when the specific noise source is suppressed to such a degree that it does not contribute to the ambient noise. Expressed in terms of $L_{Aeq,T.}$
- **Specific Sound Level:** The equivalent continuous A-weighted sound pressure level produced by the specific sound source (being assessed) at the assessment position over a given reference time interval ($L_{Aeq,Tr}$).
- **Rating Noise Level:** The specific sound level plus any adjustment for the characteristic features of the sound. Expressed in terms of $L_{Ar,Tr}$.

Noise Policy Statement for England (NPSE) Terminology

- **No Observed Effect Level (NOEL):** This is the level below which no effect can be detected. In simple terms, below this level, the sound has no effect at all (e.g. it is inaudible).
- **Lowest Observed Adverse Effect Level (LOAEL):** This is the level above which adverse effects on health and quality of life can be detected.
- **Significant Observed Adverse Effect Level (SOAEL):** This is the level above which significant adverse effects on health and quality of life occur.

Vibration Dose Value: this is a measure of the amount of vibration that is experienced over a specified period, normally the 16-hour day (07.00 – 23.00 hours) or 8-hour night (23.00 – 07.00 hours). It is used to determine the likelihood of adverse comment about vibration. Mathematically it is defined as the integral over time of the fourth power of the frequency-weighted, time varying vibration acceleration magnitude multiplied by the duration, all to the fourth root. Its units are $mm^{-1.75}$.