Noise Definitions:

Ambient Noise Level
Ambient Noise is the existing background noise level characteristic of an environment..

Attenuation
Attenuation is the reduction of sound energy by the absorption or divergence of sound waves. The amount of attenuation due to absorption varies with the substance through which the sound waves are being transmitted, or propagating. For example, sound energy is absorbed differently by a window than by a wall, or by water than by air. Similarly, attenuation due to divergence varies by the size and shape of the space between source and receiver. For example, if you toss a rock into the lake the resulting waves decrease in height as they spread outward from where the rock entered the water. Generally speaking, through air, noise decreases by six decibels for a doubling of distance when sound emanates from a single point in space. In contrast, noise emanating from a line, such as a train or constant road traffic, decreases by only three decibels per doubling of distance.

A weighted Sound Level dB(A)
Another very important characteristic of sound is its frequency, or "pitch". This is the rate of repetition of the sound pressure oscillations as they reach the human ear. Frequency is the closeness of the vibrations which means the higher the pitch and vice versa. Human ears are better equipped to hear mid and high frequencies than low frequencies, thus humans find mid and high frequency noise to be the most annoying. In general, humans respond to sound most readily when the predominant frequency is in the range of normal conversation. Several filters have been defined to approximate this sensitivity level. The A-weighted sound level/filter is used for most environmental reviews. A-weighted sound levels best matches the human ears' sensitivity.

Community Noise Equivalent Level (CNEL)
CNEL measurements are a weighted average of sound levels gathered throughout a 24-hour period. This is essentially a measure of ambient noise. Different weighting factors apply to day, evening, and nighttime periods. This measurement recognizes that humans are most sensitive to noise in late night hours and are more sensitive during evening hours than in daytime hours. CNEL depends not only on the noise level of individual aircraft approaches or departures, but also on the number of approaches or departures during the measurement period.

Day-Night Average Sound Level (DNL)
In simple terms, Ldn or DNL is the average noise level over a 24 hour period except that noise occurring at night (between the hours of 10PM and 7AM) are artificially increased by 10 dB. This weighting reflects the added intrusiveness of night noise events attributable to the fact that community background noise typically decreases by 10 dB at night. Under Federal Aviation Regulation (FAR) Part 150, the FAA has established Ldn/DNL as the cumulative noise exposure metric for use in airport noise analyses, and has developed recommended guidelines for a noise and land use compatibility evaluation.

dBC
C-weighted decibels adjust sound pressure towards the low frequency end of the spectrum. Although less consistent with human hearing than A-weighting, dBC can be used to consider the impacts of certain low frequency operations.

Decibel (dB)
In sound, decibels measure a scale from the threshold of human hearing, 0 dB, upward towards the threshold of pain, about 120-140 dB. Because decibels are such a small measure, they are computed logarithmically and cannot be added arithmetically. An increase of ten dB is perceived by human ears as a doubling of noise. Most sounds in our day-to-day environment have sound pressure levels on the order of 30 to 100 dB.

DNL Contour
The "map" of noise exposure around an airport. A contour is computed through an FAA model called the Integrated Noise Model (INM), which calculates annual noise exposure. FAA defines significant noise exposure as any area within the 65dB DNL contour; that is the area within an annual average noise exposure of 65 decibels or higher.

Effective Perceived Noise Level (EPNL)
EPNL measurements consist of a frequency weighting scheme considerably more complicated than the A-weighting filter used to determine SELs. They incorporate a penalty for the presence of pure tones to account for people's increased annoyance with single frequencies, such as the tones emanating from the compressor of turbofan engines. Thus, although specific values must be determined by computer analysis of a signal, EPNL has been adopted for certain specialized uses involving the noise of individual over-flights.

Equivalent-Continuous Sound Level (Leq)
An equivalent-continuous sound level is simply an average level over a stated time period. In other words, if you had a sound level that fluctuated over a defined period of time its equivalent non-fluctuating level is its Leq.

Frequency Weighting
The average human ear senses tone resulting from sound oscillation in frequencies between 20 and 20,000 Hertz (Hz). Because the human ear doesn't respond to all of these frequencies equally well, weightings are applied to more accurately quantify what the ear is actually sensing. The most common weighting used by the airport as directed by FAA Part 150 guidelines, is A-weighting (dBA).

Maximum Sound Level (Lmax)
This is the highest level displayed on a sound level meter during a noise event or time period.

Metrics
An acoustic metric is simply a measurement derived through the use of a mathematical formula for a specific purpose. The metrics that are most commonly used in airport noise mitigation are DNL, Leq, SEL, Lmax, Lmin, NLR, and Attenuation. These metrics are A-weighted unless otherwise noted.

Minimum Sound Level (Lmin)
This is the lowest level displayed on a sound level meter during a noise event or time period.

Noise Exposure Map (NEM)
An FAR Part 150 requirement which is prepared by airports to depict current and future noise contours. NEMs also take into account potential land use changes around airports.

Noise Contour
See DNL Contour.

Noise Level Reduction (NLR)
The Residential Acoustical Treatment Program reduces the transmission of noise into homes. This reduction is known as the noise level reduction. It is the amount, in decibels, that outdoor noise is reduced as it passes from the exterior to the interior of a structure.

Single Event Noise Exposure Level (SENEL)
The noise exposure level of a single aircraft event measured over the time between the initial and final points when the noise level exceeds a predetermined threshold. It is important to distinguish single event noise levels from cumulative noise levels such as CNEL. Single event noise level numbers are generally higher than CNEL numbers, because CNEL represents an average noise level over a period of time, usually a year.

Single Event
Noise generated by a single aircraft overflight.

Sound Exposure level (SEL)
SEL is similar to Leq. The difference between the two is that an SEL represents the entire noise event as though it occurred within a duration of one second. With the SEL metric we can directly compare two noise events having different durations.

Sound Pressure Level (SPL)

The average human ear begins sensing at a pressure of only 20 micropascals and begins to experience pain at approximately 100 pascals. The ratio between these pressures is greater than a million to one. Because the human ear perceives pressure changes logarithmically over a large range, the sound pressure level (SPL) is measured in pascals and converted to Decibels to get a more manageable logarithmic scale. Because of this logarithmic relationship, one cannot simply arithmetically add, subtract, or average decibel levels. For example if you have two 60 decibel noise sources occurring simultaneously, they combine to equal 63 decibels. While a three decibel change is generally just perceptible, a ten decibel change, either up or down, is approximately twice or half as loud.