

## Chapter 14: Noise

Sound becomes noise when it detracts from your quality of life. Traffic is the most common cause of noise resulting from development. But a neighborhood may also be disturbed by noise from a variety of other sources:

- cheering and public address systems at nearby sporting events;
- blasting and crushing operations at a mining site;
- aircraft noise, especially near airports;
- back-up beepers and clanging metal during trash collection; and
- a wide variety of other sources.

Sound is the result of a fluctuation in pressure transmitted as a wave through the air (or any other elastic medium, including water).<sup>104</sup> Both the pitch and loudness of noise may be disturbing. Noise is measured in units known as decibels (dB). The decibel scale begins at zero, which is lowest sound level we can perceive. The decibel scale is logarithmic. For example, going from zero to 10 decibels equates to a ten-fold increase in acoustic energy while an increase of 20 decibels translates to a 100-fold increase in sound energy. However, we perceive each 10-fold increase in decibel levels as a doubling of loudness. The Acoustic Wizard<sup>105</sup> website gives the following examples of dB levels for various sounds:

- 0 dB the faintest sound we can hear;
- 30 dB a quiet library or in a quiet location in the country;
- 45 dB typical office space or ambience in the city at night;
- 60 dB a restaurant at lunch time;
- 70 dB the sound of a car passing on the street;
- 80 dB loud music played at home;
- 90 dB the sound of a truck passing on the street;
- 100 dB the sound of a rock band;
- 115 dB limit of sound permitted in industry; and
- 120 dB deafening .

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<sup>104</sup> In drafting the description of noise, the author borrowed heavily from Appendix N, of the City of Hayward (CA) General Plan which provides one of the best explanations of this issue I've come across. This document can be viewed at: <http://www.hayward-ca.gov/>

<sup>105</sup> Visit the Acoustic Wizard website at: [http://www.rtagroup.com.au/wizard/definition\\_acoustics.html](http://www.rtagroup.com.au/wizard/definition_acoustics.html)

In the context of its disturbing aspects, sound is usually reported in the A-weighted decibel (dBA) scale, which gives greater weight to the frequencies we are most sensitive to. The noise level in a library might be 30 dBA while an air conditioner emits 60 dBA. Quiet human speech has a volume of 55 dBA while normal speech occurs at 65 dBA.

Sound levels can vary considerably, even during a very short period of time, which is why sound is usually reported as *Equivalent sound pressure level* or *Leq* for short. Leq is an average of the acoustical energy measured over a given period of time. The period may be an hour which is represented by Leq(1hr). Acoustical energy might also be expressed as the sound pressure exceeded for a given period. For example, L1 is the sound pressure level exceeded 1% of the time during a given period of measurement.

With respect to neighborhood quality of life, the Day/Night Average Sound level, or Ldn, is another important unit of measure. In a residential neighborhood sound is most disturbing in the evening and at night when most of us wish to sleep. Ldn is a measure of the cumulative noise a neighborhood is exposed to with greater weight given to nighttime noise, occurring say from 10:00 pm to 7:00 am. Ldn is typically computed by adding a decibel “penalty” to nighttime noise measures. For example, if a neighborhood has a daytime-evening (7:00 am to 10:00 pm) dBA of 60 and the nighttime dBA is 50, then 10 dBA might be added to the nighttime measurement for an Ldn value of 60 dBA.

The Federal Highway Administration (FHWA) has adopted noise standards for interstates and other roads. A number of states and local jurisdictions also have noise standards. For example, a source generating noise cannot cause the sound level inside a nearby home to exceed 45 dBA if the noise is steady or 55 dBA for fluctuating sound levels. Sleep can be disturbed above these levels. Exterior noise levels in residential areas may be limited to an Ldn of 55 dB. Noise at the exterior of a home may be perceived inside the home as 12 - 17 dBA lower if the windows are open and 20 dBA lower when windows are closed.

FHWA standards, along with those adopted by many state and local governments, require the use of barriers and other measures to reduce impacts sufficiently to preserve quality of life in residential areas and other noise-sensitive locations. Sound barriers, such as the walls constructed along highways, can reduce noise by 10-15 dBA.<sup>106</sup> A forest measuring 200 feet in depth reduces noise by 10 dBA. For a measure to reduce noise it must intercept the line of sight from the source, say a truck traveling along a highway, and the receptor, like a bedroom window. Also, no any gaps or holes should be present in the barrier which will allow noise to “leak” through.

As stated earlier in this section, traffic is the most common source of noise associated with development. Traffic volume, speed, and vehicle type all affect noise levels. At 2,000 vehicles per

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<sup>106</sup> Highway Traffic Noise - FHWA, available online at: <http://www.fhwa.dot.gov/environment/htnoise.htm>

hour (vph) traffic noise will sound twice as loud as at 200 vph.<sup>107</sup> Traffic moving at 65 mph will sound twice as loud as at 30 mph. And one truck traveling at 55 mph will sound as loud as 28 cars moving at the same speed.<sup>108</sup>

Traffic noise can have a significant effect on property value. A home located adjacent to a major highway may sell for 8% to 10% less when compared to one located along a quiet neighborhood street.<sup>109</sup> Heavy truck traffic lowers property value at a rate 150 times greater than cars. This is because at 50 feet heavy trucks emit noise at 90 dBA while car traffic produces noise at a level of 50 dBA.<sup>110</sup> An increase in heavy truck traffic may also cause damage to nearby homes due to vibrations transmitted through the earth. While some truck traffic is essential on neighborhood streets (e.g. refuse collection, delivery trucks, and fire engines) an excessive increase in trucks passing through a neighborhood could lower property value and overall quality of life.

Many local governments restrict activities generating excessive noise to those time when they are least disturbing. For example, Montgomery County, Maryland restricts trash collection to the hours of 7:00 a.m. through 9:00 p.m. at commercial, industrial, and other nonresidential sites located within 500 feet of homes.<sup>111</sup> This regulation was prompted by trash collections as early as 4:00 a.m. at businesses located next to residences. The sound of back-up beepers and dumpster banging was extremely disturbing to nearby residents. The regulation was originally proposed to apply to nonresidential uses within 1,000 feet of a home.<sup>112</sup>

Noise impact is one of the elements commonly addressed in an environmental impact statement (EIS) for highway projects. Also, some jurisdictions will require an applicant to prepare a noise impact analysis for certain types of development projects, such as a mining operation, a landfill or a sports facility. A noise analysis may also be required for residential projects constructed near existing noise sources.

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<sup>107</sup> Highway Traffic Noise - FHWA, available online at: <http://www.fhwa.dot.gov/environment/htnoise.htm>

<sup>108</sup> Ibid.

<sup>109</sup> Highway noise and property value by J.P. Nelson, *Journal of Transport Economics & Policy*, May 1982, p. 117-138.

<sup>110</sup> Residential noise damage costs caused by motor vehicles by D. Haling and H. Cohen, *Transportation Research Records*, Issue 1559, p. 84-95.

<sup>111</sup> See Section 48-21(b) of the Montgomery County, MD Code, which can be viewed online at: [http://www.amlegal.com/montgomery\\_county\\_md/](http://www.amlegal.com/montgomery_county_md/)

<sup>112</sup> Montgomery's Trash Pickup Debate, by Judith Valente, *The Washington Post*, Apr 20, 1978