

APPENDIX I DESCRIPTION OF NOISE EXPOSURE AND LAND USE COMPATIBILITY

Based on the relationships between noise and the collective response of people to their environment, the cumulative exposure metrics “Day-Night Average Sound Level” (DNL) and “Community Noise Equivalent Level” (CNEL) have become accepted standards for land use compatibility.⁴ In their application to airport noise in particular, DNL and CNEL projections have two principal functions:

- To provide a quantitative basis for assessing land use compatibility with aircraft noise exposure.
- To provide a means for determining the significance of changes in noise exposure that might result from changes in airport layout, operations, or activity levels.

Both these functions require application of objective criteria. Government agencies dealing with environmental noise have devoted significant attention to this issue, and have developed noise / land use compatibility guidelines to help federal, state, and local officials with this evaluation process.

The degree of annoyance people experience from aircraft noise varies depending on their activities and physical location at any given time. For example, people are usually less disturbed by aircraft noise when they are shopping, working, or driving than when they are at home. Similarly, hotel and motel guests are generally less sensitive to noise exposure than are permanent residents of the same geographic area, with identical or similar noise exposure. The concept of “land use compatibility” has arisen from this type of systematic variation in reaction to noise.

While the federal government, through the FAA, has preempted control of aircraft noise at the source (i.e., certification of aircraft for operation in the U.S.), the federal government defers to local land use jurisdictions to determine formal compatibility standards and any associated regulations. Therefore, FAA presents compatibility *guidelines* in Part 150. Section 5.2.1 presents those guidelines. Section 5.2.2 summarizes formal California standards, and Section 5.2.3 presents LAWA-adopted standards.

FAA Guidelines

Part 161 includes the following guidance regarding “noise description methods:”⁵

“The sound level at an airport and surrounding areas, and the exposure of individuals to noise resulting from operations at an airport, must be established in accordance with the specifications and methods prescribed under Appendix A of 14 C.F.R. part 150.”

Part 150 Appendix A states “[t]he yearly day-night average sound level (YDNL) must be employed for the analysis and characterization of multiple aircraft noise events and for determining the cumulative exposure of individuals to noise around airports”⁶ and sets forth FAA-recommended guidelines for noise land use compatibility, based on DNL. Table I-1 reproduces these guidelines.

The FAA’s Part 150 guidelines represent a compilation of the results of scientific research into noise-related activity interference and attitudinal response. The guidelines indicate that all uses normally are compatible with aircraft noise at exposure levels below 65 dB DNL. This limit is

⁴ Appendix G of this report introduces DNL, CNEL, and other noise terminology used in this report.

⁵ *Ibid.*, § 161.9(a), “Designation of noise description methods.”

⁶ *Ibid.*, § A150.3 “Noise descriptors,” paragraph (b) “Airport Noise Exposure.”

supported in a formal way by standards adopted by the U. S. Department of Housing and Urban Development (HUD). The HUD standards set forth in 24 C.F.R. Part 51, "Environmental Criteria and Standards", §103, define areas with exterior DNL exposure not exceeding 65 dB as acceptable. Areas exposed to noise levels between 65 dB and 75 dB DNL are "normally unacceptable," and require special abatement measures and review. Those at 75 dB and above are "unacceptable" except under very limited circumstances. HUD assistance, subsidy, or insurance "for the construction of new noise sensitive uses is prohibited generally for projects with unacceptable noise exposures and is discouraged for projects with normally unacceptable noise exposure".⁷

⁷ Title 24 C.F.R. Part 51, "Environmental Criteria and Standards", § 51.101, (a)(3). 44 FR 40861, July 12, 1979, as amended at 50 FR 9268, Mar. 7, 1985, 61 FR 13333, Mar. 26, 1996.

Table I-1 FAA Noise / Land-Use Compatibility Guidelines
 Source: 14 C.F.R. Part 150, Airport Noise Compatibility Planning, Appendix A, Table 1.

Land Use	Yearly Day-Night Average Sound Level, Ldn, in Decibels (Key and notes on following page)					
	<65	65-70	70-75	75-80	80-85	>85
<i>Residential Use</i>						
Residential other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home park	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
<i>Public Use</i>						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
<i>Commercial Use</i>						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail- building materials, hardware, and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade-general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
<i>Manufacturing and Production</i>						
Manufacturing general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
<i>Recreational</i>						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	Y	Y	Y
Golf courses, riding stables, water recreation	Y	Y	25	30	N	N

Key to Table I-1	
Y(Yes)	Land use and related structures compatible without restrictions.
N(No)	Land use and related structures are not compatible and should be prohibited.
NLR	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, or 35	Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

Notes for Table I-1	
<p>The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.</p>	
<p>(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.</p>	
<p>(2) Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.</p>	
<p>(3) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.</p>	
<p>(4) Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.</p>	
<p>(5) Land use compatible provided special sound reinforcement systems are installed.</p>	
<p>(6) Residential buildings require an NLR of 25.</p>	
<p>(7) Residential buildings require an NLR of 30.</p>	
<p>(8) Residential buildings not permitted.</p>	

California Department of Transportation Division of Aeronautics Noise Standards

The State of California has established airport noise standards and land use planning guidelines that fall under the jurisdiction of the California Department of Transportation Division of Aeronautics (Caltrans) and the Los Angeles County Airport Land Use Commission.

Caltrans Division of Aeronautics Noise Standards

For airport noise studies, the California Department of Transportation Division of Aeronautics (Caltrans) has adopted noise standards that require airports to describe cumulative exposure in terms of CNEL. Those standards state, in part:⁸

The following rules and regulations are promulgated in accordance with Article 3, Chapter 4, Part 1, Division 9, Public Utilities Code (Regulation of Airports) to provide noise standards governing the operation of aircraft and aircraft engines for all airports operating under a valid permit issued by the Department of Transportation. These standards are based upon two separate legal grounds: (1) the power of airport proprietors to impose noise ceilings and other limitations on the use of the airport, and (2) the power of the state to act to an extent not prohibited by federal law. The regulations are designed to cause the airport proprietor, aircraft operator, local governments, pilots, and the department to work cooperatively to diminish noise problems. The regulations accomplish these ends by controlling and reducing the noise impact area in communities in the vicinity of airports.⁹

The level of noise acceptable to a reasonable person residing in the vicinity of an airport is established as a CNEL value of 65 dB for purposes of these regulations. This criterion level has been chosen for reasonable persons residing in urban residential areas where houses are of typical California construction and may have windows partially open. It has been selected with reference to speech, sleep, and community reaction.¹⁰

The Division of Aeronautics noise standards further define land uses that are incompatible with aircraft noise as follow:¹¹

- Residences, including but not limited to, detached single-family dwellings, multi-family dwellings, high-rise apartments, condominiums and mobile homes, unless:
 - an aviation easement for aircraft noise has been acquired by the airport proprietor;
 - the dwelling unit was in existence at the same location prior to January 1, 1989, and has adequate acoustic insulation to ensure an interior CNEL due to aircraft noise of 45 dB or less in all habitable rooms. However, acoustic treatment alone does not convert residences having an exterior CNEL of 75 dB or greater due to aircraft noise to a compatible land use if the residence has an exterior normally occupiable private habitable area such as a backyard, patio or balcony;
 - the residence is a high rise apartment or condominium having an interior CNEL of 45 dB or less in all habitable rooms due to aircraft noise, and an air circulation or air conditioning system, as appropriate;
 - the airport proprietor has made a genuine effort as determined by the department in accordance with adopted land use compatibility plans and appropriate laws and regulations to acoustically treat residences exposed to an exterior CNEL less than 80 dB (75 dB if the residence has an exterior normally occupiable private

⁸ California Code of Regulations (CCR). 1990. Title 21, Subchapter 6, Noise Standards. Register 90. No. 10, 3/10/90. California Division of Aeronautics, Department of Transportation. Sacramento, CA.

⁹ Ibid., §5000, "Preamble," p. 219.

¹⁰ Ibid., §5006, "Findings," p. 224.

¹¹ Ibid., §5014, "Incompatible Land Uses within the Noise Impact Boundary, p. 225–226.

habitable area such as a backyard, patio, or balcony) or acquire avigation easements, or both, for the residences involved, but the property owners have refused to take part in the program; or

- the residence is owned by the airport proprietor.
- Public and private schools of standard construction for which an avigation easement for noise has not been acquired by the airport proprietor, or that do not have adequate acoustic performance to ensure an interior CNEL of 45 dB or less in all classrooms due to aircraft noise;
- Hospitals and convalescent homes for which an avigation easement for noise has not been acquired by the airport proprietor, or that do not have adequate acoustic performance to provide an interior CNEL of 45 dB or less due to aircraft noise in all rooms used for patient care; and
- Churches, synagogues, temples, and other places of worship for which an avigation easement for noise has not been acquired by the airport proprietor, or that do not have adequate acoustic performance to ensure an interior CNEL of 45 dB or less due to aircraft noise.

The regulation sets the following “Airport Noise Standard,” which establishes a requirement related to addressing airport noise impacts that is far more specific and stringent than faced by airport proprietors in any other state:¹²

- The standard for the acceptable level of aircraft noise for persons living in the vicinity of airports is hereby established to be a community noise equivalent level of 65 decibels. This standard forms the basis for the following limitation.
- No airport proprietor of a noise problem airport shall operate an airport with a noise impact area based on the standard of 65 dB CNEL unless the operator has applied for or received a variance as prescribed in Article 5 of this subchapter.

The Division of Aeronautics noise standards include a provision stating that “[a]ny county may, at any time, in accordance with the procedure herein, declare any airport within its boundaries to have a noise problem, by adopting a resolution to this effect and forwarding it to this department.”¹³ LAX is one of ten airports that county governments have designated as “noise problem airports.”¹⁴ This finding is directly relevant to a specific Part 161 requirement for a restriction on Stage 3 aircraft: “Evidence that a current or projected noise problem exists and that the proposed action could relieve the problem.”¹⁵ From a very formal standpoint, by designating LAX a problem airport, Los Angeles County has officially declared that a noise problem exists at LAX.

¹² Ibid., §5012, “Airport Noise Standard,” p. 225.

¹³ Ibid., §5020, “Designating Noise Problem Airport.” § 5001(n) provides the following related definition: “Noise Problem Airport: ‘Noise problem airport’ is an airport that the county in which the airport is located has declared to have a noise problem under section 5020.”

¹⁴ The other nine airports are: Bob Hope Airport, John Wayne Airport-Orange County, Long Beach-Daugherty Field-Airport, Metropolitan Oakland International Airport, Norman Y. Mineta-San Jose International Airport, Ontario International Airport, San Diego International Airport, San Francisco International Airport, and Van Nuys Airport.

¹⁵ Op cit., §161.305(e)(2)(i)(A).

California Airport Land Use Commission Regulations

With limited exceptions, California state statutes require each county in the state to establish an airport land use commission (ALUC). The statutes specify that the Regional Planning Commission will fill the ALUC role in Los Angeles County.¹⁶ In practice, the commission refers to itself as the ALUC when addressing airport land use compatibility matters. The commission has published a document that defines review procedures and other implementation policies.¹⁷ That document states that:

[T]he fundamental purpose of ALUCs to promote land use compatibility around airports has remained unchanged. As expressed in the present statutes, this purpose is:

“...to protect public health, safety, and welfare by ensuring the orderly expansion of airports and the adoption of land use measures that minimize the public’s exposure to excessive noise and safety hazards within areas around public airports to the extent that these areas are not already devoted to incompatible uses.”

The statutes give ALUCs two principal powers by which to accomplish this objective. First, ALUCs must prepare and adopt an airport land use compatibility plan [ALUCP]. Secondly, they must review the plans, regulations, and other actions of local agencies and airport operators for consistency with that plan.

The procedures document calls out two limitations on ALUCs’ powers: “Specifically, ALUCs have no authority over existing land uses (Section 21674(a)) or over the operation of airports (Section 21674(e)).”¹⁸

The commission last revised the Los Angeles County ALUCP on December 1, 2004.¹⁹ The ALUCP includes the following “policies related to noise:”

- N-1 Use the Community Noise Equivalent Level (CNEL) method for measuring noise impacts near airports in determining suitability for various types of land uses.
- N-2 Require sound insulation to insure a maximum interior 45 db [sic] CNEL in new residential, educational, and health-related uses in areas subject to exterior noise levels of 65 CNEL or greater.
- N-3 Utilize the Table Listing Land Use Compatibility for Airport Noise Environments in evaluating projects within the planning boundaries.
- N-4 Encourage local agencies to adopt procedures to ensure that prospective property owners in aircraft noise exposure areas above a current or anticipated 60 db [sic] CNEL

¹⁶ Ibid. § 21670.2.

¹⁷ “Los Angeles County Airport Land Use Commission Review Procedures,” prepared by the Los Angeles County Department of Regional Planning, December 2004, available on line at http://planning.lacounty.gov/assets/upl/project/aluc_review-procedures.pdf


¹⁸ Ibid.

¹⁹ “Los Angeles County Airport Land Use Commission Comprehensive Land Use Plan,” prepared by the Department of Regional Planning, adopted December 19, 1991, revised December 1, 2004, available on line at http://planning.lacounty.gov/assets/upl/data/pd_alup.pdf

are informed of those noise levels and of any land use restrictions associated with high noise exposure

Table I-2 reproduces the land use compatibility table to which policy N-3 refers.

Table I-2 Los Angeles County Land Use Compatibility for Airport Noise Environments
 Source: Los Angeles County Airport Land Use Compatibility Plan, prepared by the Los Angeles County Department of Regional Planning, Revised December 1, 2004

LAND USE COMPATIBILITY TABLE						
	<i>Satisfactory</i>					
	<i>Caution. Review Noise Insulation Needs</i>					
<i>Land Use Category</i>	<i>Community Noise Exposure</i>					
	55	60	65	70	75	
<i>Residential</i>						
<i>Educational Facilities</i>						
<i>Commercial</i>						
<i>Industrial</i>						
<i>Agriculture</i>						
<i>Recreation</i>						

Note: Consider FAR Part 150 for commercial and recreational uses above the 75 CNEL.

Los Angeles Land Use Compatibility Standards

In the 1984 Part 150 submission for LAX to the FAA, the City of Los Angeles officially adopted the FAA Part 150 guidelines as the basis for determining the compatibility of surrounding land uses with noise exposure associated with operations at the airport, with the exception that annual noise exposure was presented in terms of CNEL, rather than DNL, for consistency with state statutes setting airport noise standards and land use planning guidelines, as discussed in Section 5.2.2.1.

Since this is the City's most formal statement of noise/land use compatibility for federal purposes, the FAA Part 150 guidelines for compatibility planning will also apply to this Part 161 effort.

Based on the clearly defined and consistently applied statewide requirement to use CNEL, the FAA considers CNEL to be the functional equivalent of DNL, for Part 150 and other federal environmental studies conducted in California, and accepts application of Part 150 land use compatibility guidelines to CNEL values, without adjustment for the normally minor differences between CNEL and DNL.

Table I-1, previously shown, presents the LAWA-adopted land use compatibility standards, in terms of CNEL, that were used to determine land use compatibility in this Part 161 Study.

These standards are consistent with the Caltrans airport noise standards and the Los Angeles ALUCP land use compatibility policies.

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