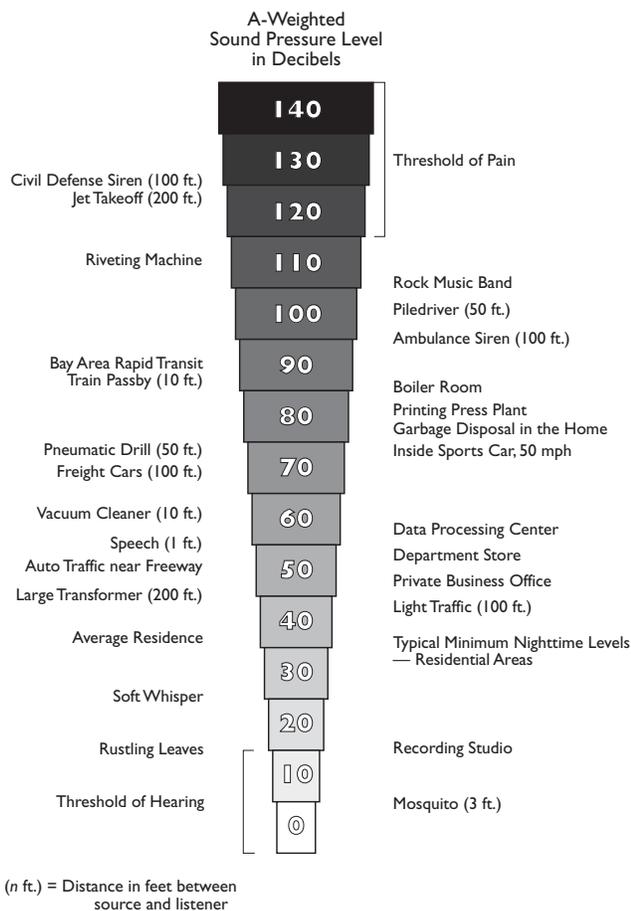




Noises are undesirable or unwanted sounds that vary widely in their scope, source, and volume. They range from individual occurrences such as a leaf blower or holiday firecrackers, to regular though intermittent disturbance by aircraft flying overhead, or an infrequent train going through town, to the fairly constant noise generated by traffic on freeways. Noise is primarily a concern with regard to noise—sensitive land uses such as residences, schools, churches, and hospitals.

This chapter identifies the noise sources that exist within the city, describes noise impacts that may result from the General Plan, and establishes policies to mitigate potential impacts through both preventative and responsive actions.



## 9.1 NOISE MEASUREMENT AND REPORTING

### Noise Measurement

Three aspects of noise are used in assessing the community noise environment:

1. **Level** is the magnitude or loudness of sound. Sound levels are measured and expressed in decibels (dB). Ten dB is roughly equal to the threshold of hearing. The graphic at left shows the decibel levels associated with different common sounds.
2. **Frequency** is the composition or spectrum of a sound. Frequency is a measure of the pressure fluctuations per second.
3. **Variation** is sound level with an added time component. Most community noise is produced by many distant noise sources that change gradually throughout the day and result in steady background noise with no identifiable source. Identifiable events of brief duration, such as aircraft flyovers, cause the community noise level to vary from instant to instant. A single number called the equivalent sound level (Leq) describes the average noise exposure level over a period of time. Transient noise events may be described by their maximum (Lmax) A-weighted noise level (dBA).



Noises are produced by a variety of sources, including construction equipment and industrial activities.

## Reporting Noise Levels

Measuring and reporting noise levels involves accounting for variations in sensitivity to noise during the daytime versus nighttime hours. Noise descriptors used for analysis need to account for human sensitivity to nighttime noise. Background noise levels are generally lower at nighttime than in the daytime and outside noise intrusions are more noticeable. The Community Noise Equivalent Level (CNEL) is an indicator that reflects noise exposure over an average day with weighting to reflect the increased sensitivity to noise at night.

Knowledge of the following relationships is helpful in understanding how changes in noise and noise exposure are perceived:

- Except under special conditions, a change in sound level of one dB cannot be perceived;
- A three dB change is considered a just noticeable difference;
- A five dB change is required before any noticeable change in community response would be expected. A five dB increase is often considered a significant impact; and
- A ten dB increase is subjectively heard as an approximate doubling in loudness and almost always causes an adverse community response.

## 9.2 EXISTING NOISE SOURCES AND LEVELS

Noise sources in Lodi generally fall into six source categories: traffic, railroad, airport, industry, construction, and equipment. Generalized noise contours that resulted from data collection and analysis are presented in Figure 9-1.

Noise contour lines are not specific boundaries of noise tolerance. A contour line denoting a 65 dBA limit, for example, does not imply that residents on one side of the line are seriously affected, while those on the other side are not. Rather, the area between 75 dBA and 65 dBA indicates that residents within this vicinity may experience a high level of noise which has the potential to interfere with daily functions.

### Community Noise Survey

A community noise survey was conducted in May 2007 at five locations throughout the Planning Area to characterize typical noise levels. The results of this survey are provided in Table 9-1. The highest maximum noise level from this sample was recorded at the intersection of Grant Avenue and Turner Road. All of the maximum values were recorded above 70 db, suggesting intermittent noise levels that could be disturbing to persons in the vicinity of the noise source. The highest average noise level was recorded at Kettleman Lane and Crescent Avenue and was one of only two locations reporting a Leq greater than 65 dBA, which suggests noise levels that may be disturbing to persons in the vicinity.

This survey provides an indication of some typical noise levels that may be found in Lodi and helps to establish relevant noise standards established by General Plan policies and the City's existing noise regulations. The following section explores the sources of noise in Lodi.

## Existing Noise Sources

### Traffic

As in most typical urbanized areas, the most pervasive noise sources in Lodi come from motor vehicles, including automobiles, trucks, buses, and motorcycles. The noise levels generated from vehicles using roads within the Planning Area are affected primarily by the number of vehicles, type of vehicles (mix of automobiles, trucks, and other large vehicles), and their speed.

The existing traffic noise level contours and distances from the center of the roadways to the respective contours were computed using the Federal Highway Administration (FHWA) Traffic Noise Prediction Model.<sup>1</sup> The highest noise levels are adjacent to larger and more heavily traveled roadways including State Route (SR) 99. Noise levels that would affect noise sensitive land uses, such as residences, schools, and hospitals, also occur along major arterials, including Cherokee Lane, Lodi Avenue, and Kettleman Lane/SR-99.

### Railroad

Several factors combine to produce railroad noises, including length of train, speed, grade, type of track, number of engines, and number of trips. Railroad noise primarily occurs from existing operations along the Union Pacific Railroad (UPRR) line, which generally runs north-south through the Planning Area. The noise level contours were estimated from the center line of the railroad. At 60 feet from the railroad, the noise level is approximately 65 dBA. At 200 feet from the railroad, the noise level is approximately 60 dBA.<sup>2</sup> Notably, these noise levels do not take into account potential shielding from existing buildings. Buildings could increase the rate of attenuation over distance, depending on the specific three-dimensional configuration and layout of the buildings.

### Airport

The greatest potential for noise intrusion occurs when aircraft land, take off, or run their engines while on the ground. The noise associated with general aviation propeller aircraft (piston and turbo-prop) is produced primarily by the propellers and secondarily from the engine and exhaust.

**TABLE 9-1: SHORT-TERM COMMUNITY NOISE MEASUREMENTS FOR THE PLANNING AREA**

LOCATION	2007 MEASURED SOUND LEVELS		
	TIME	LEQ(DBA)	LMAX
Grant Avenue & Turner Road	12:38 to 12:48	65.5	81.7
Kettleman Lane & Crescent Avenue	10:26 to 10:36	66.6	79.4
Lower Sacramento Road & Lodi Avenue	12:08 to 12:18	61.4	78.5
Stockton Street & John Blakely Park	11:03 to 11:13	58.7	72.5
Tokay Street & Virginia Avenue	11:37 to 11:47	56.0	71.0

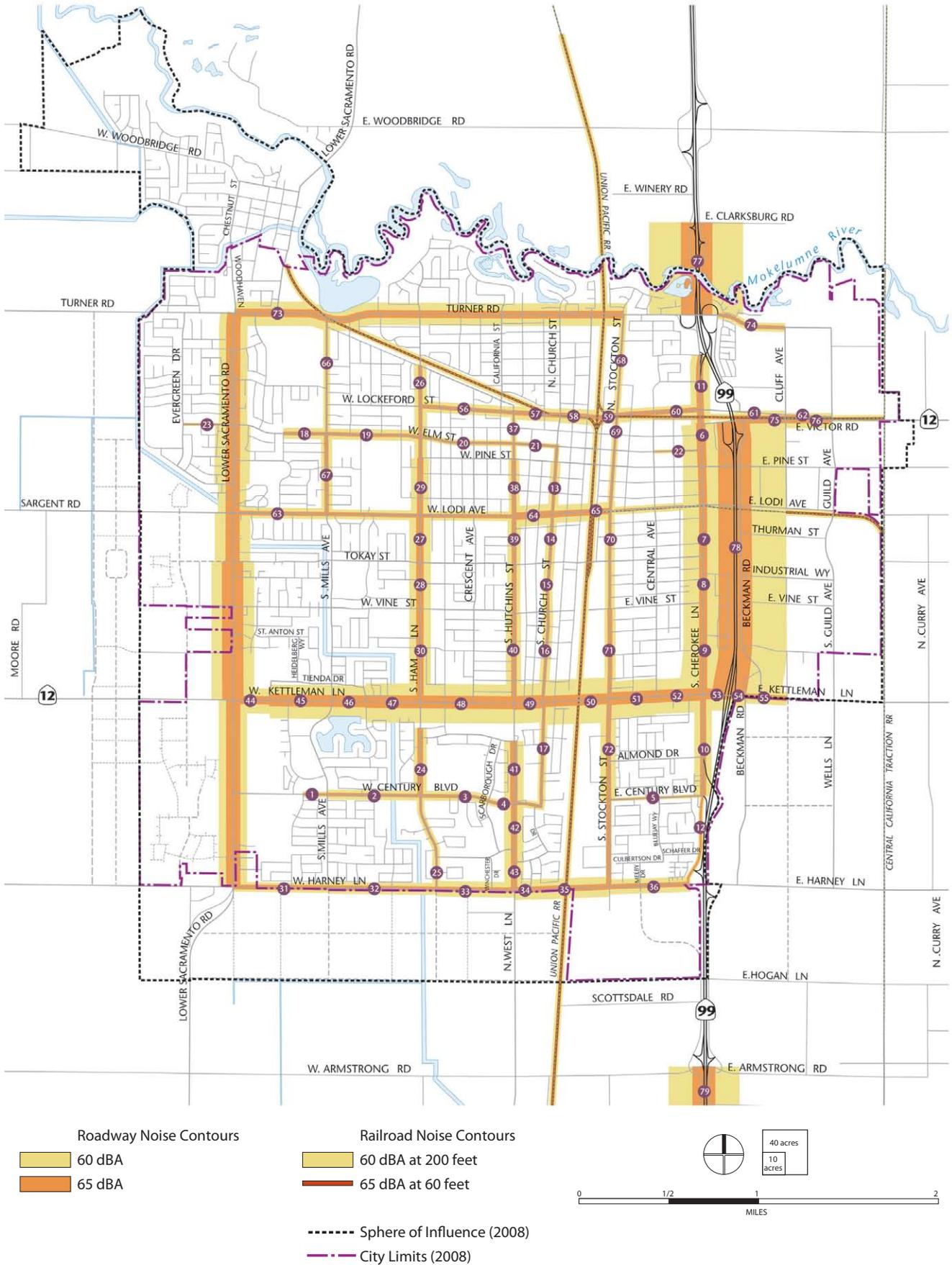
Measurements were taken 50 feet from the center of the roadway.

Source: ESA, 2007.

<sup>1</sup> The model uses traffic volume, vehicle mix, vehicle speed, and roadway geometry to compute Leq. The Leq values were converted into CNEL using FHWA methodology. The traffic volumes are based on traffic data more fully described in Chapter 5: Transportation.

<sup>2</sup> In order to assess the existing UPRR noise levels and develop noise contours along the railroad in the City of Lodi, one long-term (7-hour) measurement was collected. The Ldn from the measurement located 50 feet from the center of the railroad off of Harney lane was estimated to be 66 dBA. This measurement data, as well as an assumed attenuation rate of 3 dBA for every doubling of distance from the railroad, were used to develop the noise level contours.

**FIGURE 9-1: EXISTING NOISE CONTOURS**



Aircraft noise affecting the Planning Area is primarily generated by from the Kingdon and Lodi airparks. Both of these airparks lie outside this General Plan’s proposed urban area and are not considered substantial noise sources. The Kingdon Airpark is located about seven miles southwest of the city. This airpark is privately owned and accommodates small twin-engine airplanes and other small general aviation aircraft. Its primary use is for agricultural activities. The Lodi Airpark is located five miles southwest of the city. The facility is owned by an agricultural service firm and accommodates only small light aircraft. Noise contours developed for these two airports (not shown) report minimal noise impacts—less than 65db.

### **Industrial**

Industrial uses are another source of noise that can have a varying impact on adjacent uses. A variety of mechanical equipment, generators, and vehicles all contribute to noise levels at industrial sites.

### **Construction**

Construction can be another substantial, although typically short-term, source of noise. Construction is most disruptive when it takes place near sensitive land uses, or occurs at night or in early morning hours. The dominant construction equipment noise source is usually a diesel engine without sufficient muffling. In a few cases, such as impact pile driving or pavement breaking, process noise dominates.

### **Other Equipment**

Several other portable or small-scale pieces of equipment may also produce noise effects. Mechanical equipment, such as pumps and fans may produce low noise levels, but continuously and for substantial distances. Rooftop or otherwise exposed mechanical equipment can also produce constant and disturbing noises. Portable power equipment, such as leaf blowers and drills, is ubiquitous in the modern city, and can produce very high noise levels at the location of the work. Other amplified sounds, from automotive audio equipment or loudspeakers also create noise exposure.

## **9.3 PROJECTED NOISE SOURCES AND LEVELS**

Future development within the Planning Area will result in increased noise levels. The primary noise sources in Lodi will continue to come from automobile and train traffic. Future noise contours are illustrated in Figure 9-2.

Potential increases in noise levels were estimated using the FHWA’s Highway Traffic Noise Prediction Model and the traffic analysis completed as part of this Plan’s Transportation Element. Noise level increases of three db or greater (the threshold for perceptible noise increases) are predicted along the following three streets:

- Century Boulevard, between Lower Sacramento Road and Church Street;
- Harney Lane, between Lower Sacramento Road and Cherokee Lane; and
- Kettleman Lane, between Lower Sacramento Road and Lakeshore Drive.

The actual level of impact would depend on the presence and location of any existing or proposed land uses or barriers in relation to the noise source. The General Plan seeks to reduce noise levels at the source through mitigation policies and reduce the impact on sensitive receptors.



## 9.4 NOISE EXPOSURE STANDARDS

State standards, and City standards established in this General Plan, are designed to protect community members and sensitive uses from noise hazards and establish criteria to mitigate noise-generating development.

### State Regulations

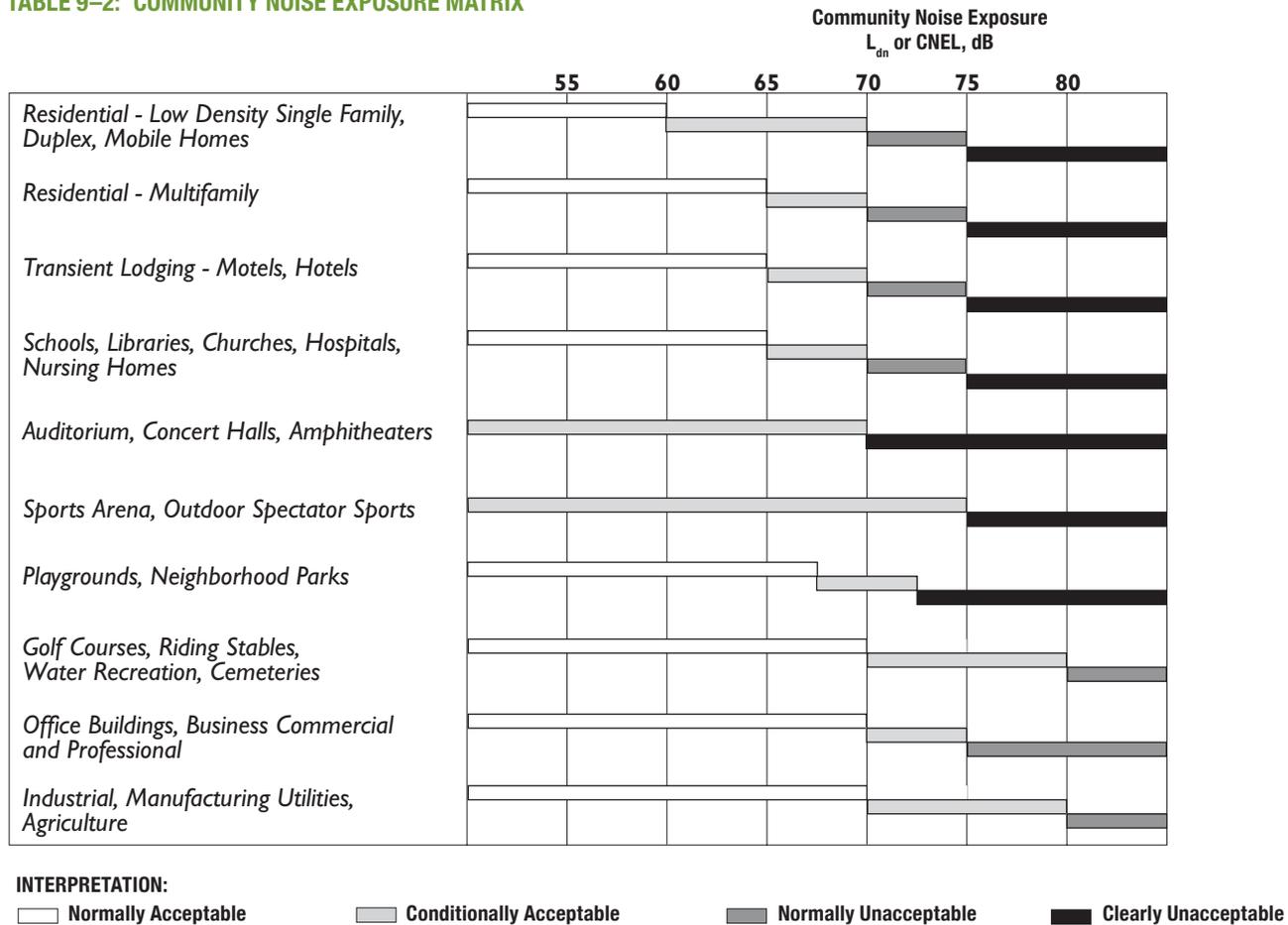
Title 24 of the California Code of Regulations, the Building Standards Administrative Code, contains the State Noise Insulation Standards, which specify interior noise standards for new hotels, motels, apartment houses, and dwellings other than single-family homes. Such new structures must be designed to reduce

outdoor noise to an interior level of no more than 45 dB in any habitable room. They require an acoustical analysis demonstrating how dwelling units have been designed to meet this interior standard where such units are proposed in areas subject to noise levels greater than 60 dB. Title 24 standards are enforced through the building permit application process.

### City of Lodi Noise Standards

General Plan noise standards are shown in Table 9-2 and Table 9-3. In addition, the City's Noise Ordinance (Chapter 9.24 of the Municipal Code) contains general standards for evaluating noise violations.

**TABLE 9-2: COMMUNITY NOISE EXPOSURE MATRIX**



## Community Noise Exposure

Table 9-2 presents the community noise exposure matrix, which explains the compatibility of land uses at various noise levels and offers criteria which the City can use to evaluate land use decisions. This matrix is adapted and slightly modified from the Office of Noise Control in the State Department of Health Services guidelines for local governments to use when setting standards for human exposure to noise and preparing noise elements for general plans. The State indicates that locating housing units in areas where exterior ambient noise levels exceed 65 dBA is undesirable.

To regulate noise exposure levels, land uses are classified as being either “normally acceptable”, “conditionally acceptable,” “normally unacceptable,” or “clearly unacceptable” as defined below.

### *Normally Acceptable*

- **Indoor Uses:** Either the activities associated with the land use are inherently noisy or standard construction methods will sufficiently attenuate exterior noise to an acceptable level. For land use types that are compatible because of inherent noise levels, sound attenuation must be provided for associated office, retail, and other noise-sensitive indoor spaces to reduce exterior noise to an interior maximum of 50 dB CNEL.
- **Outdoor Uses:** Outdoor activities associated with the land use may be carried out with minimal interference.

### *Conditionally Acceptable*

- **Indoor Uses:** Noise reduction measures must be incorporated into the design of the project to attenuate exterior noise to the indoor noise levels listed in Table 9-3.
- **Outdoor Uses:** Noise reduction measures must be incorporated into the design of the project to attenuate exterior noise to the outdoor noise levels listed in Table 9-3. Acceptability is dependent upon characteristics of the specific use.

### *Normally Unacceptable*

- **Indoor Uses:** Extensive mitigation techniques are required to make the indoor environment acceptable for indoor activities. Noise level reductions necessary to attenuate exterior noise to the indoor noise levels listed in Table 9-3 are difficult to achieve and may not be feasible.
- **Outdoor Uses:** Severe noise interference makes the outdoor environment unacceptable for outdoor activities. Noise level reductions necessary to attenuate exterior noise to the outdoor noise levels listed in Table 9-3 are difficult to achieve and may not be feasible.

### *Clearly Unacceptable*

- New construction or development should generally not be undertaken.

## Allowable Noise Exposure

Table 9-3 indicates acceptable limits of noise for various land uses for both exterior and interior environments. These limits are based on guidelines provided by the California Office of Planning and Research.

**TABLE 9-3: ALLOWABLE NOISE EXPOSURE, OUTDOOR AND INTERIOR**

LAND USE	OUTDOOR ACTIVITY AREAS <sup>1</sup> (CNEL)	INTERIOR AREAS (CNEL)
Residential	60	45
Motels, Hotels	60	45
Public/Semi-Public	65	45
Recreational	65	50
Commercial	65	50
Industrial	70	65

1. For non-residential uses, where an outdoor activity area is not proposed, the standard does not apply.

## 9.5 POLICIES

### GUIDING POLICIES

- N-G1** Protect humans, the natural environment, and property from manmade hazards due to excessive noise exposure.
- N-G2** Protect sensitive uses, including schools, hospitals, and senior care facilities, from excessive noise.

### IMPLEMENTING POLICIES

- N-P1** Control and mitigate noise at the source where feasible, as opposed to at the receptor end.
- N-P2** Encourage the control of noise through site design, building design, landscaping, hours of operation, and other techniques for new development deemed to be noise generators.
- N-P3** Use the noise and land use compatibility matrix (Table 9-2) and allowable noise exposure levels (Table 9-3) as review criteria for all new land uses. Incorporate noise attenuation measures for all projects that have noise exposure levels of “conditionally acceptable” and higher. These may include:
  - Façades constructed with substantial weight and insulation;
  - Sound-rated windows in habitable rooms;
  - Sound-rated doors in all exterior entries;
  - Active cancellation;
  - Acoustic baffling of vents for chimneys, fans and gable ends;
  - Ventilation system affording comfort under closed-window conditions; and
  - Double doors and heavy roofs with ceilings of two layers of gypsum board on resilient channels to meet the highest noise level reduction requirements.
- N-P4** Discourage noise sensitive uses such as residences, hospitals, schools, libraries, and rest homes from locating in areas with noise levels above 65db. Conversely, do

not permit new uses likely to produce high levels of noise (above 65db) from locating in or adjacent to areas with existing or planned noise-sensitive uses.

- N-P5** Noise sensitive uses, such as residences, hospitals, schools, libraries, and rest homes, proposed in areas that have noise exposure levels of “conditionally acceptable” and higher must complete an acoustical study, prepared by a professional acoustic engineer. This study should specify the appropriate noise mitigation features to be included in the design and construction of these uses, to achieve interior noise levels consistent with Table 9-3.
- N-P6** Where substantial traffic noise increases (to above 70db) are expected, such as on Lower Sacramento Road or Harney Lane, as shown on the accompanying graphic, require a minimum 12-foot setback for noise-sensitive land uses, such as residences, hospitals, schools, libraries, and rest homes.



Minimum setback of 12 feet for noise-sensitive land uses.

- N-P7** Require developers of potentially noise-generating new developments to mitigate the noise impacts on adjacent properties as a condition of permit approval. This should be achieved through appropriate means, such as:
  - Dampening or actively canceling noise sources;
  - Increasing setbacks for noise sources from adjacent dwellings;
  - Using soundproofing materials and double-glazed windows;
  - Screening and controlling noise sources, such as parking and loading

facilities, outdoor activities, and mechanical equipment;

- Using open space, building orientation and design, landscaping and running water to mask sounds; and
- Controlling hours of operation, including deliveries and trash pickup.

construction methods such as insulation, soundproofing, staggered studs, double drywall layers, and double walls.

**N-P8** Update Noise Ordinance regulations to address allowed days and hours of construction, types of work, construction equipment (including noise and distance thresholds), notification of neighbors, and sound attenuation devices.

**N-P9** Develop and implement noise reduction measures when undertaking improvements, extensions, or design changes to City streets where feasible and appropriate.

**N-P10** Encourage transit agencies and rail companies to develop and apply noise reduction technologies for their vehicles to reduce the noise and vibration impacts of bus and rail traffic.

**N-P11** Coordinate with the California Public Utilities Commission and other pertinent agencies and stakeholders to determine the feasibility of development a railroad “quiet zone” in downtown, which would prohibit trains from sounding their horns.

**N-P12** Restrict the use of sound walls as a noise attenuation method to sites adjacent to State Route (SR) 99, the railroad, and industrial uses east of SR-99.

**N-P13** Ensure that new equipment and vehicles purchased by the City of Lodi are equipped with the best available noise reduction technology.

**N-P14** Reduce vibration impacts on noise-sensitive land uses (such as residences, hospitals, schools, libraries, and rest homes) adjacent to the railroad, SR-99, expressways, and near noise-generating industrial uses. This may be achieved through site planning, setbacks, and vibration-reduction

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