9 Noise

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.

This chapter identifies the noise sources that exist within the study Area, describes noise impacts that may result from the General Plan, and establishes policies to mitigate potential impacts through both preventative and responsive actions. The regulation of noise sources such as traffic, railroad operations and aircraft operations is overseen by state and federal agencies; therefore, this element has a direct correlation with the land use, circulation, and housing elements. It guides the location of industrial land uses and transportation facilities, since they are common sources of excessive noise levels. This element also guides the location of particularly noise–sensitive uses, such as residences, schools, churches, and hospitals, so that they may be less affected by noise.

Roadway traffic is a common source of noise in urban environments.

9.1 NOISE CHARACTERISTICS AND MEASUREMENT

NOISE MEASUREMENT

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

- **Level** is the magnitude or loudness of sound. Sound levels are measured and expressed in decibels (dB) with 10 dB roughly equal to the threshold of hearing. The accompanying graphic shows the decibel levels associated with different common sounds.
- **Frequency** is the composition or spectrum of the sound. Frequency is a measure of the pressure fluctuations per second.
- **Variation** is sound level over time. 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

Figure 9-1: Typical Sound Levels

may be described by their maximum noise level (Lmax), measured in decibels "A-weighted" to correct for the frequency response of the human ear (dBA).

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 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 1 dB cannot be perceived;
- A 3 dB change is considered a just noticeable difference;
- A 5 dB change is required before any noticeable change in community response would be expected. A 5 dB increase is often considered a significant impact; and
- A 10 dB increase is subjectively heard as an approximate doubling in loudness and almost always causes an adverse community response.

In establishing noise contours for land use planning, it is customary to ignore noise attenuation afforded by buildings, roadway elevations, and depressions, and to minimize the barrier effect of natural terrain features. The result is a worst-case estimate of the existing and future (projected) noise environment. The purpose of noise contours is to identify the potential need for more detailed acoustical studies, not to predict with certainty the noise level throughout the City. The assumption is that it is desirable to overestimate the potential noise at a future noisesensitive development site than to underestimate the noise environment and allow for potentially incompatible land use development.

9.2 NOISE GENERATION IN TURLOCK

The major noise sources in Turlock are related to roadways and vehicle traffic. Other noise sources include aircraft, rail transportation, industry, and equipment. Figure 9-2 maps existing noise contours. Figure 9-3 maps future noise contours, associated with full buildout of the General Plan. According to common practice, maximum noise levels of 60 dB are considered "normally acceptable" for unshielded residential development. Noise levels from 60 dB to 70 dB fall within the "conditionally unacceptable" range, and those in the 70 to 75 dB range are considered "normally unacceptable."

TRAFFIC

Motor vehicles, including automobiles, trucks, buses, and motorcycles, are the most pervasive source of noise in the Planning Area. The level of vehicle-generated noise is related to the volume of vehicles, the speed of traffic, and the number trucks in the flow of traffic. Vehicle noise is a combination of the noises produced by the engine, exhaust, tires, and wind generated by taller vehicles. Other factors that affect the perception of traffic noise include distance from the highway, terrain, vegetation, and natural and structural obstacles. While tire noise from autos is generally located at ground level, truck noise sources can be located as high as ten to fifteen feet above the roadbed due to tall exhaust stacks and higher engines. Noise exposure contours for Turlock's major roadways were modeled by applying the Federal Highway Administration's noise modeling procedure. These noise contours are conservative, meaning that the contours are modeled with minimal noise attenuation by natural barriers and buildings.

The highest noise levels are along Highway 99, resulting in noise levels above 70 dB (normally unacceptable) in certain residential areas close to the highway. Noise levels above 65 dB are typical of residential areas somewhat further from Highway 99 and along the Golden State Boulevard corridor, as well as along stretches of several arterial or collector roads, including Monte Vista Avenue, Geer Road, Christoffersen Parkway, Fulkerth Road, Hawkeye Avenue, West Main Street, and Lander Avenue. Much of the City between Highway 99 and Golden State Boulevard, as well as parts of neighborhoods east of Golden State Boulevard and near arterial roads, have noise levels above 60 dB. These noise conditions may create impacts to sensitive receptors such as residences, schools, churches, and hospitals in many parts of Turlock.

RAILROAD

Railroad activity includes approximately 18 freight train operations per day along the Union Pacific Railroad (UPRR) track running northwest-southeast through the Planning Area parallel to Golden State Boulevard. A maximum of two local freight trains operate per day on the UPRR spur, which run parallel to Castor Street.

Several factors combine to produce railroad noises, including grade, type of track, length and speed of trains, number of engines, and number of trips. Because the railroad is directly parallel to Golden State Boulevard through most of the Planning Area and Highway 99 in the far north, noise from the railroad is mixed with traffic noise. Two long-term noise measurements were collected along the rail line. Both measurements, taken between Golf Road and F Street and just south of Pedras Road, respectively, found a DNL of 79 dB. Noise levels are assumed to attenuate at a rate of 3 dBA for every doubling of distance from the railroad. Because train noise only lasts a few minutes each time, it is considered less severe than traffic noise from high-volume roadways.

AIRPORT NOISE

There are no airports within the Study Area. Turlock Municipal Airport, approximately six miles east of the eastern edge of the Study Area, is a public General Aviation airport with a single runway and currently no commercial flights. Modesto City-County Airport, approximately seven miles northwest of the northern boundary of the Planning Area, is a primary commercial service airport with two runways.

The greatest potential for noise intrusion from airports occurs when aircraft land, take off, or run their engines while on the ground. Noise contours developed for these two airports (not shown) show noise levels elevated above 65 dB only in close proximity to the airports.

INDUSTRIAL ACTIVITY

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. The greatest potential for problems created by industrial noise arises when residential areas are affected. Most industrial expansion during the General Plan period will take place in the Westside Industrial Specific Plan area, which is separated from residences and other sensitive

noise receptors. However, industrial activities south of Downtown and in the South Golden State Boulevard corridor have the potential to affect some residential areas. Evening and nighttime operations at a number of industrial plants can make the problem worse.

CONSTRUCTION

Construction can be another substantial, though 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, however, such as impact pile driving or pavement breaking, process noise dominates.

OTHER EQUIPMENT

Other portable or small-scale pieces of equipment may also produce noise. 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, can produce very high noise levels at the location of the work. Other amplified sounds such as automotive audio equipment or loudspeakers also create noise exposure.

Existing and future noise levels along arterial roadways in Turlock were calculated using the FHWA's Highway Traffic Noise Prediction Model and traffic volume data collected for the General Plan. Future noise contours are illustrated in Figure 9-3. Future development within the Study Area will result in increased noise levels due primarily to automobile traffic. Generally, an increase of three decibels (dB) is barely perceptible. Noise increases along many Turlock roadways are expected to be perceptible, but relatively low:

- Noise along Highway 99 is projected to increase by 2 dB to 4 dB, as is noise along Hawkeye Avenue east of Berkeley Avenue;
- Noise along Golden State Boulevard, West Main Street, South Tegner Road, Countryside Drive, Olive Avenue, and Monte Vista Avenue east of Olive is projected to increase by 3 dB;

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

- Noise along Berkeley Avenue south of Canal Drive is projected to increase by 3 dB to 5 dB, along Daubenberger Road by 4 dB, and along Linwood Avenue east of South Tegner Road by 4 dB to 5 dB.
- Along Washington Road, Walnut Road, East Avenue, Fulkerth Road west of Highway 99, and Christofferson Parkway west of Olive Avenue, noise is projected to increase by 5 dB.

The most pronounced noise increases are projected along certain roadways, primarily those serving the new growth areas:

- Noise along portions of Golf Road may increase by up to 8 dB
- Along portions of Canal Drive, noise is projected to increase by between 4 and 10 dB
- Along Christofferson Parkway east of Olive, noise may increase by up to 11 dB
- Data for existing conditions along Verduga Road are not available. In the future, traffic noise along Verduga Road is projected to be DNL 71 dB to DNL 74 dB at a distance of 50 feet from the roadway centerline

The traffic model found a reduction in noise of between 1 and 5 dB along most of Taylor Road east of Highway 99, as more traffic is directed onto other roadways.

The actual level of impact will depend on the presence and location of 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.

9.3 NOISE EXPOSURE STANDARDS

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

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.

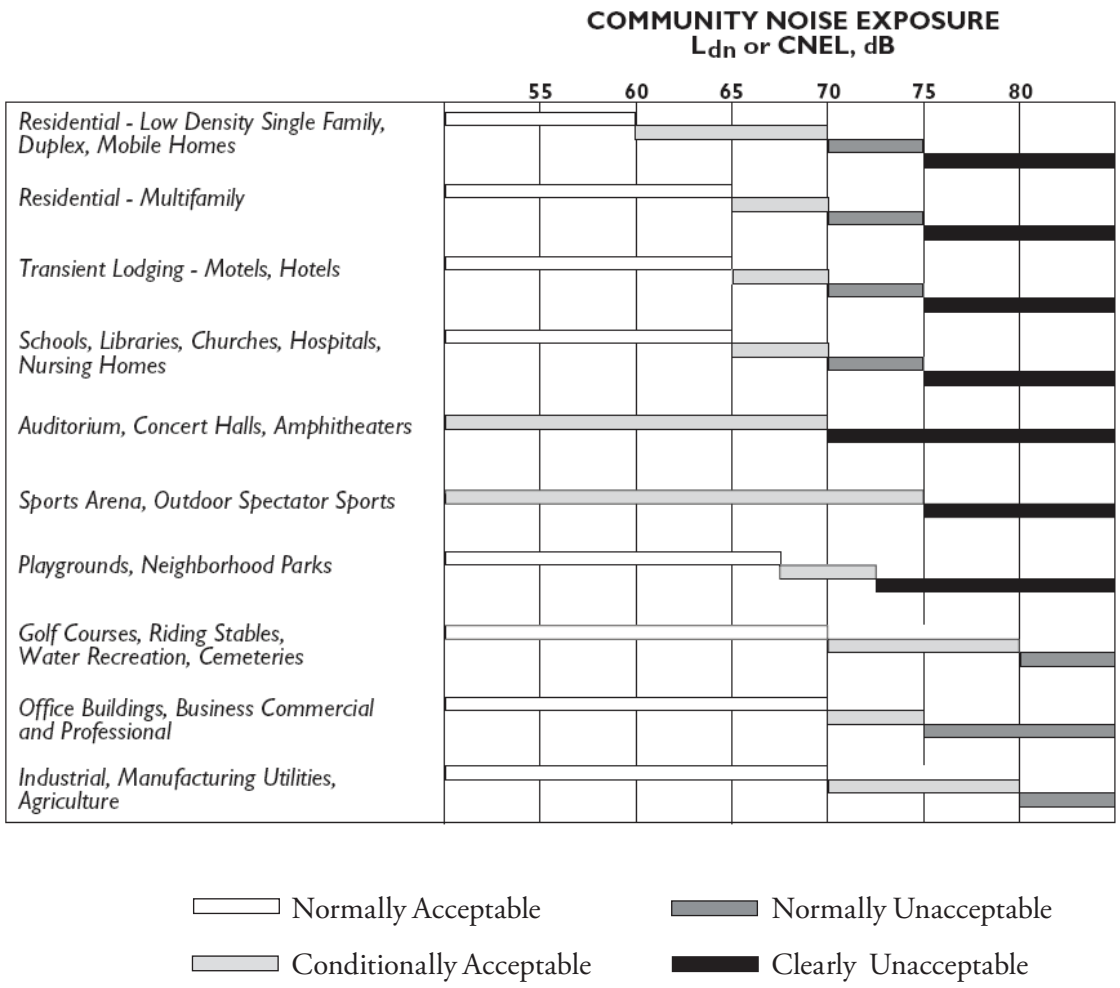
NOISE STANDARDS

General Plan noise standards are shown in Table 9-1 and Table 9-2.

Community Noise Exposure

Table 9-1 presents the community noise exposure matrix, establishing criteria the City can use to evaluate land use compatibility based on noise levels. This matrix is adapted from guidelines provided by the Office of Noise Control in the State Department of Health Services. The State indicates that locating housing in areas where exterior ambient noise levels exceed 65 dBA is undesirable.

TABLE 9–1: LAND USE CLASSIFICATIONS AND DENSITY – MINIMUMS AND MAXIMUMS



Noise exposure levels are classified as being “normally acceptable”, “conditionally acceptable,” “normally unacceptable,” or “clearly unacceptable” for different land use types.

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 sufficient 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 9-2.
- 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 9-2. 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 9-2 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 9-2 are difficult to achieve and may not be feasible.

Clearly Unacceptable

New construction or development should generally not be undertaken.

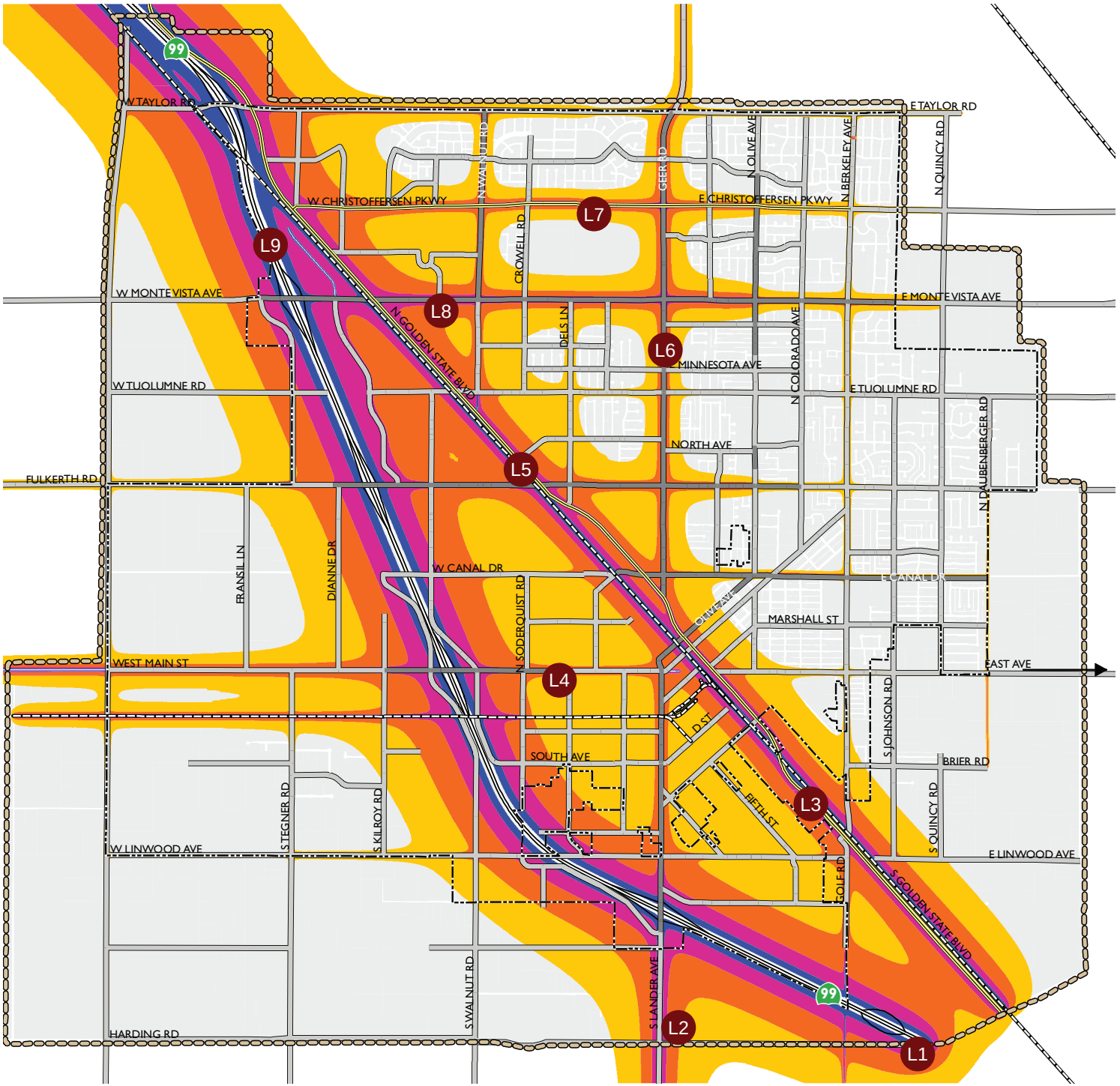


Figure 9-2: Existing Noise Contours

60 to 65 dB
65 to 70 dB
70 to 75 dB
> 75 dB

Noise Monitoring Stations

Boundaries

Study Area Boundary
City Limits & County Islands

Existing Circulation Network

Freeway
Existing Expressway
Existing Arterial
Existing Collector
Railroads

0 0.25 0.5 1
Miles

Source: Omni-Means, 2011; City of Turlock, 2011; Dyett and Bhatia, 2011; Charles Salter Associates, 2011.

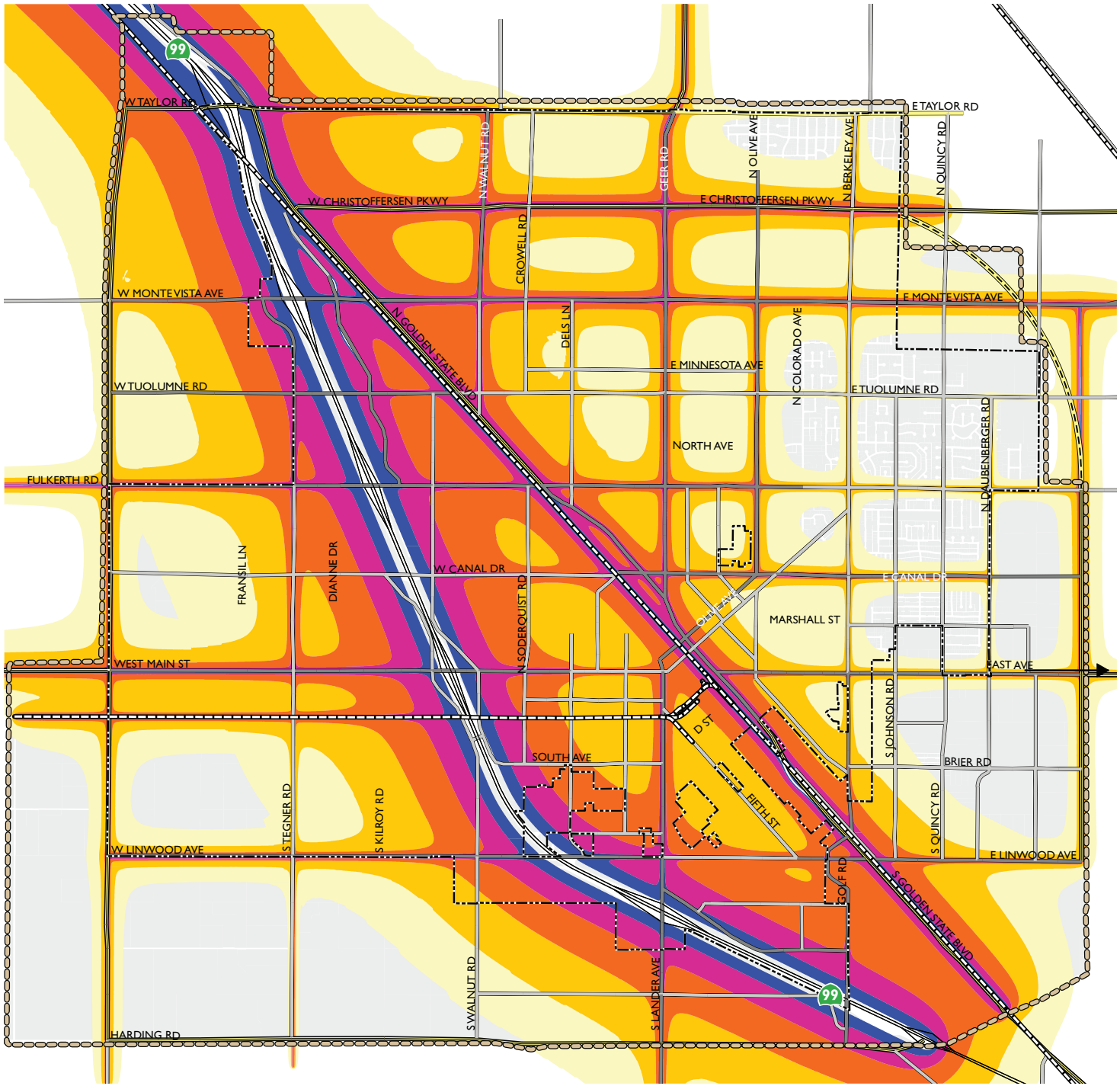


Figure 9-3: Future Noise Contours

Day-Night Average Noise Levels

- 55 to 60 dB
- 60 to 65 dB
- 65 to 70 dB
- 70 to 75 dB
- > 75 dB

Circulation (2030)

- Freeway
- Expressway
- Potential Expressway Connection
- Arterial
- Collector
- Railroads

Boundaries

- Study Area Boundary
- City Limits & County Islands

Source: Omni-Means, 2011; City of Turlock, 2011; Dyett and Bhatia, 2011; Charles Salter Associates, 2011.

Allowable Noise Exposure

Table 9-2 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 9–2: ALLOWABLE NOISE EXPOSURE

LAND USE	OUTDOOR ACTIVITY[1, 2] AREAS (CNEL)	INTERIOR SPACES (CNEL)[1]
Residential	60	45
Motels, Hotels	60	45
Hospitals, Nursing Homes, Schools, Libraries, Museums, Churches	60	45
Playgrounds, Parks, Recreation Uses	65	50
Commercial and Office Uses	65	50
Industrial Uses	70	65

Notes:

1 For non-residential uses, where an outdoor activity area is not proposed, the standard does not apply. Where the location of outdoor activity areas is unknown, the exterior noise level standard shall be applied to the property line of the receiving use.

2 Where it is not possible to reduce noise in outdoor activity areas to the allowable maximum, levels up to 5 dB higher may be allowed provided that available exterior noise level reduction measures have been im-ple-mented and interior noise levels are in compliance with this table.

Source: California Office of Planning and Research, 2011

The General Plan also provides standards for exposure to non-transportation noise sources such as industrial facilities, automotive servicing, or equipment yards, in Table 9-3. These standards apply to the noise sources themselves, as well as to proposed development that may be affected by existing noise sources.

TABLE 9–3: NOISE LEVEL PERFORMANCE STANDARDS FOR NON-TRANSPORTATION SOURCES		
NOISE LEVEL DESCRIPTOR	DAYTIME (7 A.M. TO 10 P.M.)	NIGHTTIME (10 P.M. TO 7 A.M.)
Hourly L_{eq}, dB	55	45
Maximum Level, dB	75	65
Note: Each of the noise levels specified above shall be lowered by 5 dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises.		

POLICIES

Guiding Policies

9.4-a **Land Use Compatibility.** Ensure that new development is compatible with the noise environment, by continuing to use potential noise exposure as a criterion in land use planning.

9.4-b **Prevent Degradation of Noise Environment.** Protect public health and welfare by eliminating existing noise problems where feasible, maintaining an acceptable indoor and outdoor acoustic environment, and preventing significant degradation of the acoustic environment.

Decreasing noise magnitude at the source and limiting the times certain types and volumes of noise can occur are two of the approaches to noise attenuation taken in the City's Noise Control Ordinance.

9.4-c **Protect Residential Areas and Sensitive Uses.** Minimize excessive noise exposure in residential areas and in the vicinity of such uses as schools, hospitals, and senior care facilities.

The most pronounced noise increases are projected to be along roadways serving the new growth areas. The General Plan seeks to make land use compatible with the noise environment, reduce noise levels at the source, and ensure effective mitigation.

Implementing Policies

See also section 5.5 Aviation, Rail, and Goods Movement for policies related to transportation noise sources.

9.4-d **Required Noise Analysis.** Use the noise and land use compatibility matrix (Table 9-1) and Future Noise Contours map (Figure 9-2) as review criteria for all new development. For proposed development located where projected noise exposure would be other than "normally acceptable," and which require discretionary review, require that a noise analysis be conducted.

A required noise analysis should:

- Be prepared by a certified noise consultant or acoustical engineer;
- Be funded by the applicant;
- Include a representative, on-site day and night sound level measurement;
- Include a delineation of current (measured) and projected (10 years) noise contours with and without the proposed project, ranging from 55 to 75 dBA (Ldn) within the proposed development site; and
- Include a description of adequate and appropriate noise abatement measures where sound measurements exceed Table 9-2 standards for the proposed use.

A list of accredited noise consultants is available from the State Department of Health Services, Office of Noise Control.

9.4-e **Noise-Attenuating Features.** For all projects that have noise exposure levels other than "normally acceptable" and which require discretionary review, require site planning and architecture to incorporate noise-attenuating features. With mitigation, development should meet allowable outdoor and indoor noise exposure standards in Table 9-2. In particular, new residential, transient lodging, school, library, church, hospital, and convalescent home development should be designed to provide a suitable interior noise environment of no greater than 45 dB CNEL or Ldn.

Site planning measures include setbacks, building placement in relation to topography, and orientation of sensitive indoor and outdoor activity areas away from noise sources.

Building measures may include:

- Facades constructed substantial weight and insulation;
- Sound-rated windows and doors;
- Active cancellation;
- Acoustic baffling of vents for chimneys, fans, and gable ends;
- Ventilation system affording comfort under closed-window conditions;
- Double doors and heavy roofs with ceilings of two layers of gypsum board on resilient channels.

9.4-f **Vibration Reduction.** Require that new development near railroad tracks is limited as follows to avoid impact from excessive noise vibration:

- No new buildings where low ambient vibration is essential for interior operations may be located within 225 feet of railroad tracks. These uses may include, but are not limited to, vibration-sensitive research and manufacturing; hospital research areas; concert halls; and TV/recording studios.
- No new residences or other buildings where people sleep may be located within 100 feet of railroad tracks. These include multi-family dwellings, houses, hospital patient rooms, and hotels.
- No schools, churches, or commercial offices may be located within 70 feet of railroad tracks.

9.4-g **Noise-Sensitive Uses—Required Mitigation.** Do not allow new development of noise-sensitive uses where the noise level due to non-transportation noise sources will exceed the noise level standards of Table 9-3, as measured immediately within the property line of the new development, unless effective noise mitigation measures have been incorporated into the development design to achieve the standards specified in the table.

9.4-h **Non-Transportation Noise Sources—Required Mitigation.** Require mitigation of noise created by new proposed non-transportation noise sources so that it does not exceed the noise level standards of Table 9-3 as measured immediately within the property line of lands designated for noise-sensitive uses. Appropriate mitigation measures include:

- Dampen or actively cancel noise sources;
- Increase setbacks for noise sources from adjacent dwellings;

- Use soundproofing materials and double-glazed windows;
- Screen and control noise sources, such as parking and loading facilities, outdoor activities, and mechanical equipment;
- Use open space, building orientation and design, landscaping and running water to mask sounds; and
- Control hours of operation, including deliveries and trash pickup.

This policy does not apply to noise sources associated with agricultural operations on lands zoned for agricultural uses.

9.4-i **Noise Ordinance.** Continue to enforce the City Noise Control Ordinance and update as necessary.

The City's ordinance addresses a wide range of noise-generating activities, establishing community standards and providing a basis for enforcement.

9.4-j **Transportation Noise Buffers.** Where feasible, develop and implement noise reduction measures when undertaking improvements, extensions, or design changes to City streets. Measures may involve some combination of setbacks, earth berms, solid noise walls, placement of non-occupancy accessory structures or windowless building sites towards the noise source, and building insulation techniques.

Mitigation through the design and construction of a noise barrier (wall, berm, or combination wall/berm) is the most common way of alleviating traffic noise impacts. Noise barriers often have the disadvantage of unsightliness; however, properly landscaped berms or walls shielded with climbing vines can, over time, become visual assets. The use of noise barriers should be minimized.