Chapter 9
Noise

In This Background Report

Exhibits

Tables

Introduction

This background report creates a foundation for updating the goals, policies, and programs of the Noise Element of the *Suisun City General Plan*. The Noise Element provides a basis for comprehensive local policies to control and abate environmental noise and to protect the residents from excessive noise exposure.

The responsibility of local governments is to "analyze and quantify" noise levels and the extent of noise exposure through actual measurement and/or the use of noise modeling. To do this, data relating to mobile and point sources must be collected, synthesized, and mapped. The noise element must include implementation measures and possible solutions to existing and foreseeable noise problems. The noise levels from existing land uses must be closely analyzed to ensure compatibility with proposed land uses, particularly if residential uses or other sensitive receptors are located nearby. Major noise sources in the vicinity of the City include:

- Commercial/retail activities,
- Travis Air Force Base;
- State Route 12 and other major roadways; and
- Train traffic along the Union Pacific Railroad.

Environmental Setting

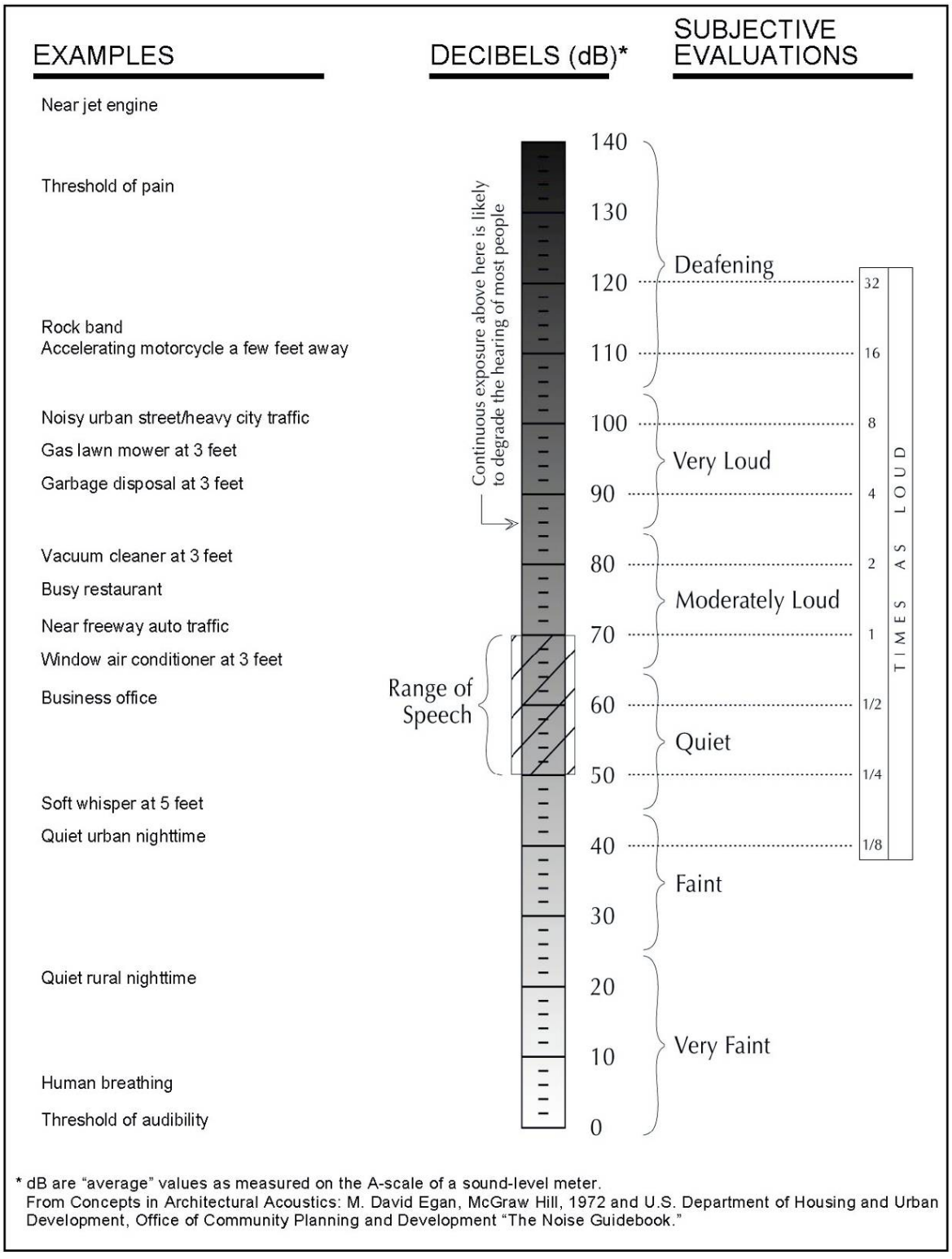
The following sections are provided to establish the context for updating the General Plan Noise Element. The material that follows summarizes important fundamentals to understanding how sound works and the current noise conditions in Suisun City.

Acoustic Fundamentals

Acoustics is the scientific study that evaluates perception, propagation, absorption, and reflection of sound waves. Sound is a mechanical form of radiant energy, transmitted by a pressure wave through a solid, liquid, or gaseous medium. Sound that is loud, disagreeable, unexpected, or unwanted is generally defined as noise; consequently, the perception of sound is subjective in nature, and can vary substantially from person to person. Common sources of environmental noise and noise levels are presented in Exhibit NOI-1.

A sound wave is initiated in a medium by a vibrating object (e.g., vocal chords, the string of a guitar, the diaphragm of a radio speaker). The wave consists of minute variations in pressure, oscillating above and below the ambient atmospheric pressure. The number of pressure variation cycles occurring per second is referred to as the frequency of the sound wave and is expressed in hertz (Hz), which is equivalent to one complete cycle per second.

Directly measuring sound pressure fluctuations would require the use of a very large and cumbersome range of numbers. To avoid this and have a more useable numbering system, the decibel (dB) scale was introduced. A sound level expressed in decibels is the logarithmic ratio of two like pressure quantities, with one pressure quantity being a



Source: Data compiled by AECOM in 2010

Exhibit NOI-1 **Typical Noise Levels**

reference sound pressure. For sound pressure in air the standard reference quantity is generally considered to be 20 micropascals, which directly corresponds to the threshold of human hearing. The use of the decibel is a convenient way to handle the million-fold range of sound pressures to which the human ear is sensitive. A decibel is logarithmic; it does not follow normal algebraic methods and cannot be directly added. For example, a 65 dB source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). A sound level increase of 10 dB corresponds to 10 times the acoustical energy, and an increase of 20 dB equates to a 100 fold increase in acoustical energy.

The loudness of sound perceived by the human ear depends primarily on the overall sound pressure level and frequency content of the sound source. The human ear is not equally sensitive to loudness at all frequencies in the audible spectrum. To better relate overall sound levels and loudness to human perception, frequency-dependent weighting networks were developed. The standard weighting networks are identified as A through E. There is a strong correlation between the way humans perceive sound and A-weighted sound levels (dBA). For this reason, the dBA can be used to predict community response to transportation and stationary noise sources. Sound levels expressed as dB in this section are A-weighted sound levels, unless noted otherwise.

As acoustic energy spreads through the atmosphere from the source to the receiver, noise levels attenuate (decrease) depending on ground absorption characteristics, atmospheric conditions, and the presence of physical barriers (e.g., walls, building façades, berms). Noise generated from mobile sources generally attenuate at a rate of 3dBA (typical for hard surfaces, such as asphalt) to 4.5 dBA (typical for soft surfaces, such as grasslands) per doubling of distance, depending on the intervening ground type. Stationary noise sources spread with more spherical dispersion patterns that attenuate at a rate of 6 to 7.5 dBA per doubling of distance.

Atmospheric conditions such as wind speed, turbulence, temperature gradients, and humidity may additionally alter the propagation of noise and affect levels at a receiver. Furthermore, the presence of a large object (e.g., barrier, topographic features, and intervening building façades) between the source and the receptor can provide significant attenuation of noise levels at the receiver. The amount of noise level reduction or "shielding" provided by a barrier primarily depends on the size of the barrier, the location of the barrier in relation to the source and receivers, and the frequency spectra of the noise. Natural barriers such as berms, hills, or dense woods, and human-made features such as buildings and walls may be used as noise barriers.

Noise Descriptors

The intensity of environmental noise fluctuates over time, and several different descriptors of time-averaged noise levels are used. The selection of a proper noise descriptor for a specific source depends on the spatial and temporal distribution, duration, and fluctuation of both the noise source and the environment. The noise descriptors most often used to describe environmental noise are defined below.

- **L_{max} (Maximum Noise Level):** The maximum instantaneous noise level during a specific period of time. The L_{max} may also be referred to as the "peak (noise) level."
- **L_{min} (Minimum Noise Level):** The minimum instantaneous noise level during a specific period of time.
- **L_x (Statistical Descriptor):** The noise level exceeded X% of a specific period of time. For example, L_{50} is the median noise level, or level exceeded 50% of the time.

- **L_{eq} (Equivalent Noise Level):** The average noise level. The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value is calculated, which is then converted back to dBA to determine the L_{eq}. In noise environments determined by major noise events, such as aircraft overflights, the L_{eq} value is heavily influenced by the magnitude and number of single events that produce the high noise levels.
- **L_{dn} (Day-Night Average Noise Level):** The 24-hour L_{eq} with a 10-dBA "penalty" for noise events that occur during the noise-sensitive hours between 10 p.m. and 7 a.m. In other words, 10 dBA is "added" to noise events that occur in the nighttime hours, and this generates a higher reported noise level when determining compliance with noise standards. The L_{dn} attempts to account for the fact that noise during this specific period of time is a potential source of disturbance with respect to normal sleeping hours.
- **CNEL (Community Noise Equivalent Level):** The CNEL is similar to the L_{dn} described above, but with an additional 5-dBA "penalty" added to noise events that occur during the noise-sensitive hours between 7 p.m. and 10 p.m., which are typically reserved for relaxation, conversation, reading, and television. When the same 24-hour noise data are used, the reported CNEL is typically approximately 0.5 dBA higher than the L_{dn}.
- **SEL (Sound Exposure Level):** The cumulative exposure to sound energy over a stated period of time.

Community noise is commonly described in terms of the ambient noise level which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq}), which corresponds to a steady-state A-weighted sound level containing the same total energy as a time-varying signal over a given time period (usually 1 hour). The L_{eq} is the foundation of the composite noise descriptors such as L_{dn} and CNEL, as defined above, and correlates well with community response to noise.

Negative Effects of Noise on Humans

Excessive and chronic exposure to elevated noise levels can result in auditory and non-auditory effects on humans. Auditory effects of noise on people are those related to temporary or permanent hearing loss caused by loud noises. Non-auditory effects of exposure to elevated noise levels are those related to behavioral and physiological effects. The non-auditory behavioral effects of noise on humans are associated primarily with the subjective effects of annoyance, nuisance, and dissatisfaction, which lead to interference with activities such as communications, sleep, and learning. The non-auditory physiological health effects of noise on humans have been the subject of considerable research attempting to discover correlations between exposure to elevated noise levels and health problems, such as hypertension and cardiovascular disease. The mass of research infers that noise-related health issues are predominantly the result of behavioral stressors and not a direct noise-induced response. The extent to which noise contributes to non-auditory health effects remains a subject of considerable research, with no definitive conclusions.

The degree to which noise results in annoyance and interference is highly subjective and may be influenced by several non-acoustic factors. The number and effect of these non-acoustic environmental and physical factors vary depending on individual characteristics of the noise environment such as sensitivity, level of activity, location, time of day, and length of exposure. One key aspect in the prediction of human response to new noise environments is the individual level of adaptation to an existing

noise environment. The greater the change in the noise levels that are attributed to a new noise source, relative to the environment an individual has become accustomed to, the less tolerable the new noise source will be to the new noise source.

The relationship between human perception and reaction to noise has been studied for many years. Some general rules of thumb apply to perception of noise (Egan 1988: 21):

- a 1dB increase is imperceptible;
- a 3 dB increase is just perceptible;
- a 6 dB increase is clearly noticeable; and
- a 10-dB increase is subjectively perceived as approximately twice as loud.

These subjective reactions to changes in noise levels was developed on the basis of test subjects' reactions to changes in the levels of steady-state pure tones or broad-band noise and to changes in levels of a given noise source. It is probably most applicable to noise levels in the range of 50 to 70 dB, as this is the usual range of voice and interior noise levels.

Vibration

Vibration is the periodic oscillation of a medium or object with respect to a given reference point. Sources of vibration include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) and those introduced by human activity (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, such the operation of machinery, or transient in nature, such as an explosion. Vibration levels can be depicted in terms of amplitude and frequency, relative to displacement, velocity, or acceleration.

Vibration amplitudes are commonly expressed in peak particle velocity (PPV) or root-mean-square (RMS) vibration velocity. PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is typically used in the monitoring of transient and impact vibration and has been found to correlate well to the stresses experienced by buildings (Federal Transit Administration [FTA] 2006, California Department of Transportation [Caltrans] 2004). PPV and RMS vibration velocity are normally described in inches per second (in/sec).

Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. The response of the human body to vibration relates well to average vibration amplitude; therefore, vibration impacts on humans are evaluated in terms of RMS vibration velocity. Similar to airborne sound, vibration velocity can be expressed in decibel notation as vibration decibels (VdB). The logarithmic nature of the decibel serves to compress the broad range of numbers required to describe vibration.

Typical outdoor sources of perceptible groundborne vibration include construction equipment, steel-wheeled trains, and traffic on rough roads. Although the effects of vibration may be imperceptible at low levels, effects may result in detectable vibrations and slight damage to nearby structures at moderate and high levels, respectively. At the highest levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings) and rarely results in damage to structural components. The range of vibration that is relevant to this analysis occurs from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings (FTA 2006). Table NOI-1 describes the general human response to different levels of groundborne vibration-velocity levels.

Table NOI-1
Human Response to Groundborne Vibration Levels

Vibration Velocity (VdB)	Human Response
65	Approximate threshold of perception for many humans.
75	Approximate dividing line between barely perceptible and distinctly perceptible.
85	Vibration acceptable only if there are an infrequent number of events per day

Note: VdB = vibration decibels
Source: FTA 2006

Road Conditions

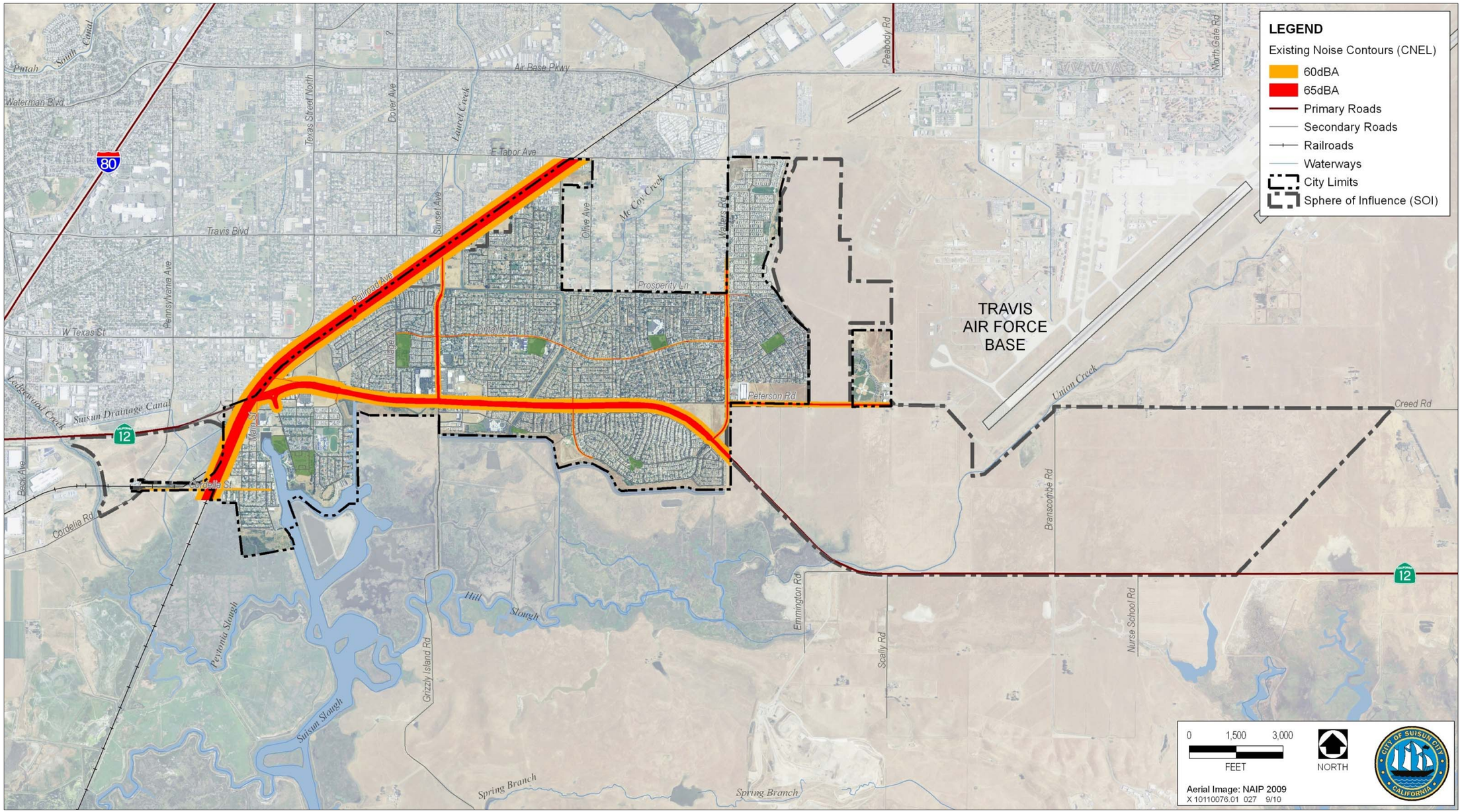
Transportation noise is a significant issue in areas along highways and other high volume roadways. In affected areas, these noise impacts must be considered in the determination of appropriate land uses. The Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA-RD-77-108) with the California Vehicle Noise Emission Level (Calveno) vehicle noise emission curves was used to estimate traffic noise levels. The FHWA Model is the traffic noise prediction model currently preferred by FHWA, Caltrans, and most local agencies for assessing traffic noise. Exhibit NOI-2 illustrates the existing 60 dBA and 65 dBA L_{dn} noise contours associated with vehicular and railway traffic. Table NOI-2 shows existing traffic volumes for the major roadways in Suisun City. It also contains model input data on truck traffic, based on Caltrans traffic counts, and estimated distances to the 55 and 60 dB L_{dn} traffic noise contours.

Vehicle speeds vary in Suisun City, and noise modeling attempted to account for such variation. The contour distances do not account for local topographic shielding such as any walls, berms, or other existing barriers.

Railways

There are two railroad lines that operate in Suisun City. The California Northern Railroad (CFNR) operates 24 miles of the Schellville Sub line from Suisun City to Schellville. The Schellville Sub line enters Suisun City from the west and parallels Cordelia Street. The CFNR line traverses Suisun City in an east-west direction from the UPRR line to the westernmost city boundary. The CFNR Schellville Sub line operates approximately 6 daily train trips through Suisun City (Suisun City 2006).

Union Pacific Railroad (UPRR) operates the Overland Route, in the City. The UPRR Overland Route traverses the northern boundary of the City and the western edge of the City's downtown area, carrying both freight and Amtrak passenger trains. The UPRR Overland Route extends to the west to Oakland and to the east to Chicago. Based on noise measurements gathered along the UPRR Overland Route line, approximately 43 daily train trips occur through Suisun City. These train trips include Amtrak operations and freight transportation. The 60 dB L_{dn} contour extends out approximately 361 feet from the center of the tracks, while the 65 dB L_{dn} contour is at approximately 168 feet. Single-event train passbys were measured at 108 feet from the UPRR track centerline. Table NOI-3 shows the distances to the 60 dB L_{dn} noise contour from the railroad lines.



Source: Traffic volumes from Fehr & Peers 2010; noise modeling by AECOM 2010

Exhibit NOI-2 **Traffic and Railroad Noise Contours**

Table NOI-2
FHWA-RD-77-108 Highway Traffic Noise Prediction Model Data Inputs and Distances to 60 and 65 dB CNEL Contours
Suisun City – Existing Conditions (2010)

Roadway	Roadway Segment	ADT	Truck %		Speed (MPH)	Distance to Contours	
			Med.	Heavy		60 dBA CNEL	65 dBA CNEL
SR 12	Woodlark Drive to Walters Road	5,600	1.5	1.0	50	186	59
SR 12	Civic Center Boulevard to Marina Boulevard	8,000	1.5	1.0	50	266	84
SR 12	Marina Boulevard to Sunset Avenue	5,600	1.5	1.0	50	186	59
SR 12	Sunset Avenue to Lawler Center Drive	5,600	1.5	1.0	50	186	59
SR 12	Walters Road to Scally Road	5,600	1.5	1.0	50	186	59
SR 12 EB Ramps	SR 12 to Lotz Way	2,300	1.5	1.0	50	76	24
Main Street	SR 12 WB Ramp to SR 12	1,600	1.5	1.0	30	17	6
Main Street	Driftwood Drive to Common Street	1,600	1.5	1.0	30	17	6
Sunset Avenue	Merganser Drive to SR 12	3,600	1.5	1.0	40	69	22
Sunset Avenue	East Tabor Avenue to Sunset Court	1,800	1.5	1.0	40	34	11
Sunset Avenue	Railroad Avenue to Railroad Avenue	3,600	1.5	1.0	40	69	22
Walters Road	Petersen Road to SR 12	3,600	1.5	1.0	40	69	22
Walters Road	McLellan Drive to Prosperity Lane	3,600	1.5	1.0	40	69	22
Walters Rd.	Air Base Parkway to Walters Court	3,600	1.5	1.0	40	69	22
Cordelia Street	Pennsylvania Avenue to West Street	1,800	1.5	1.0	40	34	11
East Tabor Avenue	Olive Avenue to Davis Drive	1,800	1.5	1.0	40	34	11
Petersen Road	Walters Road to Perimeter Road	3,600	1.5	1.0	45	92	29
Railroad Avenue	Blossom Avenue to Worley Road	1,800	1.5	1.0	40	34	11
Railroad Avenue	Birchwood Court to Village Drive	3,200	1.5	1.0	45	82	26
Emperor Drive	Harlquin Way to SR 12	1,600	1.5	1.0	35	22	7
Lawler Ranch Pkwy	SR 12 to Mayfield Way	1,600	1.5	1.0	40	31	10
Marina Blvd.	SR 12 to Lotz Way	1,600	1.5	1.0	35	22	7
Bella Vista Drive	Walters Road to Charleston Street	800	1.5	1.0	35	11	4
Pintail Drive	East Wigeon Way to Emperor Drive	1,600	1.5	1.0	35	22	7
Prosperity Lane	Langley Way to Walters Road	1,600	1.5	1.0	35	22	7

Notes: FHWA-RD-77-108 = Federal Highway Administration Highway Traffic Noise Prediction Model; dB = decibel; CNEL = community noise equivalent level; dBA = A-weighted decibel; ADT = average daily trips; SR = state route.
Medium (2 axles) and heavy trucks (3+ axles) produce significantly more noise than passenger vehicles so their percentages are taken into account with heavier weighting when computing traffic noise levels
Source: Modeling conducted by AECOM 2010

Table NOI-3
Estimated Daily Operations and Distances to Railroad Noise Contours (Feet)

Railroad Line	Daily Operations	L_{dn} at 100 feet	Distance to 60 dB L_{dn} Contour (Modeled)
Overland Route - UPRR	43	67.9	361 feet

Note: To determine the L_{dn} value associated with the railroad operations, the following formula was used: L_{dn} = SEL + 10 log Neq - 49.4 dB, where: SEL is the mean measured SEL of the train events (105 dB at a distance of 80 feet), Neq is the sum of the daytime (7 a.m. to 10 p.m.) train events plus 10 times the number of nighttime (10 p.m. to 7 a.m.) train events, and 49.4 is 10 times the logarithm of the number of seconds per day. The mean SEL for railroad operations (105 dBA) was used with the number of daily train operations to model the approximate distances to the 55 dB L_{dn} contours.
Source: AECOM 2010, Suisun City 2006: 4.4-9

Stationary Sources

Noise is a result of many processes and activities, even when the best available noise control technology is applied. Noise exposure within industrial facilities is controlled by federal and state employee health and safety regulations (i.e., the Mine Safety and Health Administration and the Occupational Safety and Health Administration). Exterior noise levels are judged against locally adopted standards. Commercial, recreational, and public service facility activities can also produce noise that affects adjacent noise sensitive land uses.

From a land use planning perspective, there are typically two basic goals relative to noise:

- preventing the introduction of new uses that will produce excessive noise in noise-sensitive areas, and
- preventing encroachment of noise-sensitive uses on existing facilities that produce excessive noise.

The first goal may be achieved by applying noise performance standards to proposed new uses that produce noise. The second goal may be achieved by requiring new noise-sensitive land uses to ensure compliance with noise performance standards when proposing to locate near existing facilities that produce noise.

With the exception of City parks, most of the city's stationary noise-producing land uses are located adjacent to railroad tracks and/or major roadways in the planning area (e.g., SR 12). The noise levels generated by these sources vary substantially, but for the purposes of this background report it was not practical to accurately isolate and quantify the noise emissions of these sources by reason of their proximity to transportation noise sources. The ambient noise environment in the immediate vicinity of these facilities includes noise generated by other industrial facilities, local vehicle traffic, and railroad activities.

In addition, Suisun City does not include large areas of industrial land uses and activities associated with these land uses primarily occur indoors and thus do not create any discernable noise outside of buildings. Traffic noise from SR 12 and local roads along with rail traffic dominate the overall noise environment.

Travis Air Force Base

Travis Air Force Base (AFB) is located in the central portion of Solano County and borders the northeastern boundary of the City. The AFB occupies approximately 10 square miles of land with operations buildings, base housing, and two runways designed to handle heavy transport aircraft (e.g., C-5's). Flight paths are integrated to minimize conflict with aircraft operations from neighboring airports. Scheduled missions, practice takeoffs, landings, instrument approaches, and run-up activities generally occur during daytime hours.

Exhibit NOI-3 shows the noise contours associated with Travis AFB operations (Solano County ALUC 2002). As shown, areas in the eastern portion of the City's Sphere of Influence are substantially affected by AFB operations. Developed portions of the City are within the 60-65 CNEL noise contours of Travis AFB.

Community Noise Survey

To quantify existing noise levels in Suisun City, a community noise survey was conducted in locations across the community. Three locations were monitored for one 24-hour period and six locations were monitored for 15-minute periods. The measurement locations for the community noise survey are shown in Exhibit NOI-4. The results of the short term and long term community noise survey measurements are provided in Tables NOI-4 and NOI-5, respectively.

The community noise survey results show that noise generated by trains on the UPRR line is a significant noise source throughout the City, but more particularly for sites located near the rail line. Sites located near SR 12 also experience significant noise levels during daytime hours. The average hourly noise levels generated by train activities on the UPRR line are higher during nighttime hours than daytime hours.

Regulatory Setting

Federal, state, and local governments have established standards and guidelines to protect citizens from potential hearing damage and various other adverse physiological and social effects associated with noise and vibration, as discussed separately below.

Federal Regulations

U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency's (EPA's) Office of Noise Abatement and Control was originally established to coordinate federal noise control activities. After its inception, EPA's Office of Noise Abatement and Control established programs and guidelines to implement the Federal Noise Control Act of 1972. These programs and guidelines are intended to identify and address the effects of noise on public health, welfare, and the environment. In 1981, EPA administrators determined that subjective issues such as noise would be better addressed at lower levels of government. Consequently, in 1982 responsibilities for regulating noise control policies were

transferred to state and local governments. However, noise control guidelines and regulations contained in EPA rulings in prior years remain in place by designated federal agencies, allowing more individualized control for specific issues by designated federal, state, and local government agencies. Standards have also been established to address the potential for groundborne vibration to cause structural damage to buildings. These standards were developed by the Committee of Hearing, Bio Acoustics, and Bio Mechanics (CHABA) at the request of EPA (FTA 2006). For fragile structures, CHABA recommends a maximum limit of 0.25 inch per second (in/sec) peak particle velocity (PPV) (Caltrans 2004: 17).

State Regulations

The State of California has adopted noise standards in areas of regulation not preempted by the federal government. State standards regulate noise levels of motor vehicles, sound transmission through buildings, occupational noise control, and noise insulation.

The State of California, Governor's Office of Planning and Research (OPR), published the State of California General Plan Guidelines (OPR 2003), which provide guidance for the acceptability of projects within specific L_{dn} contours. Table NOI-6 summarizes acceptable and unacceptable community noise-exposure limits for various land use categories.

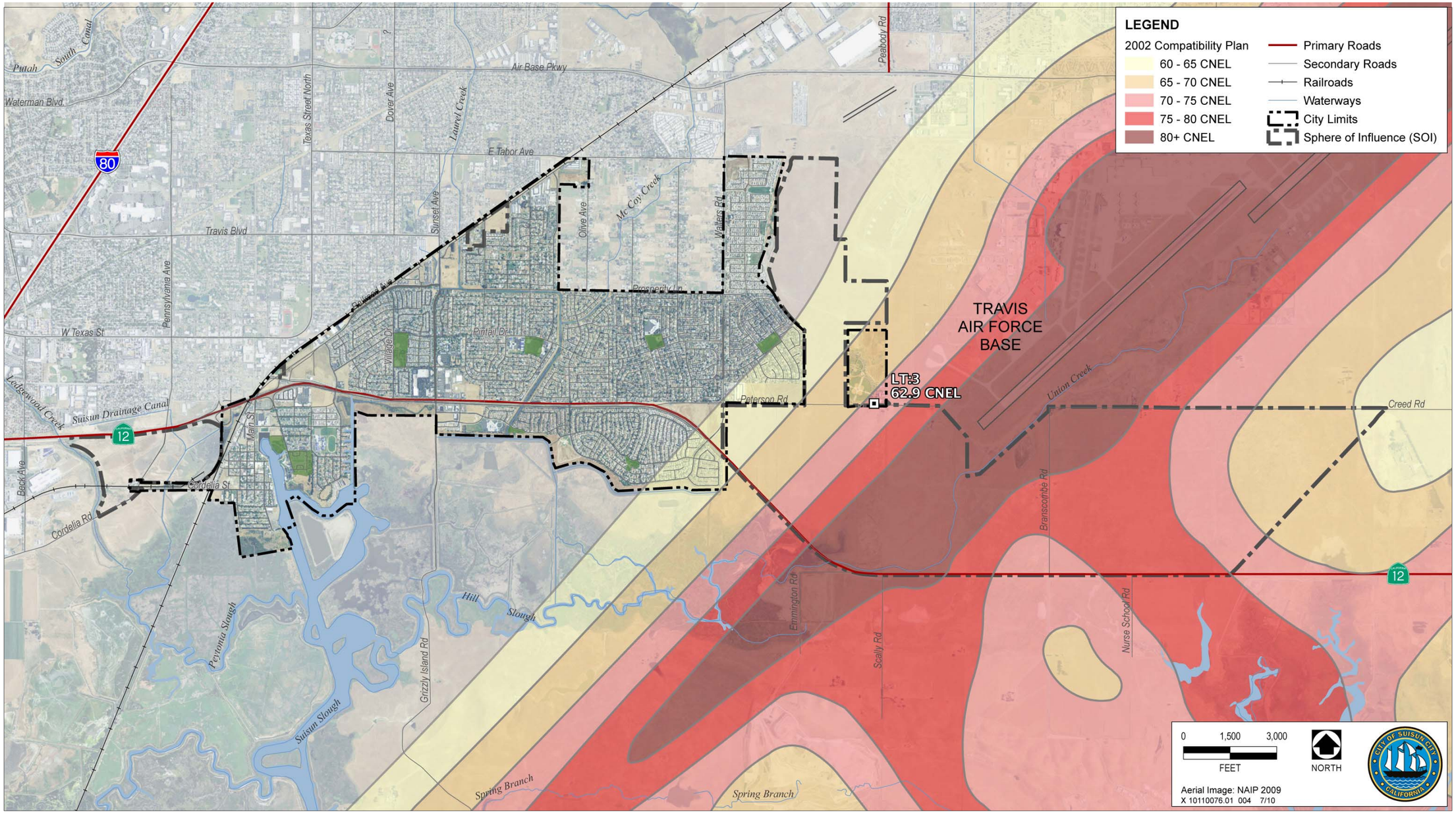
Generally, residential uses are considered to be acceptable in areas where exterior noise levels do not exceed 60 dBA L_{dn}. Residential uses are normally unacceptable in areas exceeding 70 dBA L_{dn} and conditionally acceptable within 55–70 dBA L_{dn}. Schools are normally acceptable in areas up to 70 dBA L_{dn} and normally unacceptable in areas exceeding 70 dBA L_{dn}. Commercial uses are normally acceptable in areas up to 70 dBA CNEL. Between 67.5 and 77.5 dBA L_{dn}, commercial uses are conditionally acceptable, depending on the noise insulation features and the noise reduction requirements.

The guidelines also present adjustment factors that may be used to arrive at noise acceptability standards reflecting the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

Title 24 of the California Code of Regulations, also known as the California Building Standards Code, establishes building standards applicable to all occupancies throughout the state. The code provides acoustical regulations for both exterior-to-interior sound insulation as well as sound and impact isolation between adjacent spaces of various occupied units. Title 24 regulations state that interior noise levels generated by exterior noise sources shall not exceed 45 dB L_{dn}, with windows closed, in any habitable room for general residential uses.

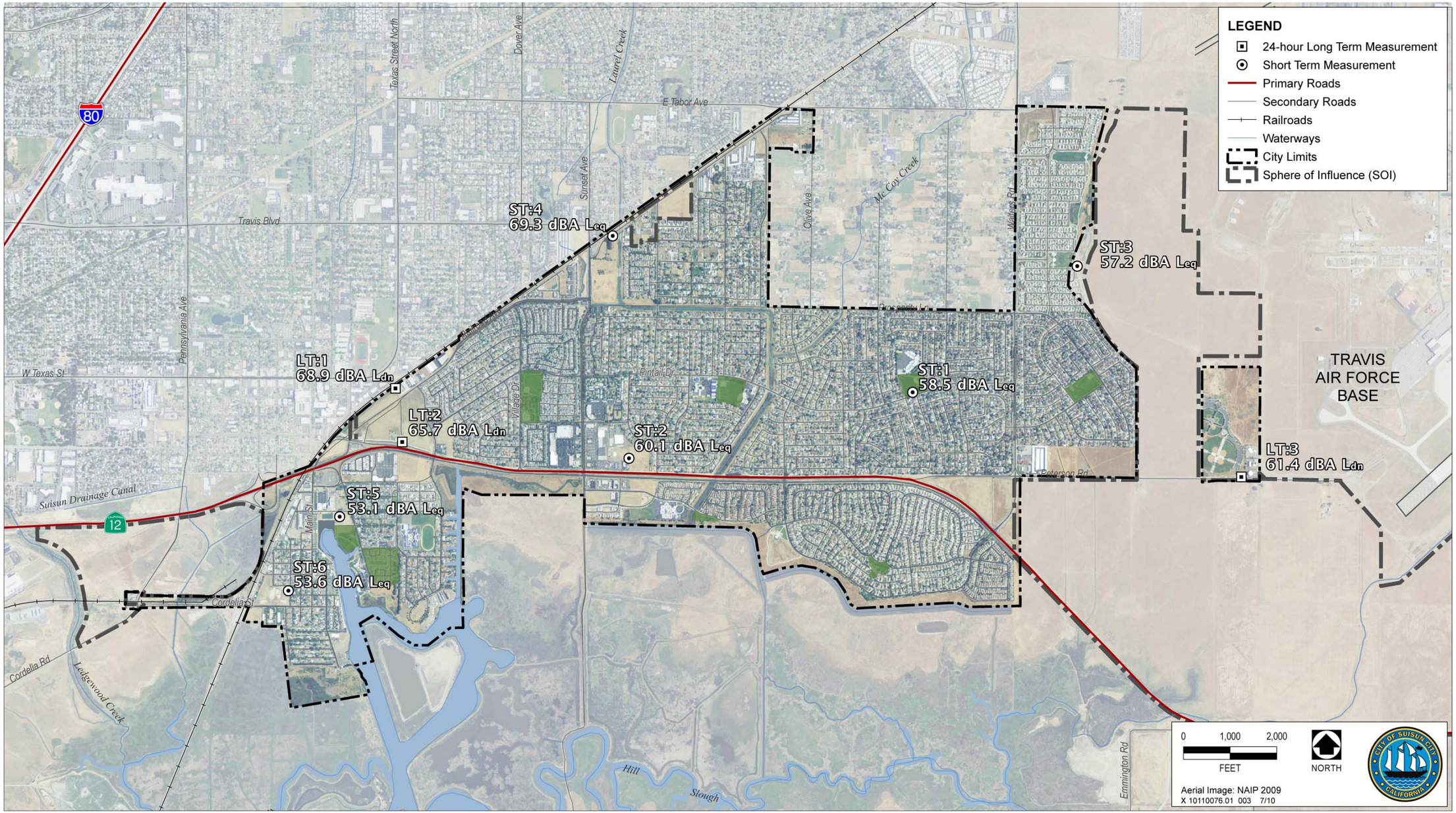
California Department of Transportation

For the protection of fragile, historic, and residential structures, Caltrans recommends a more conservative threshold of 0.2 in/sec PPV for normal residential buildings and 0.08 in/sec PPV for old or historically significant structures (Caltrans 2002). These standards are more stringent than the recommended guidelines established by FTA, presented above.



Source: Solano County ALUC 2002

Exhibit NOI-3 **Travis Air Force Base Noise Contours**



Source: Data compiled by AECOM in 2010

Exhibit NOI-4 **Community Ambient Noise Survey**

Table NOI-4
Summary of Short-Term Daytime Community Noise Survey

Date/Time	Noise Sources	A-Weighted Sound Level (dB)				
		L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}
Pintail Drive and Seagull Drive – ST: 1						
July 9, 2010 8:20-8:35 a.m.	Vehicle passbys along Pintail Drive (including 1 bus and 1 medium truck), birds chirping, dog barking	58.5	75.2	62.3	53.4	50.4
State Route 12 and Sunset Avenue (empty lot north of 7-11) – ST: 2						
July 9, 2010 8:58-9:13 a.m.	Traffic on SR 12 (including paramedic siren), activities at 7-11 gas station, train horn	60.1	75.2	61.9	57.7	54.5
Beale Circle (eastern edge of Patriot Park) – Site 3						
July 9, 2010 9:31-9:46 a.m.	Landscaping equipment, Travis Air Force Base activities (including 2 plane take-offs)	57.2	70.9	60.1	52.2	48.7
Railroad Avenue (northern edge of empty lot at Sunset Avenue) – ST: 4						
July 9, 2010 10:00-10:15 a.m.	Vehicle traffic on Railroad Avenue, train passbys/horns (including 1 Amtrak and 1 freight)	69.3	85.5	71.8	57.8	53.1
Civic Center Boulevard (southeast of Hampton Inn) – ST: 5						
July 9, 2010 10:29-10:44 a.m.	Traffic on SR 12, trains in distance	53.1	57.3	54.8	52.8	50.7
Morgan Street and School Street – ST: 6						
July 9, 2010 10:55-11:10 a.m.	Landscaping equipment, siren/horn in distance, construction activities/backup beeping in distance, vehicle passbys, vehicle door slamming	53.6	64.3	55.3	52.8	50.9

Notes: dB = decibel; dBA = A-weighted decibels; L_{dn} = day-night average noise level; CNEL = community noise equivalent level.
Source: AECOM 2010

Table NOI-5
Summary of 24-Hour Long-Term Community Noise Survey

Date	L_{dn}	Average Measured Hourly Noise Levels (dB)					
		Daytime (7:00 a.m.–10:00 p.m.)			Nighttime (10:00 p.m.–7:00 a.m.)		
		L_{eq}	L_{50}	L_{max}	L_{eq}	L_{50}	L_{max}
Railroad Avenue (southwestern end) – LT: 1							
July 7 – July 8, 2010	68.9	60.1	54.1	80.8	62.8	50.6	82.7
SR 12 and Marina Boulevard – LT: 2							
July 7 – July 8, 2010	65.7	60.9	59.0	77.1	58.9	56.7	73.4
Scandia Road and Petersen Road – LT: 3							
July 7 – July 8, 2010	61.4	60.5	52.8	79.6	52.6	50.5	66.0

Notes: dB = decibel; dBA = A-weighted decibels; L_{dn} = day-night average noise level; CNEL = community noise equivalent level.
Source: AECOM 2010

Table NOI-6
Summary of Land Use Noise Compatibility Guidelines

Land Use Category	Community Noise Exposure (dBA L_{dn})			
	Normally Acceptable[1]	Conditionally Acceptable[2]	Normally Unacceptable[3]	Clearly Unacceptable[4]
Residential—low-density single-family, duplex, mobile home	<60	55–70	70–75	75+
Residential—multifamily	<65	60–70	70–75	75+
Transient lodging—motel, hotel	<65	60–70	70–80	80+
Schools, libraries, churches, hospitals, nursing homes	<70	60–70	70–80	80+
Auditoriums, concert halls, amphitheaters	-	<70		65+
Sports arena, outdoor spectator sports	-	<75		70+
Playgrounds, neighborhood parks	<70	-	67.5–75	72.5+
Golf courses, riding stables, water recreation, cemeteries	<75	-	70–80	80+
Office buildings, business commercial, and professional	<70	67.5–77.5	75+	-
Industrial, manufacturing, utilities, agriculture	<75	70–80	75+	-

Notes: dBA = A-weighted decibels; L_{dn} = day-night average noise level
Some boxes are blank because adjacent boxes indicate a range that encompasses that category in terms of acceptable or unacceptable levels and no upper or lower range exists.
1 Specified land use is satisfactory, based on the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
2 New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice.
3 New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features must be included in the design. Outdoor areas must be shielded.
4 New construction or development should generally not be undertaken.
Source: OPR 2003

Existing General Plan Policies

The current *Suisun City General Plan* Noise Element was adopted in 1992. Current goals and policies are outlined in the review of the Noise Element below.

The existing Noise Element identifies the City's intent to consider noise issues along with the various other planning and environmental issues, with the goal of ensuring an acceptable noise environment. The Noise Element recognizes four noise sources that require analysis: traffic, railroad, fixed noise sources, and aircraft noise sources.

The current Noise Element contains objectives for acceptable noise exposure for various types of land uses and human activities so that ambient, stationary, and traffic

noise does not impede these activities. The City established, through policies of the Noise Element, 65 dB CNEL as the recommended exterior noise level for noise-sensitive land uses. Descriptions of these policies are provided below.

Policy of the Noise Element specifically identifies that areas located in the Travis Air Force Land Use Compatibility Plan (LUCP) must comply with noise and land use compatibility requirements of the LUCP. In addition, the policy recommends residential and educational land uses not be located in areas with noise levels in excess of 65 dB CNEL, and the City may use a noise level of 65 dB CNEL or greater as a basis for denying residential or other noise-sensitive land uses. Lastly, the policy states the City will refer to the Travis Air Force LUCP in determining the compatibility of land uses at various noise levels.

Another policy of the Noise Element requires setbacks or other measures for residential land uses located adjacent to SR 12, along arterial streets, in proximity to UPRR line, or near other transportation-related noise source that may exceed the recommended exterior noise level of 65 dB CNEL.

The Noise Element includes a policy aimed at protecting residential land uses from non-residential noise sources. This policy attempts to ensure that, by designating the appropriate locations for commercial and industrial uses, noise levels will not exceed 65 dB CNEL in residential areas. As part of this, the City may require design measures at industrial, commercial, or residential land development to reduce noise exposure.

Suisun City has not adopted any noise regulations or standards as part of their Municipal Code.

General Plan Issues and Opportunities

The City does not anticipate a large amount of land use change in areas affected by substantial existing noise sources. The City does not anticipate that this General Plan would involve the establishment of new substantial noise sources in proximity to existing or planned noise-sensitive land uses. Nonetheless, goals and policies pertaining to noise that are specific to Suisun City would be developed as a part of this General Plan update. Noise policies should consider current conditions, appropriate noise levels in different land use environments, and the balancing of noise issues against other environmental, economic, and social objectives. Separate standards for single noise events and 24-hour continuous noise specific to each land use type would be appropriate. Furthermore, the City may wish to consider adding a clearly defined construction policy to alleviate unacceptable short-term noise exposure for nearby noise sensitive receptors.

The updated Noise Element will be designed to provide sufficient information concerning the community noise environment so that noise may be effectively considered in the land use planning process. Part of the Noise Element will also involve developing strategies for abating excessive noise exposure through intelligent planning and site design, reducing or eliminating the need for sound walls. The City's policies will be protective of existing developed areas of the City where the noise environment is deemed acceptable with a focus on those parts of the community deemed "noise sensitive." The policy approach will also protect existing commercial retail and service,

industrial, and other uses that produce noise from encroachment by noise-sensitive land uses.

Some of the key issues for this General Plan are articulated below.

- **Roadway Noise.** SR 12 will continue to carry more traffic in the future, which may affect land uses in the surrounding areas. The highway has 60 dBA CNEL contours that extend roughly 180-280 feet today. Other major roadways will be primary noise sources in the future, as well. The updated General Plan should define criteria for critical roadway segments (e.g., SR 12 in eastern portion of city) and provide policies to ensure that strategies are used to ensure an appropriate noise environment along these corridors. What steps might Suisun City take to anticipate potential issues related to increased traffic noise? How can the City's approach to land use and transportation planning avoid unacceptable traffic noise exposure for existing and future residents? How should the City balance the need for an acceptable noise environment for residential uses with objectives for economic development and redevelopment?
- **Railway Noise.** Currently railroad operations are a contributor to noise in the City that may become an issue if noise sensitive land uses encroach on railroad corridors. The updated General Plan will define the railway noise contours and address land use change for the surrounding areas. How should the City regulate land use along railroad corridors to promote an acceptable noise environment?
- **Stationary Sources.** There are no substantial issues related to stationary noise sources and surrounding noise sensitive land uses today. However, depending on how future development is implemented, these issues could arise. The updated General Plan could provide more specific guidance for different land use types and noise sources that may be developed in the City during buildout of the General Plan. What steps should the City take to anticipate potential issues land use compatibility with respect to stationary noise sources?
- **Airport Noise.** Travis AFB's 65-dBA noise contour extends over a large portion of the city's eastern and south eastern portion of the sphere of influence. It will be important to ensure that noise sensitive land uses do not encroach into areas affected by operations at Travis AFB. To date, Travis AFB is mostly unaffected by substantial amounts of encroachment by noise sensitive land uses in Suisun City. Should the City maintain open spaces and other land uses around the AFB? If any development is allowed in the eastern portion of the Sphere of Influence, how should such development be conditioned to avoid noise problems?

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