4.11 NOISE

This section assesses the effects of the proposed General Plan and Energy and Conservation Action Strategy (ECAS) on the noise environment in Vacaville. The following discussion describes the general characteristics of sound and the categories of audible noise, followed by the regulatory framework related to noise issues at the City, State, and federal levels. Lastly, potential noise impacts associated with implementation of the proposed General Plan and ECAS are evaluated, and mitigation measures are recommended as necessary. As noted in Chapter 3, Project Description, impacts are determined by comparing the proposed General Plan and ECAS to existing conditions, rather than to the existing General Plan. The following evaluation is based on both spatial and quantitative analyses and examines the effects that the location of development will have on the exposure of people to or the generation of measured noise levels (e.g. groundborne, aircraft, or ambient) or groundborne vibration. The noise data used in this analysis is contained in Appendix F of this Draft EIR.

A. Noise and Vibration Concepts

Noise is generally defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, or sleep.

To the human ear, sound has two significant characteristics: *pitch* and *loudness*. Pitch is the number of complete vibrations or cycles per second of a wave, which results in the range of tone from high to low. Loudness is the strength of a sound that describes a noisy or quiet environment. It is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity refers to how hard the sound wave strikes an object, which in turn produces the sound's effect. This characteristic of sound can be precisely measured with instruments. Table 4.11-1 contains a list of typical acoustical terms and definitions.

1. Measurement of Sound

Sound is characterized by various parameters that describe the rate of oscillation (frequency) of sound waves, the distance between successive troughs or crests in the wave, the speed at which it travels, and the pressure level or energy content of a given sound. The sound pressure level has become the most common descriptor used to characterize the loudness (i.e. amplitude) of an ambient sound, and the decibel scale is used to quantify sound intensity.

TABLE 4.11-1 DEFINITIONS OF ACOUSTICAL TERMS

Term	Definition
Decibel, dB	A unit of measurement that denotes the ratio between two quantities proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in 1 second (i.e. number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted, unless reported otherwise.
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels equaled or exceeded by a fluctuating sound level for 1 percent, 10 percent, 50 percent, and 90 percent of a stated time period.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 5 decibels to sound levels occurring in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 decibels to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 decibels to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all-encompassing noise associated with a given environment at a specified time, usually a composite of sound from many sources at many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, and tonal or informational content, as well as the prevailing ambient noise level.

Source: Harris, C.M, 1998, Handbook of Acoustical Measurements and Noise Control.

A decibel (dB) is a unit of measurement which indicates the relative intensity of a sound. The zero point on the dB scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Changes of 3 dB or less are only perceptible in laboratory environments. Audible increases in noise levels generally refer to a change of 3 dB or more, as this level has been found to be barely perceptible to the human ear in outdoor environments.

Since the human ear is not equally sensitive to all pitches (i.e. sound frequencies) within the entire spectrum, a special frequency-dependent rating scale has been devised to relate noise to human sensitivity in a process called "A-weighting," expressed as "dBA." The dBA, or A-weighted decibel, refers to a scale of noise measurement that approximates the range of sensitivity of the

human ear to sounds of different frequencies. Table 4.11-2 shows representative noise sources and their corresponding noise levels in dBA.

Because sound can vary in intensity by over one million times within the range of human hearing, a logarithmic loudness scale[1] is used to keep sound intensity numbers at a convenient and manageable level. Thus, a 10 dBA increase in the level of a continuous noise represents a perceived doubling of loudness, while a 20 dBA increase is 100 times more intense, and a 30 dBA increase is 1,000 times more intense.

As noise spreads from a source, it loses energy so that the farther away the noise receiver is from the noise source, the lower the perceived noise level. Noise levels diminish or attenuate as distance from the source increases based on an inverse square rule, depending on how the noise source is physically configured.

Noise level from a single point source, such as a single piece of construction equipment at ground level, attenuates at a rate of 6 dB for each doubling of distance between the single point source of noise and the noise-sensitive receptor of concern. Heavily traveled roads with few gaps in traffic behave as continuous line sources and attenuate roughly at a rate of 3 dB per doubling of distance.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. The predominant rating scales for communities in the State of California are the equivalent continuous sound level (L_{eq}), the community noise equivalent level (CNEL), and the day-night average level (L_{dn}). L_{eq} describes the average level that has the same acoustical energy as the summation of all the time-varying events. This descriptor is useful because sound levels can vary markedly over a short period of time. The most common averaging period for L_{eq} is hourly, but it can be of any duration. CNEL is the energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring between 10:00 p.m. and 7:00 a.m. (defined as sleeping hours) and 5 dB added to the A-weighted sound levels occurring between 7:00 p.m. and 10:00 p.m. (defined as relaxation hours). L_{dn} is similar to the CNEL scale, but without the adjustment for events occurring during the evening relaxation hours. CNEL and L_{dn} are normally exchangeable.

[1] Unlike linear units such as inches or pounds, decibels are measured on a logarithmic scale, representing points on a sharply rising curve. The logarithmic decibel scale allows an extremely wide range of acoustic energy to be characterized in a manageable notation.

TABLE 4.11-2 **TYPICAL A-WEIGHTED SOUND LEVELS**

Noise Source	A-Weighted Sound Level in Decibels	Noise Environment
Near Jet Engine	140	Deafening
Civil Defense Siren	130	Threshold of pain
Hard Rock Band	120	Threshold of feeling
Accelerating Motorcycle at a Few Feet Away	110	Very loud
Pile Driver; Noisy Urban Street/Heavy City Traffic	100	Very loud
Ambulance Siren; Food Blender	95	Very loud
Garbage Disposal	90	Very loud
Freight Cars; Living Room Music	85	Loud
Pneumatic Drill; Vacuum Cleaner	80	Loud
Busy Restaurant	75	Moderately loud
Near Freeway Auto Traffic	70	Moderately loud
Average Office	60	Moderate
Suburban Street	55	Moderate
Light Traffic; Soft Radio Music in Apartment	50	Quiet
Large Transformer	45	Quiet
Average Residence Without Stereo Playing	40	Faint
Soft Whisper	30	Faint
Rustling Leaves	20	Very faint
Human Breathing	10	Very faint

Source: LSA Associates, Inc., 2009.

The noise environments discussed in this analysis are specified in terms of maximum levels, denoted by L_{max}; L_{max} is the highest exponential time averaged sound level that occurs during a stated time period. L_{max} reflects peak operating conditions, and addresses the annoying aspects of intermittent noise.

Noise impacts can be described in three categories. The first is an audible impact that refers to an increase in noise levels noticeable to humans. Audible increases in noise levels generally refer

to a change of 3 dBA or greater, since, as described above, this level has been found to be barely perceptible in exterior environments; changes of 5 dBA or greater are considered to be readily perceptible to the average human ear in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1 and 3 dBA. This range of noise levels has been found to be noticeable only in laboratory environments. The last category is a change in noise level of less than 1 dBA, which is inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant. For purposes of this analysis, changes of 5 dBA or greater are considered significant changes.

2. Effects of Noise

According to the US Department of Housing and Urban Development's 1985 Noise Guidebook, permanent physical damage to human hearing can occur at prolonged exposure to noise levels higher than 85 to 90 dBA. Exposure to high noise levels affects our entire system, with prolonged noise exposure in excess of 75 dBA increasing body tensions, and thereby affecting blood pressure, functions of the ear, and the nervous system. In comparison, extended periods of noise exposure above 90 dBA would result in permanent cell damage. When the noise level reaches 120 dBA, a tickling sensation occurs in the human ear, even with short-term exposure. This level of noise is called the threshold of feeling. For avoiding adverse effects on human physical and mental health in the workplace or in communities, the US Department of Labor, Occupational Health and Safety Administration (OSHA) requires the protection of workers from hearing loss when the noise exposure equals or exceeds an 8-hour time-weighted average of 85 dBA.[2]

Unwanted community effects of noise occur at levels much lower than those that cause hearing loss and other health effects. Annoyance occurs when noise interferes with sleeping, conversation, or noise-sensitive work, including learning or listening to the radio, television, or music. According to World Health Organization (WHO) noise studies, during daytime hours, few people are seriously annoyed by activities with noise levels below 55 dBA, or moderately annoyed with noise levels below 50 dBA.[3] Exposure to high noise levels is thought to affect the entire human system. In addition to hearing loss, WHO identified other potential health effects, including hypertension and heart disease, after many years of constant exposure to high noise levels in excess of 75 dBA. Noise can also adversely affect the nervous system, as well as trigger emotional reactions like anger, depression, and anxiety.

[2] OSHA Regulations (Standards – 29 CFR), Occupational Noise Exposure 1910.95.

[3] World Health Organization, 1999. *Guidelines for Community Noise*, available at http://www.who.int/docstore/peh/noise/guidelines2.html.

3. Groundborne Vibration

Vibrating objects in contact with the ground radiate vibration waves through various soil and rock strata to the foundations of nearby buildings. As the vibration extends from the foundation throughout the remainder of the building, the vibration of floors and walls may be perceptible from the rattling of windows or a rumbling noise. The rumbling sound caused by the vibration of room surfaces is called groundborne noise. When assessing annoyance from groundborne noise, vibration is typically expressed as root mean square (rms) velocity in units of decibels of 1 micro-inch per second. To distinguish vibration levels from noise levels, the unit is written as "VdB." Human perception to vibration starts at levels as low as 67 VdB, and sometimes lower. Annoyance due to vibration in residential settings starts at approximately 70 VdB. Groundborne vibrations are almost never annoying to people who are outdoors. Although the motion of the ground may be perceived, without the effects associated with the shaking of a building, the motion does not provoke the same adverse human reaction.

Common sources of groundborne vibration include trains and construction activities, such as blasting, pile driving, and operating heavy earthmoving equipment. Typical vibration source levels from construction equipment are shown in Table 4.11-3. Although Table 4.11-3 gives one level for each piece of equipment, it should be noted that there is a considerable variation in reported ground vibration levels from construction activities. The data provides a reasonable estimate for a wide range of soil conditions. In extreme cases, excessive groundborne vibration has the potential to cause structural damage to buildings.

For buildings considered of particular historical significance or that are particularly fragile structures, the damage threshold is approximately 96 VdB; the damage threshold for other structures is 100 VdB.[4]

B. Regulatory Framework

This section summarizes existing federal, State, and local laws, policies, and regulations that apply to noise in and around Vacaville.

1. Federal Noise Control Act

In 1972, Congress enacted the Noise Control Act. This act authorized the US Environmental Protection Agency (EPA) to publish descriptive data on the effects of noise and establish levels of sound "requisite to protect the public welfare with an adequate margin of safety." These levels are separated into health (i.e. hearing loss levels) and welfare (i.e. annoyance levels), as shown in Table 4.11-4.

[4] Harris, C.M, 1998, *Handbook of Acoustical Measurements and Noise Control.*

TABLE 4.11-3 TYPICAL VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment		Approximate VdB at 25 Feet
Pile Driver (impact)	Upper range	112
	Typical	104
Pile Driver (sonic)	Upper range	105
	Typical	93
Clam shovel drop (slurry wall)		94
Hydromill (slurry wall)	In soil	66
	In rock	75
Vibratory roller		94
Hoe ram		87
Large bulldozer		87
Caisson drilling		87
Loaded trucks		86
Jackhammer		79
Small bulldozer		58

Source: Federal Transit Administration, 2006. Transit Noise and Vibration Impact Assessment.

TABLE 4.11-4 SUMMARY OF EPA NOISE LEVELS

Threshold	Level	Area
Hearing loss	$L_{eq}(24) \leq 70$ dB	All areas.
Outdoor activity interference and annoyance	$L_{dn} \leq 55$ dB	Outdoors in residential areas, farms, and other outdoor areas where people spend widely varying amounts of time, and other places in which quiet is a basis for use.
	$L_{eq}(24) \leq 55$ dB	Outdoor areas where people spend limited amounts of time, such as school yards and playgrounds.
Indoor activity interference and annoyance	$L_{eq} \leq 45$ dB	Indoor residential areas.
	$L_{eq}(24) \leq 45$ dB	Other indoor areas with human activities, such as schools, etc.

Note: These are the threshold levels in order to avoid hearing loss, interference, and annoyance.
Source: US Environmental Protection Agency, 1974, *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.*

EPA cautions that these identified levels are not standards because they do not take into account the cost or feasibility of the levels. These levels provide guidance to local agencies, such as the City of Vacaville, that regulate noise.

For protection against hearing loss, 96 percent of the population would be protected if sound levels are less than or equal to a $L_{eq(24)}$ of 70 dBA. The "(24)" signifies a L_{eq} duration of 24 hours. The EPA activity and interference guidelines are designed to ensure reliable speech communication at about 5 feet in the outdoor environment. For outdoor and indoor environments, interference with activity and annoyance should not occur if levels are below 55 dBA and 45 dBA, respectively.

2. State Laws and Regulations

This section describes State laws and regulations pertaining to noise.

a. California Noise Insulation Standards

The State of California has established regulations that help prevent adverse impacts to occupants of buildings located near noise sources. Referred to as the "State Noise Insulation Standards," they require buildings to meet performance standards through design and/or building materials that would offset any noise source in the vicinity of the receptor. State construction regulations include requirements that are intended to limit the extent of noise transmitted into habitable spaces of new hotels, motels, apartment houses, and dwellings other than detached single-family homes. These requirements are found in the California Code of Regulations, Title 24, Part 2 (known as the California Building Code), Appendix Chapters 12 and 12A. For limiting noise transmitted between adjacent dwelling units, the noise insulation standards specify the extent to which walls, doors, and floor ceiling assemblies must block or absorb sound. For limiting noise from exterior noise sources, the noise insulation standards set an interior standard of 45 dBA L_{dn} in any habitable room with all doors and windows closed. In addition, the standards require preparation of an acoustical analysis demonstrating the manner in which dwelling units have been designed to meet this interior standard, where such units are proposed in an area with exterior noise levels greater than 60 dBA L_{dn}.

b. California Government Code Section 65302(f)

Section 65302(f) of the California Government Code mandates that all General Plans include a Noise Element that analyzes and quantifies, to the extent practicable, current, and projected noise levels from all of the following sources:

- ♦ Highways and freeways.
- ♦ Primary arterials and major local streets.

- Passenger and freight on-line railroad operations and ground rapid transit systems.
- Commercial, general aviation, heliport, helistop, and military airport operations, aircraft overflights, jet engine test stands, and all other ground facilities and maintenance functions related to airport operations.
- Local industrial plants, including, but not limited to, railroad classification yards.
- Other ground stationary sources identified by local agencies as contributing to the community noise environment.

This section of the Government Code also requires the local agency to recognize the State Noise Element Guidelines, and provide noise contours for all of the noise sources listed above using CNEL or L_{dn} measurement levels, based on monitoring or acceptable modeling. The noise contours are to be used to determine land use so that exposure to excessive noise can be minimized. The Noise Element must include actions that avoid existing and foreseeable noise problems, and address the State's noise insulation standards. The proposed General Plan includes a Noise Element that complies with this State requirement.

3. Vacaville Municipal Code

The Municipal Code includes ordinances addressing community noise standards. Chapter 8.10, Public Nuisance, includes restrictions on the permitted hours of noise-producing construction activities. Chapter 9.16, Loudspeakers, Sound Amplifiers and Lighting Equipment, outlines the City's restrictions on the use of loudspeakers and sound amplifiers within the city limits through required registration and approval processes. Chapter 10.44, Motor Vehicles on Public or Private Property, outlines the City's reinforcement of the State's Vehicle Code vehicle noise emission levels.

Section 14.09.127.120 of the Land Use and Development Code includes the City's standards and restrictions on noise from both project-related transportation and non-transportation (i.e. stationary) noise sources. All new development must comply with the land use determination standards for ground and air transportation that are provided in Tables 14.09.127.01 and 14.09.127.02 of the Land Use and Development Code.

C. Existing Conditions

This section summarizes existing ambient noise conditions in the EIR Study Area. The primary source of noise in Vacaville is vehicle traffic from highways and major roadways. Additional noise sources include the Union Pacific Railroad, Nut Tree Airport, and Travis Air Force Base. In addition, existing industrial areas within Vacaville are a source of stationary noise.

1. Existing Noise-Sensitive Land Uses

Noise-sensitive land uses are defined as locations where people reside or where the presence of unwanted sound could adversely affect the use of the land. Specific uses considered sensitive to noise include senior housing, hospitals or healthcare facilities, parks and wildlife areas, places of worship, libraries, and schools.

2. Existing Noise Sources

This section summarizes existing noise sources in the EIR Study Area, including mobile noise sources, stationary noise sources, and groundborne vibration sources.

a. Mobile Noise Sources

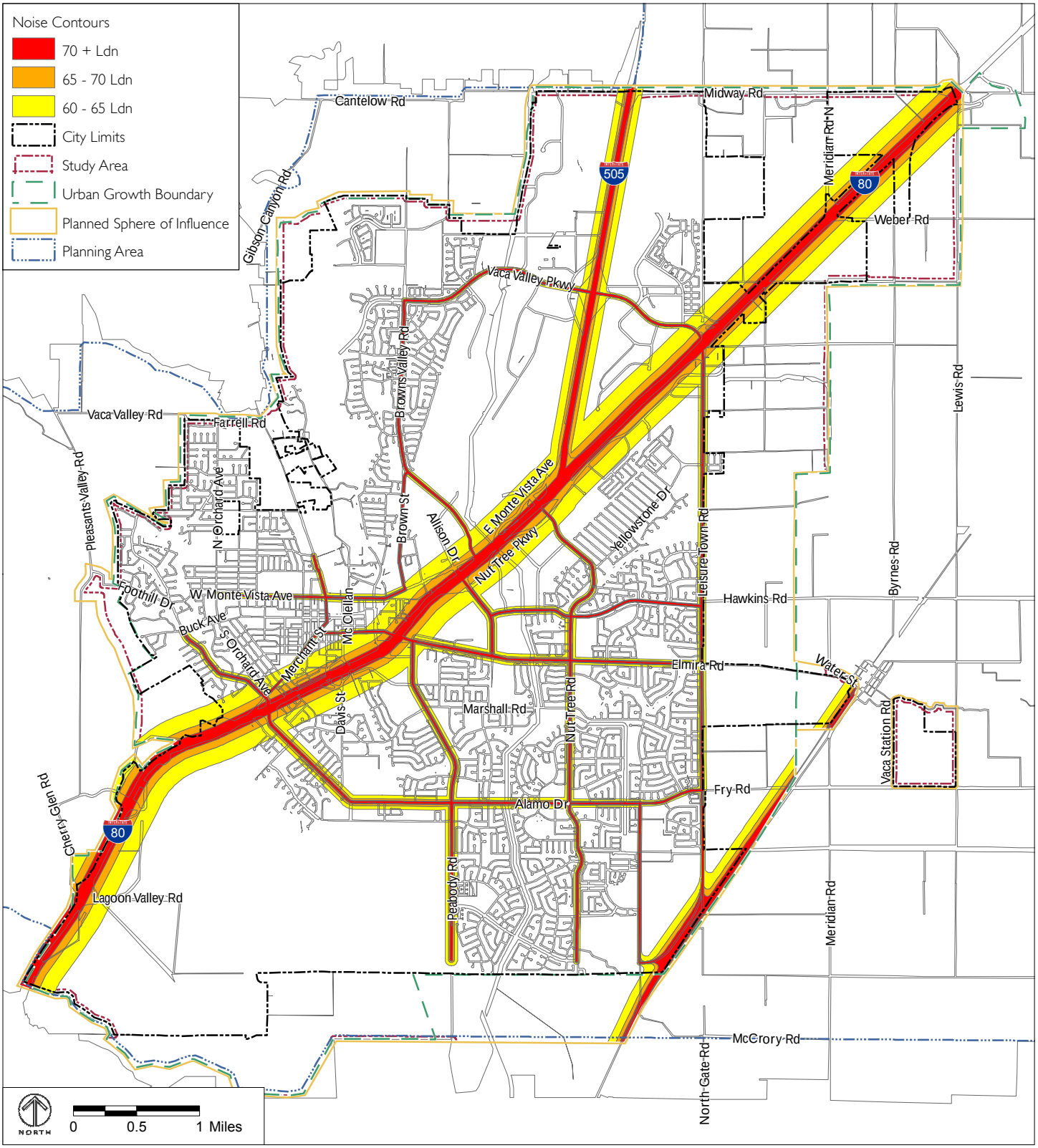
This section describes mobile noise sources, including traffic, railroads, and aircraft.

i. Traffic

Motor vehicles have distinctive noise characteristics and are a dominant noise source in Vacaville. The amount of noise varies according to many factors, such as the volume of traffic, vehicle mix (i.e. percentage of cars and trucks), average traffic speed, and distance from the receptor. Major contributing roadway noise sources include Interstate 80, Interstate 505, Leisure Town Road, Vaca Valley Parkway, Monte Vista Avenue, Peabody Road, Elmira Road, Alamo Drive, and other arterial and collector roadways throughout the city.

The Federal Highway Administration (FHWA) highway traffic noise prediction model[5] was used to evaluate existing traffic-related noise conditions along roadway links within the city. The model uses a typical vehicle mix for urban and suburban areas in California. Model input data include average daily traffic volumes, vehicle speeds, ground attenuation factors, and roadway widths. The resultant noise levels are weighted and summed over 24-hour periods to determine the L_{dn} values. The results of the traffic noise modeling for the existing traffic noise conditions in Vacaville are shown in Table 4.11-5 and Figure 4.11-1. Locations along roadway segments with L_{dn} levels of 70 dBA or greater would be considered "normally unacceptable" for residential, educational, lodging, and recreational uses, according to the Land Use Compatibility standards in both the existing and proposed General Plans, as shown in Table 4.11-8, below. Locations with L_{dn} levels of 65 to 70 dBA would require detailed analysis and noise mitigation measures for residential, educational, or lodging uses.

[5] Federal Highway Administration, Highway Traffic Noise Prediction Model, RD-77-108.



Source: LSA Associates, 2012.

FIGURE 4.11-1
EXISTING NOISE LEVEL CONTOURS

TABLE 4.11-5 EXISTING TRAFFIC NOISE CONTOURS, dBA

	Roadway Segment	ADT[a]	Centerline to 70 L_{dn} (Feet)	Centerline to 65 L_{dn} (Feet)	Centerline to 60 L_{dn} (Feet)	L_{dn} (dBA) 50 Feet From Centerline of Outermost Lane
1	Vaca Valley Parkway – Browns Valley Road to Eubanks Drive	6,100	< 50 [b]	< 50	108	63.7
2	Vaca Valley Parkway – Eubanks Drive to Monte Vista Avenue	9,300	< 50	67	142	65.5
3	Vaca Valley Parkway – I-505 NB Ramps to Leisure Town Road	7,500	< 50	60	124	64.1
4	Leisure Town Road – Orange Drive to Maple Road	15,000	< 50	91	195	67.6
5	Leisure Town Road – Maple Road to Ulatis Drive	12,300	< 50	80	171	66.7
6	Leisure Town Road – Ulatis Drive to Elmira Road	13,000	< 50	83	178	67.0
7	Leisure Town Road – Elmira Road to Alamo Drive	13,100	< 50	83	178	67.6
8	Leisure Town Road – Alamo Drive to Vanden Road	5,600	< 50	< 50	101	63.9
9	Vanden Road – Leisure Town Road to Alamo Drive	6,200	< 50	< 50	89	63.1
10	Alamo Drive – Leisure Town Road to Vanden Road	7,300	< 50	59	122	64.0
11	Alamo Drive – Vanden Road to Nut Tree Road	13,400	< 50	86	182	66.6
12	Alamo Drive – Nut Tree Road to Peabody Road	20,100	54	111	238	68.4
13	Alamo Drive – Peabody Road to I-80 EB Ramps	27,800	66	138	295	69.8
14	Alamo Drive – Merchant Street to Buck Avenue	13,700	< 50	87	184	66.7
15	Monte Vista Avenue – Orchard Avenue to Dobbins Street	9,700	< 50	56	120	65.0
16	Monte Vista Avenue – Dobbins Street to Depot Street	17,800	< 50	87	182	66.2
17	Monte Vista Avenue – Depot Street to Brown Street	17,300	< 50	85	178	66.0
18	Merchant Street - Orchard Avenue to Mason Street	7,300	< 50	< 50	102	62.3
19	Dobbins Street - Merchant Street to Monte Vista Avenue	5,600	< 50	< 50	67	61.2
20	Dobbins Street - Monte Vista Avenue to Hemlock Street	10,000	< 50	60	124	64.1
21	Mason Street - Merchant Street to Davis Street	7,600	< 50	< 50	83	62.0
22	Mason Street - Davis Street to Depot Street	14,500	< 50	75	158	65.7

[a] ADT = average daily trips.

TABLE 4.11-5 EXISTING TRAFFIC NOISE CONTOURS, dBA

	Roadway Segment	ADT[a]	Centerline to 70 L_{dn} (Feet)	Centerline to 65 L_{dn} (Feet)	Centerline to 60 L_{dn} (Feet)	L_{dn} (dBA) 50 Feet From Centerline of Outermost Lane
23	Elmira Road - Peabody Road to Nut Tree Road	21,000	58	116	245	68.1
24	Elmira Road - Nut Tree Road to Leisure Town Road	10,900	< 50	75	159	65.7
25	Peabody Road - CMF Entrance to Alamo Drive	22,700	60	122	258	68.5
26	Peabody Road - Alamo Drive to Elmira Road	15,000	< 50	94	196	66.7
27	Allison Drive - Elmira Road to Ulatis Drive	15,400	< 50	95	200	66.8
28	Allison Drive - Ulatis Drive to Nut Tree Parkway	17,200	< 50	102	215	67.3
29	Ulatis Drive - Allison Drive to Nut Tree Road	12,400	< 50	83	173	65.8
30	Ulatis Drive - Nut Tree Road to Leisure Town Road	3,200	< 50	< 50	74	60.0
31	Nut Tree Road - Foxboro Drive to Alamo Drive	8,600	< 50	65	136	64.7
32	Nut Tree Road - Alamo Drive to Elmira Road	14,000	< 50	90	188	66.4
33	Nut Tree Road - Elmira Road to Ulatis Drive	18,200	< 50	106	223	67.5
34	Nut Tree Road - Ulatis Drive to Orange Drive	8,200	< 50	65	132	64.0
35	Brown Street – Monte Vista Avenue to Browns Valley Parkway	4,700	< 50	< 50	74	61.9
36	Browns Valley Parkway – Monte Vista Avenue to Brown Street	7,900	< 50	64	129	63.9
37	Browns Valley Road – Brown Street to Vaca Valley Parkway	4,400	< 50	< 50	87	62.3
38	I-505 – I-80 to Vaca Valley Parkway	30,500	129	271	581	73.4
39	I-505 – Vaca Valley Parkway to Midway Road	25,500	115	241	516	72.6
40	I-80 – Rivera Road to Alamo Drive	93,000	267	567	1,219	77.3
41	I-80 – Alamo Drive to Davis Street	93,000	267	567	1,219	77.3
42	I-80 – Davis Street to I-505	90,000	261	555	1,192	77.2
43	I-80 – I-505 to Midway Road	83,000	248	526	1,130	76.8

a. ADT = average daily trips.
b. Traffic noise within 50 feet of roadway centerline requires site specific analysis.
Note: Please see Table 4.11-8, which shows noise levels considered to be acceptable for given land uses, based on the City's adopted community noise level compatibility standards.
Source: LSA Associates, Inc., June 2012.

ii. Railroad

Rail operations are a source of noise in Vacaville. Factors that influence the overall impact of railroad noise on adjacent uses include the distance of buildings from the tracks, surrounding land topography, number of tracks and frequency of train operations, and the absence or presence of sound walls or other barriers between the tracks and adjacent uses.The train activity along the Union Pacific rail line bordering the southeast portion of the City of Vacaville includes Amtrak passenger trains and freight trains. According to Union Pacific, approximately 36 commuter and passenger trains, and approximately 34 freight trains, operate daily on the tracks.[6] This analysis utilized the Federal Transit Administration's (FTA) train noise modeling methodology for the computation of the 24-hour weighted average L_{dn}. This analysis utilized a conservative estimate of 70 total daily train passings, an average of two locomotives and 30 cars per train, traveling at an average of 50 miles per hour along the rail line segments adjacent to the city. The modeling results show that the day-night average noise level could range up to approximately 91 dBA L_{dn} at 50 feet from the nearest at-grade railroad crossings when warning horns are sounded, and up to 76 dBA L_{dn} at 50 feet from the center of the rail line along segments where train horns are not sounded. The contributions to the existing noise contours from current rail operations are shown in Figure 4.11-1.

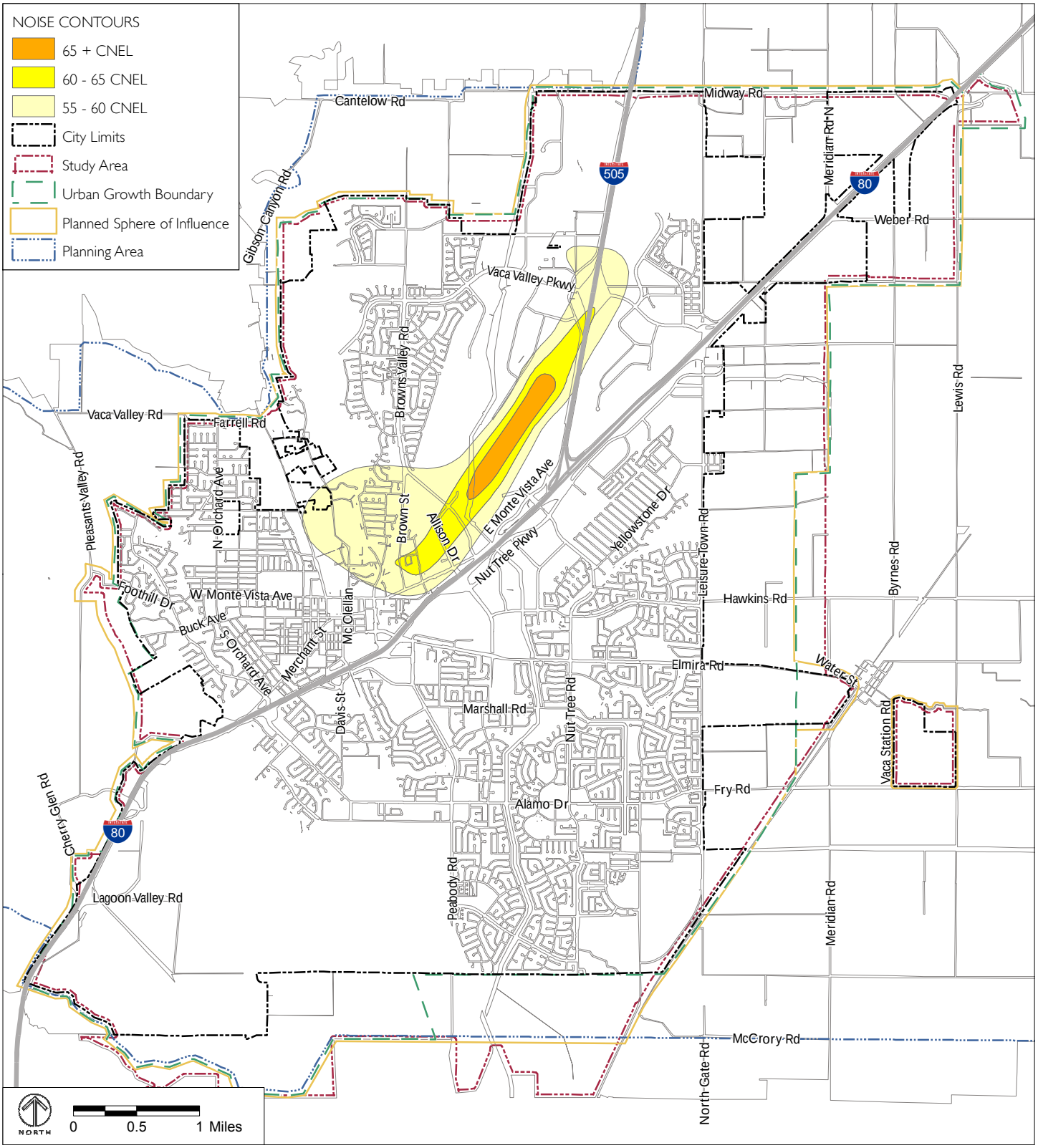
A new commuter rail station, the Vacaville-Fairfield multi-modal rail station, is planned to be constructed in northeast Fairfield along Amtrak's Capitol Corridor. Although the construction of the station itself is not anticipated to increase the number of train trips,[7] it is possible that trips will be expanded in the future. Any additional train trips added by this train station could increase the L_{dn} values within the areas closest to the tracks. However, it should be noted that, based on FTA train noise modeling results, even an additional 20 train passings per day would not increase the ambient L_{dn} by a perceptible amount (3 dBA or greater).

iii. Aircraft

Aircraft overflights contribute to the ambient noise levels in Vacaville. The Nut Tree Airport is located in the north central portion of Vacaville, and Travis Air Force Base is located southeast of the city limits. The noise contours for the Nut Tree Airport are shown in Figure 4.11-2. No portion of the EIR Study Area lies within the 60 dBA CNEL noise contour of the Travis Air Force Base airfield.

[6] City of Vacaville, 2005, *Draft EIR Southtown Project.*

[7] City of Fairfield, 2010, *Fairfield-Vacaville Train Station Project Initial Study*, page 61.



Source: Nut Tree Airport, 2012. Depiction: The Planning Center/DC&E, 2012

FIGURE 4.11-2
NUT TREE AIRPORT NOISE CONTOURS

The 65 dBA CNEL noise contour of the Nut Tree Airport is essentially contained within the airport property boundary. Existing land uses in the portions of the city that lie within the 60 dBA CNEL noise contour of the Nut Tree Airport include open space, business park, and industrial land uses, and a few residential land uses in the area north of Monte Vista Avenue between Brown Street and Browns Valley Parkway. The City has also adopted a Policy Plan for the Nut Tree Ranch property allowing the future development of a mixed-use commercial, residential, office, and entertainment development on this site, portions of which lie within the 60 dBA CNEL noise contour. Residential land uses are also located adjacent to, but outside of, the 60 dBA CNEL noise contour for Nut Tree Airport. The 55 dBA CNEL contour covers a larger portion of, and uses in, Vacaville.

In January 2010, the Nut Tree Airport provided the City with a draft of the *Initial Study/Mitigated Negative Declaration for Nut Tree Airport Improvements and Obstruction Removal*. This document indicates that the Airport intends to conduct several improvements to its facility, including adding more hangars and expanding the aircraft parking areas. These proposed changes, along with the ability to accommodate additional aircraft, will affect the existing noise contours of the airport. According to the report, most of the 65 dBA CNEL will remain on airport property. However, a small portion of this contour will be extended north of the airport into the industrial parks, and also onto commercial properties on the Nut Tree Ranch property and other commercial properties southeast of the airport. No sensitive receptors (e.g. residents, schools, and hospitals) are located within the projected 65 dBA CNEL contour associated with the forecasted 2025 projection. However, the 60 dBA CNEL contour line is estimated to project further into the adjacent Nut Tree Ranch project mixed use area, potentially affecting areas already zoned to allow residential uses. The Nut Tree Airport Master Plan Update associated with the aforementioned environmental document is currently undergoing the public review process.

b. Stationary Noise Sources

Existing stationary noise sources throughout most of the city include heating ventilation and conditioning (HVAC) mechanical systems, delivery truck idling and loading/unloading activities, and recreational and parking lot activities, such as slamming car doors and talking. Of these noise sources, noise generated by delivery truck activity typically generates the highest maximum noise levels. Delivery truck loading and unloading activities can result in maximum noise levels from 75 dBA to 85 dBA L_{max} at 50 feet. Typical parking lot activities, such as people conversing or doors slamming, generates approximately 60 dBA to 70 dBA L_{max} at 50 feet. Other noise sources specific to commercial centers and industrial zones of the city include light and medium industrial land uses, which can vary in noise levels. For example, noise at a Vacaville light industrial facility on Allison Way was measured at 76 dBA L_{max} at 120 feet, which would be 83 dBA L_{max} at 50 feet.

c. Groundborne Vibration Sources

Common sources of groundborne vibration include trains and construction activities, such as blasting, pile driving, and operating heavy earthmoving equipment.

Construction activities can temporarily expose persons in the vicinity of construction sites to excessive groundborne vibration or groundborne noise levels. Some types of construction activity can result in damage to fragile or sensitive structures. As noted in Section A.3, Groundborne Vibration, for buildings considered historically significant or that are particularly fragile structures, the damage threshold is approximately 96 VdB; the damage threshold for other structures is 100 VdB. Activities such as pile driving can generate vibration levels of up to 112 VdB at 25 feet. In order to reduce potential groundborne vibration impacts from construction activities on buildings considered historically significant or that are particularly fragile structures, standard planning practice is to require detailed vibration impact assessments for all projects proposing to use pile driving, earthmoving, other high impact construction equipment near these types of sensitive structures.

In addition to construction activities, railroad activities are a common source of groundborne vibration. According to the FTA,[8] the screening distance for vibration impact assessments from conventional commuter rail line sources is 200 feet for sensitive land uses, such as residential developments, and 120 feet for institutional or office land uses that do not use vibration-sensitive equipment, but still have potential for activity interference. Therefore, in order to reduce groundborne vibration impacts of railroad activity from exceeding levels that would be apparent to a reasonable person, some cities choose to require a detailed vibration impact assessment for all projects proposing to construct sensitive land uses within 200 feet of the existing rail line.

3. Existing Ambient Noise Measurements

LSA conducted ambient noise surveys in Vacaville on June 2, 2010. A Larson-Davis Model 720 sound level meter was used to conduct the ambient noise survey. Short-term, 15-minute, ambient noise level measurements were taken at representative locations within the city. Table 4.11-6 lists the eight short-term noise monitoring results, describes each noise monitoring location, and lists the audible noise sources at each location.

[8] Federal Transit Administration, May 2006, Transit Noise and Vibration Impact Assessment.

TABLE 4.11-6 **SHORT-TERM[a] AMBIENT NOISE MONITORING RESULTS**

Site No.	Start Time	dBA L_{eq}[b]	Location	Noise Source
1	7:55 a.m.	65	Park area next to 719 Atchison Drive, along Leisure Town Road	Traffic on Leisure Town Road, trash truck in residential neighborhood
2	8:45 a.m.	63	117 Del Rio Circle, next to 7 Flags Car Wash, along Elmira Road	Traffic on Elmira Road, operations at 7 Flags Car Wash
3	9:20 a.m.	70	270 Butcher Road, by multi-family residential units, along I-80	Traffic on I-80
4	9:50 a.m.	56	City Hall Park, along Walnut Avenue	Traffic noise from I-80 clearly audible, traffic on Walnut Avenue, parking lot activities in City Hall parking lot
5	11:30 a.m.	63	140 Cernon Street, by multi-family residential units, across from the Transit Plaza	Traffic on Cernon Street, buses at Transit Plaza, vehicles at bank drive-through ATM, airplanes in distance
6	1:20 p.m.	62	Northwest corner of Catherine Street and Wilson Street, near welding shop on Main Street	Roadway traffic, construction equipment operating along creek, welding shop operations
7	1:50 p.m.	63	3500 Harbison Drive, next to patio of multi-family residential unit	Traffic on Harbison Drive, wind, construction equipment operating on site for new Transit Plaza
8	2:25 p.m.	54	Between residential uses on Cashel Circle and light industrial uses on Allison Way	Saw and compressor operations at cabinetry shop, wind, distant airplanes, people talking in residential neighborhood

Note: Noise monitoring was conducted on June 2, 2010.
[a] 15-minute measurements.
[b] Rounded to the nearest decibel.
Source: LSA Associates, Inc., June 2010.

The noise monitoring results indicate that the measured existing daytime noise levels throughout the city range from 54 to 70 dBA L_{eq}. This range of noise levels is typical of an urban or suburban setting. In addition to vehicular traffic, other documented audible noise sources that contribute to the ambient noise environment included aircraft overflights, heavy equipment operations, construction activity, loading and unloading operations, commercial activities, dog barking, birds chirping, wind blowing, and people conversing.

Ambient noise levels throughout the city have also been documented in other environmental reports that have been prepared for various development projects. Table 4.11-7 provides a summary of some of these supplemental documented ambient noise levels.

TABLE 4.11-7 **SUPPLEMENTAL AMBIENT NOISE MONITORING RESULTS, dBA**

Location	Date	Long-Term Measurement (L_{dn})	Document Source
Adjacent to Leisure Town Road between Elmira Road and Marshall Road.	June 30 to July 1, 2009	74.8	Easterly Wastewater Treatment Plant Tertiary Project Draft EIR, January 2010
Vaca Station Road adjacent to Easterly Wastewater Treatment Plant north entrance.	June 30 to July 1, 2009	63.8	Easterly Wastewater Treatment Plant Tertiary Project Draft EIR, January 2010

Source: AES, Easterly Wastewater Treatment Plant Tertiary Project Draft EIR, January 2010.

D. Standards of Significance

Implementation of the proposed General Plan and ECAS would have a significant impact with regard to noise if they would:

- Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
- Expose persons to or generate excessive groundborne vibration or groundborne noise levels.
- Substantially, permanently increase ambient noise levels in the project vicinity by more than 5 dBA above levels existing without the project.
- Substantially, temporarily, or periodically increase ambient noise levels in the project vicinity by more than 5 dBA above levels existing without the project.
- Expose people residing or working in the project area to excessive noise levels from aircraft noise sources.

E. Impact Discussion

This section discusses potential impacts of the proposed General Plan on noise in the EIR Study Area. Implementation of the proposed ECAS would have minimal noise impacts and is discussed, where relevant, in the sections below.

1. Project Impacts

This discussion of potential project impacts is organized by and responds to each of the potential impacts identified in the Standards of Significance.

a. Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

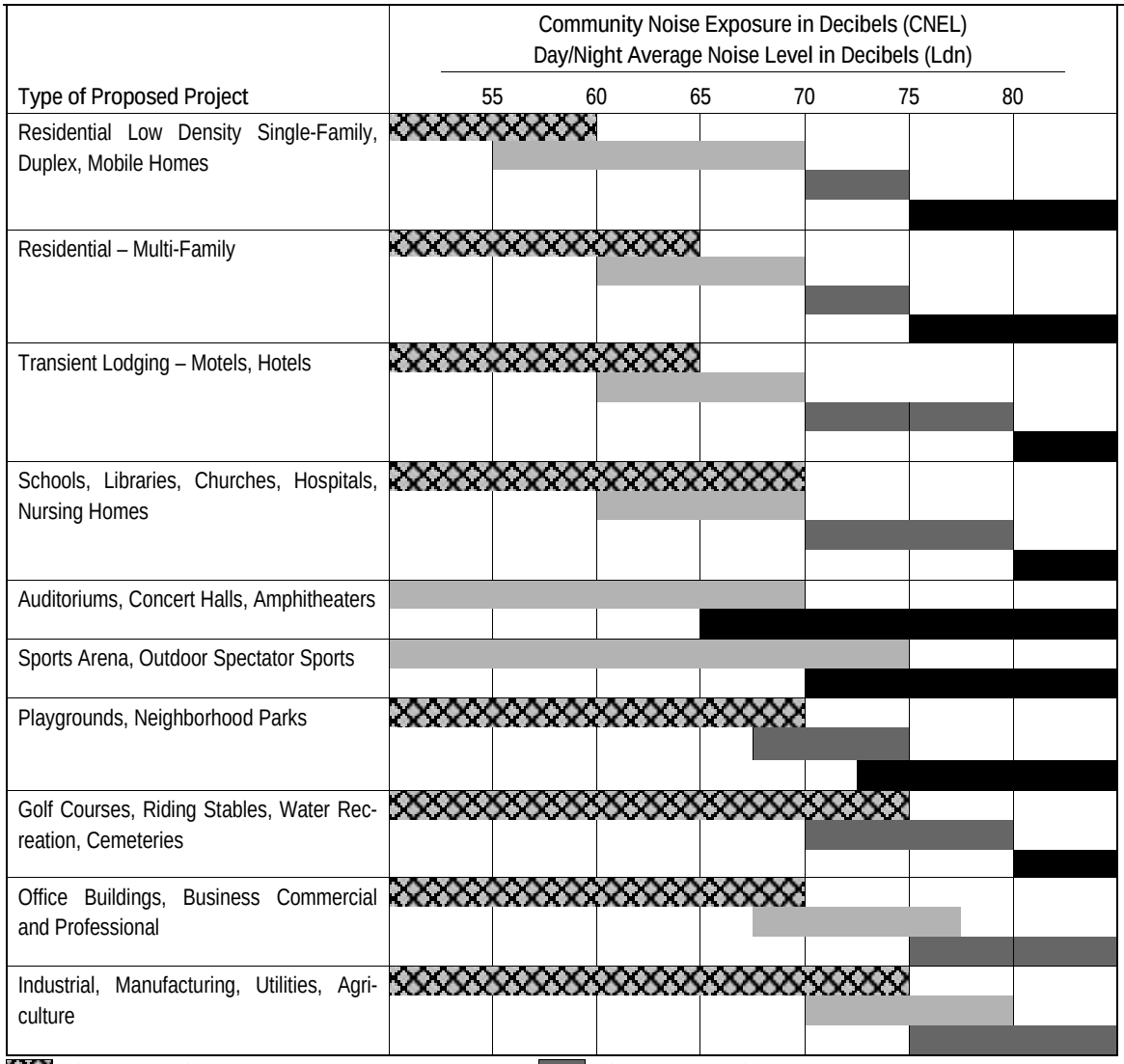
The proposed General Plan Noise Element discusses the effects of noise exposure on the population and sets goals designed to protect residents and businesses from excessive and persistent noise intrusions. The proposed General Plan Noise Element contains noise thresholds for developments located adjacent to mobile or transportation noise sources and thresholds for stationary noise sources. This section evaluates the project-level impacts of implementation of the proposed General Plan related to noise standards.

For reference, the State of California General Plan Guidelines publication[9] contains guidelines for assessing noise compatibility, organized by land use type. These guidelines are used to evaluate a proposed project's compatibility with exterior ambient noise levels. Cities and counties in California either adopt the State guidelines or modify the State guidelines for particular local conditions. However, cities and counties in California are pre-empted by federal law from controlling noise generated from most mobile sources, including noise generated by vehicles and trucks on the roadway, trains on the railroad, and airplanes. Since cities cannot control these mobile noise sources, they instead regulate what types of land uses are acceptable within different noise environments. A noise-land use compatibility matrix, like the one in Table 4.11-8, is generally used to gauge whether new development is compatible in the noise environment generated by mobile sources. The Land Use Compatibility Standards for Community Noise Environments that are included in the proposed General Plan are presented in Table 4.11-8.

Table 4.11-8 identifies "normally acceptable," "conditionally acceptable," "normally unacceptable," and "clearly unacceptable" noise levels for various land uses. For example, if a new library was proposed for a vacant lot, such a proposed land use would be classified as "normally acceptable" for existing area noise levels up to 70 dBA CNEL, but would be "conditionally acceptable" between 60 and 70 dBA CNEL. This means that the City has the discretion to require detailed analysis in areas between 60 and 70 dBA to verify if the noise level is acceptable for that use. Further, that same proposed use would be classified as "normally unacceptable" for ambient noise levels between 70 and 80 dBA CNEL and 'clearly unacceptable' if the area noise levels were greater than 80 dBA CNEL.

[9] Governor's Office of Planning and Research, 2003, 2003 General Plan Guidelines.

TABLE 4.11-8 LAND USE COMPATIBILITY STANDARDS FOR COMMUNITY NOISE ENVIRONMENTS



NORMALLY ACCEPTABLE
Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

NORMALLY UNACCEPTABLE
New construction or development should 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 included in the design.

CONDITIONALLY ACCEPTABLE
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.

CLEARLY UNACCEPTABLE
New construction or development clearly should not be undertaken.

Source: State of California General Plan Guidelines, 2003.

i. Stationary Sources

Development allowed by the proposed General Plan may result in the installation or creation of new stationary sources of noise, or could include the development of new sensitive land uses in the vicinity of existing stationary noise sources. For commercial or industrial uses, these noise sources could include loading/unloading operations, generators, and outdoor speakers; for residential uses, stationary noise sources may include air conditioners or pool pumps. These stationary sources of noise would have the potential to disturb adjacent sensitive receptors. In addition, the proposed ECAS promotes the development of alternative energy production facilities; facilities such as wind turbines could also be stationary sources of noise. However, the proposed General Plan includes policies to address noise from stationary noise sources by requiring project-by-project environmental review to ensure that noise impacts from stationary sources are evaluated and mitigated. For example, Policies NOI-P1.1, NOI-P1.2, and NOI-P1.3 would ensure that noise impacts from stationary sources are minimized by requiring mitigation of noise impacts for new development projects to comply with the Land Use Compatibility Standards shown in Table 4.11-8. Policy NOI-P2.5 encourages site planning and project design strategies, including the use of noise barriers if necessary, to buffer new and existing development from noise. In addition, Policies NOI-P4.1 and NOI-P4.2 would further minimize noise impacts from stationary noise sources by requiring project specific conditions of approval for stationary noise sources, including mechanical equipment as well as maintenance and construction activities.

Adherence to the policies contained in the proposed General Plan would ensure that the exposure of sensitive receptors to excessive noise levels from stationary noise impacts would be sufficiently mitigated such that related potential noise impacts would be *less than significant*.

ii. Rail Noise Sources

Implementation of the proposed General Plan is not anticipated to result in increased railroad operations within the city. Therefore, noise levels associated with rail operations are anticipated to remain similar to the existing conditions with implementation of the proposed project. While development allowed by the proposed General Plan could expose new sensitive land uses to excessive noise levels from existing railroad noise sources, policies included in the proposed General Plan would require project-by-project environmental review to ensure that noise impacts from railroad sources are considered in the design and planning stages for specific projects. Specifically, Policies NOI-P1.1, NOI-P1.2, and NOI-P1.3 would ensure that noise impacts from railroad sources are minimized by requiring mitigation of noise impacts for new development projects to comply with the Land Use Compatibility Standards. Policy NOI-P2.5 encourages site planning and project design strategies, including the use of noise barriers if necessary, to buffer new and existing development from noise. In addition, Policy NOI-P2.7 would help minimize noise impacts from railroad sources by requiring minimum 100-foot setbacks from railroad centerlines for development of sensitive land uses.

Therefore, implementation of the proposed General Plan would not result in the exposure of sensitive receptors to excessive noise levels from railroad noise sources, and this impact would be considered *less than significant*.

iii. Traffic Noise Sources

Development allowed by the proposed General Plan may include the development of new sensitive land uses in the vicinity of existing traffic noise sources.

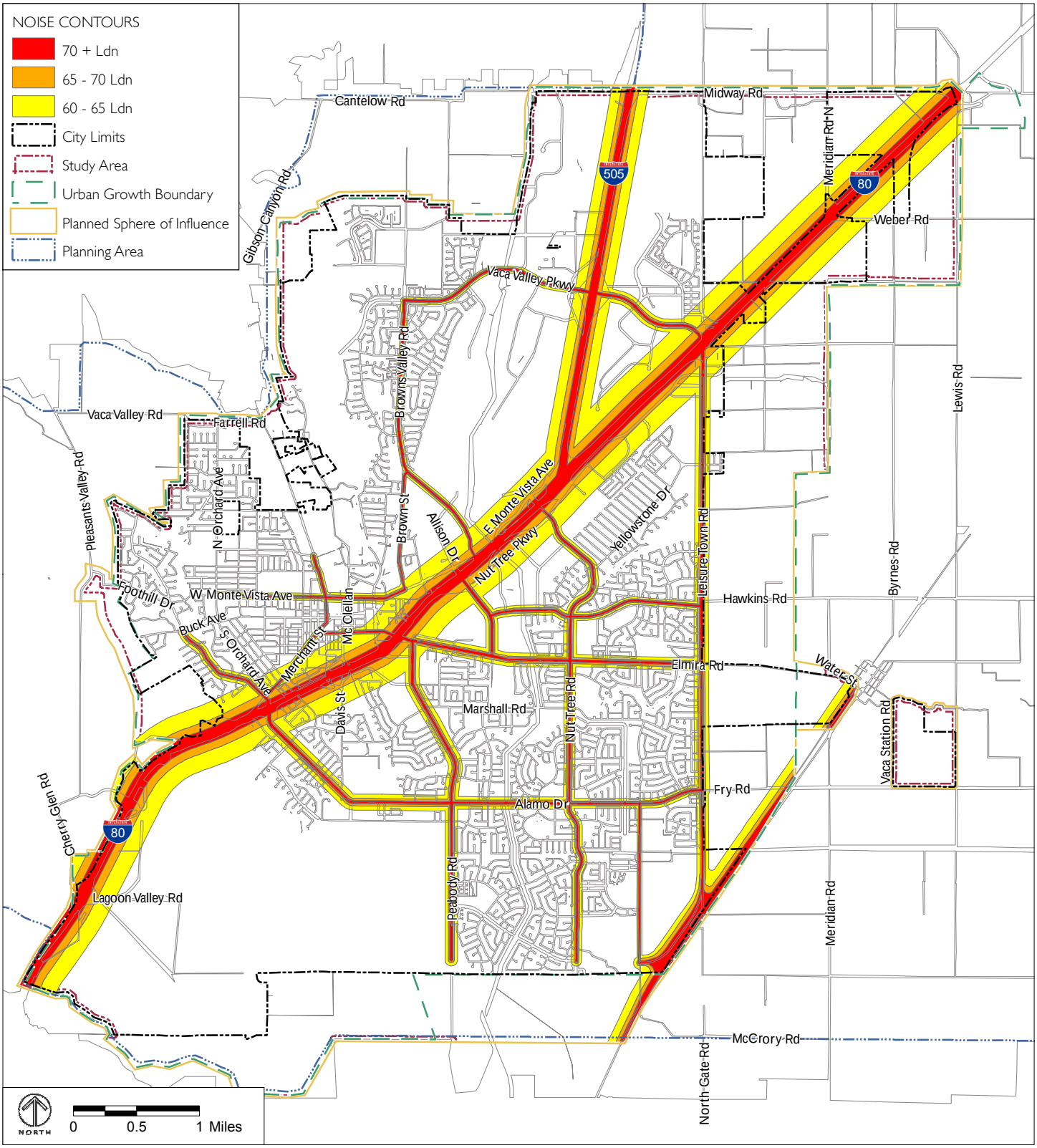
Potential impacts from future development allowed by the proposed General Plan stem mainly from the addition of vehicles along freeways and roadways in the city and trains on the UPRR rail lines. The average daily traffic (ADT) volumes provided by the traffic analysis prepared for this EIR[10] were used to identify roadway segments where future traffic noise levels would or may be substantially increased over existing conditions. Traffic noise contour boundaries are often utilized by local land planning authorities to evaluate sound level exposures on land near roadways that is being considered for development. Noise contour boundaries are utilized in this analysis to assess the traffic noise level impacts associated with future development allowed by the proposed General Plan. The traffic noise contour boundaries for existing and long-range conditions were estimated using the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (RD-77-108).[11] These results are summarized in Table 4.11-9, which shows the existing and projected year 2035 traffic noise levels along major roadway segments in the city with development allowed by the proposed General Plan.

The numerical results from the Table 4.11-9 are depicted graphically in Figure 4.11-3, which shows the noise contours from roadway traffic and railroad activities along major thoroughfares within the city for 2035 conditions. Noise levels in these figures do not account for noise attenuation provided by intervening structures or topographical barriers that could reduce traffic noise levels at adjacent land uses, but, rather, assume a worst-case direct line-of-sight over a hard surface to the modeled traffic noise sources. Additionally, the minimum distance considered for the noise level contours was 50 feet.[12] While this distance is generally within the extent of the road's right-of-way, on some roadways that are not a total of 100 feet wide, the contour lines may be depicted farther from the roadway centerline than would result from a detailed investigation of those segments. These assumptions and levels of analysis are appropriate for a program-level noise analysis. These figures are included in order to provide a generalized image of area-spotentially exposed to mobile noise sources within the EIR Study Area and are not suitable for project-level planning purposes.

[10] Prepared by Kittelson & Associates; see Chapter 4.14, Traffic and Transportation.

[11] LSA Associates, 2012

[12] LSA Associates, 2012



Source: LSA Associates, 2012.

FIGURE 4.11-3
FUTURE NOISE LEVEL CONTOURS IN 2035

TABLE 4.11-9 **SUMMARY OF TRAFFIC NOISE CONTOURS**

		Existing Conditions		Existing General Plan in 2035		33Proposed General Plan in 2035			
	Roadway Segment	ADT[a]	Ldn (dBA) 50 Feet from Centerline of Outermost Lane	ADT[a]	Ldn (dBA) 50 Feet from Centerline of Outermost Lane	ADT[a]	Ldn (dBA) 50 Feet from Centerline of Outermost Lane	Increase Over Existing Conditions	Increase Over Existing General Plan
1	Vaca Valley Parkway – Browns Valley Road to Eubanks Drive	6,100	63.7	9,800	65.7	9,500	65.6	1.9	-0.1
2	Vaca Valley Parkway – Eubanks Drive to Monte Vista Avenue	9,300	65.5	14,800	67.5	14,000	67.3	1.8	-0.2
3	Vaca Valley Parkway – I-505 NB Ramps to Leisure Town Road	7,500	64.1	24,700	69.3	24,400	69.2	5.1	-0.1
4	Leisure Town Road – Orange Drive to Sequoia Drive	15,000	67.6	29,800	70.6	29,300	70.5	2.9	-0.1
5	Leisure Town Road – Sequoia Drive to Ulatis Drive	12,300	66.7	28,100	70.3	28,800	70.4	3.7	0.1
6	Leisure Town Road – Ulatis Drive to Elmira Road	13,000	67.0	27,700	70.3	28,800	70.4	3.4	0.1
7	Leisure Town Road – Elmira Road to Alamo Drive	13,100	67.6	28,200	70.9	29,800	71.2	3.6	0.3
8	Leisure Town Road – Alamo Drive to Vanden Road	5,600	63.9	19,600	69.3	21,400	69.7	5.8	0.4
9	Vanden Road – Leisure Town Road to Alamo Drive	6,200	63.1	8,100	64.2	7,000	63.6	0.5	-0.6
10	Alamo Drive – Leisure Town Road to Vanden Road	7,300	64.0	15,000	67.1	16,600	67.5	3.5	0.4

[a] ADT = average daily trips.

TABLE 4.11-9 **SUMMARY OF TRAFFIC NOISE CONTOURS**

		Existing Conditions		Existing General Plan in 2035		33Proposed General Plan in 2035			
	Roadway Segment	ADT[a]	Ldn (dBA) 50 Feet from Centerline of Outermost Lane	ADT[a]	Ldn (dBA) 50 Feet from Centerline of Outermost Lane	ADT[a]	Ldn (dBA) 50 Feet from Centerline of Outermost Lane	Increase Over Existing Conditions	Increase Over Existing General Plan
11	Alamo Drive – Vanden Road to Nut Tree Road	13,400	66.6	16,300	67.5	16,800	67.6	1.0	0.1
12	Alamo Drive – Nut Tree Road to Peabody Road	20,100	68.4	22,500	68.9	23,100	69.0	0.6	0.1
13	Alamo Drive – Peabody Road to I-80 EB Ramps	27,800	69.8	33,500	70.6	33,000	70.5	0.7	-0.1
14	Alamo Drive – Merchant Street to Buck Avenue	13,700	66.7	18,900	68.1	17,900	67.9	1.2	-0.2
15	Monte Vista Avenue – Orchard Avenue to Dobbins Street	9,700	65.0	13,000	66.3	13,000	66.3	1.3	0.0
16	Monte Vista Avenue – Dobbins Street to Depot Street	17,800	66.2	22,300	67.1	21,900	67.1	0.9	0.0
17	Monte Vista Avenue – Depot Street to Brown Street	17,300	66.0	25,900	67.8	25,500	67.7	1.7	-0.1
18	Merchant Street – Orchard Avenue to Mason Street	7,300	62.3	12,300	64.5	12,900	64.8	2.5	0.3
19	Dobbins Street – Merchant Street to Monte Vista Avenue	5,600	61.2	13,000	64.9	7,500	62.5	1.3	-2.4
20	Dobbins Street – Monte Vista Avenue to Hemlock Street	10,000	64.1	13,300	65.3	12,600	65.1	1.0	-0.2
21	Mason Street – Merchant Street to Davis Street	7,600	62.0	7,700	62.0	7,900	62.1	0.1	0.1
22	Mason Street – Davis Street to Depot Street	14,500	65.7	17,600	66.5	17,500	66.5	0.8	0.0

[a] ADT = average daily trips.

TABLE 4.11-9 **SUMMARY OF TRAFFIC NOISE CONTOURS**

		Existing Conditions		Existing General Plan in 2035		33Proposed General Plan in 2035			
	Roadway Segment	ADT[a]	Ldn (dBA) 50 Feet from Centerline of Outermost Lane	ADT[a]	Ldn (dBA) 50 Feet from Centerline of Outermost Lane	ADT[a]	Ldn (dBA) 50 Feet from Centerline of Outermost Lane	Increase Over Existing Conditions	Increase Over Existing General Plan
23	Elmira Road – Peabody Road to Nut Tree Road	21,000	68.1	26,800	69.2	27,000	69.2	1.1	0.0
24	Elmira Road – Nut Tree Road to Leisure Town Road	10,900	65.7	18,500	68.0	22,700	68.9	3.2	0.9
25	Peabody Road – CMF Entrance to Alamo Drive	22,700	68.5	27,500	69.3	23,100	68.5	0.0	-0.8
26	Peabody Road – Alamo Drive to Elmira Road	15,000	66.7	23,600	68.6	27,500	69.3	2.6	0.7
27	Allison Drive – Elmira Road to Ulatis Drive	15,400	66.8	21,100	68.2	21,500	68.2	1.4	0.0
28	Allison Drive – Ulatis Drive to Nut Tree Parkway	17,200	67.3	20,600	68.0	21,800	68.3	1.0	0.3
29	Ulatis Drive – Allison Drive to Nut Tree Road	12,400	65.8	16,000	67.0	16,800	67.2	1.4	0.2
30	Ulatis Drive – Nut Tree Road to Leisure Town Road	3,200	60.0	10,200	65.0	11,100	65.4	5.4	0.4
31	Nut Tree Road – Foxboro Drive to Alamo Drive	8,600	64.7	11,200	65.8	16,800	67.6	2.9	1.8
32	Nut Tree Road – Alamo Drive to Elmira Road	14,000	66.4	21,300	68.2	19,700	67.9	1.5	-0.3
33	Nut Tree Road – Elmira Road to Ulatis Drive	18,200	67.5	23,800	68.7	24,200	68.7	1.2	0.0
34	Nut Tree Road – Ulatis Drive to Orange Drive	8,200	64.0	16,600	67.1	16,500	67.1	3.1	0.0
35	Brown Street - Monte Vista Avenue to Browns Valley Parkway	4,700	61.9	6,200	63.1	5,900	62.9	1.0	-0.2
36	Browns Valley Parkway - Monte Vista Avenue to Brown Street	7,900	63.9	11,700	65.6	11,300	65.4	1.5	-0.2

[a] ADT = average daily trips.

TABLE 4.11-9 SUMMARY OF TRAFFIC NOISE CONTOURS

		Existing Conditions		Existing General Plan in 2035		33Proposed General Plan in 2035			
	Roadway Segment	ADT[a]	Ldn (dBA) 50 Feet from Centerline of Outermost Lane	ADT[a]	Ldn (dBA) 50 Feet from Centerline of Outermost Lane	ADT[a]	Ldn (dBA) 50 Feet from Centerline of Outermost Lane	Increase Over Existing Conditions	Increase Over Existing General Plan
37	Browns Valley Road – Brown Street to Vaca Valley Parkway	4,400	62.3	8,000	64.9	7,600	64.6	2.3	-0.3
38	I-505 – I-80 to Vaca Valley Parkway	30,500	73.4	60,200	76.4	46,700	75.3	1.9	-1.1
39	I-505 – Vaca Valley Parkway to Midway Road	25,500	72.6	50,400	75.6	46,700	75.3	2.7	-0.3
40	I-80 – Rivera Road to Alamo Drive	93,000	77.3	101,300	77.7	101,300	77.7	0.4	0.0
41	I-80 – Alamo Drive to Davis Street	93,000	77.3	101,300	77.7	101,300	77.7	0.4	0.0
42	I-80 – Davis Street to I-505	90,000	77.2	101,300	77.7	101,300	77.7	0.5	0.0
43	I-80 – I-505 to Midway Road	83,000	76.8	101,300	77.7	101,300	77.7	0.9	0.0

[a] ADT = average daily trips.
Note: Existing General Plan noise conditions are provided for informational purposes only, and a comparison of the proposed project to the existing General Plan does not affect the impact findings. Impact findings are based on a comparison of the proposed General Plan to existing conditions.
Source: LSA Associates, Inc., May 2012.

Implementation of the proposed General Plan Policies NOI-P1.1, NOI-P1.2, and NOI-P1.3 would reduce traffic noise impacts on new land use developments. These policies require new development projects, including both transportation and non-transportation projects, to incorporate necessary mitigation in order to comply, to the extent that is technically and economically feasible, with the Land Use Compatibility Standards shown in Table 4.11-8. Policy NOI-P2.2 discourages the development of residential land uses adjacent to Interstate 80 and Interstate 505. Policies NOI-P2.3 and NOI-P2.4 further require the design and maintenance of street networks to minimize transportation-related noise impacts to noise-sensitive land uses. Policy NOI-P2.5 encourages site planning and project design strategies, including the use of noise barriers if necessary, to buffer new and existing development from noise. Policy NOI-P2.5 would apply to existing streets, and therefore implementation of this policy could involve the retrofit of existing streets to address unacceptable noise levels.

In addition, Policies NOI-P3.1 and NOI-P3.2 would further minimize noise impacts from transportation noise sources by enforcing truck routes through the city. Policy NOI-P3.3 would reduce transportation noise impacts on new commercial and office land use development by requiring increased setbacks along freeways.

With implementation of these policies, the exposure of sensitive receptors to excessive noise levels from traffic noise sources associated with projected growth under the proposed General Plan would be a *less-than-significant* impact.

b. Expose persons to or generate excessive groundborne vibration or groundborne noise levels.

Common sources of groundborne vibration and noise include trains and construction activities such as blasting, pile driving and operating heavy earthmoving equipment. Development allowed by the proposed General Plan has the potential to result in disturbance to new residences from groundborne vibration and noise associated with development that may occur near the Union Pacific rail line. In addition, construction activities associated with projects that could occur under the proposed General Plan could result in exposure of sensitive land uses to excessive groundborne vibration and noise levels. Problems, such as disturbance, due to groundborne vibration and noise from these sources are usually contained within areas within about 100 feet of the vibration source.[13] Typically, the main effect of groundborne vibration and noise is to cause annoyances for occupants of nearby buildings.

Similar to the discussion of potential noise impacts associated with railroad activities in Section E.1.a.ii, Project Impacts, implementation of the proposed General Plan Policies NOI-P1.1, NOI-P1.2, and NOI-P1.3 would ensure that groundborne vibration and noise impacts from railroad sources are minimized by requiring consistency with the Land Use Compatibility Standards

[13] US Department of Transportation, Federal Transit Administration, 1995, *Transit Noise and Vibration Impact Assessment.*

in planning and development decisions. Policy NOI-P2.5 encourages site planning and project design strategies, including the use of noise barriers if necessary, to buffer new and existing development from noise. Policy NOI-P2.7 would also help minimize groundborne vibration impacts from railroad sources by requiring minimum 100-foot setbacks from railroad centerlines for development of sensitive land uses.

Similarly, implementation of the proposed General Plan Policies NOI-P4.1 and NOI-P4.2 would also minimize potential groundborne vibration and noise impacts from construction activity that could occur from development allowed by the proposed General Plan by requiring control measures that reduce the exposure of noise sensitive land uses to construction-related groundborne vibration and noise.

With implementation of these policies, the exposure of sensitive receptors to excessive groundborne vibration or noise levels associated with development allowed by the proposed General Plan would be a *less-than-significant* impact.

c. Substantially, permanently increase ambient noise levels in the project vicinity above levels existing without the project.

It is projected that traffic volumes on some streets within the city would increase due to development allowed by the proposed General Plan (see Table 4.11-9). This increase in traffic volumes would result in increased traffic noise levels compared to existing conditions. See Chapter 4.14, Transportation and Circulation, for a description of the assumptions included in the 2035 traffic conditions.

As stated in Section A, Noise and Vibration Concepts, while changes of 3 dBA are considered to be barely perceptible in exterior environments, changes of 5 dBA or more have been found to be readily perceptible to the human ear in outdoor environments. Therefore, for purposes of this analysis, increases of more than 5 dBA in ambient noise levels above existing levels are considered a significant impact. While most evaluated roadway segments would have higher future traffic noise when compared to their existing levels, only three modeled roadway segments would experience a traffic noise increase of more than 5 dBA compared to their existing traffic noise levels. Each of these impacted roadway segments is identified and described in more detail as follows:

- **Vaca Valley Parkway from the Interstate 505 Northbound Ramps to Leisure Town Road.** This roadway segment would experience traffic noise levels of approximately 69 dBA L_{dn} at 50 feet from the centerline of the outermost travel lane under the proposed General Plan in 2035. These noise levels would result in a projected increase of 5.1 dBA over existing traffic noise levels. The adjoining land uses include office and commercial, uses, as well as Kaiser Hospital.

Due to the existing necessary ingress and egress to adjacent properties along this impacted segment, traffic noise mitigation in the form of sound walls would not be feasible. An alternative mitigation measure would be to resurface this portion of Vaca Valley Parkway with Rubberized Hot Mix Asphalt – Open Graded (RHMA-O) or similar quieter pavement. This type of pavement has been shown in various studies to result in a 4 to 6 dBA reduction in noise levels with an average 4 dBA reduction in traffic noise realized in a California long-term study.[14]

- **Leisure Town Road from Alamo Drive to Vanden Road.** This roadway segment would experience traffic noise levels of approximately 70 dBA L_{dn} at 50 feet from the centerline of the outermost travel lane under the proposed General Plan in 2035. These noise levels would result in a projected increase of 5.8 dBA over existing traffic noise levels. The adjoining land uses include residential and agricultural land uses.

  Demolition of existing sound walls along the residential property line bordering this roadway segment in order to build substantially higher sound walls would not be considered feasible due to cost constraints, potential environmental and annoyance impacts to residential properties, required environmental clearance for such a retrofit project, and the potential visual impacts associated with substantially higher sound walls. An alternative mitigation measure would be to resurface this portion of Vaca Valley Parkway with RHMA-O or similar quieter pavement whenever these surfaces are scheduled for re-surfacing, which would result in an average 4 dBA reduction in traffic noise.

- **Ulatis Drive from Nut Tree Road to Leisure Town Road.** This roadway segment would experience traffic noise levels of approximately 65 dBA L_{dn} at 50 feet from the centerline of the outermost travel lane under the proposed General Plan in 2035. These noise levels would result in a projected increase of 5.4 dBA over existing traffic noise levels. The adjoining land uses include residential uses and the North Bay Vaca Valley Hospital.

  Demolition of existing sound walls along the residential property line bordering this roadway segment in order to build substantially higher sound walls would not be considered feasible due to cost constraints, potential environmental and annoyance impacts to residential properties, required environmental clearance for such a retrofit project, and the potential visual impacts associated with substantially higher sound walls. An alternative mitigation measure would be to resurface this portion of Vaca Valley Parkway with RHMA-O or similar quieter pavement whenever these surfaces are scheduled for re-surfacing, which would result in an average 4 dBA reduction in traffic noise.

[14] Sacramento County, Department of Environmental Review and Assessment, 1999, *Report of the Status of Rubberized Asphalt Traffic Noise Reduction in Sacramento County.*

Implementation of the policies summarized in Section E.1.a, Project Impacts, would require the City to consider noise and land use compatibility issues when evaluating individual development proposals, and to take steps to minimize traffic noise to the extent feasible where significant noise impacts would result. However, while these proposed General Plan policies would help to mitigate the severity of the effects of traffic noise, they would not prevent all of the anticipated traffic noise increases along the roadway segments described in this section, and the impact would be *significant*.

Impact NOI-1: Increased traffic from projected development allowed by the proposed General Plan would result in a significant increase in traffic noise levels of more than 5 dBA compared to existing conditions along the following roadway segments:

- Vaca Valley Parkway from the Interstate 505 northbound ramps to Leisure Town Road
- Leisure Town Road from Alamo Drive to Vanden Road
- Ulatis Drive from Nut Tree Road to Leisure Town Road

This would be a *significant* impact.

Mitigation Measure NOI-1: The project applicant shall ensure that the following roadway segments shall be re-surfaced with a quiet pavement, such as Rubberized Hot Mix Asphalt – Open Graded (RHMA-O):

- Vaca Valley Parkway from the Interstate 505 northbound ramps to Leisure Town Road
- Leisure Town Road from Alamo Drive to Vanden Road
- Ulatis Drive from Nut Tree Road to Leisure Town Road

Significance after Mitigation: Implementation of this mitigation measure would reduce the significant increase in traffic noise levels of more than 5 dBA associated with the proposed General Plan to a *less-than-significant* level.

d. Substantially, temporarily, or periodically increase ambient noise levels in the project vicinity above levels existing without the project.

Two types of short-term noise impacts would occur during demolition, site preparation, and construction of projects allowed by the proposed General Plan. The first type would result from the increase in traffic flow on local streets associated with the transport of workers, equipment, and materials to and from specific project sites. The transport of workers and construction equipment and materials to specific project sites would incrementally increase noise levels on access roads leading to each site. The second type would result from equipment use and activities associated with demolition, site preparation, and construction of projects. Construction is performed in discrete steps, each of which has its own mix of equipment and, consequently, its

own noise characteristics. These phases would change the character of the noise generated on project sites and, therefore, the noise levels surrounding sites as construction progresses.

Table 4.11-10 lists typical maximum noise levels for various pieces of construction equipment, as measured at a distance of 50 feet from the operating equipment. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. The site preparation phase, which includes excavation and grading, tends to generate the highest noise levels because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavating machinery such as backhoes, bulldozers, draglines, and front loaders. Earthmoving and compacting equipment include compactors, scrapers, and graders.

Typical operating cycles for these types of construction equipment may involve one or two minutes of full-power operation followed by three or four minutes at lower power settings. Typical maximum noise levels during the site preparation phase of construction can range up to 91 dBA L_{max} at 50 feet from multiple pieces of operating equipment.

Implementation of proposed General Plan Policies NOI-P1.1 and NOI-P1.2 would ensure that noise impacts from construction activities associated with development allowed by the proposed General Plan would be minimized by requiring consistency with the Land Use Compatibility Standards. In addition, Policies NOI-P4.1 and NOI-P4.2 would further minimize noise impacts from stationary construction noise sources by requiring project specific conditions of approval for new development.

With implementation of these policies, the exposure of sensitive receptors to excessive noise levels from construction activities associated with development allowed by the proposed General Plan would be considered a *less-than-significant* impact.

e. Expose people residing or working in the project area to excessive noise levels from aircraft noise sources.

As noted in Section C, Existing Conditions, aircraft noise in Vacaville is primarily related to aircraft operations at the Nut Tree Airport, which is located in the north central portion of Vacaville, and Travis Air Force Base, which is located southeast of the city limits. Portions of the city lie within the 60 dBA CNEL noise contour of the Nut Tree Airport. Proposed land use designations within this area include open space, business park, and industrial land uses, and a few residential land uses in the area north of Monte Vista Avenue between Brown Street and Browns Valley Parkway, all of which are compatible land uses for these ambient noise levels. Residential land use designations are located adjacent to the 60 dBA CNEL noise contour for Nut Tree Airport.

TABLE 4.11-10 **TYPICAL CONSTRUCTION EQUIPMENT MAXIMUM NOISE LEVELS**

Type of Equipment	Range of Maximum Sound Level (dBA L_{max} at 50 Feet)	Suggested Maximum Sound Level for Analysis (dBA L_{max} at 50 Feet)
Pile Drivers	81 to 96	93
Rock Drills	83 to 99	96
Jackhammers	75 to 85	82
Pneumatic Tools	78 to 88	85
Pumps	68 to 80	77
Scrapers	83 to 91	87
Haul Trucks	83 to 94	88
Electric Saws	66 to 72	70
Portable Generators	71 to 87	80
Rollers	75 to 82	80
Dozers	85 to 90	88
Tractors	77 to 82	80
Front-End Loaders	86 to 90	88
Hydraulic Backhoe	81 to 90	86
Hydraulic Excavators	81 to 90	86
Graders	79 to 89	85
Air Compressors	76 to 89	85
Trucks	81 to 87	85

Source: Bolt, Beranek & Newman, 1987, *Noise Control for Buildings and Manufacturing Plants.*

The Nut Tree Airport Master Plan is being updated, currently going through various stages of the public review process. Over the life of the proposed General Plan, it is anticipated that the Nut Tree Airport will conduct several improvements to its facility, including adding more hangars and expanding the aircraft parking areas.[15] These proposed changes, along with the ability to accommodate additional aircraft, will affect the existing noise contours of the airport. According to studies performed to date, most of the area with noise over 65 dBA CNEL will still be

[15] Unless otherwise indicated, information in this paragraph is taken from Nut Tree Airport, January 2010, *Initial Study/Mitigated Negative Declaration for Nut Tree Airport Improvements and Obstruction Removal.*

restricted to airport property. However, a small portion of this contour will be extended north of the airport into the industrial parks, and also onto commercial properties on the Nut Tree Ranch property and other commercial properties southeast of the airport. The proposed General Plan would not locate any sensitive receptors (e.g. residents, schools, and hospitals) within the projected 65 dBA CNEL contour associated with the forecasted 2025 projection.

No portion of the city lies within the 60 dBA CNEL noise contour of the Travis Air Force Base airfield. Implementation of the proposed General Plan is not anticipated to result in any substantial increase in aircraft operations at this airfield compared to existing conditions as the Travis Air Force Base airfield is under the jurisdiction and control of the federal government.

Implementation of the following proposed General Plan policies would ensure that any potential aircraft noise impacts associated with development allowed by the proposed project would be minimized:

- Policies NOI-P1.1 and NOI-P1.2 would ensure that noise impacts from aircraft sources are minimized by requiring additional analysis and possible noise mitigation measures for projects that would locate land uses in areas with ambient noise levels in excess of the Land Use Compatibility Standards.
- Policy NOI-P1.4 prohibits new low and moderate density residential development where exterior noise associated with aircraft operations at Nut Tree Airport or Travis Air Force Base exceeds 60 dBA CNEL.
- Policy NOI-P3.4 directs the City to work with the Solano County Airport Land Use Commission and other agencies to reduce noise generated from sources such as aircraft operations.
- Action NOI-A3.1 directs the City to update aircraft noise contour projections as future operations at the Nut Tree Airport and Travis Air Force Base are projected to change.

With implementation of these policies, the exposure of sensitive receptors to excessive noise levels from aircraft noise sources would be a *less-than-significant* impact.

2. Cumulative Impacts

The traffic noise levels predicted in 2035 and evaluated in Section E.1, Project Impacts, are based on cumulative traffic conditions that take into account cumulative development in the region, including development within other parts of Solano County. Anticipated development in surrounding cities within Solano County will also contribute to increased traffic to roadways within the city.

A cumulative noise impact would occur if implementation of a project, along with other planned or approved projects, would result in an increase in ambient noise levels for existing noise environments that are currently exposed to noise levels in excess of the City's conditionally acceptable land use compatibility standard of 70 dBA L_{dn} for noise-sensitive land uses. As shown in the traffic noise modeling results in Table 4.11-9, none of the modeled roadway segments that have adjacent land uses that are currently exposed to noise levels in excess of 70 dBA L_{dn} would experience increases in traffic noise levels from development allowed by the proposed General Plan in combination with other cumulative development in the region.

In addition, as explained in Section E.1.a.iii, Project Impacts, implementation of proposed General Plan Policies NOI-P1.1, NOI-P1.2, and NOI-P1.3 would reduce traffic noise impacts on new development. These policies require new development projects, including both transportation and non-transportation projects, to incorporate necessary mitigation in order to comply, to the extent that is technically and economically feasible, with the Land Use Compatibility Standards shown in Table 4.11-8. Policy NOI-P2.2 discourages the development of residential land uses adjacent to Interstate 80 and Interstate 505. Policies NOI-P2.3 and NOI-P2.4 further require the design and maintenance of street networks to minimize transportation-related noise impacts to noise sensitive land uses. Policy NOI-P2.5 encourages site planning and project design strategies, including the use of noise barriers if necessary, to buffer new and existing development from noise. In addition, Policies NOI-P3.1 and NOI-P3.2 would further minimize noise impacts from transportation noise sources by enforcing truck routes through the city. Policy NOI-P3.3 would reduce transportation noise impacts on new commercial and office land use development by requiring increased setbacks along freeways.

Therefore, implementation of the proposed General Plan would result in a *less-than-significant* cumulative contribution to the regional noise environment.

F. Full Buildout

The full buildout anticipated under the proposed General Plan would include significantly more development than the 2035 horizon-year development projection analyzed in Section E, Impact Discussion. Under these conditions, both the amount and the extent of development would be increased, which would in turn increase the potential for noise impacts. However, as discussed in Chapter 3, Project Description, it is extremely unlikely that full buildout would ever occur under the proposed General Plan. Therefore, an analysis of full buildout is not required by CEQA.