Chapter 5
Noise

Introduction

This report provides an overview of the existing noise environment in Yolo County. In general, the purpose of the general plan noise element as outlined in California Government Code Section 65302(f) is to serve as a guide for establishing a pattern of land uses that minimizes exposure of community residents to excessive noise. California Government Code Section 65302(f) specifies the required contents of the general plan noise element and states that it shall quantify current and projected noise levels for 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 strands, and all other ground facilities and maintenance functions related to airport operations;
- local industrial plants including, but not limited to, railroad classification yards; and
- other ground stationary noise sources identified by local agencies as contributing to the community noise environment.

The State of California General Plan Guidelines (OPR 2003), published by the Governor's Office of Planning and Research, provide guidance to be used in development of the general plan noise element in accordance with requirements of the California Government Code Section 65302(f).

The purpose of this report is to quantify the current baseline noise conditions in Yolo County. Specifically, this involves:

- quantifying existing noise levels from major noise sources in the county;
- identifying existing land uses that are sensitive to noise, including residential area, hospitals, or healthcare facilities, libraries, parks, and schools; and

- identifying conflicts between existing noise sources and noise-sensitive uses.

Sound, Noise, and Acoustics

Sound is a disturbance that is created by a moving or vibrating source in a gaseous or liquid medium or the elastic stage of a solid and that is capable of being detected by the hearing organs. Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a medium to a hearing organ, such as a human ear. For traffic sound, the medium of concern is air. Noise is defined as loud, unpleasant, unexpected, or undesired sound.

Sound is actually a process that consists of three components: the sound source, the sound path, and the sound receiver. All three components must be present for sound to exist. Without a source to produce sound or a medium to transmit sound pressure waves, there is no sound. Sound must also be received; a hearing organ, sensor, or object must be present to perceive, register, or be affected by sound or noise. In most situations, many different sound sources, paths, and receivers occur, not only one of each. Acoustics is the field of science that deals with the production, propagation, reception, effects, and control of sound.

Frequency and Hertz

A continuous sound can be described by its frequency (pitch) and its amplitude (loudness). Frequency relates to the number of pressure oscillations per second. Low-frequency sounds are low in pitch, like the low notes on a piano, whereas high-frequency sounds are high in pitch, like the high notes on a piano. Frequency is expressed in terms of oscillations, or cycles, per second. Cycles per second are commonly referred to as Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilo-Hertz (kHz), or thousands of Hertz. The extreme range of frequencies that can be heard by the healthiest human ears spans from 16 to 20 Hz on the low end to about 20,000 Hz (20 kHz) on the high end.

Sound Pressure Levels and Decibels

The amplitude of a sound determines its loudness. Loudness of sound increases and decreases with increasing and decreasing amplitude. Sound-pressure amplitude is measured in units of micro-Newtons per square meter ($\mu N/m^2$), also called micro-Pascals (µPa). One µPa is approximately one-hundred billionth (0.00000000001) of normal atmospheric pressure. The pressure of a very loud sound may be 200 million µPa, or 10 million times the pressure of the weakest audible sound (20 µPa). Because expressing sound levels in terms of µPa would be cumbersome, sound pressure level (SPL) is used to describe in logarithmic units the ratio of actual sound pressures to a reference pressure squared. These units are called bels, named after Alexander Graham Bell. To provide finer resolution, a bel is divided into 10 decibels (dB).

Addition of Decibels

Because decibels are logarithmic units, SPL cannot be added or subtracted by ordinary arithmetic means. For example, if one automobile produces an SPL of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB; rather, they would combine to produce 73 dB. When two sounds of equal SPL are combined, they produce a combined SPL 3 dB greater than the original individual SPL. In other words, sound energy must be doubled to produce a 3-dB increase. If two sound levels differ by 10 dB or more, the combined SPL is equal to the higher SPL; the lower sound level would not increase the higher sound level.

A-Weighted Decibels

SPL alone is not a reliable indicator of loudness. The frequency of a sound also has a substantial effect on how humans respond. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the SPL in that range. In general, the healthy human ear is most sensitive to sounds from 1,000 to 5,000 Hz and perceives a sound within that range as being more intense than a sound of higher or lower frequency with the same magnitude. To approximate the frequency response of the human ear, a series of SPL adjustments is usually applied to the sound measured by a sound level meter. The adjustments, referred to as a weighting network, are frequency-dependent.

The A-scale weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-, C-, and D-scales), but these scales are rarely used in conjunction with highway-traffic noise. Noise levels for environmental noise studies are typically reported in terms of A-weighted decibels (dBA). In environmental noise studies, A-weighted SPLs are commonly referred to as noise levels. Table Noise-1 shows typical A-weighted noise levels.

Table Noise-1. Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 300 meters (1000 feet)		
	— 100 —	
Gas lawn mower at 1 meter (3 feet)		
	— 90 —	
Diesel truck at 15 meters (50 feet) at 80 kph (50 mph)		Food blender at 1 meter (3 feet)
	— 80 —	Garbage disposal at 1 meter (3 feet)
Noisy urban area, daytime		
Gas lawn mower, 30 meters (100 feet)	— 70 —	Vacuum cleaner at 3 meters (10 feet)
Commercial area		Normal speech at 1 meter (3 feet)
Heavy traffic at 90 meters (300 feet)	— 60 —	
		Large business office
Quiet urban daytime	— 50 —	Dishwasher next room
Quiet urban nighttime	— 40 —	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night, concert
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing

Source: Caltrans 1998b.

Human Response to Noise

In general, noise can result in the following effects on people:

- annoyance;
- interference with activities such as speech, sleep, learning; and
- physiological effects such as hearing loss.

Annoyance and interference with activities can typically result from the everyday environment that we live in. Physiological effects such as hearing loss are typically limited to high noise environments such as industrial workplaces. Levels of noise exposure that can result in hearing loss are generally well defined and are incorporated in workplace hearing damage criteria. Criteria for evaluating the more subjective effects of noise such as annoyance and interference with activities are more difficult to define. However, environmental noise criteria developed by the Environmental Protection Agency (EPA 1974) are based on the effects of activity interference and annoyance. These criteria form the basis for land use compatibility standards recommended by the California Office of Planning and Research. The standards are commonly used in general plan noise elements in California.

Under controlled conditions in an acoustics laboratory, the trained, healthy human ear is able to discern 1-dB changes in sound levels when exposed to steady, single-frequency ("pure-tone") signals in the midfrequency range. Outside such controlled conditions, the trained ear can detect 2-dB changes in normal environmental noise. However, it is widely accepted that the average healthy ear can barely perceive 3-dB noise level changes. A 5-dB change is readily perceptible, and a 10-dB change is perceived as being twice or half as loud. Doubling sound energy results in a 3-dB increase in sound; therefore, doubling sound energy (e.g., doubling the volume of traffic on a highway) would result in a barely perceptible change in sound level.

Noise Descriptors

Noise in our daily environment fluctuates over time. Some fluctuations are minor, but some are substantial. Some noise levels occur in regular patterns, but others are random. Some noise levels fluctuate rapidly, but others slowly. Some noise levels vary widely, but others are relatively constant. Various noise descriptors have been developed to describe time-varying noise levels. The following are the noise descriptors most commonly used in traffic noise analysis. The difference between these descriptors is how or whether sound is averaged over the time it is measured.

- **Equivalent Sound Level (L_{eq}):** L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level that in a stated period would contain the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level (L_{eq}[h]), is the energy average of the A-weighted sound levels occurring during a 1-hour period. This descriptor averages all noise over the period, without taking account of when the noise occurred.
- **Percentile-Exceeded Sound Level (L_x):** L_x represents the sound level exceeded for a given percentage of a specified period (e.g., L_{10} is the sound level exceeded 10% of the time, L_{90} is the sound level exceeded 90% of the time).
- **Maximum Sound Level (L_{max}):** L_{max} is the highest instantaneous sound level measured during a specified period.
- **Day-Night Level (L_{dn}):** L_{dn} 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 p.m. and 7 a.m. This gives noise in the night time a greater weight in the average than noise during the day, reflecting the greater sensitivity of people to night time noise.

- **Community Noise Equivalent Level (CNEL):** 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 p.m. and 7 a.m. and 5 dB added to the A-weighted sound levels occurring between 7 p.m. and 10 p.m. This gives noise in the night time and the evening a greater weight in the average than noise during the day, reflecting the greater sensitivity of people to night time noise. Noise in the night receives a greater weight than noise in the evening.

Sound Propagation

When sound propagates over a distance, it changes in level and frequency content. The manner in which noise reduces with distance depends on the following factors:

- **Geometric Spreading:** Sound from a small, localized source (i.e., a point source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates (or drops off) at a rate of 6 dBA for each doubling of distance. Highway noise is not a single, stationary point source of sound. The movement of vehicles on a highway makes the source of the sound appear to emanate from a line (i.e., a line source) rather than a point. This line source results in cylindrical spreading rather than the spherical spreading that results from a point source. The change in sound level from a line source is 3 dBA per doubling of distance.
- **Ground Absorption:** The noise path between the highway and the observer is usually very close to the ground. Noise attenuation from ground absorption and reflective-wave canceling adds to the attenuation associated with geometric spreading. Traditionally, excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is done for simplification only because prediction results based on this scheme are sufficiently accurate for distances of less than 200 feet. For acoustically hard sites (i.e., those sites with a reflective surface, such as a parking lot or a smooth body of water, between source and receiver), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees, between source and receiver), an excess ground-attenuation value of 1.5 dBA per doubling of distance is normally assumed. When added to the geometric spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dBA per doubling of distance for a line source and 7.5 dBA per doubling of distance for a point source.
- **Atmospheric Effects:** Atmospheric conditions can have a significant effect on noise propagation. Wind has been shown to be the most important meteorological factor within approximately 500 feet of the source, whereas

vertical air-temperature gradients are more important for greater distances. Other factors such as air temperature, humidity, and turbulence also have significant effects. Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lower noise levels. Increased sound levels can also occur as a result of temperature inversion conditions (i.e., increasing temperature with elevation).

- **Shielding by Natural or Human-Made Features:** A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by this shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dB of noise reduction. A taller barrier may provide as much as 20 dB of noise reduction.

Noise Regulations and Guidelines

A discussion of federal, state, and local noise regulations and guidelines that apply in Yolo County follows below. This information is intended to provide the regulatory context against which existing noise conditions can be compared.

Federal Agency Guidelines

The federal Noise Control Act of 1972 (Public Law 92-574) established a requirement that all federal agencies administer their programs to promote an environment free of noise that would jeopardize public health or welfare. The U.S. Environmental Protection Agency (EPA) was given the responsibility for:

- providing information to the public regarding identifiable effects of noise on public health and welfare,
- publishing information on the levels of environmental noise that will protect the public health and welfare with an adequate margin of safety,
- coordinating federal research and activities related to noise control, and
- establishing federal noise emission standards for selected products distributed in interstate commerce.

The Noise Control Act also directed that all federal agencies comply with applicable federal, state, interstate, and local noise control regulations.

Although the EPA was given a major role in disseminating information to the public and coordinating federal agencies, each federal agency retains authority to adopt noise regulations pertaining to agency programs. The EPA can, however, require other federal agencies to justify their noise regulations in terms of Noise Control Act policy requirements.

- **Housing and Urban Development (HUD):** Noise standards for federally funded housing projects
- **Federal Aviation Administration (FAA):** Noise standards for aircraft noise
- **Federal Highway Administration (FHWA):** Noise standards for federally funded highway projects
- **Federal Transit Administration:** Noise standards for federally funded transit projects
- **Federal Railroad Administration:** Noise standards for federally funded rail projects

U.S. Environmental Protection Agency

In 1974, in response to the requirements of the federal Noise Control Act, EPA identified indoor and outdoor noise limits to protect public health and welfare (communication disruption, sleep disturbance, and hearing damage). Outdoor L_{dn} limits of 55 dB and indoor L_{dn} limits of 45 dB are identified as desirable to protect against speech interference and sleep disturbance for residential, educational, and healthcare areas. Sound-level criteria to protect against hearing damage in commercial and industrial areas are identified as 24-hour L_{eq} values of 70 dB (both outdoors and indoors).

U.S. Department of Housing and Urban Development

The U.S. Department of Housing and Urban Development has established guidelines for evaluating noise impacts on residential projects seeking financial support under various grant programs (44 FR 135:40860 40866, January 23, 1979). Sites are generally considered acceptable for residential use if they are exposed to outdoor L_{dn} values of 65 dB or less. Sites are considered “normally unacceptable” if they are exposed to outdoor L_{dn} values of 65–75 dB. Sites are considered unacceptable if they are exposed to outdoor L_{dn} values above 75 dB The HUD goal for the interior noise level in residences is that noise levels should not exceed 45-dB-L_{dn}.

Federal Aviation Administration

14 CFR Part 150, “Airport Noise Compatibility Planning” prescribes the procedures, standards, and methodology to be applied airport noise compatibility planning activities. Noise levels below 65 L_{dn} are normally considered to be acceptable for noise sensitive land uses.

Federal Highway Administration

FHWA regulations (23 CFR 772) specify procedures for evaluating noise impacts associated with federally funded highway projects and for determining whether these impacts are sufficient to justify funding noise abatement actions. The FHWA noise abatement criteria are based on worst hourly L_{eq} sound levels, not L_{dn} or CNEL values. The worst-hour 1-hour L_{eq} criteria for residential, educational, and healthcare facilities are 67 dB outdoors and 52 dB indoors. The worst-hour 1-hour L_{eq} criterion for commercial and industrial areas is 72 dB (outdoors).

Federal Transit Administration

Federal Transit Administration (FTA) procedures for the evaluation of noise from transit projects are specified in the document titled, "Transit Noise and Vibration Impact Assessment" (Federal Transit Administration (FTA) 1995). The FTA Noise Impact Criteria categorizes noise sensitive land uses into the following:

- **Category 1:** Buildings or parks where quiet is an essential element of their purpose.
- **Category 2:** Residences and buildings where people normally sleep. This includes residences, hospitals, and hotels where nighttime sensitivity is assumed to be of utmost importance.
- **Category 3:** Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, churches, and active parks.

L_{dn} is used to characterize noise exposure for residential areas (Category 2). For other noise sensitive land uses, such as outdoor amphitheaters and school buildings (Categories 1 and 3), the maximum 1-hour L_{eq} during the facility's operating period is used. Noise impacts are identified based on absolute predicted noise levels and increases in noise associated with the project.

Federal Railroad Administration

Federal Railroad Administration (FRA) noise standards are the same as those specified by FTA.

State Agency Guidelines

State of California General Plan Guidelines

The State of California General Plan Guidelines (OPR 2003) identify guidelines for the noise elements of local general plans, including a sound level/land use compatibility chart that categorizes, by land use, outdoor L_{dn} ranges in up to four categories (normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable). For many land uses, the chart shows overlapping L_{dn} ranges for two or more compatibility categories.

The noise element guidelines chart (Figure Noise-1) identifies the normally acceptable range for low-density residential uses as less than 60 dB, and the conditionally acceptable range as 55–70 dB. The normally acceptable range for high-density residential uses is identified as L_{dn} values below 65 dB, and the conditionally acceptable range is identified as 60–70 dB. For educational and medical facilities, L_{dn} values below 70 dB are considered normally acceptable, and L_{dn} values of 60–70 dB are considered conditionally acceptable. For office and commercial land uses, L_{dn} values below 70 dB are considered normally acceptable, and L_{dn} values of 67.5–77.5 are categorized as conditionally acceptable.

These overlapping L_{dn} ranges are intended to indicate that local conditions (existing sound levels and community attitudes toward dominant sound sources) should be considered in evaluating land use compatibility at specific locations.

California Noise Insulation Standards

Part 2 Title 24 of the California Code of Regulations "California Noise Insulation Standards" establishes minimum noise insulation standards to protect persons within new hotels, motels, dormitories, long-term care facilities, apartment houses, and dwellings other than single family residences. Under this regulation interior noise levels attributable to exterior noise sources cannot exceed 45 L_{dn} in any habitable room. Where such residences are located in an environment where exterior noise is 60 L_{dn} or greater, an acoustical analysis is required to ensure that interior levels do not exceed the 45 L_{dn} interior standard.

Division of Aeronautics Noise Standards

Title 21 Chapter 5000 of the California Code of Regulations identifies noise compatibility standards for airport operations. Section 5014 of the code states that the standard for the acceptable level of aircraft noise for persons living in the vicinity of airports is established to be a community noise equivalent level of 65 decibels. Land uses such a residences, schools, hospitals, or places of worship exposed to aircraft noise exceeding 65 dB CNEL are deemed to be in a noise impact area. This standard forms the basis for the limitation that no airport proprietor of an airport shall operate an airport with a noise impact area based on the standard of 65 dB CNEL unless the operator has applied for or received a variance.

Yolo County and Other Local Guidelines

Yolo County General Plan

The Yolo County General Plan Noise Element (originally adopted in 1976) identified noise sources such as roadways, rails, and airports within the County. Noise land use compatibility guidelines listed by the U.S. Department of Housing and Urban Development are included in the Noise Element. The 1983 revision of the General Plan Noise Elements provides general policies but does not establish any noise level standards. The Yolo County does not have a noise ordinance or other noise enforcement code at the present time.

Off-Channel Mining Plan (OCMP) and Implementing Ordinances

The Aggregate Resource Element of the Draft Off-Channel Mining Plan (OCMP) for the Lower Cache Creek includes the following performance standards (PS):

- PS 2.5-11: From 6:00 a.m. to 6:00 p.m., noise levels shall not exceed an average noise level equivalent (L_{eq}) of eighty (80) decibels (dBA) measured at the property boundaries of the site. However, noise levels may not exceed an average noise level equivalent (L_{eq}) of sixty (60) decibels (dBA) for any nearby off-site residences or other noise-sensitive land uses.

  From 6:00 p.m. to 6:00 a.m., noise levels shall not exceed an average noise level equivalent (L_{eq}) of sixty-five (65) decibels (dBA) measured at the property boundaries of the site.

OCPM also required vegetated buffers between restored habitat areas and adjoining farmland to minimize impact from noise, dust, and spraying generated by agricultural operations. (Action 6.4-11). The OCMP EIR proposes, as a mitigation measure, that the applicable criterion for residential land uses be changed from 60 dBA L_{eq} to 60 dBA CNEL. The CNEL is a 24-hour average noise metric. This implies that the duration and specific hours of operation must be included in the impact calculations.

Noise-Sensitive Land Uses

Noise-sensitive land uses are generally defined as locations where people reside or where the presence of unwanted sound could adversely affect the use of the land. Places where people live, sleep, recreate, worship, and study are generally considered to be sensitive to noise because intrusive noise can be disruptive to these activities. These areas in the county are identified and discussed in the following sections. Figure Noise-2 gives a general location of existing land uses. Specific areas considered sensitive to noise include:

- residences,
- hospitals or healthcare facilities,
- parks and wildlife areas,
- places of worship,
- libraries, and
- schools.

Residences

Yolo County is an urban and rural county with most of the population concentrated in the urban areas around Davis, Woodland, Winters, West Sacramento, and East Yolo. A number of small farm community centers are scattered throughout the city. Outside these communities are scattered individual dwellings. Residential community areas in Yolo County and unincorporated county are listed below, along with the 2000, 2010, and 2020 population and population growth in these areas (Census 2000 and SACOG projections).

Table Noise-2. Yolo County Population Growth

Area	2000	2010	2020
Davis	60,308	65,615	68,740
West Sacramento	31,615	48,410	66,940
Winters	6,125	8,710	12,515
Woodland	49,151	57,010	66,570
Unincorporated	21,461	29,290	33,140
County Total	**168,660**	**209,035**	**247,905**

Source: Census 2000 and SACOG projections.

Hospitals and Healthcare Facilities

No hospitals are located in unincorporated areas of the county. One healthcare facility is located in the unincorporated area of the county:

- Rosewood Care Center; 16730 County Road 87, Esparto, CA

Parks, Wildlife Areas, and Recreation Areas

Public parks, wildlife areas, and other recreation areas, including campgrounds and picnic areas, in Yolo County are identified in Figure Noise-3 and below:

- Cache Creek Canyon,

- Otis Ranch Open Space Area,
- Camp Haswell Park,
- Vernon A. Nicols Park,
- Capay Open Space Park Site,
- Esparto Community Park,
- Putah Creek Fishing Access (4 Sites),
- Airport Park,
- Grassland Regional Park,
- Clarksburg Boat Launch,
- Elkhorn Regional Park & Boat Launch,
- Knights Landing Boat Launch, and
- Dunnigan Park.

Places of Worship

Names and addresses of places of worship in unincorporated areas of Yolo County are:

- Countryside Community Church; 26479 Grafton St, Esparto, CA
- Esparto Baptist Church; 26534 Madison St, Esparto, CA
- Grace Valley Christian Center; 27173 County Road 98, Davis, CA
- Christ Temple Apostolic Faith Church; 3624 County Road 88B, Dunnigan, CA
- St. Martin Parish; E. Grafton Street, Esparto, CA
- Jehovah’s Witnesses Kingdom Hall of Yolo; 13980 County Road 99W, Zamora, CA
- New Life Christian Center; 2898 Hurlbut, Madison, CA
- Unitarian Universalist Church of Davis; 27074 Patwin Road, Davis, CA
- West Valley Baptist Church; 18045 County Road 95, Woodland, CA
- Church of Christ; 39960 Barry Road, Davis, CA
- Methodist Community Church; 9487 Mill Street, Knights Landing, CA
- Clarksburg Community Church; 52910 Netherlands Avenue, Clarksburg, CA

Libraries

Names and addresses of libraries in unincorporated areas of Yolo County are:

- Clarksburg Library; 52915 Netherlands Ave, Clarksburg, CA
- Esparto Branch Library; 17065 Yolo Ave, Esparto, CA
- Knights Landing Branch Library; 42351 3rd St, Knights Landing, CA
- Yolo Branch Library; 37750 Sacramento St, Yolo, CA

Schools

Names and addresses of schools in unincorporated areas of Yolo County are:

- Cache Creek High School; 14320 2nd Street, Yolo, CA
- Esparto Elementary School; 17120 Omega Street, Esparto, CA
- Esparto High School; 17121 Yolo Avenue, Esparto, CA
- Esparto Middle School; 26058 County Road 21A, Esparto, CA
- Esparto Unified School District; 26675 Plainfield Street, Esparto, CA
- Fairfield Elementary School; 26960 County Road 96, Davis, CA
- Grace Valley Christian Center; 27173 County Road 98, Davis, CA
- Grafton School; 9544 Mill Street, Knights Landing, CA
- Grafton State Preschool; 9544 Mill Street, Knights Landing, CA
- Plainfield Elementary School; 20450 County Road 97, Woodland, CA

Existing Noise Conflicts in Yolo County

In general, very few noise conflicts exist in Yolo County. A key indicator of noise conflicts is the number of complaints registered with the county, which does not track noise complaints separately from other violations (Morrison pers. comm.). Generally, noise complaints are few in number but typically are associated with mining, airports, and/or agricultural operations.

Existing Noise Conditions in Yolo County

Existing noise conditions in Yolo County are described by identifying noise sources and, to the extent possible, quantifying noise from these sources.

The dominant sources of noise in Yolo County are related to transportation and included automobile and truck traffic, aircraft, and trains. Stationary sources in the county included construction sites, mining activities, farming activities, and commercial and industrial facilities.

Roadway Traffic

Interstates (I)-80, 5, 505, and State Routes (SRs) 113 and 16, are major sources of traffic noise in the county. Existing noise levels in the project area have also been characterized using traffic noise modeling. Existing traffic noise levels in Yolo County were calculated using the FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108) and existing traffic volumes. The FHWA model is the standard model recommended by the FHWA and Caltrans for traffic noise prediction. Traffic volumes used in the model were obtained from the project traffic engineers, Fehr and Peers. Table Noise-3 summarizes the traffic noise modeling results based on existing traffic conditions.

Aircraft

Aircraft operations in the vicinity of airport can be a significant source of noise. As identified in Figure Noise-4, four airports are located in the county:

- Watts-Woodland Airport,
- Yolo County Airport,
- University Airport, and
- Borges-Clarksburg Airport.

Yolo County Airport serves Davis, Woodland, Winters and Yolo County and is owned by Yolo County. The facility is at an elevation of 98 feet at a distance of about 6 miles from Davis, Woodland and Winters. Noise Contours for the Yolo County airport are depicted in Figure Noise-5.

The Watts-Woodland airport is privately owned and located west of Woodland. Noise contours for the Watts-Woodland airport are depicted in Figure Noise-6.

University Airport serves Davis and Yolo County and is owned by University Of California. The facility is at an elevation of 68 feet at a distance of about 2 miles from Davis. Noise contours for the University Airport are depicted in Figure Noise-7.

The Borges-Clarksburg airport is a privately-owned airport just north of Clarksburg. According to airport staff, airplane activity is variable, but typically one aircraft operation a day (Gustason pers. comm.). Because of the small number of aircraft operations, no noise contours were developed for the airport.

Trains

As identified in Figure Noise-4, Yolo County has four active train lines:

- Union Pacific Railroad,
- Amtrak,
- California Northern Railroad Company (Sierra Northern Railway), and
- the Sacramento River train.

The Union Pacific Railroad (UPRR) maintains a rail line that runs through Yolo County. The rail line carries both freight trains and passenger trains from Amtrak. According to Union Pacific personnel, 35 daily train passages typically occur on the line. The UPPR typically uses about 4–120 rail cars and 2–8 locomotives for freight trains. The average speed is 70 mile per hours (Kerr pers. comm.).

The Amtrak passenger rail service uses the UPRR rail line. According to Amtrak personnel, an average of 21 daily passages go eastbound and 21 daily trips go westbound. Amtrak train typically uses four rail cars and one locomotive. The average speed is 79 mile per hour (Swain pers. comm.).

The California Northern Railroad rail line is currently in operated and used by the Sierra Northern Railroad Company: The freight line runs through Davis, Woodland, and follows I-5 past Dunnigan. The freight line schedule is variable depending on freight trains seasonal demands. According to the Sierra Northern Railroad Company personnel, the rail line carries two trains daily. The freight trains typically use 1-50 rail cars and 1-2 locomotives. The average speed is 15 mile per hour (Magaw pers. comm.).

The Sacramento River Train rail line is operated by the Sierra Northern Railroad Company. This rail line is an entertainment passenger train that runs through Woodland to the Delta town of Clarksburg. According to the Sierra Northern Railroad personnel, one round trip typically occurs per day. The trains typically have 2–25 rail cars and 1–2 locomotives. Average speed is 15 miles per hour (Magaw pers. comm.).

Railroad noise levels in Yolo County have been characterized using the Federal Railroad Administration (FRA) noise model. The information provided by railroad personnel described above was used to develop typical operations to be applied in the model. Table Noise-4 summarizes the operations assumed in the model and the calculated railroad noise levels.

Table Noise–3. Existing Traffic Noise Modeling

Roadway	Segment	Existing Daily Traffic Volumes	Speed (MPH)	L_{dn} (100 feet from roadway centerline)	Distance (feet) to L_{dn} Noise Contour for Existing Conditions		
					70 L_{dn}	65 L_{dn}	60 L_{dn}
Chiles Road/County Road 32B	Mace Boulevard to Webster Road	2700	55	60	NA[1]	44	94
Clarksburg Road	State Route 84 to South River Road	700	55	54	NA[1]	NA[1]	38
County Road 6	County Road 86 to Interstate 5	100	55	45	NA[1]	NA[1]	NA[1]
County Road 12A	County Road 85 to Interstate 505	100	55	45	NA[1]	NA[1]	NA[1]
County Road 12A/92/12	Interstate 505 to County Road 99W	100	55	45	NA[1]	NA[1]	NA[1]
County Road 13	Interstate 5 to State Route 113	1500	55	57	NA[1]	30	64
County Road 14	County Road 85 to Interstate 505	500	55	52	NA[1]	NA[1]	31
	Interstate 505 to Interstate 5	1400	55	57	NA[1]	28	61
County Road 16A	Interstate 5 to State Route 113	300	55	50	NA[1]	NA[1]	NA[1]
County Road 17	State Route 113 to County Road 102	1000	25	46	NA[1]	NA[1]	NA[1]
County Road 19	County Road 87 to Interstate 505	400	55	51	NA[1]	NA[1]	26
	Interstate 505 to County Road 94B	400	55	51	NA[1]	NA[1]	26
County Road 21A	County Road 85B to State Route 16	1600	55	57	NA[1]	31	66
County Road 23	County Road 85B to County Road 89	700	55	54	NA[1]	NA[1]	38
County Road 24	County Road 90 to County Road 95	700	55	54	NA[1]	NA[1]	38
	County Road 95 to County Road 98	1700	55	58	NA[1]	32	69
County Road 27	Interstate 505 to County Road 95	900	55	55	NA[1]	NA[1]	45
	County Road 95 to County Road 98	1100	55	56	NA[1]	NA[1]	52
	County Road 98 to State Route 113	1800	55	58	NA[1]	33	72
County Road 28H	County Road 102 to County Road 105	400	25	42	NA[1]	NA[1]	NA[1]
County Road 29A/92E/29	Interstate 505 to County Road 95	200	55	48	NA[1]	NA[1]	NA[1]
County Road 29	County Road 95 to County Road 98	600	55	53	NA[1]	NA[1]	35
	County Road 98 to State Route 113	1200	55	56	NA[1]	NA[1]	55
	State Route 113 to County Road 102	2200	55	59	NA[1]	38	82
County Road 31	County Road 93A to County Road 95	3700	55	61	NA[1]	54	116
	County Road 95 to County Road 98	4300	55	62	28	60	128

Table Noise–3. Continued

Roadway	Segment	Existing Daily Traffic Volumes	Speed (MPH)	L_{dn} (100 feet from roadway centerline)	Distance (feet) to L_{dn} Noise Contour for Existing Conditions		
					70 L_{dn}	65 L_{dn}	60 L_{dn}
County Road 32A	Mace Boulevard to County Road 105	1500	55	57	NA[1]	30	64
	County Road 105 to Webster Road	1200	55	56	NA[1]	NA[1]	55
County Road 85B	County Road 23 to County Road 21A	400	55	51	NA[1]	NA[1]	26
	County Road 21A to State Route 16	1800	55	58	NA[1]	33	72
County Road 85	State Route 16 to County Road 12	300	55	50	NA[1]	NA[1]	NA[1]
County Road 85/8/86	County Road 12 to County Road 6	200	55	48	NA[1]	NA[1]	NA[1]
County Road 87	State Route 16 to County Road 14	200	55	48	NA[1]	NA[1]	NA[1]
County Road 89	County Road 29A to County Road 27	1200	55	56	NA[1]	NA[1]	55
	County Road 27 to County Road 24A	1200	55	56	NA[1]	NA[1]	55
	County Road 24A to State Route 16	1000	55	55	NA[1]	NA[1]	49
County Road 94B	State Route 16 to County Road 19	200	55	48	NA[1]	NA[1]	NA[1]
County Road 98	Solano County Line to County Road 31	3000	55	60	NA[1]	47	101
	County Road 31 to County Road 29	4100	55	61	27	58	124
	County Road 29 to County Road 27	4600	55	62	29	62	134
	County Road 27 to County Road 24	4500	55	62	29	61	132
	County Road 24 to State Route 16	7100	55	64	39	83	179
County Road 99	County Road 31 to County Road 27	1800	55	58	NA[1]	33	72
	County Road 27 to Gibson Road	2600	55	59	NA[1]	43	92
County Road 99W	County Road 8 to County Road 6	1000	55	55	NA[1]	23	49
	County Road 6 to County Road 2	1800	55	58	NA[1]	33	72
County Road 101A	Covell Boulevard to County Road 29	2800	55	60	NA[1]	45	96
County Road 102	Covell Boulevard to County Road 29	5200	55	62	31	68	146
	County Road 29 to County Road 27	5100	55	62	31	67	144
	County Road 27 to Interstate 5	4500	55	62	29	61	132
	Interstate 5 to County Road 17	4700	55	62	29	63	136
	County Road 17 to State Route 113	6800	55	64	38	81	174

Table Noise–3. Continued

Roadway	Segment	Existing Daily Traffic Volumes	Speed (MPH)	L_{dn} (100 feet from roadway centerline)	Distance (feet) to L_{dn} Noise Contour for Existing Conditions		
					70 L_{dn}	65 L_{dn}	60 L_{dn}
County Road 105	County Road 32A to County Road 28H	400	45	49	NA[1]	NA[1]	NA[1]
Covell Boulevard	County Road 98 to State Route 113	16700	45	65	47	102	219
	State Route 113 to County Road 102	18700	45	66	51	110	237
	County Road 102 to Mace Boulevard	13000	45	64	40	86	186
East Street	Gibson Road to Interstate 5	6200	45	61	NA[1]	53	113
Gibson Road	Coutny Road 98 to State Route 113	17100	45	65	48	103	223
Harbor Boulevard	U.S. 50 to Reed Avenue	9100	45	62	32	68	146
Mace Boulevard	County Road 35 to County Road 32D	3000	45	57	NA[1]	31	66
	County Road 32D to Interstate 80	11200	45	63	34	74	160
Main Street	County Road 98 to State Route 113	21200	45	66	55	119	257
Old River Road	County Road 127 to County Road 118	3900	55	61	26	56	120
Railroad Avenue	State Route 128 to Winters City Limits	3100	55	60	NA[1]	48	103
Reed Avenue	Interstate 80 to Jefferson Boulevard	16700	55	68	68	147	317
Russell Boulevard	Interstate 505 to County Road 31	4400	55	61	26	56	121
	County Road 98 to State Route 113	17800	55	67	66	143	308
South River Road	Clarksburg Road to Freeport Bridge	1300	35	51	NA[1]	NA[1]	NA[1]
	Freeport Bridge to Burrows Avenue	1600	35	52	NA[1]	NA[1]	29
Willow Point Road	State Route 84 to South River Road	200	35	43	NA[1]	NA[1]	NA[1]
Interstate 5	Colusa County Line to Interstate 505	15500	70	72	145	312	672
	Interstate 505 to County Road 13	13700	70	72	133	287	619
	County Road 13 to State Route 113 (East)	23600	70	74	192	413	890
	State Route 113 (East) to County Road 102	35800	70	76	253	545	1175
	County Road 102 to Sacramento County Line	38700	65	76	242	521	1122
Interstate 505	Solano County Line to State Route 128	12000	70	71	122	263	567
	State Route 128 to State Route 16	8300	70	70	96	206	443
	State Route 16 to County Road 14	5600	70	68	73	158	341

Table Noise–3. Continued

Roadway	Segment	Existing Daily Traffic Volumes	Speed (MPH)	L_{dn} (100 feet from roadway centerline)	Distance (feet) to L_{dn} Noise Contour for Existing Conditions		
					70 L_{dn}	65 L_{dn}	60 L_{dn}
	County Road 14 to Interstate 5	4400	70	67	63	135	290
Interstate 80	Solano County Line to Mace Boulevard	88600	65	79	420	905	1949
	County Road 32A to U.S. 50	55700	65	77	308	664	1430
State Route 113	Solano County Line to Covell Boulevard	35300	65	75	227	490	1055
	Covell Boulevard to Gibson Road	21600	65	73	164	353	761
	Gibson Road to Interstate 5	5700	65	67	67	145	313
	Interstate 5 to County Road 17	3500	65	65	49	105	226
	Coutny Road 17 to County Road 13	1200	65	61	24	51	111
	County Road 13 to County Road 102	2000	65	63	34	72	156
	County Road 102 to State Route 45	7000	65	68	77	167	359
State Route 128	Napa County Line to County Road 86	70	55	47	NA[1]	NA[1]	NA[1]
	County Road 86 to Railroad Avenue	7000	55	67	63	135	291
	Railroad Avenue to Interstate 505	9500	55	68	77	166	357
State Route 16	Arbuckle Road to County Road 78	1500	55	60	22	48	104
	County Road 78 to County Road 85B	7200	55	67	64	138	297
	County Road 85B to County Road 87	0	55	N/A	N/A	N/A	N/A
	County Road 87 to County Road 21A	0	55	N/A	N/A	N/A	N/A
	County Road 21A to Interstate 505	9200	55	68	75	162	350
	Interstate 505 to County Road 94B	9700	55	68	78	168	362
	County Road 94B to County Road 98	9500	55	68	77	166	357
	Main Street to Interstate 5	4400	55	65	46	99	214
State Route 45	State Route 113 to County Road 98A	500	55	56	NA[1]	NA[1]	50
State Route 84	Clarksburg Road to Gregory Avenue	1400	55	60	NA[1]	46	100
	Gregory Avenue to U.S. 50	18900	55	71	122	262	565

Note: NA[1:] = not applicable. Contour falls within roadway right-of-way.

Table Noise-4. Modeled Train Noise for Existing Conditions

Railroad Track	Number of Daily Train Passages	Average Speed (mph)	Number of Locomotives	Number of Rail Cars	Distance to 65 L_{dn} Contour (feet)
Union Pacific Railroad (UPRR)	35	70	6	100	930
Amtrak	42	79	1	4	79
Sierra Northern Freight Line	2	15	2	50	11
Sierra Northern Passenger Line (Sacramento River Train)	1	15	2	25	0

Mining Activities

Mining sites in Yolo County are generally isolated from population areas and are located along the Cache Creek corridor indicated in Figure Noise-8. Mining activities in the county are primarily for sand and gravel extraction. Primary noise sources associated with mining activities include heavy equipment operations associated with material extraction, processing activities, and material trucking. Noise generated from mining activities is variable depending on the type and intensity of the operations.

Site-specific information on noise levels generated by mines in the county is available. However, Table Noise-5 summarizes noise level produced by typical mining operations.

Table Noise-5. Typical Noise Produced by Typical Mining Operations at 500 Feet

Activity	L_{eq}	L_{max}	L_{50}
Loading & Batching	63	74	58
Rock Plant Operations	69	76	67
Excavator/Haul Truck	61	72	50
Scrapers	62	72	60

Notes: Noise performance standards in the Aggregate Resource Element of the Draft Off-Channel Mining Plan (OCMP) for the Lower Cache Creek limits noise to the following levels:

80 dBA-L_{eq} at property boundaries (6:00 a.m. to 6:00 p.m.)
60 dBA-L_{eq} at offsite residences or noise-sensitive uses (6:00 a.m. to 6:00 p.m.)
65 dBA-L_{eq} at property boundaries (6:00 p.m. to 6:00 a.m.)

Source: Giroux 1998.

Farming Activities

The primary sources of noise related to farming activity are tractors, harvesters, and crop-dusting aircraft. Typical noise levels from tractors as measured at a distance of 50 feet range from about 75 dBA to 95 dBA with an average of about 84 dBA (Toth 1979). These noise levels should be reasonably representative of noise levels from other wheeled and tracked farm equipment.

Using a source level of 84 dBA at 50 feet, and assuming nominal point source attenuation of 6 dB per doubling of distance, the distance to 70-, 60-, and 50-dBA contours are as follows:

Table Noise-6. Distance to Noise Contours

Distance from Source (feet)	Calculated Noise Level (dBA)
50	84
100	78
200	72
400	66
800	60
1,600	54

Other Miscellaneous Commercial/Industrial Facilities and Plants

Food processing, winery, olive oil processing, and other commercial/industrial faculties are also a source of noise in the County. Mechanical equipment and trucking are the primary sources of noise associated with these facilities. A list commercial/industrial facilities and plants in the unincorporated areas of the county are provided in Appendix Noise-A.

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