SECTION 5.10 NOISE

This section includes background information concerning noise fundamentals, a summary of applicable regulations, a description of existing noise conditions, and an analysis of potential short-term and long-term noise impacts of the Feather River Levee Repair Project (FRLRP). In addition, mitigation measures are recommended, as necessary, to reduce significant noise impacts.

5.10.1 NOISE FUNDAMENTALS

SOUND AND THE HUMAN EAR

Sound is energy that is transmitted through the air as the result of a disturbance or vibration, and that may evoke an auditory sensation. Noise is generally defined as sound that is loud, unpleasant, unexpected, or disagreeable.

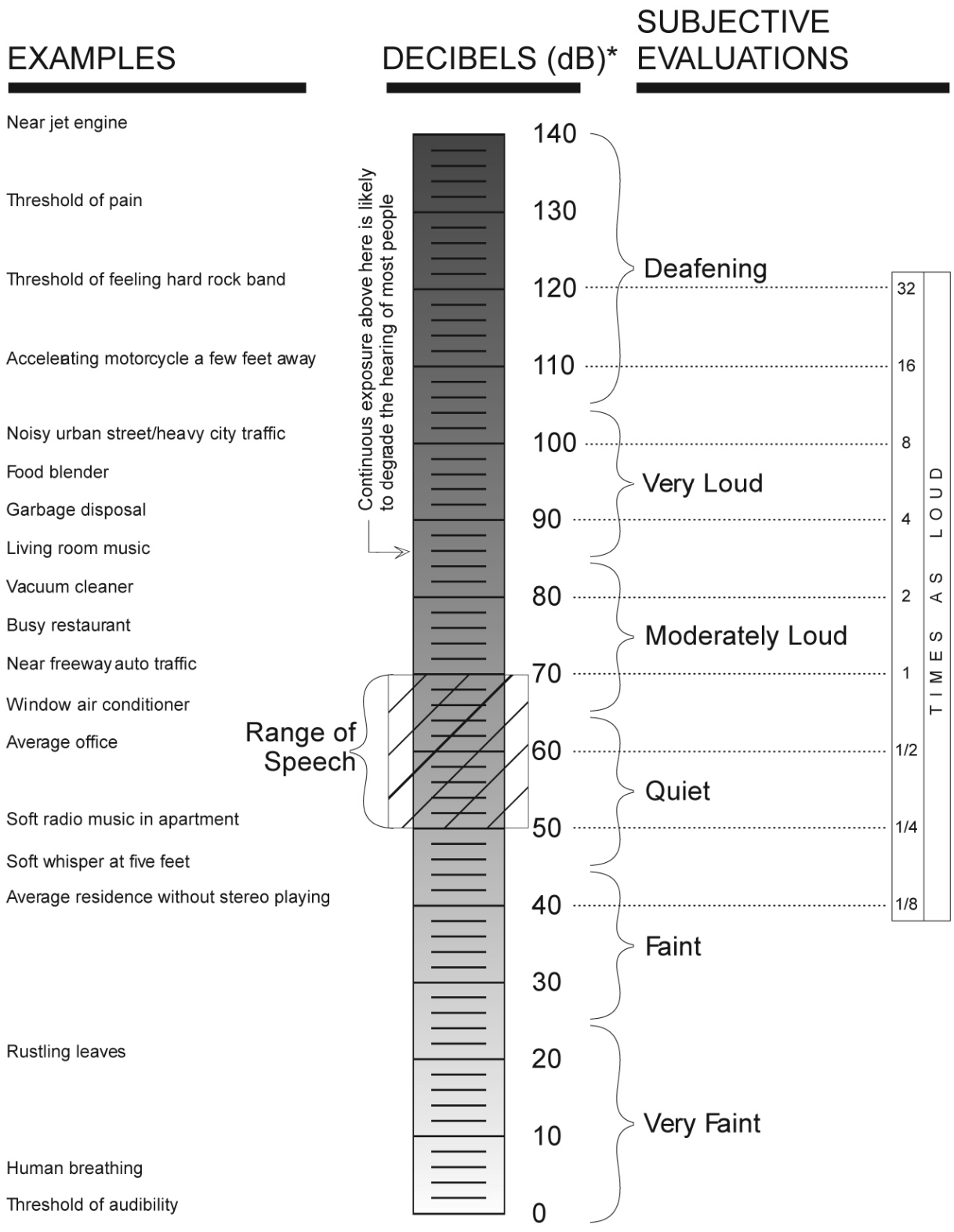
Because of the ability of the human ear to detect a wide range of sound-pressure fluctuations, sound-pressure levels are expressed in logarithmic units called decibels (dB). In addition, because the human ear is not equally sensitive to sound at all frequencies, a specific frequency-dependent rating scale was devised to relate noise to human sensitivity. An A-weighted dB (dBA) scale performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear. The basis for compensation is the faintest sound audible to the average ear at the frequency of maximum sensitivity. This A-weighted dB scale has been chosen by most authorities for purposes of environmental noise regulation.

Typical indoor and outdoor noise levels are presented in Figure 5.10-1, "Typical Indoor and Outdoor Noise Levels." As indicated, typical sounds range from 10 dBA (very quiet) to 100 dBA (very loud). Conversation is roughly 60 dBA at 3–5 feet. As background noise levels exceed 60 dBA, speech intelligibility becomes increasingly difficult. Noise becomes physically discomforting at 110 dBA.

SOUND PROPAGATION

As sound (noise) propagates from the source to the receptor, the attenuation, or manner of noise reduction in relation to distance, depends on such factors as the inverse square law, surface characteristics, atmospheric conditions, and presence of physical barriers. The inverse square law describes the attenuation resulting from the pattern in which sound travels from the source to the receptor. Sound travels uniformly outward from a point source in a spherical pattern with an attenuation rate of 6 dBA per doubling of distance (dBA/DD). However, from a line source, sound travels uniformly outward in a cylindrical pattern with an attenuation rate of 3 dBA/DD.

The surface characteristics between the source and receptor may result in additional sound absorption and/or reflection. In addition, atmospheric conditions such as wind speed, temperature, and humidity may affect noise levels. Furthermore, the presence of a barrier between the source and receptor may also attenuate noise levels. The actual amount of attenuation depends on the barrier size and noise frequency. A noise barrier may be any natural



*dB are "average" values as measured on the A-scale of a sound-level meter
(From Concepts in Architectural Acoustics: M. David Egan, McGrawHill, 1972 and U.S. Department of Housing and Urban Development, Office of Community Planning and Development "The Noise Guidebook").

EDAW

FEATHER RIVER LEVEE REPAIR PROJECT

Typical Indoor and Outdoor Noise Levels

Figure 5.10-1

G 015

or human-made feature, such as a hill, tree, building, wall, or berm (California Department of Transportation 1998).

NEGATIVE EFFECTS OF NOISE ON HUMANS

Negative effects of noise exposure include physical damage to the human auditory system, interference, and disease. Exposure to noise may result in physical damage to the auditory system, which may lead to gradual or traumatic hearing loss. Gradual hearing loss is caused by sustained exposure to moderately high noise levels over a period of time. By contrast, traumatic hearing loss is caused by sudden exposure to extremely high noise levels over a short period of time. However, gradual and traumatic hearing loss both may result in permanent hearing damage. In addition, noise may interfere with or interrupt sleep, relaxation, recreation, and communication. Although most interference may be classified as annoying, the inability to hear a warning signal may be considered dangerous. Noise may also be a contributor to diseases associated with stress, such as hypertension, anxiety, and heart disease. The degree to which noise contributes to such diseases is dependent upon the noise frequency, bandwidth, level, and exposure time (California Department of Transportation 1998).

NOISE DESCRIPTORS

The selection of a proper noise descriptor for a specific source depends on the spatial and temporal distribution, duration, and fluctuation of the noise. The noise descriptors most often used to describe traffic, community, and environmental noise are defined below (California Department of Transportation 1998):

- L_{max} (maximum noise level): The maximum instantaneous noise level during a specific period of time. The L_{max} may also be referred to as the "peak (noise) level."
- L_X (statistical descriptor): The noise level exceeded X% of a specific period of time.
- L_{eq} (equivalent noise level): The energy mean noise level. The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value is calculated; this is then converted back to dBA to determine the L_{eq}.
- L_{dn} (day-night noise level): The 24-hour L_{eq} with a 10-dBA "penalty" for the noise-sensitive hours between 10 p.m. and 7 a.m. The L_{dn} is used to account for the fact that noise during this specific period of time, considered normal sleeping hours, is a potential source of disturbance to sleepers.
- CNEL (community noise equivalent level): A noise level similar to the L_{dn} described above, but with an additional 5-dBA "penalty" for the noise-sensitive hours between 7 p.m. and 10 p.m., which are typically reserved for relaxation, conversation, reading, and television. When the same 24-hour noise data are used, the CNEL value is typically about 0.5 dBA higher than the L_{dn} value.

5.10.2 REGULATORY SETTING

FEDERAL PLANS, POLICIES, REGULATIONS AND LAWS

No federal plans, policies, regulations, or ordinances related to noise are applicable to the proposed project. However, to address the human response to groundborne vibration, the Federal Transit Administration (FTA) has set forth the following maximum acceptable vibration criteria for different types of land uses (Federal Transit Administration 1995):

- 65 vibration decibels (VdB) for land uses where low ambient vibration is essential for interior operations (such as hospitals and high-tech manufacturing or laboratory facilities),
- 80 VdB for residential uses and buildings where people normally sleep, and
- 83 VdB for institutional land uses with primarily daytime operations (such as schools, churches, clinics, and offices).

Standards have also been established to address the potential for groundborne vibration to cause structural damage to buildings. These standards were developed by the Committee of Hearing, Bio Acoustics, and Bio Mechanics (CHABA) at the request of the U.S. Environmental Protection Agency (Federal Transit Administration 1995). For fragile structures, CHABA recommends a maximum of 0.25 inch per second (in/sec) peak particle velocity (PPV) (Federal Transit Administration 1995).

STATE PLANS, POLICIES, REGULATIONS AND LAWS

The *State of California General Plan Guidelines*, published by the Governor's Office of Planning and Research (2003), provide guidance for the acceptability of different land uses within specific L_{dn}/CNEL contours to assist local agencies in their preparation of general plan noise elements. It would be the responsibility of Yuba County to incorporate these standards as appropriate into the *Yuba County General Plan* (see below). These state standards are not directly relevant to the evaluation of the FRLRP.

With respect to groundborne vibration, for the protection of fragile, historic, and residential structures, the California Department of Transportation (Caltrans) recommends a threshold of 0.2 in/sec PPV for normal residential buildings and 0.08 in/sec PPV for old or historically significant structures (California Department of Transportation 2002). These standards are more stringent than the federal standard established by CHABA, presented above.

LOCAL PLANS, POLICIES, REGULATIONS AND LAWS

Yuba County General Plan Noise Element

The *Yuba County General Plan* Noise Element, adopted in August 1980 (Yuba County 1980), contains objectives for acceptable noise exposure with respect to land use designations. The recommended noise-level criteria in the general plan are summarized in Table 5.10-1, "Recommended Objectives for Ambient Allowable Noise Levels in Yuba County." These designations are established for land use planning purposes and are intended to apply to long-term exposure to noise, as opposed to temporary noise sources, such as from construction.

Table 5.10-1
Recommended Objectives for Ambient Allowable Noise Levels in Yuba County

Land Use Category	7 a.m.–10 p.m.	10 p.m.–7 a.m.
Low-density residential	50 dBA	50 dBA
Multifamily residential	55 dBA	50 dBA
Schools	45 dBA	45 dBA
Retail/commercial	60 dBA	55 dBA
Passive recreation	45 dBA	45 dBA
Active recreation	70 dBA	70 dBA
Hospitals/mental health facilities	45 dBA	40 dBA
Agriculture	50 dBA	50 dBA
Neighborhood commercial	55 dBA	55 dBA
Professional office	55 dBA	55 dBA
Light manufacturing	70 dBA	65 dBA
Heavy manufacturing	75 dBA	70 dBA

Note: dBA = A-weighted decibels
Source: Yuba County 1994

Yuba County Noise Ordinance

Yuba County has adopted a noise ordinance, codified as Chapter 8.20 of the Yuba County Ordinance Code, to protect the citizens of Yuba County from unnecessary, excessive, and annoying noise and vibration and maintain quiet in areas that exhibit low noise levels. The maximum permissible noise levels for different land uses, as specified in Section 8.20.140 of the Yuba County Ordinance Code, are shown in Table 5.10-2, "Yuba County Noise Regulations." As specified in Section 8.20.140, where the ambient noise level is less than designated in this listing, the governing permissible noise level is the respective maximum noise level shown.

Table 5.10-2
Yuba County Noise Regulations

Zone	Time Period	Ambient Level	Maximum Permissible Noise Levels (dBA)
Single-family residential	10 p.m.–7 a.m. 7–10 p.m. 7 a.m.–7 p.m.	45 50 55	55 60 65
Multifamily residential	10 p.m.–7 a.m. 7 a.m.–10 p.m.	50 55	60 65
Commercial—Business and Professional (BP) subzone	10 p.m.–7 a.m.	55	65
Commercial	7 a.m.–10 p.m.	60	70
M-1 (General Industrial)	Any time	65	75
M-2 (Extractive Industrial)	Any time	70	80

Note: dBA = A-weighted decibels
Source: Yuba County Noise Regulations, Chapter 8.20 of the Yuba County Ordinance Code

The Yuba County noise ordinance also contains the following regulation that is applicable to the FRLRP:

> 8.20.310. Construction of Buildings and Projects. It shall be unlawful for any person within a residential zone, or within a radius of 500 feet therefrom, to operate equipment or perform any outside construction or repair work on buildings, structures, or projects or to operate any pile driver, power shovel, pneumatic hammer, derrick, power hoist, or any other construction type device between the hours of 10:00 p.m. of one day and 7:00 a.m. of the following day in such a manner that a reasonable person of normal sensitiveness residing in the area is caused discomfort or annoyance unless a permit has been duly obtained beforehand from the Director of the Planning and Building Services Department as set forth in Section 8.20.710 of the Noise Ordinance.

COMMUNITY AMBIENT NOISE DEGRADATION

In addition to the criteria discussed above, another consideration in defining impact criteria is based on the degradation of the existing noise environment. A variety of reactions result from the exposure to noise, ranging from serious annoyance to no awareness. About 10% of the population is so sensitive to noise that they object to any noise not of their own making. Thus, some complaints occur in even the quietest environments. Another sizable portion of the population (about 25%) does not react or complain even in very severe noise exposure. People can be expected to respond to changes in sound level as follows:

- Except in carefully controlled laboratory experiments, an increase or decrease of only 1 dBA is difficult to perceive.
- Outside of the laboratory, a 3-dBA increase or decrease is considered a noticeable difference.
- A 10-dBA increase is generally perceived as a doubling of loudness and would likely cause an adverse community reaction.

A noise impact is considered “generally not significant” if no noise-sensitive sites are located in the project area, or if increases in community noise level with implementation of the project are expected to be 3 dBA or less at noise-sensitive locations, and the project would not result in violations of local ordinances or standards. Noise-sensitive sites include residences, motels, hotels, public meeting rooms, auditoriums, schools, churches, libraries, hospitals, amphitheaters, parks, and other areas where low noise levels are essential.

The “significance” of a change in noise levels is somewhat subjective. However, both the Federal Highway Administration (FHWA) and Caltrans have published general criteria, applicable to roadway noise, that can also be used to define noise impacts associated with other community noise increases. In general, if the increase in noise exposure level would be greater than 3 dBA, the significance of the impact will depend on the ambient noise level and the presence of noise-sensitive uses. Noise impacts can be considered “possibly significant” if increases in noise exposure levels are expected to be no greater than 5 dBA with implementation of the project. Noise impacts can be considered “generally significant” if a project would cause noise standards or ordinances to be exceeded, would increase community noise levels by 6–10 dBA in urban areas, or would increase noise levels by 10 dBA in more rural areas.

5.10.3 ENVIRONMENTAL SETTING

SOURCES OF INFORMATION

Information for this section was obtained primarily from the following sources:

- Volume I, "Environmental Setting and Background," of the *Yuba County General Plan* (Yuba County 1994);
- *Draft Environmental Impact Report for the Yuba-Feather Supplemental Flood Control Project* (Yuba County Water Agency 2003);
- *Draft Environmental Impact Report for the Feather-Bear Rivers Levee Setback Project* (Three Rivers Levee Improvement Authority 2004b); and
- observations of noise-sensitive receptors during various field visits by project team members.

EXISTING NOISE-SENSITIVE RECEPTORS

Noise-sensitive land uses generally include those uses where exposure would result in adverse effects (e.g., sleep disturbance, annoyance), as well as uses where quiet is an essential element of their intended purpose. Residences are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Other sensitive land uses include hospitals, convalescent facilities, parks, auditoriums, amphitheaters, public meeting rooms, motels, hotels, churches, schools, libraries, and other uses where low interior noise levels are essential.

The noise-sensitive receptors in the FRLRP project vicinity are single-family residences, a school (Cedar Lane Elementary School, located several hundred feet east of the existing Feather River levee in project Segment 3), and a nursing home located just east of the Above Star Bend (ASB) setback levee alignment on Ella Avenue. There are few residences in project Segment 1 (see Section 5.7, "Aesthetic Resources"). In Segment 2, as described in Chapter 4, "Description of the Proposed Project," preliminary surveys of existing facilities identified approximately five to 10 residences in the ASB levee setback area (Alternative 2). In addition, as stated above, a small nursing home is located just to the east (land side) of the ASB setback levee alignment. In the intermediate levee setback area (Alternative 3) there are also five to 10 residences, although this alignment is several hundred feet west of the nursing home. Project Segment 3 is generally more developed than the other two project segments, with substantially more residences, and many of the homes in this segment are adjacent to the existing Feather River levee (see Section 5.7). Multiple residences in the project area (primarily in Segment 3) are located within 500 feet of the existing levee or one of the proposed setback levee alignments. At least one residence in Segment 1 and several residences in Segment 3 are located within 150 feet of the existing levee or one of the proposed setback levee alignments. The evaluation of effects of construction noise on sensitive uses focuses on these residences.

EXISTING NOISE ENVIRONMENT

Vehicle traffic is the primary noise source in the project vicinity. The major roadways in the area are State Route (SR) 70 and Feather River Boulevard (see Figure 5.11-1, "Roads in the Vicinity

of the FRLRP," in Section 5.11, "Transportation and Circulation"). Traffic on these roadways includes agricultural equipment; truck traffic from food processing plants, industrial sites, and logging; recreational vehicles; and vehicle traffic associated with the Plumas Lake area, Olivehurst, Linda, Marysville, and Yuba City, including commuters traveling to places of employment in the Sacramento region. Additional sources of noise in this area include agricultural operations, boats, pets, and occasional train pass-bys and/or aircraft flights overhead.

Existing roadway traffic noise levels were calculated for SR 70 and Feather River Boulevard using the FHWA Traffic Noise Prediction Model (Federal Highway Administration 1988) with traffic data for segments of SR 70 and Feather River Boulevard in the project area (California Department of Transportation 2006, Yuba County 1994). Assumptions regarding the distribution of vehicle types (i.e., percentage of automobiles, light trucks, heavy trucks, and other vehicles) were based on default model settings for the project area as contained in URBEMIS 2002 (California Air Resources Board 2002), which are interpolated from California Department of Motor Vehicles data. Additional input assumptions included day/night percentages of autos and medium and heavy trucks, vehicle speeds, ground attenuation factors, and roadway widths. The inputs and calculations are shown in Table 5.10-3, "Modeled Existing Vehicular Traffic-Noise Levels on State Route 70 and Feather River Boulevard," and in Appendix F.

Table 5.10-3
Modeled Existing Vehicular Traffic-Noise Levels on State Route 70 and Feather River Boulevard [1]

Roadway Segment	Distance (ft) from Roadway Centerline to CNEL/L_{dn} (dBA)				CNEL/L_{dn} (dBA) 50 Feet from Centerline of Near Travel Lane
	70 CNEL	65 CNEL	60 CNEL	55 CNEL	
State Route 70					
Between Yuba County line and Feather River Boulevard	104.8	221.1	473.9	1019.9	72.46
Between Feather River Boulevard and McGowan Road	92.3	193.4	414.0	890.6	71.57
Between McGowan Road and SR 65	133.5	283.8	609.7	1312.4	741.0
Between SR 65 and Olivehurst Avenue	185.6	397.2	854.3	1839.6	76.30
Between Olivehurst Avenue and Erle Road	202.2	433.1	931.8	2006.6	76.87
Between Erle Road and Feather River Boulevard	203.7	436.3	938.7	2021.4	76.91
Between Feather River Boulevard and North Beale Road	244.4	524.4	1128.7	2430.7	78.11
Feather River Boulevard					
North of Broadway	NA	NA	105	225	64
South of Grand Avenue	NA	101	217	468	69

Notes CNEL = community noise equivalent level; dBA = A-weighted decibels; ft = feet; Ldn = day-night noise level; NA = not available; SR = State Route

[1] Modeled noise levels do not consider any shielding or reflection of noise by existing structures or terrain features or noise contribution from other sources and where:

- ► dBA is a measure on a logarithmic scale that indicates the squared ratio of sound pressure to a reference sound pressure. A-weighted (A) refers to the specific frequency-dependent rating scale that is used to approximate human response.
- ► CNEL is the energy average of the A-weighted noise levels during a 24-hour period with 5 dBA added to the evening (7–10 p.m.) hours and 10 dBA to the night (10 p.m.–7 a.m.) hours.
- ► Ldn is the energy average of the A-weighted noise levels during a 24-hour period with 10 dBA added to the night (10 p.m.–7 a.m.) hours.

Sources: Yuba County 1994, Yuba County Water Agency 2003, California Department of Transportation 2006, data provided by EDAW in 2006

5.10.4 ENVIRONMENTAL IMPACTS

This impact analysis addresses impacts of project-related noise on humans. Potential noise effects on wildlife are discussed in Section 5.5, "Terrestrial Biological Resources."

THRESHOLDS OF SIGNIFICANCE

Thresholds for determining the significance of noise impacts were based on general standards for community ambient noise degradation and the Yuba County standards identified above. A project alternative would have a significant noise impact if:

- construction equipment would be operated or construction work would be performed within 500 feet of a residential zone during the noise-sensitive hours between 10 p.m. and 7 a.m. (Yuba County Ordinance Code Section 8.20.310),
- construction operations would result in a noticeable increase (3 dBA) in ambient noise levels at the closest occupied (interior) or regularly used (exterior) portion of a noise-sensitive receptor,
- operation of the project would result in long-term noise levels that exceed Yuba County's applicable exterior noise standards, or
- operation of the project would result in an increase of 3 dBA in the ambient noise level at the property line of a noise-sensitive receptor.

A project alternative would have a significant impact related to vibration if:

- construction-generated vibration levels would exceed 80 VdB (FTA's maximum acceptable vibration standard with respect to human response at residential uses) (Federal Transit Administration 1995) or 0.2 in/sec PPV (Caltrans's recommended standard with respect to the prevention of structural building damage for normal residential buildings [California Department of Transportation 2002]) at nearby existing noise-sensitive land uses.

IMPACT ANALYSIS

Analysis Method

Almost all noise that would be associated with the FRLRP would be generated by construction activities and, therefore, would be short term. The estimates of construction-related noise levels are based on anticipated equipment use and noise-generation factors developed by the U.S. Environmental Protection Agency (1971) and the Federal Transit Administration (1995). Construction-generated groundborne vibration impacts were assessed based on existing documentation (e.g., vibration levels produced by specific construction equipment) and the distance of structures and sensitive receptors from the given source.

No long-term sources of noise would be associated with levee repairs and strengthening or with setting back the Feather River levee. The only operational activities that would be associated with the ASB setback levee (proposed under Alternative 2) or the intermediate setback levee

(proposed under Alternative 3) would be the continuation at the setback levee of maintenance activities currently performed at the existing Feather River levee. These activities would be performed only periodically and would not increase ambient noise levels noticeably. Further, no new stationary sources of noise would be introduced to the project area. Although an existing source of operational noise would be relocated, that is, Pump Station No. 3, it would not be moved near any sensitive receptors. In addition, the current pump equipment at Pump Station No. 3 is exposed. The replacement pump station would enclose the pump equipment in a structure, likely resulting in decreased noise generation during pump operation. For these reasons, only construction-generated noise is addressed in this section.

Alternative 1 – The Levee Strengthening Alternative

Impact LS-5.10-a

Temporary Increase in Noise Levels during Construction. Noise levels associated with construction activities could exceed the maximum permissible noise limits at residences. Construction equipment may operate between the hours of 10 p.m. and 7 a.m., and could operate within 500 feet of a residential zone during these hours. Therefore, construction activities occurring between 10 p.m. and 7 a.m. could result in annoyance and/or sleep disruption of certain receptors within the project area. In addition, construction operations may result in a noticeable temporary increase (3 dBA or more) in ambient noise levels at these residences. Therefore, this impact would be **significant.**

Construction activities under Alternative 1 would include grading, clearing, and excavation associated with site preparation; borrow excavation and detention basin construction; transport of materials; and other activities. The on-site equipment required for levee repairs and strengthening is anticipated to include two hydraulic excavators, six scrapers, three bulldozers, three graders, three rollers, two water wagons, 20 highway dump trucks, one lubricating truck, one loader, a truck-mounted crane, and numerous pickup trucks. Mobile equipment for construction of the slurry cutoff wall may include three hydraulic excavators, three bulldozers, three utility excavators, and three integrated tool carriers. Depending on the operations conducted, individual equipment noise levels can range from 77 to 98 dBA at 50 feet, as indicated in Table 5.10-4, "Typical Equipment Noise Levels."

The simultaneous operation of the on-site construction equipment associated with levee repair and strengthening activities, as identified above (including construction of the slurry cutoff wall), could result in combined intermittent noise levels of approximately 102 dBA 50 feet from the alignment of the existing levee (Appendix F). This estimate is calculated based on the very conservative assumption that multiple pieces of equipment that generate the highest noise levels would be operating at the same site along the levee alignment at the same time. However, this scenario would be very unlikely to occur, particularly with the narrow linear nature of the construction area. Also, the construction effort would consist of three main activities: construction of a slurry cutoff wall, other levee repair and strengthening activities, and excavation and transport of borrow materials. The three main activities would take place at different locations. Nevertheless, it is assumed for this analysis that noise from these sources may have cumulative effects on nearby sensitive receptors, and that noise levels 50 feet from any part of the construction area where heavy equipment is operating could be in the range of 74–102 dBA.

Table 5.10-4
Typical Equipment Noise Levels

Type of Equipment	Noise Level in dBA at 50 Feet	
	Without Feasible Noise Control	With Feasible Noise Control *
Dozer or tractor	80	75
Scraper	88	80
Excavator	88	80
Compactor	82	75
Roller	74	–
Backhoe or loader	85	75
Grader	85	75
Crane	83	75
Generator	78	75
Drill	98	80
Compressor	81	75
Pump	76	75
Truck	91	75
Chain saw	77	77

Note: dBA = A-weighted decibels

* Feasible noise control includes the use of intake mufflers, exhaust mufflers, and engine shrouds in accordance with manufacturers' specifications.

Sources: U.S. Environmental Protection Agency 1971, Federal Transit Administration 1995

At least one residence is within about 150 feet of the existing levee along project Segment 1 and multiple residences are within 150 feet of the existing levee in Segment 3. Based on the equipment noise levels described above and assuming a noise attenuation rate of 6 dBA/DD, exterior noise levels approximately 100 feet from the part of the levee alignment where repairs are occurring could be as high as 96 dBA without the use of feasible noise control, and noise levels 200 feet from the construction area could be as high as 90 dBA. Noise levels in areas within about 6,500 feet of the levee alignment could exceed 60 dBA, without feasible noise control, as a result of construction activity. Some noise-sensitive receptors in these areas are already within areas of higher noise contours associated with SR 70 and Feather River Boulevard, and the Yuba County Airport, but would likely experience more elevated noise levels during levee construction for up to several weeks.

In addition to equipment operation, additional noise would also be generated by off-site construction-related traffic. As described in Section 5.11, "Transportation and Circulation," there would be approximately 84,910 construction-related truck trips over two construction seasons, averaging approximately 4,250 truck round trips per month or about 190–200 per work day. These trips would occur throughout the work day and would be spread geographically, as work would occur simultaneously in several locations along the levee alignment. Employee travel to and from the work sites could increase traffic on local roadways during peak morning and evening periods. For Alternative 1 the maximum workforce during peak construction periods is

estimated to be 100 employees, resulting in up to 100 employee-generated commute trips in the mornings and evenings, assuming that no ridesharing occurs. Typically, a doubling of traffic volumes is required before a noticeable increase (3 dBA) in traffic noise levels occurs. The annual average daily traffic (AADT) volume on SR 70 has been estimated to range from 13,300 to 60,000 trips between the Yuba-Sutter County line and the Yuba River. The increase in vehicle traffic associated with project construction would not substantially increase traffic volume during peak hours on SR 70, but it could substantially increase traffic on local roadways between SR 70 and the construction area, causing a temporary noticeable increase (3 dBA) in off-site ambient noise levels.

The exact hours of equipment operation at the construction sites are not known and have not been specifically limited to the hours between 7 a.m. and 10 p.m. According to the Yuba County Ordinance Code, construction operations may occur during the noise-sensitive hours between 10 p.m. and 7 a.m., but not within 500 feet of residences. Because residences are located closer than 500 feet to the construction area in several locations (particularly in Segment 3), if the proposed construction activities were to take place during the more noise-sensitive evening and nighttime hours, this could violate Section 8.20.310 of the Yuba County Ordinance Code and/or may result in a noticeable temporary increase (3 dBA or more) in ambient noise levels and cause annoyance or sleep disruption to occupants of these residences closest to construction areas. For the reasons discussed above, this impact would be significant.

Impact LS-5.10-b

Exposure of Sensitive Receptors to Excessive Groundborne Vibration During Construction. Construction-generated vibration levels would not result in levels above 0.2 in/sec PPV (Caltrans's recommended standard with respect to the prevention of structural building damage) or 80 VdB (FTA's maximum acceptable vibration standard with respect to human response at residential uses) at the nearest land uses. Thus, this impact would be **less than significant.**

Construction activities have the potential to result in varying degrees of temporary ground vibration, depending on the specific construction equipment used and operations involved. Ground-vibration levels associated with various types of construction equipment are summarized in Table 5.10-5, "Typical Construction Equipment Vibration Levels." Vibration generated by construction equipment typically spreads through the ground and diminishes in magnitude with increases in distance. While effects of ground vibration may be imperceptible at low levels, they may result in detectable vibrations and slight damage to nearby structures at moderate and high levels, respectively. At the highest levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings) and rarely results in structural damage.

Construction operations associated with Alternative 1 would be anticipated to include excavators, bulldozers, graders, and trucks, among other miscellaneous pieces of equipment. Groundborne noise and vibration resulting from levee repair and strengthening activities would be associated primarily with the use of bulldozers and movement of other tracked vehicles (i.e., excavators), which typically result in levels of groundborne vibration at 25 feet from the process that can exceed the applicable threshold of annoyance (80 VdB), as shown in Table 5.10-5. However, because the nearest residential structures would be located approximately 100–150 feet from the construction site at the nearest point, and groundborne vibration dissipates rapidly with distance, vibration levels would not surpass the 80-VdB threshold at these nearby

residential structures. Note that none of the pieces of construction equipment shown in Table 5.10-5 exceed the vibration threshold of 0.2 in/sec for structural damage. Pile drivers are the primary piece of construction equipment capable of exceeding this threshold, and there are no proposals to use impact pile drivers as part of FRLRP construction. Thus, the temporary construction vibration associated with on-site equipment would not be anticipated to expose sensitive receptors to or generate excessive groundborne vibration or groundborne noise levels. Therefore, this impact would be less than significant.

Table 5.10-5
Typical Construction Equipment Vibration Levels

Equipment	PPV at 25 feet (in/sec)	Approximate L_v at 25 feet
Large bulldozer	0.089	87
Caisson drilling	0.089	87
Trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

Notes: in/sec = inches per second; L_v = velocity level in decibels (VdB) and based on the root mean square (RMS) velocity amplitude; PPV = peak particle velocity

Source: Federal Transit Administration 1995

Alternative 2 – The Levee Strengthening and ASB Setback Levee Alternative

Impact ASB-5.10-a

Temporary Increase in Noise Levels during Construction. Noise levels associated with construction activities could exceed the maximum permissible noise limits at residences. Construction equipment may operate between the hours of 10 p.m. and 7 a.m. and could operate within 500 feet of a residential zone during these hours. Therefore, construction activities occurring between 10 p.m. and 7 a.m. could result in annoyance and/or sleep disruption of certain receptors within the project area. In addition, construction operations may result in a noticeable temporary increase (3 dBA or more) in ambient noise levels at these residences. This impact would be **significant.**

This impact is similar to Impact LS-5.10-a, described under Alternative 1 above. The on-site equipment required for levee repairs and strengthening and construction of the ASB setback levee is anticipated to include two hydraulic excavators, eight to 10 scrapers, four bulldozers, three to four graders, four rollers, two water wagons, 20 highway dump trucks, one lubricating truck, one loader, a truck-mounted crane, and numerous pickup trucks. Mobile equipment for construction of the slurry cutoff wall may include two hydraulic excavators, two bulldozers, two utility excavators, and two integrated tool carriers. Depending on the operations conducted, individual equipment noise levels can range from 77 to 98 dBA at 50 feet, as indicated in Table 5.10-4.

The simultaneous operation of the on-site construction equipment associated with levee repair and strengthening activities and the ASB levee setback, as identified above (including construction of the slurry cutoff wall), could result in combined intermittent noise levels of

approximately 104 dBA 50 feet from the alignment of the existing levee (Appendix F). This estimate is calculated based on the very conservative assumption that multiple pieces of equipment that generate the highest noise levels would be operating at the same site along the project alignment at the same time. However, this scenario is very unlikely to occur, particularly with the linear nature of the construction area. Also, the construction effort would consist of several activities: construction of a slurry cutoff wall, other levee repair and strengthening activities, construction of the ASB setback levee, and excavation and transport of borrow material from borrow sites. These activities would take place at different locations, and in some cases, during different construction seasons. Nevertheless, it is assumed for this analysis that noise from these sources may have cumulative effects on nearby sensitive receptors, and that noise levels 50 feet from any part of the construction area where heavy equipment is operating could be in the range of 74–104 dBA.

At least one residence is within approximately 150 feet of the existing levee along project Segment 1. The ASB setback levee alignment is within several hundred feet of some residences and a nursing home along Segment 2. Multiple residences are within 150 feet of the existing levee in Segment 3. Therefore, based on the equipment noise levels described above and assuming a noise attenuation rate of 6 dBA/DD, exterior noise levels approximately 100 feet from the part of the existing or setback levee alignment where construction is occurring could be as high as 98 dBA without the use of feasible noise control, and noise levels 200 feet from the construction area could be as high as 92 dBA. Noise levels in areas within about 6,500 feet of the existing or setback levee alignment could exceed 60 dBA, without feasible noise control, as a result of construction activity.

Construction-generated traffic under Alternative 2 would be greater than under Alternative 1, primarily because of the need to transport a greater volume of material from borrow sites to the setback levee alignment. During the second construction season, when the setback levee is being constructed, truck round trips are estimated to average approximately 8,400 trips per month or roughly 380–390 trips per work day. During peak construction periods up to approximately 100 employee commute trips would occur in the mornings and evenings, assuming that no ridesharing occurs. Construction-related traffic would be much less during the first construction season when repairs of the existing levee in Segments 1 and 3 would take place. Typically, a doubling of traffic volumes is required before a noticeable increase (3 dBA) in traffic noise levels occurs. The AADT volume on SR 70 has been estimated at greater than 16,000 trips. The increase in vehicle traffic associated with project construction would not substantially increase traffic volume during peak hours on SR 70, but it could substantially increase traffic on local roadways between SR 70 and the construction area, causing a temporary noticeable increase (3 dBA) in off-site ambient noise levels.

As described under Impact LS-5.10-a, the exact hours of equipment operation at the construction sites are not known and have not been specifically limited to the hours between 7 a.m. and 10 p.m. Because construction operations may occur during the noise-sensitive hours between 10 p.m. and 7 a.m. within 500 feet of residences, the proposed activities could violate Section 8.20.310 of the Yuba County Ordinance Code. For this reason, construction activities could result in a potentially significant noise impact. In addition, the occurrence of construction operations, particularly during the noise-sensitive hours, may result in a noticeable temporary increase (3 dBA or more) in ambient noise levels and cause annoyance or sleep disruption to

occupants of residences closest to construction areas. For the reasons discussed above, this impact would be significant.

Impact ASB-5.10-b

Exposure of Sensitive Receptors to Excessive Groundborne Vibration during Construction. This impact would be the same as Impact LS-5.10-b, described under Alternative 1 above. Construction processes under Alternative 2 would not occur any closer to sensitive land uses than discussed under Alternative 1, and no new construction equipment or processes that would generate additional groundborne vibration would be used. For the same reasons as described above, this impact would be **less than significant.**

Alternative 3 – The Levee Strengthening and Intermediate Setback Levee Alternative

Impact IS-5.10-a

Temporary Increase in Noise Levels during Construction. This impact would be similar to Impact ASB-5.10-a, described under Alternative 2 above. Although the intermediate setback levee alignment is in a different location than the ASB alignment relative to some sensitive receptors, and traffic generation may be somewhat different based on needs for borrow material, the extent and nature of the impact would not be appreciably different. For the same reasons as described above, this impact would be **significant.**

Impact IS-5.10-b

Exposure of Sensitive Receptors to Excessive Groundborne Vibration During Construction. This impact would be the same as Impact LS-5.10-b, described under Alternative 1 above. Construction processes under Alternative 2 would not occur any closer to sensitive land uses than those discussed under Alternative 1, and no new construction equipment or processes that would generate additional groundborne vibration would be used. For the same reasons as described above, this impact would be **less than significant.**

5.10.4 MITIGATION MEASURES

ALTERNATIVE 1 – THE LEVEE STRENGTHENING ALTERNATIVE

No mitigation is required for Impact LS-5.10-b (exposure to excessive groundborne vibration during construction). Mitigation is provided below for Impact LS-5.10-a (temporary increase in noise levels during construction).

LS-5.10-a **Limit Generation of Noise by Equipment during Project Construction.** This mitigation would reduce the potential impact, but not to a less-than-significant level.

Three Rivers Levee Improvement Authority (TRLIA) shall ensure that the primary construction contractor implements the following mitigation measures during construction activities:

(a) To the extent practicable, construction activities shall be limited to the hours of 7 a.m. to 10 p.m. when operations occur within 500 feet of a residential or other noise-sensitive land use. Decisions as to whether nighttime construction is needed within 500 feet of residential or other noise-sensitive land uses shall only consider the need to complete project activities before the beginning of

the flood season and the associated need to maintain human safety and the integrity of the flood control system.

(b) All construction equipment shall be properly maintained and equipped with noise control, such as mufflers, in accordance with manufacturers' specifications.

(c) To the extent feasible, the simultaneous operation of construction equipment within 50 feet of the project boundary shall be limited.

In addition, TRLIA shall implement the following measure:

(d) Before construction at each site near noise-sensitive receptors, TRLIA shall provide written notification to potentially affected receptors, identifying the type, duration, and frequency of construction operations. Notification materials will also identify a mechanism for residents to register complaints with TRLIA and Yuba County (the agency responsible for enforcement of the Yuba County noise ordinance) if construction noise levels are overly intrusive or construction occurs outside the permitted hours. TRLIA and/or Yuba County would then take corrective action.

Implementation of measure (a) would encourage compliance with Section 8.20.310 of the Yuba County Ordinance Code, but it would not ensure compliance, as schedule constraints and the need to maintain the integrity of the flood control system may require nighttime construction. Implementation of measures (b) and (c) would reduce construction-generated noise levels at the nearest noise-sensitive receptors by approximately 10 dBA. In addition, measure (d) would be consistent with International Standards Organization recommendation R-1996 by providing a mechanism for affected individuals to provide input or to seek corrective action if construction levels are overly intrusive. However, even with implementation of the proposed measures, noticeable increases (3 dBA) in the ambient noise environment would be anticipated to occur temporarily at some nearby residences. Therefore, implementing this mitigation would reduce the potential temporary noise impact, but not to a less-than-significant level.

ALTERNATIVE 2 – THE LEVEE STRENGTHENING AND ASB SETBACK LEVEE ALTERNATIVE

No mitigation is required for Impact ASB-5.10-b (exposure to excessive groundborne vibration during construction). Mitigation is provided below for Impact ASB-5.10-a (temporary increase in noise levels during construction).

ASB-5.10-a Limit Generation of Noise by Equipment during Project Construction. This measure is identical to Mitigation Measure LS-5.10-a above. This mitigation would reduce the impact, but not to a less-than-significant level.

ALTERNATIVE 3 – THE LEVEE STRENGTHENING AND INTERMEDIATE SETBACK LEVEE ALTERNATIVE

No mitigation is required for Impact IS-5.10-b (exposure to excessive groundborne vibration during construction). Mitigation is provided below for Impact IS-5.10-a (temporary increase in noise levels during construction).

IS-5.10-a **Limit Generation of Noise by Equipment during Project Construction.** This measure is identical to Mitigation Measure LS-5.10-a above. This mitigation would reduce the impact, but not to a less-than-significant level.

5.10.5 IMPACTS REMAINING SIGNIFICANT AFTER MITIGATION

ALTERNATIVE 1 – THE LEVEE STRENGTHENING ALTERNATIVE

Impact LS-5.10-a (temporary noise increase during construction of the setback levee) would remain significant and unavoidable after mitigation.

ALTERNATIVE 2 – THE LEVEE STRENGTHENING AND ASB SETBACK LEVEE ALTERNATIVE

Impact ASB-5.10-a (temporary noise increase during construction of the setback levee) would remain significant and unavoidable after mitigation.

ALTERNATIVE 3 – THE LEVEE STRENGTHENING AND INTERMEDIATE SETBACK LEVEE ALTERNATIVE

Impact IS-5.10-a (temporary noise increase during construction of the setback levee) would remain significant and unavoidable after mitigation.