

CONSOLIDATED FINAL RESTORATION PROJECTS STATEWIDE ORDER
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CHAPTER 3 ENVIRONMENTAL SETTING, IMPACTS, AND MITIGATION MEASURES
3.14 NOISE

3.14 Noise

3.14.1 Introduction

This section describes acoustic fundamentals and noise-sensitive land uses in the study area, and the potential noise and vibration impacts of the types of restoration projects that would be permitted under the Order. (Section 2.6, *Categories of Restoration Projects in the Order*.) The environmental setting and evaluation of noise impacts is based on a review of existing published documents, including city and county general plans; information regarding example projects that are similar to those permitted under the Order that may be implemented by other agencies; and other information sources listed in Chapter 8, *References*. See Section 3.5, *Biological Resources—Terrestrial*, and Section 3.6, *Biological Resources—Aquatic*, for potential noise impacts on special-status species.

Future restoration projects that would be permitted under the Order could generate noise or vibration during construction or operation, or both. As discussed further in this section, noise or vibration could be generated by all of the following:

- ◆ Mobilization of equipment and materials
- ◆ Use of staging areas and access and haul routes
- ◆ Site preparation
- ◆ Preparation of borrow sites
- ◆ Site restoration and demobilization
- ◆ Disposal of excess materials
- ◆ Operations and maintenance (O&M) activities

Section 3.6, *Biological Resources—Aquatic*, presents an analysis of noise, motion, and vibration disturbance impacts on listed fish species.

No comments specifically addressing noise and vibration were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.14.2 Environmental Setting

Acoustic Fundamentals

Definitions of Acoustics Terms

Acoustics is the scientific study of the perception and properties of sound waves. Table 3.14-1 presents definitions of the acoustics terms used to establish the environmental setting and examine the potential noise impacts of future restoration projects permitted under the Order.

Noise Generation and Attenuation

Both mobile sources such as automobiles, trucks, and airplanes and stationary sources such as construction activities, machinery, and commercial and industrial operations can generate noise. As a sound wave is initiated in a medium by a vibrating object, the sound wave contains minute variations of pressure that rise above and fall below the ambient atmospheric pressure. Once initiated, sound travels through the atmosphere from the source to the receiver. Noise levels fluctuate depending on characteristics such

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Table 3.14-1
Acoustics Terms

Term	Definition
Noise	Sound that is loud, disagreeable, unexpected, or unwanted.
Decibel (dB)	A measurement of sound levels. The decibel scale was developed to relate to the range of human hearing. A decibel is logarithmic and cannot be directly summed. For example, a 65-dB source of sound, such as a truck, when joined by another 65-dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). A sound level increase of 10 dB corresponds to 10 times the acoustical energy, and an increase of 20 dB equates to a 100-fold increase in acoustical energy.
A-weighted decibel (dBA)	An adaptation of the decibel measurement reflecting that the human ear is not equally sensitive to loudness at all frequencies in the audible spectrum. To better relate overall sound levels and loudness to human perception, frequency-dependent weighting networks were developed, identified as A through E. There is a strong correlation between the way humans perceive sound and A-weighted sound levels. For this reason, A-weighted sound levels are used to predict community response to noise from the environment, including noise from transportation and stationary sources, and are expressed as A-weighted decibels. All sound levels discussed in this section are A-weighted decibels unless otherwise noted.
Equivalent noise level (Leq)	The average noise level during a specified time period; that is, the equivalent steady-state noise level in a stated period of time that would contain the same acoustic energy as the time-varying noise level during the same period (i.e., average noise level).
Maximum noise level (Lmax)	The highest instantaneous noise level during a specified time period.
Minimum noise level (Lmin)	The lowest instantaneous noise level during a specified time period.
Day-night noise level (Ldn)	The 24-hour Leq with a 10-dB penalty applied during the noise-sensitive hours from 10 p.m. to 7 a.m., which are typically reserved for sleeping.
Community noise equivalent level (CNEL)	Similar to the Ldn described above with an additional 5-dB penalty applied during the noise-sensitive hours from 7 p.m. to 10 p.m., which are typically reserved for evening relaxation activities.
Single-event noise level (SEL)	Sounds that occur in an irregular or non-repetitive manner, which makes them difficult to anticipate; these are usually measured by Lmax noise levels.

SOURCE: Caltrans 2013a

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as ground absorption, atmospheric conditions, and the presence of physical barriers. Mobile sources generally generate noise at a rate of 4.5 decibels (dB) per doubling of distance from the source. Noise from stationary sources spreads with more spherical dispersion patterns and is generated at a rate of 6 to 7.5 dB per doubling of distance from the source.

Meteorological changes such as wind speed, wind direction, turbulence, temperature gradients, and humidity can alter noise distribution and affect noise levels at a receiver. Barriers such as topographic features, intervening buildings, or dense vegetation can substantially reduce noise levels at the receiver. Noise barriers can be both natural (e.g., berms, hills, and dense vegetation) and human-made (e.g., buildings and walls).

Table 3.14-2 shows the sound levels associated with common sources of environmental and noise levels.

**Table 3.14-2
Typical Sound Levels Measured in the Environment and Industry**

Common Outdoor Activities	Sound Level (dBA)	Common Indoor Activities
	110	Rock band
Jet flyover at 1,000 feet	100	
Gas lawn mower at 3 feet	90	
Diesel truck moving at 50 mph at 50 feet	80	Food blender at 3 feet, garbage disposal at 3 feet
Noisy urban area, gas lawn mower at 100 feet	70	Vacuum cleaner at 10 feet, normal speech at 3 feet
Commercial area, heavy traffic at 300 feet	60	
Quiet urban daytime	50	Large business office, dishwasher in next room
Quiet urban nighttime	40	Theater, large conference room (background)
Quiet suburban nighttime	30	Library, bedroom at night, concert hall (background)
Quiet rural nighttime	20	Broadcast/recording studio
	10	
Threshold of human hearing	0	Threshold of human hearing

SOURCE: Caltrans 2013a

NOTES: dBA = A-weighted decibels; mph = miles per hour

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Effects of Noise on Humans

Excessive and chronic (long-term) exposure to elevated noise levels can result in auditory and non-auditory effects on humans. Auditory effects are the temporary or permanent hearing loss caused by loud noises. Exposure to noise can cause physical damage to the auditory system, resulting in gradual or extreme hearing loss. Sustained exposure to moderately high noise levels over a period of time can cause gradual hearing loss, whereas a short period of sudden exposure to extremely high noise levels can cause extreme hearing loss. Both of these hearing changes can result in the permanent loss of hearing.

The degree to which noise results in annoyance, nuisance, and dissatisfaction in humans is highly variable and can be influenced by multiple non-auditory factors. The human response to noise varies depending on individual characteristics such as sensitivity, location, time of day, location, and length of exposure.

Ground Vibration

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

Vibration amplitudes are commonly expressed in peak particle velocity (PPV) or root-mean-square vibration velocity. PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is typically used in the monitoring of transient and impact vibration and has been found to correlate well to the stresses experienced by buildings (FTA 2018; Caltrans 2013a). PPV and root-mean-square vibration velocity are normally described in inches per second.

PPV is appropriate for evaluating the potential for building damage but is not always suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the body responds to average vibration amplitude. The root mean square of a signal is the average of the squared amplitude of the signal, typically calculated over a 1-second period. As with airborne sound, the root-mean-square velocity is often expressed in decibel notation as vibration decibels (VdB), which serves to compress the range of numbers required to describe vibration (FTA 2018). Table 3.14-3 shows the general human response to different ground vibration-velocity levels.

The typical background vibration-velocity level in residential areas is approximately 50 VdB. Typical outdoor sources of perceptible ground vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground vibration is rarely perceptible. The range of interest is from approximately 50 VdB, the typical background vibration-velocity level, to 100 VdB, the general threshold at which minor damage can occur in fragile buildings. Construction activities can generate

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sufficient ground vibration to pose a risk to nearby structures. Constant or transient vibration can weaken structures, crack facades, and disturb occupants (FTA 2018).

**Table 3.14-3
 Human Response to Different Levels of Groundborne Noise and Vibration**

Vibration-Velocity Level	Human Reaction
65 VdB	Approximate threshold of perception.
75 VdB	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find that transportation-related vibration at this level is unacceptable.
85 VdB	Vibration acceptable only if there is an infrequent number of events per day.

SOURCE: FTA 2018

NOTE: VdB = vibration decibels referenced to 1 microinch per second and based on the root mean square velocity amplitude

Construction activities can be transient, random, or continuous. Transient construction vibration is generated by blasting, impact pile driving, and wrecking balls. Continuous vibration results from vibratory pile drivers, large pumps, and compressors. Random vibration can result from jackhammers, pavement breakers, and heavy construction equipment.

Existing Environment

Noise-sensitive land uses typically include places where quiet is crucial to their intended purpose, or those where noise exposure could result in detrimental effects on the health of individuals. Residences, hospitals, places of worship, libraries and schools, nature and wildlife preserves, and parks are considered sensitive to increased exterior noise levels. Fragile buildings, such as historical or lightweight buildings, are sensitive to groundborne vibration. Buildings whose operations could be disrupted by vibration, such as commercial and industrial buildings, are also considered vibration-sensitive; they may be sensitive at levels below those associated with human annoyance.

Restoration projects permitted under the Order could be implemented statewide. Primary sources of noise and vibration vary in each county, city, and region; generally, however, they consist of roadway traffic, railroads, aircraft, watercraft, and other sources such as farming, mining, timber, harvesting, industrial, and construction equipment. Fixed noise sources include lumber mills, auto maintenance shops, car washes, loading docks, recycling centers, electricity-generating stations, landfills, and athletic fields.

Numerous freeways, expressways, and railroads serve the study area, and a number of private and public airports of various sizes and daily flight frequencies serve the state. California’s leading ports include the Ports of Los Angeles and Long Beach on San Pedro Bay, yet harbors are found throughout the state.

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As discussed in Section 2.6, *Categories of Restoration Projects in the Order*, the Order would permit the construction, modification, or operation of the following types of restoration projects:

- ◆ Stream crossing and fish passage improvements
- ◆ Removal of small dams, tide gates, flood gates, and legacy structures
- ◆ Bioengineered bank stabilization
- ◆ Restoration and enhancement of off-channel/side-channel habitat
- ◆ Water conservation
- ◆ Floodplain restoration
- ◆ Removal of pilings and other in-water structures
- ◆ Removal of non-native terrestrial and aquatic invasive species and revegetation with native plants
- ◆ Establishment, restoration, and enhancement of tidal, subtidal, and freshwater wetlands
- ◆ Establishment, restoration, and enhancement of stream and riparian habitats

Project areas could include a wide range of land uses from wildlands and forest lands to agricultural, rural residential, suburban, and urban. In general, noise is less prevalent in agricultural, rural, and rural-residential areas than in suburban and urban areas. All categories of sensitive receptors exist in the study area.

3.14.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, and laws, and ordinances pertaining to noise and vibration impacts.

Future permitted restoration projects that would be implemented under the Order may be subject to the laws and regulations listed below, as well as other local or individual restoration projects requirements, depending on the project location.

Federal

U.S. Environmental Protection Agency Office of Noise Abatement

The U.S. Environmental Protection Agency's Office of Noise Abatement and Control was originally established to coordinate federal noise control activities. The Office of Noise Abatement and Control subsequently enforced the Federal Noise Control Act of 1972, which established programs and for identifying and addressing the effects of noise on public health, welfare, and the environment.

In 1981, agency administrators determined that subjective issues such as noise would be better addressed at more local levels of government. Consequently, in 1982, responsibilities for regulating noise control policies were transferred to state and local governments. However, federal action is essential for dealing with major noise sources

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in commerce, control of which requires nationally uniform treatment. Congress has directed the U.S. Environmental Protection Agency to coordinate the programs of all federal agencies related to noise research and noise control.

U.S. Department of Transportation

To address the human response to groundborne vibration, the Federal Transit Administration (FTA) set forth guidelines identifying maximum-acceptable vibration criteria for different types of land uses. These guidelines include the following maximum-acceptable vibration limits (FTA 2018):

- ◆ 65 VdB, referenced to 1 microinch per second and based on the root-mean-square velocity amplitude, for land uses where low ambient vibration is essential for interior operations (e.g., hospitals, high-tech manufacturing, laboratory facilities)
- ◆ 80 VdB for residential uses and buildings where people normally sleep
- ◆ 83 VdB for institutional land uses with primarily daytime operations (e.g., schools, churches, clinics, offices)

State

The State of California has adopted noise standards in areas of regulation not preempted by the federal government. State standards regulate the noise levels of motor vehicles, sound transmission through buildings, occupational noise, and noise insulation. Though not adopted by law, the *State of California General Plan Guidelines 2003*, published by the California Governor's Office of Planning and Research, provides guidance for project compatibility in areas of specific noise exposure. Acceptable and unacceptable community noise exposure limits for various land use categories have been identified to help guide new land use decisions in California communities. Many local jurisdictions use these guidelines to derive local noise standards and guidance.

Generally, residential uses (e.g., mobile homes) are considered acceptable in areas where exterior noise levels do not exceed 60 dBA L_{dn}. Residential uses are normally unacceptable in areas where exterior noise levels exceed 70 dBA L_{dn} and conditionally acceptable where levels are in the range of 55–70 dBA L_{dn}. Schools are normally acceptable in areas with exterior noise levels up to 70 dBA L_{dn} and normally unacceptable where with levels exceed 70 dBA L_{dn}. Commercial uses are normally acceptable in areas with exterior noise levels up to 70 dBA community noise equivalent level. Day-night noise levels between 67.5 and 77.5 dBA for commercial uses are conditionally acceptable, depending on the noise insulation features and noise reduction requirements. The guidelines also present adjustment factors that may be used to determine noise acceptability standards that reflect the particular community's noise control goals, sensitivity to noise, and assessment of the relative importance of noise pollution.

California Department of Transportation

In 2013, the California Department of Transportation published the *Transportation and Construction Vibration Guidance Manual*. The manual provides general guidance on vibration issues associated with project construction and operation relative to human

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perception and structural damage. Table 3.14-4 lists vibration levels that could damage structures exposed to continuous vibration.

**Table 3.14-4
 California Department of Transportation Recommendations regarding Vibration Levels**

PPV (in/sec)	Effect on Buildings
0.4 to 0.6	Architectural damage and possible minor structural damage
0.2	Risk of architectural damage to normal dwelling houses
0.1	Virtually no risk of architectural damage to normal buildings
0.08	Recommended upper limit of vibration to which ruins and ancient monuments should be subjected
0.006 to 0.019	Vibration unlikely to cause damage of any type

SOURCE: Caltrans 2013b

NOTES: in/sec = inch per second; PPV = peak particle velocity

Regional and Local

The Order would encompass all counties and cities throughout California. Government Code Section 65302(f) requires city and county general plans to include a noise element. Each county and city has local regulations and a general plan containing noise goals and policies that establish acceptable noise level criteria for transportation and stationary noise sources to guide future development and reduce land use conflicts. Noise ordinances establish limits that may be enforced by applying penalties or taking other actions. A noise ordinance generally must not be exceeded, whereas general plan standards are guidance to be considered during project development and may not represent strict limits, depending on the particular circumstances of the project.

3.14.4 Impacts and Mitigation Measures

Methods of Analysis

Noise and vibration impacts from the types of restoration projects permitted under the Order are evaluated in terms of how typical construction and operation of project components could introduce temporary or permanent noise and vibration sources near sensitive receptors (e.g., residences); identifies the potential for noise levels to exceed applicable local ordinances; and determines the potential for a substantial permanent increase in ambient noise levels. However, the precise locations and character of potential future permitted restoration projects are yet to be determined. Therefore, this noise analysis focuses on reasonably foreseeable impacts of the types of restoration projects and actions that might be taken in the future consistent with the level of detail appropriate for a program-level analysis.

Permanent impacts are considered those that would continue through the life of a project as a result of the environmental conditions caused by restoration projects permitted under the Order (e.g., fish screens on water intakes that could involve

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operating a pump station that would produce noise). Temporary impacts are considered those that would be temporary in nature (e.g., construction-related activities).

The approach to assessing noise and vibration impacts was to identify and review existing environmental studies, data, model results, and other information for projects that are consistent with those identified in Section 2.6, *Categories of Restoration Projects in the Order*, and Section 2.7, *Typical Construction, Operation, and Maintenance Activities and Methods*.

Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, an impact related to noise is considered significant if the types of projects that would be permitted under the Order would do any of the following:

- ◆ Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies
- ◆ Generate excessive groundborne vibration or groundborne noise levels
- ◆ For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels

Impacts were determined based on methodologies, reference emission levels, and usage factors from FTA's *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018) and the Federal Highway Administration's *Roadway Construction Noise Model User's Guide* (FHWA 2006). Jurisdictions throughout the study area apply a variety of numeric thresholds that would indicate a substantial temporary increase in ambient noise levels. This analysis uses a temporary increase of 10 dBA over ambient noise levels as a threshold: A 10-dBA increase is perceived as a doubling of loudness and may therefore indicate that the impact of the noise increase would be potentially significant. A long-term or permanent increase of 5 dBA over ambient noise levels would indicate a potentially significant increase in ambient noise levels. Human perception of changes in noise level generally can be perceived at an increase of 5 dBA (Caltrans 2013a) over ambient sound. The threshold is lower for long-term or permanent noise increases than for temporary noise increases because tolerance is greater for temporary changes in noise levels than for long-term or permanent changes (Caltrans 2013a).

For the purposes of this analysis, a project's impact from groundborne construction vibration would be significant if the project would expose residential structures or other buildings used by people to groundborne vibration levels exceeding either of the following standards:

- ◆ FTA's maximum acceptable vibration standard of 80 VdB for residential uses (e.g., annoyance, sleep disturbance)
- ◆ The California Department of Transportation–recommended standard of 0.2 inch per second PPV with respect to the prevention of damage to residential structures

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Impacts and Mitigation Measures

Table 3.14-5 summarizes the impact conclusions presented in this section for easy reference.

As part of the State Water Board or Regional Board’s issuance of a NOA for a restoration project under the Order, compliance with the general protection measures and mitigation measures listed below would be required when applicable to a given project. Not all general protection measures and mitigation measures would apply to all restoration projects. The applicability of the general protection measures and mitigation measures would depend on the individual restoration activities, project location, and the potentially significant impacts of the individual restoration project. Implementation of the mitigation measures would be the responsibility of the project proponent(s) under the jurisdiction of the State Water Board, appropriate Regional Board, or other authorizing regulatory agency.

**Table 3.14-5
Summary of Impact Conclusions—Noise**

Impact Statement	Construction Activities	Constructed Facilities and Operations and Maintenance
3.14-1: Implementing future restoration projects permitted under the Order could result in a temporary or permanent increase in ambient noise levels in excess of standards established in applicable plans and ordinances.	SU	LTSM
3.14-2: Implementing future restoration projects permitted under the Order could expose sensitive receptors to excessive groundborne vibration.	SU	LTSM
3.14-3: Implementing future restoration projects permitted under the Order could expose sensitive receptors to excessive groundborne noise levels.	SU	LTSM
3.14-4: Implementing future restoration projects permitted under the Order that are located within the vicinity of a private airstrip, an airport land use plan, or where such a plan has not been adopted, within 2 miles of a public airport or public use airport, could expose people residing or working in the project area to excessive noise levels.	LTSM	LTS

SOURCE: Data compiled by Environmental Science Associates in 2019 and 2020

NOTES: LTS = less than significant; LTSM = less than significant with mitigation;
SU = significant and unavoidable

Impact 3.14-1: Implementing future restoration projects permitted under the Order could result in a temporary or permanent increase in ambient noise levels in excess of standards established in applicable plans and ordinances.

Effects of Project Construction Activities

Construction activities for future restoration projects permitted under the Order could require the use of haul trucks and heavy equipment (Section 2.7.1, *Construction Activities and Methods*). Depending on the types and models of equipment used for construction, typical noise levels for these kinds of construction equipment would range from 80 to 95 dBA maximum noise level at 50 feet (FTA 2018). Most construction activities would occur during daylight hours; however, in rare cases, some activities, expedited projects, and projects where the construction schedule is nearing the prohibited work time frames (e.g., for biological species) may require continuous daytime and nighttime work. Also, several cities and counties have exempted construction activities from restrictive noise limits during specified daytime hours, while others have placed numeric limits on noise generated during construction.

For example, a restoration project involving levee deconstruction and construction may use heavy equipment during site preparation, restoration-related grading and excavation, and levee deconstruction. In addition, fish passage improvement projects (e.g., construction of fish screens and removal of dams) could require the use of pile driving methods and explosives. In such a case, construction activities could influence noise levels at and near the project site. These noise levels would fluctuate depending on the particular type, number, and duration of equipment used (e.g., small power tools, generators, dump trucks, graders). If, for example, the construction activity was located near single-family and multifamily residential and transient lodging, restoration activities could expose these sensitive receptors to increased noise levels. The highest levels of noise would be generated during simultaneous operation of multiple pieces of construction equipment.

Most restoration projects would likely occur far from residential areas and other sensitive receptors and would take place during the day. However, some construction-related activities may occur close to receptors and/or at night (e.g., if construction must be completed before a blackout period for a sensitive species). Therefore, this impact would be **potentially significant**.

Projects implementing applicable general protection measures (Appendix E) included in the Order would further reduce impacts to noise. The following general protection measures may apply to noise impacts:

- ◆ GPM-2: Construction Work Windows
- ◆ GPM-3: Construction Hours
- ◆ GPM-6: Work Area and Speed Limits
- ◆ IWW-9: In-Water Pile Driving Plan for Sound Exposure

However, the specific locations of restoration projects that would be permitted under the Order are yet to be determined. Therefore, even with implementation of general protection measures, some construction activities could result in temporary or

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permanent increases in ambient noise levels. Actual exposure levels would depend on multiple variables such as the intensity of construction activity, the distance of sensitive receptors to the noise source, and any structures or topography that might intervene and affect noise attenuation. Therefore, this impact would be **potentially significant**.

As part of the State Water Board or Regional Board's issuance of a NOA for a restoration project under the Order, compliance with Mitigation Measure NOISE-1 would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the project proponent(s) under the jurisdiction of the State Water Board, appropriate Regional Board, or other authorizing regulatory agency.

Mitigation Measure NOISE-1: Minimize Noise Conflicts

The following measures shall be implemented during construction of any restoration project permitted under the Order:

- ◆ Noise-generating activities shall follow the applicable general plan and/or noise ordinances for the jurisdiction located within the vicinity of the project.
- ◆ Construction equipment shall be located away from sensitive receptors, to the extent feasible, to reduce noise levels below applicable local standards.
- ◆ Construction equipment shall be maintained to manufacturers' recommended specifications, and all construction vehicles and equipment shall be equipped with appropriate mufflers and other approved noise-control devices.
- ◆ Idling of construction equipment shall be limited to the extent feasible to reduce the time that noise is emitted.
- ◆ An individual traffic noise analysis of identified haul routes shall be conducted and mitigation, such as reduced speed limits, shall be provided at locations where noise standards cannot be maintained for sensitive receptors.
- ◆ The project shall incorporate the use of temporary noise barriers, such as acoustical panel systems, between construction activities and sensitive receptors if it is concluded that they would be effective in reducing noise exposure to sensitive receptors.

Mitigation Measure NOISE-1 would be implemented to reduce the impacts of restoration projects under the Order. However, because the extent and location of such actions are not known at this time, it is not possible to conclude that the mitigation measure, or equally effective mitigation measures, would reduce significant impacts to a less-than-significant level in all cases. Therefore, this impact would be **significant and unavoidable**.

Effects of Constructed Facilities (Natural or Artificial Infrastructure) and Operations and Maintenance of those Facilities

Routine O&M activities for constructed facilities (natural or artificial infrastructure) for restoration projects that would be permitted by the Order could produce ambient noise. For example, O&M work for fish screens on water intakes could involve operating a pump station that would produce noise. However, pump stations are normally enclosed

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and would not be expected to result in a permanent substantial noise increase relative to existing conditions, nor would noise levels generated by the pump station exceed local jurisdictions' noise standards.

Most maintenance activities would involve truck trips, vegetation removal, sediment removal within or near the facilities, and inspection and maintenance of facilities. These activities could require heavy equipment that would generate noise at levels similar to those described above. However, elevated noise levels would be less frequent than during construction of these projects, because maintenance would be less frequent than ongoing construction activities.

Therefore, the impact of operation of constructed facilities for restoration projects permitted by the Order related to a temporary or permanent increase in ambient noise levels would be **less than significant**.

As part of the State Water Board or Regional Board's issuance of a NOA for a restoration project under the Order, compliance with Mitigation Measure NOISE-2 would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the project proponent(s) under the jurisdiction of the State Water Board, appropriate Regional Board, or other authorizing regulatory agency.

Mitigation Measure NOISE-2: Minimize Operations and Maintenance Noise Conflicts

The following measures shall be implemented during O&M activities for any restoration project permitted under the Order:

- ◆ Noise-sensitive receptors in the vicinity of project activities shall be identified and projects shall be designed to minimize exposure of sensitive receptors to long-term, operational noise sources (for example, water pumps) to reduce noise levels below applicable local standards.
- ◆ The hours of operation at noise generation sources near or adjacent to noise-sensitive areas shall be limited, wherever practicable, to reduce the level of exposure to meet applicable local standards.

Implementing Mitigation Measure NOISE-2 would reduce the impact related to a temporary or permanent increase in ambient noise levels from operation of constructed facilities for restoration projects permitted by the Order to a **less-than-significant level**.

Impact 3.14-2: Implementing future restoration projects permitted under the Order could expose sensitive receptors to excessive groundborne vibration.

Effects of Project Construction Activities

Construction activities for restoration projects permitted under the Order could require the use of heavy equipment such as pile drivers, bulldozers, haul trucks, and jackhammers, and explosives. These types of equipment or processes could generate groundborne vibration at levels ranging from 0.035 to 1.518 inches per second PPV at 25 feet and 79–112 VdB at 25 feet (FTA 2018) and could expose sensitive receptors to elevated vibration levels.

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Vibration levels typically tend to dissipate rapidly as distance increases from the vibration source. For example, stockpiling of materials may require constructing piers for barge landings, and pier construction may use pile drivers that could generate 1.518 inches per second PPV and 112 VdB at 25 feet. Applying FTA's recommended procedure for determining vibration levels at various distances from the source, the predicted most-conservative ground vibration levels would exceed the threshold of 80 VdB for human disturbance for pile driving at distances within 290 feet. With regard to structural damage, the threshold of 0.2 inch per second PPV would be exceeded for pile driving at distances within 96 feet. Therefore, this impact would be **potentially significant**.

Projects implementing applicable general protection measures (Appendix E) included in the Order would further reduce impacts to noise. The following general protection measures may apply to noise impacts:

- ◆ IWW-9: In-Water Pile Driving Plan for Sound Exposure

Mitigation Measure NOISE-1, or equally effective mitigation measures, would help to reduce significant impacts to a less-than-significant level for many projects. However, because the exact locations of restoration projects permitted under the Order are yet to be determined at this time, it is possible that construction activities could take place near sensitive receptors which could be exposed to excessive ground borne vibration. The factors necessary to determine individual restoration projects impacts include the type and exact location of construction activities, construction schedule, type of equipment used, and applicable local noise standards. Therefore, this impact may, in some cases, be **significant and unavoidable**.

Effects of Constructed Facilities (Natural or Artificial Infrastructure) and Operations and Maintenance of those Facilities

Operation of restoration projects permitted under the Order could expose people to elevated groundborne vibration, but far less frequently than during construction. Some projects, such as the construction of new levees, are not likely to generate vibration during operation. However, some heavier maintenance and repair activities could generate impacts similar to those discussed for Impact 3.14-1, except that jackhammering and pile driving and other activities that would generate the highest levels of vibration would not be expected to commonly be used as part of O&M activities. These operation and maintenance activities could result in temporary ground borne vibration at a level that is **potentially significant**.

Implementation of MM-NOISE 1 and NOISE-2 would reduce the impact of groundborne vibration during O&M activities for constructed facilities for restoration projects permitted by the Order to a **less-than-significant level**.

Impact 3.14-3: Implementing future restoration projects permitted under the Order could expose sensitive receptors to excessive groundborne noise levels.

Effects of Project Construction Activities

Construction activities for future restoration projects permitted under the Order could expose sensitive receptors to excessive groundborne noise levels (i.e., pile drivers,

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bulldozers, haul trucks, jackhammers and explosives [e.g., small dam removal]). As shown in Table 3.14-2, groundborne noise levels ranging from 25 to 40 dBA are the approximate threshold of perception for many humans ranging from inaudible to excessive for quiet sleeping areas; 35–50 dBA is the approximate dividing line between barely perceptible and distinctly perceptible, ranging from tolerable for sleeping areas to excessive in most quiet occupied areas; and 45–60 dBA ranges from excessive for sleeping areas to excessive even for infrequent events for some activities (FTA 2018). A noise level increase of 10 dBA or more is considered substantial. Construction activities would take place mostly during the day when construction-related noise increases would be smaller; however, it is possible that these increases could be substantial. Furthermore, a project may require some nighttime work to complete work before prohibited work time frames (e.g., for biological species).

Because the specific locations and scale of applicable projects are not known at this time, the potential for permitted actions to result in exposure of sensitive receptors to excessive groundborne noise levels cannot be determined. Factors necessary to determine individual restoration projects impacts include the type and precise locations of project activities, construction schedule, types of equipment used, and local ambient and groundborne noise levels. Construction activities that would be permitted under the Order could increase groundborne noise levels by more than 10 dBA. This impact would be **potentially significant**.

The general protection measures listed for Impact 3.14-1 and Mitigation Measure NOISE-1 would be used to reduce the potential impacts of project construction related to the exposure of sensitive receptors to excessive groundborne noise levels.

Mitigation Measure NOISE-1 would be implemented to reduce the impacts of restoration projects under the Order. However, because the extent and location of such actions are not known at this time, it is not possible to conclude that the mitigation measure, or equally effective mitigation measures, would reduce significant impacts to a less-than-significant level in all cases. Therefore, this impact would be **significant and unavoidable**.

Effects of Constructed Facilities (Natural or Artificial Infrastructure) and Operations and Maintenance of those Facilities

Routine O&M activities for constructed facilities (natural or artificial infrastructure) for future restoration projects permitted by the Order could result in a substantial (10-dBA) long-term or permanent increase in groundborne noise levels. For example, operation of fish screens on water intakes could involve using a pump station that would produce noise. Ordinarily, these facilities are enclosed and would not be expected to result in a permanent substantial increase in noise levels relative to existing conditions, nor would the noise levels generated by pump stations be expected to exceed the local jurisdictions' noise standards. However, these projects could be located in a quiet rural environment where typical noise levels may be as low as 20 dBA. As a result, operation of restoration projects permitted under the Order could expose sensitive receptors to excessive groundborne noise levels by more than 10 dBA.

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Most maintenance activities would involve truck trips, vegetation removal, sediment removal within or near the facilities, and inspection and maintenance of facilities. These activities could require heavy equipment that would generate noise levels similar to those described above, but elevated noise levels would occur less frequently than during construction of these projects, because maintenance would be less frequent than ongoing construction activities.

Therefore, the impact of excessive groundborne noise levels generated during operation of constructed facilities for restoration projects permitted by the Order would be **less than significant**.

Although the impact would be less than significant, mitigation measures may help to further reduce impacts associated with excessive groundborne noise levels associated with operation of constructed facilities. As part of the State Water Board or Regional Board's issuance of a NOA for a restoration project under the Order, compliance with Mitigation Measure NOISE-2 would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the project proponent(s) under the jurisdiction of the State Water Board, appropriate Regional Board, or other authorizing regulatory agency.

Excessive groundborne noise levels associated with operation of constructed facilities that would be permitted by the Order would remain **less than significant**.

Impact 3.14-4: Implementing future restoration projects permitted under the Order that are located within the vicinity of a private airstrip, an airport land use plan, or where such a plan has not been adopted, within 2 miles of a public airport or public use airport, could expose people residing or working in the project area to excessive noise levels.

Effects of Project Construction Activities

Construction of restoration projects that would be permitted under the Order could be located in the vicinity of a private airstrip, an airport land use plan, or within 2 miles of a public airport or public use airport. These restoration projects would not include occupied structures; therefore, exposure of excessive noise levels to the people residing in the area of a restoration project is not discussed further.

As discussed in Impact 3.10-3 in Section 3.10, *Hazards and Hazardous Materials*, it is possible that some projects could be constructed within 2 miles of an airport. These projects would be likely be subject to consistency requirements of an airport land use plan. However, because each project's specific location and scale are yet to be determined, the risks associated with noise levels near an airport cannot be determined. The necessary factors to determine risks associated with noise levels in the vicinity of an airport include the project's location relative to the airport. Implementation of projects in the vicinity of an airport could expose people working in the project area to excessive noise levels. This impact would be **potentially significant**. The Order does not include any general protection measures applicable to this impact.

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As part of the State Water Board or Regional Board's issuance of a NOA for a restoration project under the Order, compliance with Mitigation Measure NOISE would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the project proponent(s) under the jurisdiction of the State Water Board, appropriate Regional Board, or other authorizing regulatory agency.

Mitigation Measure NOISE-3: Prepare Preconstruction Safety Plans

To reduce potential impacts on people residing or working in the vicinity of a private airstrip, an airport land use plan, or where such a plan has not been adopted within 2 miles of a public airport or public use airport, construction contracts shall include requirements for the contractor to prepare a construction safety plan. The plan shall be developed before construction activities begin, in collaboration with aviation base personnel, to coordinate construction activities including a schedule, coordination of personnel with aviation radios, and notice requirements. Furthermore, the contractor shall coordinate with emergency service personnel.

Implementing Mitigation Measure NOISE-3 would reduce this impact to a **less-than-significant** level.

Effects of Constructed Facilities (Natural or Artificial Infrastructure) and Operations and Maintenance of those Facilities

Routine O&M activities for facilities constructed for restoration projects permitted under the Order could be located within the vicinity of a private airstrip, an airport land use plan, or where such a plan has not been adopted, within 2 miles of a public airport or public use airport. Depending on their location, these projects could expose people working in the project area to excessive noise levels. However, routine O&M activities (e.g., vegetation clearing, debris removal, monitoring) would be limited and temporary, occurring yearly, monthly, weekly, or on an as-needed basis, depending on the restoration project. As stated above, restoration projects permitted under the Order would not include occupied structures; therefore, exposure of people residing in the area to excessive noise levels is not applicable.

The level of significance for potential impacts depends, in large part, on its proximity to an airport use plan, or on the project's location within 2 miles of a public airport or public use airport. However, because O&M activities would be temporary, this impact would be **less than significant**.